

2017-18

The following colour represents the syllabus revision, skill, employability and entrepreneurship.

Green : Skill

Pink : Employability

Sky : Entrepreneurship

**CENTURION UNIVERSITY OF TECHNOLOGY
& MANAGEMENT:: PARALAKHEMUNDI
ODISHA**

CHOICE BEASED CREDIT SYSTEM

COURSE STRUCTURE & SYLLABUS

BASKET I

[With effect from 2016-17 Admitted Batch]



**Centurion
UNIVERSITY**

*Shaping Lives...
Empowering Communities...*

School of Engineering & Technology

2016

BASKET - I
(Basic Sciences)

<i>Course Code</i>	<i>Course Title</i>	<i>Course Type</i>	<i>Credits</i>	<i>Prerequisite</i>	<i>Department Offering</i>
<i>FCBS0401</i>	<i>Applied Analytical Chemistry</i>	<i>Theory + Practice</i>	<i>3</i>	<i>Nil</i>	<i>Chemistry</i>
<i>FCBS0402</i>	<i>Industrial Chemistry</i>	<i>Theory + Practice</i>	<i>3</i>	<i>Nil</i>	<i>Chemistry</i>
<i>FCBS0403</i>	<i>Applied Engineering Materials</i>	<i>Theory + Practice</i>	<i>3</i>	<i>Nil</i>	<i>Chemistry</i>
<i>FCBS0404</i>	<i>Electricity and Magnetism</i>	<i>Theory + Practice</i>	<i>4</i>	<i>Nil</i>	<i>Physics</i>
<i>FCBS0405</i>	<i>Basic Mechanics and Properties of Matter</i>	<i>Theory + Practice</i>	<i>4</i>	<i>Nil</i>	<i>Physics</i>
<i>FCBS0406</i>	<i>Optics and Optical Fibres</i>	<i>Theory + Practice</i>	<i>4</i>	<i>Nil</i>	<i>Physics</i>
<i>FCBS 0101</i>	<i>Environmental Science</i>	<i>Theory</i>	<i>3</i>	<i>Nil</i>	<i>Chemistry</i>
<i>FCBS 0102</i>	<i>Differential Equations</i>	<i>Theory</i>	<i>3</i>	<i>Nil</i>	<i>Mathematics</i>
<i>FCBS 0103</i>	<i>Linear Algebra & Vector Calculus</i>	<i>Theory</i>	<i>3</i>	<i>Nil</i>	<i>Mathematics</i>
<i>FCBS 0104</i>	<i>Integral Transform</i>	<i>Theory</i>	<i>3</i>	<i>Nil</i>	<i>Mathematics</i>
<i>FCBS 0105</i>	<i>Complex Analysis</i>	<i>Theory</i>	<i>3</i>	<i>Nil</i>	<i>Mathematics</i>
<i>FCBS0106</i>	<i>Discrete Mathematics</i>	<i>Theory</i>	<i>3</i>	<i>Nil</i>	<i>Mathematics</i>

SYLLABUS

FCBS0401 APPLIED ANALYTICAL CHEMISTRY

<i>Pre-requisite</i>	<i>Course Type</i>	<i>Credits</i>
<i>Nil</i>	<i>Theory + Practice</i>	<i>3</i>

Course Objective

The aim of this course is to give students that are going to carry out an experimental work the necessary comprehension in analytical chemistry.

The course will also provide the student with knowledge to be able to understand and critically evaluate experimental data produced by others.

Module-1

Water Analysis: Importance of water, different types of water, sources and uses of water, types of water pollutants and domestic and industrial significance of analysis of water. Removal of hardness by Lime-Soda, Zeolite and Ion exchange methods. Removal of DO and dissolved CO₂ from water by De-aeration method. Desalination of brackish water by Reverse osmosis and electro dialysis process. Water disinfection by bleaching powder, liquid Cl₂, and chloramine.

Practice:

1. Determination of total hardness by EDTA method, total dissolved solids, total alkalinity
2. Determination of Turbidity by nephelometer, pH, Conductivity.
3. Determinations of BOD, COD, DO.

NB: The above parameters can also be determined by using water kits and the results are to be compared with those obtained manually.

Module-2

Soil Analysis: Composition of rocks and minerals, soil profile and properties.

Practice:

1. Determination of texture of soil.
2. Determination of moisture content in a soil sample, pH, electrical conductivity,
3. Determination of water holding capacity of soil.
4. Measurement of Calcium and Magnesium Using EDTA methods.

Module-3

Chemistry of fuels: Classification of fuels, composition and properties of Petroleum, LPG, Water gas, producer gas, CNG. Knocking – Mechanism of knocking, harmful effects, Anti knocking agents – TEL, Catalytic converters – Principle & working, Unleaded petrol, Power alcohol & Biodiesel. Photovoltaic cells - construction & working of a PV cell

Practice:

1. Proximate analysis of fuel (Coal, biomass etc.) Moisture, Volatile content, Ash, fixed carbon
2. Testing of fuel properties of the plastic oil and bio diesel: Specific gravity by picnometer, flash point and fire point by pesky-Marten flash point apparatus, viscosity by Redwood viscometer, calorific value by bomb calorimeter

Course outcome

Explain fundamental principles for environmental analytical methods (titration, electro-chemistry, instrumentation and basic parameters of water, soil, fuel etc)

Point out suitable analytical techniques for analyzing a specific compounds in an environmental matrix

*Point out suitable techniques for sampling and handling of environmental samples
 Apply quality control on chemical analysis and laboratory work and explain its importance
 Plan and carry out laboratory experiments, including data analysis and conclusions
 Describe simple approaches for troubleshooting*

FCBS0402 INDUSTRIAL CHEMISTRY

<i>Pre-requisite</i>	<i>Course Type</i>	<i>Credits</i>
<i>Nil</i>	<i>Theory + Practice</i>	<i>3</i>

Course Objective

Students may also explore in depth specialized areas of chemistry of materials, including ores, metals, cement as well as dyes, oils, soaps

Introduce the students to industrial processing principles as applicable to chemical and allied industries.

Provide the students with the knowledge of how raw materials are sourced for various chemical industries and how these materials are processed.

Provide students with advanced technical skills in Chemical Engineering that will enable them to (a) translate fundamental discoveries in materials and other high technology areas to commercial exploitation, and (b) adapt readily to the challenges presented in a diverse range of industrial sectors that can benefit from process engineering approaches.

Module 1: Preparation of soap, dyes and oil analysis :

Introduction: Types of soap (soft and hard soap), methods of preparation of soap, mechanism, difference between fats and oils, physical properties of fats and oil, general introduction to chemistry of dye, various example of dyes, types of dyes.

Practice:

Preparation of soap by saponification

Determination of the properties different type of soap

1. pH test

2. Foam test

Hard water test

Determination of iodine number of oil

Preparation of dyes (azo dyes): 2- naphthol + 4 - nitro aniline: salicylic acid + 4- nitro aniline

Preparation of Phenyle.

Applications: Effect of water hardness in cleansing action of soap. Application of dyes to cloth

Module 2: Metals estimation from ores

Introduction: General introduction on ores, types of ore, important ore minerals, application of ores.

Practice:

Estimation of Cu in copper ore

Determination of Fe as ferrous iron in an ore sample

Determination of Zn in Zinc ore by EDTA complex metric method

Module 3: Analysis of cement

Introduction: what is cement? types of cement, composition of cement, preparation of cement, applications.

Practice:

Estimation of calcium in Portland cement
 Cement hydration and pH evaluation during curing
 To check the quality of cement (colour, texture, smell test, float test, shape test and strength test)

Course outcome

Appreciate better their future roles as chemists in Industrial establishments

Be able to explain the origin of raw materials used in the chemical and allied industries

Have a good understanding of how chemical raw materials are processed into finished products.

Graduates find employment in, quality control, oil and petroleum industry, textile industry, dyes and paints industry, cement industry, just to name a few.

FCBS0403 APPLIED ENGINEERING MATERIALS

<i>Pre-requisite</i>	<i>Course Type</i>	<i>Credits</i>
<i>Nil</i>	<i>Theory + Practice</i>	<i>3</i>

Course Objective

To understand the importance of the chemical approach to nanomaterials

To study the preparation, analysis and applications of metal nanoparticles

To develop an understanding of conjugated polymers and their applications

To understand how polymer composition and architecture imparts unique properties and behavior

To study organic-inorganic hybrid materials (COMPOSITES) and how the incorporation of metals in the polymer architecture leads to new properties and applications

Module 1: Nano Materials:

Introduction, nano scale, applications in various fields.

Practice:

Synthesis of Ag, Au nano particles by wet chemical methods.

Synthesis of ZnO Nanoparticles by Precipitation Method

Synthesis of Cu nano particles Sonochemical method.

Synthesis of Fe nano particles Co-precipitation method.

Thickness measurement by sol-gel process of coating.

Module 2: Polymers

Introduction, types of polymers, Polymerisation mechanisms.

Practice:

Synthesis of Thiokol Rubber

Synthesis of a Rubber Ball from Rubber Latex

Synthesis of Polystyrene (PS)

Synthesis of Polymethyl Methacrylate (PMMA)

Synthesis of Nylon-6:6.

Determination of molecular weight of polymers by visometry method.

Module 3: Composites

Introduction :Biopolymers or synthetic polymers reinforced with natural or biofibers(termed as bio composites) as a viable alternative to glass fibre composites.Biocomposites“ refers to those composites that can be employed in bioengineering.Biocomposites are composite materials, that is, materials formed by a matrix (resin) and a reinforcement of natural fibers (usually derived from plants or cellulose). Bio composites are the combination of natural fibers (biofibers) such as wood fibers (hardwood and softwood) or non - wood fibers (e.g., wheat, kenaf, hemp, jute, sisal, and flax) with polymer matrices from both renewable and non-renewable resources.

Practice:

Synthesis of bio composite materials by using jute fibres and wood fibres

Course outcome

- Know what it takes to have a career in nanotechnology
- Understand the need to increase Nanotechnology awareness
- Understand the definition of Nanotechnology
- Know the processing of Nanoparticles and Nanomaterials
- Know the application of Nanotechnology and nanomaterials

FCBS0404 ELECTRICITY AND MAGNETISM

<i>Pre-requisite</i>	<i>Course Type</i>	<i>Credits</i>
<i>Nil</i>	<i>Theory + Practice</i>	<i>4</i>

Course Objective

- To understand electric circuit components and their use.*
- To learn and verify the fundamental laws of electricity, learn how to use certain electrical devices.*
- Understanding magnetic properties of matter and performing experiments to realize magnetism.*

Practice I

Theory:

Electric field, Potential, EMF, capacitance, resistance, series connection, parallel connection, Kirchhoff's laws, RC circuits, LC circuits.

Lab:

1. Use a Multi-meter for measuring (a) Resistance, (b) AC and DC Voltages, (c) DC Current, (d) Capacitance and (e) Checking electrical fuses.
2. To determine an unknown Low Resistance using Potentiometer.
3. To determine an unknown Low Resistance using Carey Foster's Bridge.

Practice II

Theory: Electrical Circuits: AC Circuits: Kirchhoff's laws for AC circuits. Complex Reactance and Impedance. Series LCR Circuit: (1) Resonance, (2) Power Dissipation and (3) Quality Factor, and (4) Band Width. Parallel LCR Circuit.

Lab:

1. To verify the Superposition, and Maximum power transfer theorems.
2. To determine self-inductance of a coil by Anderson's bridge.

- To study response curve of a Series LCR circuit and determine its (a) Resonant Frequency, (b) Impedance at resonance, (c) Quality factor Q, and (d) Band width.
- To study the response curve of a parallel LCR circuit and determine its (a) Anti-resonant frequency and (b) Quality factor Q.

PRACTICE III

Theory: Magnetic Properties of Matter: Magnetization vector (**M**). Magnetic Intensity (**H**). Magnetic Susceptibility and permeability. Relation between **B**, **H**, **M**. Ferromagnetism. B-H curve and hysteresis.

Electromagnetic Induction: Faraday's Law. Lenz's Law. Self Inductance and Mutual Inductance. Reciprocity Theorem. Energy stored in a Magnetic Field.

Lab:

- To study the induced e.m.f. as a function of the velocity of the magnet.
- Measurement of field strength B and its variation in a solenoid.
- Determination of ratio.

Course outcome

Realizing the importance and use of electrical components in a circuit.

Learning how to do different connections and their purpose.

Understanding magnetism of matter and its applications

Text Book:

- Electricity and Magnetism By K. K. Tiwari, S. Chand Publishing

References:

- Electricity and Magnetism, By M. C. Saxena, Satya Prakash, V. P. Arora, Publisher: Pragati Prakashan
- Introduction to Electrodynamics, by David J. Griffiths Prentice-Hall; 3 edition (2011)
- Electricity and Magnetism by - D. C. Tayal, Himalaya Publishing, 2009.

FCBS0405 BASIC MECHANICS AND PROPERTIES OF MATTER

<i>Pre-requisite</i>	<i>Course Type</i>	<i>Credits</i>
<i>Nil</i>	<i>Theory + Practice</i>	<i>4</i>

Course Objective

To give the students overall idea about material properties and also hands on experience to measure them.

To make them realize the applications of material properties.

To expose them to phenomena like hydrostatics, elasticity, viscosity, surface tension and their applications in various places.

Encouraging them to build simple models to explain the mechanical properties.

Theory:

Elasticity: Elastic constants, Relation among elastic constants, torsion of right circular cylinder, bending of beams, Vibration of loaded cantilever.

Lab:

- Young's modulus by single/double cantilever
- Young's modulus by Searle's method
- Rigidity modulus using Barton's apparatus
- Poisson's ratio

Practice II

Theory:

Hydrostatics: hydrostatic force on a body, buoyancy, metacentric height, hydrostatic pressure, pressure measurement: manometer

Viscosity: Viscosity of fluids, Stoke's law, terminal velocity, Poiseulle's equation, Searle's viscometer.

Surface tension & surface energy: Pressure difference across curved liquid surface.

Lab:

1. Viscosity by Stokes method
2. Viscosity by Poiseulle's method
3. Metacentric height of floating body
4. Measurement of Pressure by manometer
5. Surface tension by capillary rise method
6. Determination of surface tension by Quincke's method

Practice III:

Basic Mechanics

Theory: Kinematics and Kinetics, Effort amplification using levers and pulleys, Friction, Laws of friction.

Rotational Motion: Moment of Inertia, Theorem of Parallel and Perpendicular axes. Moment of inertia of circular disc.

Lab:

1. Effort-output ratio using combination of pulleys
2. Verification of laws of static and dynamic friction
3. Moment of inertia of fly wheel

Course outcome

To understand material properties and perform experiments on them.

To understand the applications of material properties in real life.

To be able to make small models for explain few mechanical properties.

Text Book:

1. *Elements of Properties of Matter, Dec 2010 by D.S. Mathur, S.Chand (G/L) & Company Ltd*

Reference Books:

1. *A Text Book of Fluid Mechanics by R.K. Bansal, Laxmi Publishers, 2005*
2. *Engineering Mechanics Statics and Dynamics by A. K. Tayal, Umesh Publications.*

FCBS0406 OPTICS AND OPTICAL FIBRE

<i>Pre-requisite</i>	<i>Course Type</i>	<i>Credits</i>
<i>Nil</i>	<i>Theory + Practice</i>	<i>4</i>

Course Objective

To understand optical phenomena.

To understand different light sources and their use

Understand designing of microscope and artificial light sources

Understanding optical fiber and its applications

Practice I

Theory: Reflection and refraction of light. Mirror formula, lens maker's formula. Refraction through a prism. Dispersion, light sources: Principle and operations of sodium lamp, mercury lamp and LASER.

Lab:

1. To determine refractive index of the Material of a prism using sodium source.
2. To determine the dispersive power and Cauchy constants of the material of a prism using mercury source.
3. To determine the refractive index of glass slab using travelling microscope.
4. Designing of a compound microscope.

Practice II

Theory: Interference. Young's experiment, conditions for interference, Intensity distribution of fringes, Interference in thin films, Newton's rings.

Diffraction: types of diffraction, Fraunhofer diffraction at a single slit, diffraction at N-parallel slits and plane diffraction grating.

Polarization: Polariser and analyser, optical rotation and Polarimeter

Lab:

1. Determination of wavelength of light by Newton's ring method.
2. Determination of wavelength of LASER source by diffraction grating method
3. Thickness of thin paper by wedge-shaped films
4. Dispersive power and resolving power of a plane diffraction grating.
5. Polarimetry

Practice-III

Theory: Optical properties—scattering, refraction, reflection, transmission & absorption. Introduction, principle of Laser, stimulated and spontaneous emission, Coherence (temporal and spatial) Ruby Laser, Application of Lasers.

Optical Fibres: Introduction, numerical aperture, step index and graded index fibres, attenuation & dispersion mechanism in optical fibers (Qualitative only), application of optical fibres, optical communication (block diagram only)

Lab:

1. Measurement of attenuation and bending losses of an optical fibre.
2. Measurement of numerical aperture of an optical fibre
3. Study of spatial and temporal coherence of LASER
4. Making of a light guide

Course outcome

Students should understand optical phenomena.

Students should learn about different light sources and their use

Students should be able to understand optical fiber principle, operations and its applications.

Text Book:

1. *A Text Book of Optics* by M.N. Avadhanulu, Brij Lal, N. Subrahmanyam, S Chand; 23rd Rev. Edn.

References:

2. *Optics* by Ajoy Ghatak, McGraw Hill Education; 5 edition
3. *Physics-I for engineering degree students* by B.B. Swain and P.K.Jena.
4. *Concepts in Engineering Physics* by I Md. N. Khan.

FCBS0101 ENVIRONMENTAL SCIENCE

<i>Pre-requisite</i>	<i>Course Type</i>	<i>Credits</i>
<i>Nil</i>	<i>Theory</i>	<i>2</i>

Course Objective:

1. *To understand the concept of multi-disciplinary nature of Environmental Science where different aspects are dealt with a holistic approach.*
2. *Students will develop a sense of community responsibility by becoming aware of environmental issues in the larger social context.*
3. *One must be environmentally educated.*

MODULE-I

Environment and its multidisciplinary nature; Need for public awareness; Renewable and non-renewable resources—forest, water, mineral, land, food and energy resources; Structure and function of ecosystems of forest, grass land, desert and aquatic types.

MODULE -II

Biodiversity and its conservation: Biodiversity at global, national and local levels; Threats to biodiversity - Habitat loss; wild life poaching and man - wildlife conflicts; Endangered and endemic species; conservation measures.

Causes, effects and control measures of pollution, air, water and noise pollution; Nuclear hazards; solid-waste management—Causes, effects and control measures; Management of disasters due to natural causes of floods, earthquakes, cyclones and landslides.

MODULE-III

Social issues and the environment; Sustainable environment, Water conservation measures; Rain water harvesting; Resettlement and rehabilitation of people; Climate change and global warming; Acid rain; Ozone layer depletion; water land reclamation; Consumerism and waste products; Features of Environment Protection Act, Air pollution and Control of Pollution Acts; Water Pollution and its Control Act. Effects of Pollution explosion on environment and public health; Need for value education to Protect environment and resources.

Course Outcome:

1. Understand the natural environment and its relationships with human activities.
2. Characterize and analyze human impacts on the environment.
3. Integrate facts, concepts, and methods from multiple disciplines and apply to environmental problems.
4. Design and evaluate strategies, technologies and methods for sustainable management of environmental systems and for the remediation or restoration of degraded environments.

Text Book: Anubhav Kaushik & C.P. Kaushik : Environmental Studies-New age International Publishers.

Reference Books:

1. Benny Joseph : Environmental Studies-Tata Mac Graw Hill
2. E. Bharucha : Text book of Environmental Studies for Under graduate courses– Universities Press. (Book prepared by UGC Committee.

FCBS0102 DIFFERENTIAL EQUATIONS

<i>Pre-requisite</i>	<i>Course Type</i>	<i>Credits</i>
<i>Nil</i>	<i>Theory</i>	<i>3</i>

Course Objectives:

- 1) To understand most of the physical phenomena from Science and Engineering which are modeled by differential equations.
- 2) To find and interpret the solutions of the ODE & PDE appearing in signal systems, dynamical systems, stability theory and a number of applications to scientific and engineering problems.
- 3) To develop the ability to apply differential equations to significant applied and/or theoretical problems.

Course Outcomes: Upon successful completion of this course, the student will be able to:

- 1) Learn fundamental concepts of ODE & PDE theories and where and how such equations arise in applications to scientific and engineering problems.
- 2) Be competent in solving linear/non-linear 1st & higher order ODEs & PDEs using analytical solution methods to obtain their exact solutions.
- 3) Recognize the major classification of ODEs & PDEs and the qualitative differences between the classes of equations.

MODULE-I (12 Hours)

First Order Differential Equations: Separable Equations, Homogeneous & Non-homogeneous Equations, Exact Differential Equations, Integrating Factor, Linear Differential Equations, Bernoulli Equation.

MODULE-II (15 Hours)

Second & Higher Order Linear Differential Equations: Linear Dependence and Independence of Solutions, Wronskian, Constant Coefficient Homogeneous Equations, Cauchy-Euler Equation, Non-homogeneous Equations, Method of Variation of Parameter, Method of Inverse Operator, Legendre Equation.

MODULE-III (15Hrs)

Partial Differential Equation of First Order, Linear and Non-linear Partial Differential Equations, Charpit's Method, Homogeneous and Non-homogeneous Linear Partial Differential Equations with Constant Coefficients, Cauchy Type Differential Equation.

Text Book:

1) *Higher Engineering Mathematics* by B.V. Raman Publisher: TMH
Chapters: 8 (8.1 to 8.10); 9 (9.1 to 9.7), 18 (18.1 to 18.8)

Reference Book:

1) *Advanced Engineering Mathematics* by P.V.O' Neil Publisher: Thomson

FCBS0103 LINEAR ALGEBRA & VECTOR CALCULUS

<i>Pre-requisite</i>	<i>Course Type</i>	<i>Credits</i>
<i>Nil</i>	<i>Theory</i>	<i>3</i>

Course Objectives:

1. To apply concepts of Linear Algebra & Vector Calculus to the problems related to models in work, circulation and flux Problems, hydrodynamics and fluid dynamics, electrical circuits, networking, linear programming, graph theory, computer graphics, cryptography, thermodynamics, construction of curves and surfaces through specified points etc.
2. To solve the system of linear equations appearing in the problems of electrical engineering, mechanical engineering, applied mechanics etc.
3. To apply vectors in higher dimensional space in experimental data, storage and warehousing, electrical circuits, graphical images, mechanical systems and in physics.

Course Outcomes: Upon successful completion of this course, the student will be able to:

1. Use matrix operations to solve systems of linear equations and be able to determine the nature of the solutions.
2. Compute with the characteristic polynomial, eigenvalues, eigenvectors and eigenspaces of a matrix as well as the geometric and the algebraic multiplicities of an eigenvalue and then to diagonalise that matrix.
3. Determine the important quantities associated with scalar and vector fields.

MODULE-I (14 Hours)

Linear Algebra, Basic Concepts, Linear System of Equations, Solution by Gauss Elimination, Conditions of Existence and Uniqueness of Solutions, Rank of a Matrix, Determinants and Cramer's Rule, Linear Dependence and Independence.

MODULE-II (14 Hours)

Eigen Values and Eigen Vectors, Basis, Symmetric, Skew-Symmetric and Orthogonal Matrices, Complex Matrices, Similarity of Matrices, Diagonalization.

MODULE-III (14 Hours)

Vector Differential Calculus: Vector Algebra, Inner Product, Vector Product, Vector & Scalar Functions and Fields, Derivatives, Gradient of a Scalar Field, Directional Derivative, Divergence of a Vector Field, Curl of a Vector Field.

Text Book:

1) *Advanced Engineering Mathematics* by E. Kreyszig Publisher: Johnwiley & Sons Inc-8th Edition
Chapters: 6 (6.1 to 6.6); 7 (7.1, 7.3 to 7.5), 8 (8.1 to 8.4, 8.9 to 8.11)

Reference Books:

- 1) *Advanced Engineering Mathematics* by P.V.O' Neil Publisher: Thomson
- 2) *Mathematical Methods* by Potter & Goldberg ; Publisher : PHI

FCBS0103 INTEGRAL TRANSFORM

<i>Pre-requisite</i>	<i>Course Type</i>	<i>Credits</i>
<i>Nil</i>	<i>Theory</i>	<i>3</i>

Course Objectives: To describe the ideas of Fourier and Laplace Transforms and indicate their applications in the fields such as Signal & System, Digital Signal Processing, Image Processing, Theory of Control Systems, Differential Equations and many others.

1. To use Fourier series for solving boundary value problems appearing in scientific & engineering problems.
2. To get acquainted with the fact that the Laplace transform is related to the Fourier transform, but the Fourier transform expresses a function or signal as a series of modes of vibration (frequencies), whereas the Laplace transform resolves a function into its moments.

Course Outcomes: Upon successful completion of this course, the student will be able to:

1. Obtain Laplace transform of simple functions, functions expressed in graphical form, integrals and derivatives.
2. Solve differential & integral equations with initial conditions using Laplace transform.
3. Compute the Fourier series representation of a periodic function, in both exponential and sine-cosine forms.
4. Evaluate the Fourier transform of a continuous function and be familiar with its basic properties.

MODULE-I (16 Hours)

Laplace Transforms, Transforms of Derivatives and Integrals, Derivatives and Integrals of Transforms, Shifting Properties, Unit Step Function, Dirac's Delta Function, Convolution, Inverse Transforms, Solution to Differential Equation, Integral Equation.

MODULE-II (12 Hours)

Periodic Functions, Trigonometric Series, Fourier Series, Fourier Expansion of Functions of any Period, Even and Odd Functions, Half Range Expansions,

MODULE-III (14Hrs)

Fourier Integrals: Fourier Sine Integral, Fourier cosine Integral. Fourier Transforms: Fourier Sine Transform, Fourier Cosine Transform.

Text Book:

Advanced Engineering Mathematics by E.Kreyszig
 Publisher: Johnwiley & Sons Inc-8th Edition
 Chapters: 5 (5.1 to 5.6); 10 (10.1 to 10.4, 10.8, 10.9)

Reference Books:

- 1) *Advanced Engineering Mathematics* by P.V.O'Neil .Publisher: Thomson
- 2) *Higher Engineering Mathematics* by B.V.Raman .Publisher: TMH

FCBS0105 COMPLEX ANALYSIS

<i>Pre-requisite</i>	<i>Course Type</i>	<i>Credits</i>
<i>Nil</i>	<i>Theory</i>	3

Course Objectives:

- 1) *To understand the application of Complex Analysis to Two-Dimensional problems in Physics including Hydrodynamics and Thermodynamics and also in Engineering fields such as; Nuclear, Aerospace, Mechanical and Civil engineering, signal processing & communications.*
- 2) *To acquire the skill of contour integration to evaluate complicated real integrals appearing in Engineering problems via residue calculus.*

Course Outcomes: Upon successful completion of this course, the student will be able to:

- 1) *To get equipped with the understanding of the fundamental concepts of functions of a complex variable along with the concepts of analyticity, Cauchy-Riemann relations and harmonic functions.*
- 2) *Evaluate complex contour integrals applying the Cauchy integral theorem, Cauchy integral formula and Residue theorem.*
- 3) *Illustrate the applications of the calculus of residues in the evaluation of real integrals.*

MODULE-I (14 Hours)

Complex Analysis: Analytic Function, Cauchy-Riemann Equations, Laplace Equation, Harmonic Function, Linear Fractional Transformation.

MODULE-II (14 Hours)

Parametric representation , Line Integral in the Complex plane, Cauchy's Integral Theorem, Cauchy's Integral Formula, Derivatives of Analytic Function.

MODULE-III (14Hrs)

Power Series, Taylor's Series, Maclaurin Series, Laurent's Series, Singularities and Zeroes, Residue Theorem, Residue Integration Method, Evaluation of Real Integrals.

Text Book:

1) *Advanced Engineering Mathematics* by E. Kreyszig Publisher: Johnwiley & Sons Inc-8th Edition
 Chapters: 12 (12.1 to 12.4 ,12.9) ; 13, 14 (14.2,14.4) & 15.

Reference Books:

- 1) *Advanced Engineering Mathematics* by P.V. O'Neil Publisher: Thomson
- 2) *Fundamentals of Complex Analysis (with Applications to Engineering and Science)* by E.B. Saff & A.D. Snider Publisher: Pearson

FCBS0106 Discrete Mathematics

<i>Pre-requisite</i>	<i>Course Type</i>	<i>Credits</i>
<i>Nil</i>	<i>Theory</i>	<i>3</i>

Course Objectives:

1. To learn a particular set of mathematical facts and to apply their applications in many subjects of Computer Science and Engineering such as Cryptography, Theory of Computation & Data Networking.
2. To understand mathematical reasoning in order to read, comprehend and construct mathematical arguments as well as to solve problems, occurred in the development of programming languages.
3. To work with discrete structures such as graphs to study the structure of the world wide web, to model a computer network and to find the shortest path between two places in a transportation network.

Course Outcomes: Upon successful completion of this course, the student will be able to:

1. Evaluate elementary mathematical arguments and identify fallacious reasoning.
2. Apply the logical structure of proofs and work symbolically with connectives and quantifiers to produce logically valid, correct and clear arguments.
3. Reformulate statements from common language to formal logic. Apply truth tables and the rules of propositional and predicate calculus.
4. Model and solve real-world problems using graphs, both quantitatively and qualitatively.

MODULE-I (12 Hours)

Propositional Logic, Propositional Equivalence, Predicates and Quantifiers, Nested Quantifiers, Rules of Inference, Recurrence Relations, Solving Linear Recurrence Relations.

MODULE-II (16 Hours)

Relations and its properties, Representation of Relations, Closure of Relations, Equivalence Relations and Partitions, Partial Ordering, POSet, Hasse Diagram, Maximal & Minimal elements of a Poset, Supremum & Infimum of a Poset, Lattice, Basic properties of Lattices.

MODULE-III (14Hrs)

Introduction to Graph Theory, Graph terminology, Representation of graphs, Graph Isomorphism, Connectivity, Euler and Hamiltonian Paths, Planar graph, Graph Coloring,

Text Books:

- 1 *Discrete Mathematics and its Applications* by K.H.Rosen Publisher: TMH, Sixth Edition Chapters:1(1.1 to 1.5) ; 6 (6.1, 6.2) ; 7; 8(8.1 to8.5, 8.7, 8.8)
- 2 *Elements of Discrete Mathematics* by C.L.liu & D.P. Mohapatra Publisher: TMH, Third Edition Chapter: 11 (11.1 to 11.4)

Reference Books:

- Discrete and Combinatorial Mathematics* by R.P.Grimaldi Publisher: Pearson
Discrete Mathematics and Applications by Thomas Koshy Publisher: Elsevier
Discrete Mathematical Structures by B. Kolman, R.C. Busby & S. Ross Publisher: PHI

2017 CURRICULUM**COURSES OFFERED BY DEPARTMENT OF HUMANITIES AND MANAGEMENT****BASKET - II**

Course Code	Course Title	Course type	Credits	Prerequisite	Department Offering
<i>FCHU1201</i>	<i>Foundations of English Communication</i>	<i>Workshop</i>	<i>2</i>	<i>Nil</i>	<i>Humanities</i>
<i>FCHU1202</i>	<i>Communicative Practice Laboratory -I</i>	<i>Workshop</i>	<i>2</i>	<i>Nil</i>	<i>Humanities</i>
<i>FCHU1203</i>	<i>Business Communication</i>	<i>Workshop</i>	<i>2</i>	<i>Nil</i>	<i>Humanities</i>
<i>FCHU1204</i>	<i>Communicative Practice Laboratory-II</i>	<i>Workshop</i>	<i>2</i>	<i>Nil</i>	<i>Humanities</i>
<i>FCHU1205</i>	<i>Corporate Readiness Laboratory</i>	<i>Workshop</i>	<i>2</i>	<i>Nil</i>	<i>Humanities</i>
<i>FCHU1206</i>	<i>IT Enabled Communication</i>	<i>Workshop</i>	<i>2</i>	<i>Nil</i>	<i>Humanities</i>
<i>FCHU1207</i>	<i>Career Communication</i>	<i>Workshop</i>	<i>2</i>	<i>Nil</i>	<i>Humanities</i>
<i>FCHU1208</i>	<i>Personality Development</i>	<i>Workshop</i>	<i>2</i>	<i>Nil</i>	<i>Humanities</i>
<i>FCHU1209</i>	<i>Seminar and Technical Writing</i>	<i>Workshop</i>	<i>2</i>	<i>Nil</i>	<i>Humanities</i>
<i>FCHU1210</i>	<i>Professional Etiquette</i>	<i>Workshop</i>	<i>2</i>	<i>Nil</i>	<i>Humanities</i>
<i>FCHU1211</i>	<i>Creative Writing</i>	<i>Workshop</i>	<i>2</i>	<i>Nil</i>	<i>Humanities</i>
<i>FCHU1212</i>	<i>English for Competition (GRE/GMAT/TOEFL/IELTS)</i>	<i>Workshop</i>	<i>2</i>	<i>Nil</i>	<i>Humanities</i>
<i>FCHU0210</i>	<i>Life Skills Development (LSD) – I</i>	<i>Practice</i>	<i>2</i>	<i>Nil</i>	<i>Humanities</i>
<i>FCHU0211</i>	<i>Life Skills Development (LSD) – II</i>	<i>Practice</i>	<i>2</i>	<i>Nil</i>	<i>Humanities</i>
<i>FCHU0212</i>	<i>Life Skills Development (LSD) - III</i>	<i>Practice</i>	<i>2</i>	<i>Nil</i>	<i>Humanities</i>
<i>FCMG0101</i>	<i>Economics</i>	<i>Theory</i>	<i>2</i>	<i>Nil</i>	<i>Management</i>
<i>FCMG0102</i>	<i>Accounting & Finance</i>	<i>Theory</i>	<i>2</i>	<i>Nil</i>	<i>Management</i>
<i>FCMG0103</i>	<i>Management Processes and OB</i>	<i>Theory</i>	<i>2</i>	<i>Nil</i>	<i>Management</i>
<i>FCMG0104</i>	<i>Production and Operation Management</i>	<i>Theory</i>	<i>2</i>	<i>Nil</i>	<i>Management</i>
<i>FCMG0105</i>	<i>Marketing Management</i>	<i>Theory</i>	<i>2</i>	<i>Nil</i>	<i>Management</i>
<i>FCMG0108</i>	<i>Introduction to Research</i>	<i>Theory</i>	<i>2</i>	<i>Nil</i>	<i>Management</i>
<i>FCMG0113</i>	<i>Indian Society and Culture</i>	<i>Theory</i>	<i>2</i>	<i>Nil</i>	<i>Management</i>

FCMG1201	Disaster Management	Workshop	2	Nil	Management
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Note: The evaluation for Workshop type subject will be 100% internal by the concerned faculty.

SYLLABUS

FCHU1201 FOUNDATIONS OF ENGLISH COMMUNICATION

<i>Pre - requisites</i>	<i>Course Type</i>	<i>Credits</i>
<i>Nil</i>	<i>Workshop</i>	<i>2</i>

COURSE OBJECTIVES

To develop vocabulary and grammar knowledge

To develop reading comprehension skills

COURSE OUTCOMES

Development of academic and sub-technical vocabulary

Enhancement of basic language skills, i.e., listening, speaking, reading and writing

Development of grammatical competence

Confidence level improvement

This course aims to build the vocabulary, comprehension, and writing skills for effective communication in English language. It will focus on reading, listening to, and writing passages, as a means of Course communications skills.

The essential elements of this course will include:

MODULE-I: READING SKILLS (7hrs.)

Read **one** of the following books:

Animal Farm

Alice in Wonderland

Guide

Malgudi Days

Harry Potter

Amar Chitra Katha

Comprehension Skills: Students will respond to comprehension lessons from the chosen book.

MODULE-II: WRITING SKILLS (7hr.)

Students learn grammar and usage by writing passages, and getting formal feedback on these.

MODULE-III: LISTENING SKILLS (6hrs.)

Students respond to questions based on listening to videos, audio, or speaking assignments of classmates.

MODULE-IV: SPEAKING SKILLS (7hrs.)

Speaking assignments based on chosen book or contemporary topics.

TEXT BOOKS:

Esteras, Santiago Remacha and Fabre, Elena Marco. (2007). *Professional English in Use ICT Student's Book*. Cambridge: Cambridge University Press.

REFERENCES:

Grellet, F. (1981). *Developing Reading Skills*. Cambridge: Cambridge University Press

McCarthy, M. & O'Dell, F. (2008). *Academic Vocabulary in Use*. Cambridge: Cambridge University Press.

Ur Penny, (1992). *Five-Minute Activities: A Resource Book of Short Activities (Cambridge Handbooks for Language Teachers)*. Cambridge: CUP

F Klippel. (1984). *Keep Talking*. Cambridge: CUP

EVALUATION SYSTEM (CONTINUOUS INTERNAL ASSESSMENT)

Methods	Convers-ation	Listening Comprehension	Book Review Presentation	Vocab.	Mid-I (Presentation)	Mid-II (Online) Common Errors	Mid-III (Written)	% of Marks 100(Best 5)
Total	20	20	20	20	20	20	20	100

S. No.	Topic	Pedagogy	Details	Instructional Hrs			
				Th	Pract	video	Proj
1	Getting to Know Each Other	Activity Based Learning	Catch the Ball Introductions Ice-breaker Share an interesting fact, stories, questions, memories, embarrassing moments or sometimes relevant to the context. Useful link: http://www.icebreakers.ws/small-group/catch-ball-introductions-icebreaker.html	0	1	0	0
2	Conversation Practice	Pair work using Realia	Formulaic Expressions Doing Things with Words/ Objects Description: Student practice real life situations like using maps, asking for directions, small talk on weather, holidays, parties and eating out.	0	1	1	0
3	Formal and Informal Communication	Degrees of Formality	Worksheet: Ask the students to work in small groups of 2/3. They must read through the phrases in the table, deciding whether each phrase is formal or informal in conversation a conversation situation. When they have finished, review the exercise as a class (answers provided in the worksheet)	0	1	1	0

S. No.	Topic	Pedagogy	Details	Instructional Hrs			
				Th	Pract	video	Proj
4	Shadowing	Pronunciation – intonation, stress, pause	Find an Audio to Listen & Repeat – BBC News, Seminar Talk, Ted Talk etc. https://www.youtube.com/watch?v=GVWFGIyNswI	0	1	1	0
5	Speech Acts	Plain English	Students can 'become' anyone they like for a short time! They will be encouraged to come forward and perform small speech acts and role-plays.	0	1	0	0
6	Ask Me Questions Challenge	Questions & Responses	Individual to respond- the whole class to ask questions. In this session, a student will learn communication management.	0	1	0	0
7	TED Talk Listening	Listening Comprehension	Ice-breaker: Talkathon Assignment: In groups of 4, you are going to create/write 10 questions about the TED Talk	0	1	1	0

			Afterwards, the groups of 4 will split up in new groups of 4 to discuss and compare their questions. <i>Comprehension Test</i>				
8	Ted Talks	Communication & Confidence Body Language	Listen to a Ted Talk & make a presentation on a popular/contemporary topic	0	1	1	0
9	Reading Comprehension Strategies - 1	Pre-reading	Students are encouraged to read any two books in the first semester. [Animal Farm/Old Man and The Sea/ Guide/Malgudi Days/Amar Chitra Katha]	0	1	1	0
10	Reading Comprehension Strategies - 2	Mid - reading	Students respond to comprehension lessons from the chosen books. [Comprehension Passages, Gap filling and Sentence Completion]	0	1	1	0
11	Reading Comprehension Strategies - 3	Post Reading	Students respond to comprehension lessons from the chosen books. [Summarizing/ Narrating/ Enacting/Vocabulary Quiz/]	0	1	0	0
12	Book Review	Writing Short Passages/ Paragraphs	Write a review of your favorite book in at least 250 words. Mention 3 specific learnings and 3 distinct ways in which you plan to incorporate them in your life. To choose from the recommended books.	0	1	0	0
13	News Reading	7 Cs of Communication	Group Activity: Campus/ National News Reading Students read notice boards and visit departments Prepare campus news headlines Present in the class	0	1	0	0

S. No.	Topic	Pedagog	Details	Instructional Hrs			
				Th	Pract	video	Proj
14	Writing to the Point	Word Usage and Sentence Structure Main Idea, Coherence & Cohesion	Each group is seated in a circle. In this activity, the leader of each group cannot see (either blind or blind fold using a handkerchief), but can hear the peer voice. Ask the leader to flip through the pages, and put the finger randomly on fifteen words from the chosen book in five minutes. The other participates copy the words that are closest to the finger. This time bound activity increases the curiosity of the students and engages them in exciting communication and completion of the task. Then, I ask the students to shape the randomly chosen disconnected words into a short poem/story/essay by adding a title to it. <i>Read Out Loud in the Class</i>	0	1	0	0

15	Word Power	Synonyms & Antonyms	App: SPEAK ENGLISH	0	1	1	0
16	Homonyms	Some confusing words Minimizing errors through discussions	Activity: Select the correct option, Use the confusables in sentences to bring out their meaning	0	1	0	0
17	Reading and Writing about visuals	Useful Expressions	Presentation about visuals Task: Selecting information from a visual	0	1	0	0
18	Word Formation	Word structure Word hunt Vocabulary explorations	Group Activity: Students make word clouds	0	1	0	0
19	Vocabulary Building	Descriptive words	Activity : Describe yourself/ your favorite person using 5 descriptive words	0	1	0	0
20	Listen to Popular Songs	Verb tense and aspect of grammar Vocabulary Idioms and expressions	Listen to the song with lyrics Ask questions about the title Gap Filling Exercises	0	1	0	0
21	Vocabulary Development	Word Power	Quiz/ Puzzle	0	1	0	0
22	Grammar	Common Errors	Surprise Quiz && debriefing	0	1	0	0
23	Grammar	Correct Usage	Easy Grammar App-Practice Sets	0	1	0	0
24	English Language Enhancement-I	Tenses	Usage, Question and explanation Fill in the blanks	0	1	0	0
25	English Language Enhancement -II	Active and Passive	I am passive..../I am active activity	0	1	0	0
26	English Language Enhancement-III	Reported Speech	Assignment & debriefing	0	1	0	0
27	English Language Enhancement -IV	Subject-verb agreement	Online Quiz & debriefing	0	1	0	0
28	Learn Grammar with Fun	Conditionals	Activity: The whole class is divided into The Zero Conditional, The First conditional, The Second conditional, and The Conditional to perform the task	0	1	0	0

FCHU1202 COMMUNICATIVE PRACTICE LABORATORY –I

<i>Pre - requisites</i>	<i>Course Type</i>	<i>Credits</i>
<i>Nil</i>	<i>Workshop</i>	<i>2</i>

The language laboratory acts as a platform for learning, practicing and producing language skills through interactive lessons and communicative mode of teaching.

COURSE OBJECTIVES

To expose the students to a variety of self- instructional, learner- friendly modes of language learning.

To enable them to learn better pronunciation through stress on word accent, intonation, and rhythm.

To maintain good linguistic - through accuracy in grammar, pronunciation and vocabulary.

COURSE OUTCOMES

Ability to communicate fluently in different business situation

Effective oral and written communication

Appropriate word usage with correct pronunciation

Clarity of word stress and intonation

A student is required to take up five lab tests of 100 marks- three tests in spoken mode and two tests in written mode.

MODULE-I: FRIENDLY COMMUNICATION (9 HOURS)

Doing Things with Words: To ask for information, help, permission; To instruct, command, request, accept, refuse, prohibit, persuade

Practice of Formulaic Expressions: Greetings, farewells, introductions, thanks, apologies, regrets, good wishes, congratulations, condolences, offers.

Conversation Practice in familiar and unfamiliar situations

(This module will be practiced through conversation activities in pairs & groups)

MODULE-II: GRAMMAR AND VOCABULARY (9 HOURS)

The focus will be on the appropriate usage of language.

Elimination of common errors

Editing passages

Word power A-Z: Easy and quick techniques

Vocabulary building exercises

(Open Source Language Laboratory will be used to take quizzes and practice grammar & vocabulary)

MODULE-III: PHONETICS AND SPOKEN ENGLISH (12 HOURS)

Students will be trained to find out the correct pronunciation of words with the help of a dictionary /software, to enable them to monitor and correct their own pronunciation.

Pronunciation Guidelines: Consonants and Vowels

Pronunciation practice (for accent neutralization), particularly of problem sounds, in isolated words as well as sentences

Speaking Techniques: Using correct stress patterns, developing voice quality

Rhythm and Intonation

(Reading aloud of dialogues, speeches etc. for practice in pronunciation)

(In this module, the learners will use video series from BBC & Sky Pronunciation Suite to improve spoken English)

TEXT BOOKS:

Dwyer, J. (2000). *The Business Communication Handbook*. New Jersey: Prentice Hall.

REFERENCES:

Brown, G & Yule, G. (1983). *Teaching the Spoken Language*. Cambridge: Cambridge University Press.

Brown, H. D. (1994). *Teaching by Principles: An Interactive Approach to Language Pedagogy*. New Jersey: Prentice Hall.

EVALUATION SYSTEM (CONTINUOUS INTERNAL ASSESSMENT)

Methods	Role play	Speech Acts	Grammar Quiz	Story Telling	JAM	Vocabulary-Exercise	Vocabulary-Quiz	% of Marks 100(Best 5)
Total	20	20	20	20	20	20	20	100

SESSION PLAN: COMMUNICATIVE PRACTICE LABORATORY -1**MODULE I: FRIENDLY COMMUNICATION (9 HOURS)**

S. No.	Topic	Pedagogy	Details	Instructional Hrs.			
				Th	Prac	Video	Proj
Lab-1	Ice-Breaking/ Introductory Session	Name Game and Other Ice-breaking Activities	Knowing Each Other http://www.buzzle.com/articles/classroom-icebreaker-activities-for-students.html http://cutmlanguagelab.org/course/view.php?id=3	0	2	0	0
Lab - 2	Conversation Practice-I	Role Plays OSLL (Moodle)	Speech Acts/ Formulaic Expression http://cutmlanguagelab.org/course/view.php?id=3	0	2	0	0
Lab - 3	Conversation Practice-Ii	Small Skits	Small Skits Using Formulaic Expressions http://www.lazybeescripts.co.uk/Scripts/Results.aspx?iSh=5&iSk=1&iMR=11&iXR=15&iPo=2&i17=1&iAS=2&iPS=2 http://cutmlanguagelab.org/course/view.php?id=3	0	2	0	0

MODULE II: GRAMMAR AND VOCABULARY (12 HOURS)

S. No.	Topic	Pedagogy	Details	Instructional Hrs.			
				Th	Prac	Video	Proj
Lab-4	Elimination of Common Grammatical Errors	Quiz OSLL (Moodle)	Emphasis on Tense, Verbs, Modals, Conditionals, Active and Passive Voice, Statements, Questions and Responses, Articles, Preposition & Concord http://cutmlanguagelab.org/course/view.php?id=3 http://www.learnenglishfeelgood.com	0	2	0	0

Lab - 5	Document Makeover	Assignment OSL (Moodle)	Editing passages: Grammatical and Construction errors http://cutmlanguagelab.org/course/view.php?id=3	0	2	0	0
Lab - 6	Vocabulary Building- Word Power	Assignment and Online practice	http://a4esl.org/ http://cutmlanguagelab.org/course/view.php?id3	0	2	0	0
Lab - 7 & 8	Vocabulary Building	Assignment and Online practice	Synonyms, Antonyms, Homophones, One-Word Substitution, Phrasal Verbs http://www.majortests.com/word-focus/vocabulary-tests.php http://www.grammarbank.com/synonyms-antonyms-worksheet.html http://cutmlanguagelab.org/course/view.php?id3	0	2	0	0

MODULE-III: PHONETICS AND SPOKEN ENGLISH (12 HOURS)

S. No.	Topic	Pedagogy	Details	Instructional Hrs.			
				Th	Prac	Video	Proj
Lab -9	Phonetics-I	Online Practice OSL (Moodle)	Phonemic Transcription Using IPA Symbols, Stress Pattern in Words and Phrases http://usefulengish.ru/phonetics/practice-consonants http://www.agendaweb.org/phonetic.html http://cutmlanguagelab.org/course/view.php?id=3 https://www.youtube.com/watch?v=htmkblboG9Q	0	1	1	0
Lab -10	Phonetics-Ii	Online Practice OSL (Moodle) Sky Pronunciation Suite	Rhythm and Intonation http://www.learning-english-online.net/areas/pronunciation/stress-and-intonation/ http://www.tolearnenglish.com/english_lessons/intonation-exercises http://cutmlanguagelab.org/course/view.php?id=3	0	2	0	0
Lab -11	Event Narration, Story Telling	Assignment	http://gdpi.hitbullseye.com/other-selection-tools-extempore.php http://cutmlanguagelab.org/course/view.php?id=3 http://grammar.about.com/od/developingessays/a/topnarrative07.htm	0	2	0	0

Lab -12	Speaking - Jam, Extempore	Activity Based OSLL (Moodle)	http://orelt.col.org/module/unit/3-practice-public-speaking http://cutmlanguagelab.org/course/view.php?id=3 https://www.youtube.com/watch?v=wV166cH5uQ https://www.youtube.com/watch?v=Mm-4T7qOS4	0	2	0	0
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FCHUI203 BUSINESS COMMUNICATION

<i>Pre - requisites</i>	<i>Course Type</i>	<i>Credits</i>
<i>Nil</i>	<i>Workshop</i>	<i>2</i>

COURSE OBJECTIVES

The course on Business Communication focuses on the basic skills required to be an effective communicator. It aims at imparting the communication skills that are needed in the academic and professional pursuits.

This is directed towards helping the students gain skills in comprehension, group discussions, presentations, interviews, active listening, technical writing and the ability to manage cross-cultural interactions. The focus is on the difficulty experienced by individual students, and the effort to explore a useful strategy for self-improvement. This is achieved through an amalgamation of lecture oriented approach of teaching with the task based skill oriented methodology of learning.

COURSE OUTCOMES

- Understand the differences between general communication and business communication*
- Development of basic language skills, i.e., listening, speaking, reading and writing*
- Effective participation in group discussion and job interviews*

MODULE-I: UNDERSTANDING COMMUNICATION IN BUSINESS (8 hrs.)

The module is a guide to organization communication. It is directed towards enabling students to develop the skills necessary to manage the human resources of their organization.

General Communication and Business Communication

Communication in Organizational Settings: Patterns of Communication in the Business World

– Upward, Downward, Horizontal Grapevine etc, Channels of Communication- Internal and External, Formal and Informal

Introduction to Cross Cultural Communication

Strategies to Overcome Communication Barriers

MODULE-II: READING AND WRITING (10 hrs.)

This unit works on the competency in reading and writing skills through such tasks/activities as reading books, articles, magazines, novels, developing outlines, key expressions, situations, slogan writing and theme building exercises, dialogue writing, interpreting pictures, technical writing.

Importance of Developing Reading Skills

Sub-Skills of Reading: Predicting Content, Skimming & Scanning, Topic sentence and supporting details, Inferential Reading, Guessing the Meaning of Unfamiliar Words, Note Making

Importance of Writing Skills and Principles of Effective Writing

Writing Process: Pre-writing, Drafting and Re-Writing

Paragraph Writing

Summaries and Abstracts

Business Correspondence: Writing Business Letters, E-mail Messages, Memo, Notice, Circulars, Reports, Proposals
 Career Communication: Writing Resume/ CV and Job Application Letter

MODULE-III: LISTENING AND SPEAKING (9 HOURS)

Listening is the mother of all speaking. This unit aims to achieve competence in speaking i.e., the ability to communicate orally in clear, coherent, and persuasive language appropriate to purpose, occasion, and audience. The module focuses on developing this competency which includes acquiring poise and developing control of the language through experience in making presentations to small groups, to large groups, and through the media.

Listening Skills: Listening Process, Hearing and Listening, Types and Barriers, Effective Listening Strategies

Common forms of Oral Communication in the Business World:

Meetings: Organize Meetings, Preparing an Agenda, Chairing a Meeting, Drafting Resolutions, Writing Minutes

Persuasive Speaking: Improving Fluency and Self-Expressions, Articulation, Good Pronunciation, Voice Quality

Making an Oral Presentation: Planning, Preparing and Delivery

Facing an Interview: Preparation, Types of Interview, Do's and Don'ts

Group Discussions: Debate and GD, Types of GD, GD Etiquette

(Treatment: Developing listening and speaking skills through various activities, such as role play activities, practicing short dialogues, JAM, group discussions, debates, speeches, listening to news bulletins, viewing and reviewing documentaries and short films etc.)

TEXT BOOKS:

An Introduction to Professional English and soft skills by B.K Das et al., Cambridge University Press

REFERENCES:

Effective Technical Communication, M. Ashraf Rizvi, TMH Publications.

Business Communication, Krizan. Merrier. Logan. Williams, Thomson

Business Communication Today, Courtland L Bovee, John V Thill&MukeshChaturvedi, Pearson Education.

Business communication by Meenakshi Raman and Prakash Singh (Oxford)

Business Communication, UrmilaRai& S.M Rai, Himalaya Publishing House

EVALUATION SYSTEM (CONTINUOUS INTERNAL ASSESSMENT)

Methods	Role Plays (Org. Comm.)	Reading Comprehension & Note –Making	Listening & Individual Presentation	GD	Mid-I (Online Test on Vocabulary)	Mid-II (Written exam on module 2)	Mid-III (Oral Presentation)	% of Marks 100(Best 5)
Total	20	20	20	20	20	20	20	100

SESSION PLAN: BUSINESS COMMUNICATION

S. No.	Topic	Pedagogy	Details	Instructional Hrs			
				Th	Pract	video	Proj
1	Introduction To Business Communication	Business games Written Assignment	What is Business Communication? General Communication vs. Professional Comm. Das, AIPE & SS,	0	1	0	0
2	General Communication & Business Communication	Audio-visual clips Communication on game-Change your style	Difference in Style Degrees of Formality pp. 6-7 http://christopherhouse.blogspot.in/2012/08/difference-between-business.html	0	1	0	0
3	Communication In Organisational Settings	Small group work Role Plays Quiz	Internal Communication: Formal Communication Network Informal Communication Network External Communication Raman, BC, pp- 13-21 http://keydifferences.com/difference-between-formal-and-informal-communication.html	0	1	0	0
4	Understanding The Importance Of Cross-Cultural Communications	Flip class-Match your points Role Plays	The Global Marketplace The Multicultural Workforce Krizen, BC, Chapter 2 & Bovee, BCT, pp. 63- 65 http://study.com/academy/lesson/cross-cultural-communication-definition-strategies-examples.html	0	1	0	0

S. No.	Topic	Pedagogy	Details	Instructional Hrs			
				Th	Pract	video	Proj
5	Improving Intercultural Sensitivity	Communication Games and activities	Recognise Cultural Differences Overcome Ethnocentrism Study other Cultures Overcome Language Barriers Develop Effective intercultural Skills Bovee, BCT, pp. 66-82	0	1	0	0
6	Over Coming Miscommunication	Workshop (Emphasis on listening skill)	The Information Gap principle Organizational Structure Difference in Status Incorrect Choice of Medium Message Complexity Cultural Differences Psychological Barriers Noise, and barriers http://www.businesscoachphil.com/overcoming-miscommunication-at-work Raman, BC, pp.22-27	0	1	0	0
7	Strategies For Improving	Good Listener Case Studies	Open Feedback, Simple Language, Avoid Overload, Walk the Talk	0	1	0	0

	Organisational Communication	Role plays & presentations	http://debo10199businesscommunication.blogspot.in/2012/02/strategies-for-improving-organizational.html Raman, BC, pp.34-40				
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MODULE II: READING AND WRITING

S. No.	Topic	Pedagogy	Details	Instructional Hrs			
				Th	Pract	video	Proj
8	Importance Of Developing Reading Skills & Reading Strategies	Reading News clips	The Importance of Developing Reading Skills Vocabulary Skills Word Meaning Recognition Guessing the Meaning from Word Structure and Context Guidelines for Improving Reading Skill Types of Reading Tips for Improving Reading Speed Rizvi, ETC, pp. 219- 224 http://www.nclrc.org/essentials/reading/stratread.htm	0	1	0	0
9	The Sub-Skills of Reading	Guessing Game	Understanding the Main Idea and Supporting Details Reading between the Lines: Inferential Reading Understanding the Writer's Point Of View Making Predictions · Guessing the Meanings of Unfamiliar Words · Skimming and Scanning Rizvi, ETC, pp. 228-250 http://literallycommunication.blogspot.in/2013/06/reading-skills-and-its-sub-skills.html	0	1	0	0
10	Note-Making	Topicalizing Schematising Use of Reduction Devices Methods of Sequencing Practice in Note	Mechanics of Note Making Note Writing Techniques Rizvi, ETC, pp.273-289 · http://www2.le.ac.uk/offices/ld/resources/study/notes	0	1	0	0

S. No.	Topic	Pedagogy	Details	Instructional Hrs			
				Th	Pract	video	Proj
11	Importance of Writing Skills	Tasks on small paragraphs Creative writing	Writing Process: Pre-writing, Drafting and Re-writing Idea Mapping Writing and Editing Rai, BC, pp. 182-192 http://smallbusiness.chron.com/importance-writing-skills-business-845.html	0	1	0	0

12	Paragraph Writing	Written Assignment Developing story outline	Unity in writing Topic sentence Chronological order of development Using Connectives Organizing a Paragraph Adequate Development of supporting details Cohesion & Coherence in a Paragraph Rizvi, ETC, pp.337-350 http://www.wikihow.com/Write-a-Paragraph	0	1	0	0
13	Summaries & Abstracts	Written Assignment based on guidelines	Differences between Abstract and Summary Procedure for Writing Abstracts Procedure for writing summary Rizvi, ETC, pp.290-307 http://www.uts.edu.au/current-students/support/helps/self-help-resources/academic-writing/abstract-and-executive-summary	0	1	0	0
14	Writing Business Letter & Proposal	Written Assignment based on guidelines	Purpose & goal Principles of effective letter writing: Courtesy and consideration, Directness and conciseness, Avoid verbosity, Participial endings, Positive and direct statements, Clarity and precision Structure and layout Rizvi, ETC, pp.351-365 & Raman, BC, PP.256-260 http://www.writing-business-letters.com/business-proposal-letter.html	0	1	0	0
15	Memo, Notice, Circulars & Email	Written Assignment based on guidelines	What is a Memo? Email writing format Characteristics of Effective Memo Difference between notice and circular Essentials of notice and notice format Rizvi, ETC, pp.423-436 http://www.umuc.edu/writingcenter/writingresources/effective_memos.cfm http://www.englishtransform.com/2014/04/difference-between-circular-memo-notice.html	0	1	0	0
16	Reports	Written Assignment based on guidelines	Definition and Types Deciding on Format and Length Structure / Parts of Formal Report Topics Covered in a Report Introduction, Body and Closing Krizen, BC, pp 259-303 & Rizvi, ETC, pp. 452-467 http://cgu.edu/pages/852.asp	0	1	0	0

TREATMENT: Tasks/activities as reading books, articles, magazines, novels, developing outlines, key expressions, situations, slogan writing and theme building exercises, dialogue writing, interpreting pictures, technical writing.

MODULE III: LISTENING AND SPEAKING

S. No.	Topic	Pedagogy	Details	Instructional Hrs			
				Th	Pract	video	Proj
17	Listening Skills	Effective Listening Strategies TED Talks: Listening and individual presentation	Listening Process Hearing and Listening Types and Barriers Rizvi, ETC, pp. 59-75 Video : https://www.youtube.com/watch?v=C8zNx_IarUw	0	1	0	0
18	Listening Attentively	News video clips and quizzing	Overall comprehension Extracting Detail information Listening between the lines Note taking Video https://www.youtube.com/watch?v=t2z9mdX1j4A	0	1	0	0
19	Persuasive Speaking	Inspirational audio-video clips for language improvement	Communication module for persuasive meeting Feed back Taking care of non-verbal elements Decoding message Handling noise Raman, BC, pp. 123- 169 & Rizvi, ETC, pp.195 -218 Video: https://www.youtube.com/watch?v=NBObNfR2n_4 Reference: http://www.speaking.pitt.edu/student/public-speaking/persuasive.html	0	1	0	0
20	Oral Presentation	Individual presentation on Events	Improving Fluency and Self-Expressions Articulation Good Pronunciation, Voice Quality Planning & Preparing your Oral Presentation Types of Delivery Guidelines for Delivery: Verbal elements, non-verbal elements, visual elements Practice delivery elements Controlling Nervousness and Stage freight Handling questions responsively narration/JAM Raman, BC, pp. 123- 169 & Rizvi, ETC, pp.195 -218 http://www4.caes.hku.hk/epc/presentation/VIDEO https://www.youtube.com/watch?v=WJIOzFLQ5w4	0	2	0	0
21	Group Discussions	GD Sessions on current/ social issues	Nature of Group Discussion Characteristics of Group Discussion Skills Selection Group Discussions Subject knowledge Oral communication skills Team management	0	2	0	0

			<i>Group Discussion Strategies</i> <i>Role Functions in Group Discussions</i> <i>Rizvi, ETC, pp 165-187</i> https://www.youtube.com/watch?v=ymcMo7JWSu8 http://placement.freshersworld.com/what-is-group-discussion/33122049				
22	<i>Group Discussions</i>	<i>GD Sessions on current/ social issues</i>	<i>Debate and GD</i> <i>Types of GD</i> <i>GD Etiquette</i>		1		
23	<i>Revision</i>	<i>TUTORIAL</i>	<i>Module - I</i>		1		
24	<i>Revision</i>	<i>TUTORIAL</i>	<i>Module - I</i>		1		
25	<i>Revision</i>	<i>TUTORIAL</i>	<i>Module - I</i>		1		

FCHU1204 COMMUNICATIVE PRACTICE LABORATORY –II

<i>Pre - requisites</i>	<i>Course Type</i>	<i>Credits</i>
<i>Nil</i>	<i>Workshop</i>	<i>2</i>

The suggestive assignments in the laboratory are intended as learning activities to facilitate the students in accomplishing the language skills which are needed to succeed in the business world.

COURSE OBJECTIVES

To master Study Skills

To acquire strategic competence to use both spoken & written language to use in a wide range of communication strategies

To acquire Business Performance Skills

COURSE OUTCOMES

The students will be able to

Write effectively for a variety of professional and social settings. They will practice writing as a process of motivated inquiry engaging others writers' ideas as they explore and develop their own. They will demonstrate an ability to revise for content and edit for grammatical and stylistic clarity. And they will develop an awareness and confidence in their own voice as a writer.

Become accomplished, active readers who appreciate ambiguity and complexity, and who can articulate their own interpretations with an awareness and curiosity for other perspectives.

Demonstrate the skills needed to participate in a conversation that builds knowledge collaboratively; listening carefully and respectfully to others' view points; articulating their own ideas in relation to other voices and ideas. Students will be able to prepare, organize and deliver and engaging oral presentation.

A student is required to take up five lab tests of 100 marks- at least two tests in written mode and three tests in spoken mode.

MODULE-I: LISTENING (6 HOURS)

Exercises on Active Listening: The whole group listens to any speech/news broadcast in English and notes down the important points. They listen again to check their points and evaluate themselves. The group then compares points to see how well they have understood the broadcast.

MODULE- II: SPEAKING (8 HOURS)

Situational Dialogues / Role Play: Organization Communication

Oral Presentations- Prepared and Extempore

'Just a minute' Sessions (JAM)

Debates

Mock Meetings

Cracking Job Interviews: Mock Sessions

Group Discussions on current topics

(This module will be practiced through speaking activities like role plays, presentations, and discussions)

MODULE-III: READING (8 HOURS)

Students will be given practice in reading and comprehension 6-8 passages of 100-300 words each, on topics of General as well as professional interest. The texts will be supported by suitable exercises designed to foster comprehension skills and vocabulary enrichment. Students are encouraged to read newspapers, articles, books and novels.

Reading Comprehension Exercises Through Tests, Writing Summary and Presenting, Note Making

Review Presentation (Movie/ Article/ Book)

Vocabulary Building Exercises

(This module encourages extensive use of reading materials)

MODULE-IV: WRITING (8 HOURS)

The Writing Lab content is designed to acquaint the students not only with the techniques of effective writing but also give them an insight into planning and writing documents that produce results.

Short Paragraphs on current general and technical topics

Creative Writing: Idea Generation

Business Letters, Email Messages, Project Writing

Writing Resumes and Cover Letters

(* Students will be required to produce and submit by the end of second semester a 350-500 word project report on a topic of their choice. The project should involve data collection, analysis and reporting. Ten marks (out of 100 marks allocated for Lab Test) will be set apart for the project.)

TEXT BOOK:

An Introduction to Professional English and soft skills by B.K Das et al., Cambridge University Press

REFERENCES:

Effective Business Communication, AshaKaul, Prentice Hall

Professional Communication, ArunaKoneru, TMH

EVALUATION SYSTEM (CONTINUOUS INTERNAL ASSESSMENT)

<i>Methods</i>	<i>Listening Skills</i>	<i>Movie Review</i>	<i>Role Plays</i>	<i>Group Discussion</i>	<i>Mock Interview</i>	<i>JAM</i>	<i>Vocabulary/ Comprehension</i>	<i>% of Marks</i>
Total	20	20	20	20	20	20	20	100(Best 5)

SESSION PLAN: COMMUNICATIVE PRACTICE LABORATORY –II

MODULE I: LISTENING (6 HOURS)

S No.	Topic	Pedagogy	Details	Instructional Hrs			
				Th	Pract	Video	Proj
Lab-1	Introduction and Ice Breakers	Activity - Based	Knowing Each Other, People's Bingo http://cutmlanguagelab.org/course/view.php?id=4	0	2	0	0
Lab - 2	Exercises On Active Listening	Activity Based	Feedback, Note Taking, Summarizing, Paraphrasing and Non-verbal Cues http://cutmlanguagelab.org/course/view.php?id=4 https://www.youtube.com/watch?v=cSohjLYOI2A	0	1	1	0
Lab - 3	Movie Review Presentation	Activity Based	The October Sky/ In Pursuit of Happiness/A Beautiful Mind/ Any Other http://cutmlanguagelab.org/course/view.php?id=4	0	1	1	0

MODULE II: SPEAKING (8 HOURS)

S. No.	Topic	Pedagogy	Details	Instructional Hrs			
				Th	Pract	Video	Pro
Lab-4	Organization Communication	Role play	Business Situations and Mock Meeting http://cutmlanguagelab.org/course/view.php?id=4 http://eduscapes.com/distance/course_activities/simulations.htm https://www.youtube.com/watch?v=3X51J-ZDMmE	0	2	0	0
Lab - 5	Oral Presentations	Activity OSLL (Moodle)	Prepared and Extempore/ Debate / 'Just a Minute' Talk (JAM) http://cutmlanguagelab.org/course/view.php?id=4	0	2	0	0
Lab - 6	Interview /Group Discussion	Mock Interview /Group Discussion OSLL (Moodle)	Frequently Asked Questions (FAQs) Discussion on Current Topics - General, Social, Political, Management, Creative, Education and Sports http://cutmlanguagelab.org/course/view.php?id=4 https://www.youtube.com/watch?v=ymcMo7JWSu8 https://www.youtube.com/watch?v=7gcsZ9H2I6s	0	2	0	0

MODULE-III: READING (8 HOURS)

S. No.	Topic	Pedagogy	Details	Instructional Hrs			
				Th	Pract	Video	Pro
Lab -7	Reading Assignment - I	Assignment , online practice and discussion	Reading abridged texts, relevant topics, and news articles http://cutmlanguagelab.org/course/view.php?id=4	0	2	0	0
Lab -8	Reading Assignment - II		Reading for comprehension and vocabulary http://cutmlanguagelab.org/course/view.php?id=4 http://www.majortests.com/sat/reading-comprehension.php	0	2	0	0

MODULE-IV: WRITING (8 HOURS)

S. No.	Topic	Pedagogy	Details	Instructional Hrs			
				Th	Pract	Video	Pro
Lab -9	Writing Short Paragraphs - General, Current and Technical Topics	Assignment, online practice and discussion	Write, Rewrite, Expand, Correct, Complete, and Improve Paragraphs http://cutmlanguagelab.org/course/view.php?id=4	0	2	0	0
Lab -10	Idea Generation and Creative Writing	Assignment and discussion	Problem solving/decision making, Strategy development, Outline a proposal, Create a timeline Collaboration technique, Expression of creativity, Condensing various thoughts, Put visuals and text together http://cutmlanguagelab.org/course/view.php?id=4	0	2	0	0
Lab -11	Memo Writing & Emails	Assignment and discussion	Adopt the steps of writing process for preparing of memo and emails http://cutmlanguagelab.org/course/view.php?id=4 https://www.youtube.com/watch?v=6zHLHc9CcvQ	0	2	0	0
Lab -12	Preparation Of Business Reports/ Proposals And Presentation	Project Work and discussion	Adopt the steps of writing process for preparing business reports and proposals http://cutmlanguagelab.org/course/view.php?id=4 mails https://www.youtube.com/watch?v=eLKVRDBAMvQ	0	2	0	0

FCHU1205 CORPORATE READINESS LABORATORY

<i>Pre - requisites</i>	<i>Course Type</i>	<i>Credits</i>
<i>Nil</i>	<i>Workshop</i>	<i>2</i>

A real-time project approach in the laboratory is intended to provide a developmentally appropriate ambience, make the students proactive, encourage and motivate as well as develop skills to become a good listener, good communicator and responsible. A student will experience the challenging application process and at the same time prepare for the challenging world. The experience gained from working on projects can help one understand the appropriate and effective use of language skills. It also creates context in which learners engage in purposeful communication.

All communication activities are supported with the help of live projects on general techno-management or local themes which provide exposure to the students and help them to find a suitable job in the industry.

A student is required to take up five laboratory tests of 100 marks.

COURSE OBJECTIVES

- Understand the process of communication*
- View communication from the perspective of each stakeholder*
- Plan and manage communication difficulties*
- Learn exactly how, when and what of communication*

COURSE OUTCOMES

- Understanding the convention of project report*
- Understanding the process of data collection and documentation*
- Preparation and presentation of project report*
- Preparation for various academic and professional needs*

INSTRUCTION AND DELIVERY

Instruction- led facilitation highlights interactions between students and their facilitators, and emphasizes guidance from the facilitator who will track, assess and mentor them.

Students will make a team of four members who will take up real problems and run through the semester trying to solve the problems. The lab program will augment this learning with the right theory.

Participants will use PPTS, flash presentations or high impact presentations, flip charts, blogs, boards with graphical or pictorial representations, with captions and outlines, video display or any other best mode of presentation, post-it notes and group activities to document all processes and methodology.

OUTLINE

LAB1: Introduction to the Lab Program (Session will be driven by the Facilitators)

(Structure, Objective, Methodology, Objective of Choosing Project as a Vehicle to Learn the Course, Process of Carrying out the Project, Announcing the List of Projects)

LAB2: Discussion on Project Approach and Communication (Session will be driven by the Facilitators)

LAB3: Win Your Project: A Presentation by Groups (Session will be driven by the Students)

LAB4: Project Plan Presentation by Groups (Session will be driven by the Students)

LAB5: Review of Weekly Status Reports by the Guide, and Discussions (Session will be driven by the Students)

LAB6: Progress Presentation by Groups, and Feedback by Guide and Co-Guide (Session will be driven by the Students)

LAB7: Review of Documentation File/Dossier, and Feedback by Guide

LAB8: Progress Presentation and Submission of Dossier Containing Documentary Notes

(E.g., compilation of weekly status reports, minutes, photocopies of emails, feedbacks, testimonials, photographs)

LAB 9: Presentation on the Project, Feedback by the Guide and Co-guide

LAB 10: Final Presentation by Groups in front of a Panel and Submission of Project Work

TEXT BOOK:

The Essential Guide to Doing your Research Project by O'LEARY (2011)

REFERENCES:

Logical Framework Analysis, Capacity Building Workshop for Dryland Management, May 3-5, 2000

Professional Presentations by Goodale (2007)

EVALUATION SYSTEM (CONTINUOUS INTERNAL ASSESSMENT)

Methods	Win Your Project	Project Plan Presentation	Weekly Reports	Progress Presentation	Project Presentation	Documentation	Project Report	% of Marks 100 (Best 5)
Total	20	20	20	20	20	20	20	100

S. No.	Topic	Pedagogy	Details	Instructional Hrs				
				Th	Pract	video	Proj	
1	Introduction to the Lab Program	Project-based Learning Discussion Beyond the class Learning	Structure, Objective, Methodology, Objective of Choosing Project as a Vehicle to Learn the Course, Process of Carrying out the Project (Session will be driven by the Facilitators)	0	2	0	0	
2	Announcing the List of Projects		Topics available in OSLL (Moodle) http://cutmlanguagelab.org/	0	1	0	1	
3	Project Approach & Communication		(Session will be driven by the Facilitators) https://www.youtube.com/watch?v=1ybtFwYb7Oc	0	1	0	1	
4	Win Your Project		Rationale for choosing the project topic What makes you say that you deserve the project?/ Why should we give you the project (Session will be driven by the Students)	0	1	0	1	
5	Project Plan		Stakeholder Analysis, Objective Analysis, Situation Analysis, Problem Analysis, Strategy Analysis (Session will be driven by the Students)	0	1	0	1	
6	6Review of Weekly Status		Dossier Verification/Reports by the Guide	0	1	0	1	
7	Review of Progress		Progress Presentation by Groups, and Feedback by Guide and Co-Guide (Session will be driven by the Students)	0	1	0	1	
8	Documentation Review		Presentation with Facilitator Beyond the class Learning	Review of Documentation File/Dossier, and Feedback by Guide	0	1	0	1
9	Progression Presentation and Report Submission		Project-based Learning Presentation and Report Writing	Progress Presentation and Submission of Dossier Containing Documentary Notes (E.g., compilation of weekly status reports, minutes, photocopies of emails, feedbacks, testimonials, photographs)	0	1	0	1

		<i>Beyond the class Learning</i>					
10	<i>Presentation on the Project</i>	<i>Project-based Learning Beyond the class Learning</i>	<i>Presentation on the Project, Feedback by the Guide and Co-guide</i>	0	1	0	1
11	<i>Project Work</i>	<i>Discussion</i>	<i>Performance Analysis</i>	0	0	0	2
12	<i>Communication</i>	<i>Discussion</i>	<i>Performance Analysis</i>	0	2	0	0

FCHU1206 IT ENABLED COMMUNICATION

<i>Pre - requisites</i>	<i>Course Type</i>	<i>Credits</i>
<i>Nil</i>	<i>Workshop</i>	<i>2</i>

COURSE OBJECTIVE AND OUTCOME

Upon completing the syllabus, students should be able to:

- *Speak confidently and fluently, in both formal and informal contexts.*
- *Write clearly, correctly and cogently*
- *Design and have a Home Page/Blog Space, Facebook Page and post comments/reports for collaboration & online presence*
- *Evolve from the role of an 'information provider', through 'motivator' and 'catalyst of change', to 'Change Agent'.*

COURSE OUTLINE

MODULE I: CONCEPTUAL FOUNDATIONS

Pre-Course Assessment

Tell me a bit about yourself: Your background, your major, your professional aspirations ... your likes ... and maybe your favorite movie, and what you like to do in your spare time...

Do you know?

Introduction to IT Enabled Communication

Communication in the New Age Context and Demand for Communication Interventions
(*This module includes pre-course assessments and presentations*)

MODULE II: BLOG DESIGNING & POSTING

Step-by- Step to Writing a Blog: Researching, Brainstorming and Structuring, Writing, Posting, Editing and Accessorizing

Photoshop for Image, Editing and graphic design

(*This module will be driven through methods like self-learning, learning by doing, and workshop*)

MODULE III: TECHNOLOGY AND COMMUNICATION

Tools for Business Correspondence and web-based exercises

Creating and delivering high impact presentations with Slides and other Visuals

Video Documentaries

Video Conferencing Sites, Skype, Team Viewer

(*This module will be facilitated through presentations, use of tools and technology*)

TEXT BOOKS

Shirley Taylor, Model Business Letters (MBL) and Other Business Documents, 5th Edition. Krizen. Merrier.Logan. Williams, Business Communication, and Thomson (BC: Krizen).

M.M. Monippally, *Business Communication Strategies (BCS: MMM)*, TMH, New Delhi, 2001.
 Arthur H. Bell & Dayle M. Smith, *Management Communication (MC: AHB & DMS)*, Wiley Student Edition, 2005

LINKS

http://ctb.ku.edu/en/tablecontents/section_1017.htm

Useful websites for some topics will be linked to the course for improving language proficiency skills of the students.

www.a4esl.org

www.learnenglishfeelgood.com

EVALUATION SYSTEM (CONTINUOUS INTERNAL ASSESSMENT)

Methods	Presenta- tion	Blog Design & Post	Video Documentary	E-mail Writing	Business Letters	Poster/ Template Design	Mid-Sem written Exam	% of Marks 100(Best 5)
Total	20	20	20	20	20	20	20	100

MODULE I: CONCEPTUAL FOUNDATIONS (3HRS)

S. No.	Topic	Pedagogy	Details	Instructional Hrs			
				Th	Pract	video	Proj
1	Pre-Course Assessment [IT Enabled Communication]	Record pre-course assessments on communication management & technology by 'Probing & Doing'	Do you Know?	0	1	0	0
2	Tell me a bit about yourself	Know each other, and create a classroom philosophy through a game	Your background, your major, your professional aspirations ... your likes ... and maybe your favorite movie, and what you like to do in your spare time...	0	1	0	0
3	Communication in the New Age	Presentation	Context and Demand for Communication Interventions Explore top five social networking sites relevant to technology sector and present in the class, create and maintain online presence on Facebook, Google + or any other	0	1	0	0

MODULE II: BLOG DESIGNING & POSTING

S. No.	Topic	Pedagogy	Details	Instructional Hrs			
				Th	Pract	video	Pro j
4	Step-by- Step to Writing a Blog - 1	Learning to Learn (Self-learning)	Researching	0	1	0	0
5	Step-by- Step to Writing a Blog - 2	Learning to Learn (Self-learning)	Brainstorming & Structuring	0	1	0	0
6	Step-by- Step to Writing a Blog - 3	Learning to Learn (Self-learning)	Writing & Posting	0	1	0	0

7	Step-by- Step to Writing a Blog - 4	Learning to Learn (Self-learning)	Editing & Accessorizing	0	1	0	0
8	Blog	Workshop (Self-learning)	One Day Workshop On Blog Design (CUTM e-content)	0	1	1	0
9	Blog Design	Posting assignments/ weekly reports/share what he/she has learnt (Doing)	Assignment: "Me in a Minute" blog post, email your blog's web address to the facilitators and peer group	0	1	0	0
10	Photoshop - 2	Self- Learning & Peer Learning	Editing and Graphic Design	0	1	1	0
11	Photoshop -3	Photoshop (FOSS) Training	Video tool www.spoken-tutorial.org	0	1	0	0
12	Photoshop	Workshop	One Day Workshop On Blog Design (CUTM e-content)	0	1	1	0

MODULE III: TECHNOLOGY AND COMMUNICATION

S. No.	Topic	Pedagogy	Details	Instructional Hrs			
				Th	Pract	video	Proj
13	Business Correspondence	Document Makeover, Web-based Exercises	Letters & Emails [Write to the point with correctness, conciseness, coherence and completeness]	0	1	0	0
14	Impress Presentation	Training and Practice	Language Laboratory Impress (FOSS)- Presentations (www.spoken-tutorial.org)	0	1	0	0
15	Enhancing presentation through slides and other visuals	Use of media for presenting the visual contents to reinforce the message, and create online presence	Equip the learners with techniques where they feel more confident in front of an audience Assignment [Improve the slides] Slide Share/ Upload on YouTube or Google +	0	1	0	0
16	Delivering High Impact Presentations	Video Recording & Peer Evaluation	Mastering the Art of Delivery, Preparing to Speak, Overcoming Anxiety, Handling Questions Watch-YouTube: Steve Jobs and iPod	0	1	0	0
17	Video Documentaries	Video documentary (Self- Learning)	Each student/group will make a short documentary movie (CSR, Facilities Labs, Student Projects etc.)	0	1	0	0
18	Making of Video Documentary	Workshop	One Day Workshop on Making Video Documentaries	0	1	1	0

19	Documentary Movie	10 min. video presentation by individuals/ groups	Feedback and Analysis	0	1	0	0
20	Video Conferencing	Free conference calls, webcam chat, video conferencing, group calls	Create Account & Practice [Skype, TeamViewer, Mobile]	0	1	0	0
21	Organize and Manage a Video Conference	Use video conference for business meetings Video conference etiquette & tips	Organise, Share & Collaborate	0	1	0	0

FCHU1207 CAREER COMMUNICATION

<i>Pre - requisites</i>	<i>Course Type</i>	<i>Credits</i>
<i>Nil</i>	<i>Workshop</i>	<i>2</i>

OBJECTIVES

- Prepare the graduates to acquire their dream jobs.*
- Build their mindset with right attitude, self-awareness, pro-activeness.*
- Build confidence, and enhance their communication skills to handle all situations.*

OUTCOMES

- Build the confidence of students*
- Trigger the thinking and analyzing ability of the learners to solve problems.*
- Readiness to work on their dream jobs.*

List of Experiments

LAB 1: Introduction to Career Communication

LAB 2: Presentation on Corporate House

Create an awareness and exposure on corporate life and culture.

Learners get exposure to corporate life and culture.

LAB 3: Corporate Quiz

LAB 4: Telephonic Conversation

Learners are equipped with basic knowledge and skill practice for improved telephonic communication.

LAB 5: Email Writing

Learn the characteristics of successful e- mail messages.

Create an effective e-mail message.

LAB 6: Mini Test on Email Writing

LAB 7: Learning Etiquette

Understand what etiquette is & why it's important.

Provide practical techniques and generally-accepted professional and ethical conduct or behaviour that will help create a favourable impression in social and professional life.

Practice proper manners like greeting, saying 'please', 'thank you'.

Appear professional and well groomed.

LAB 8 :Identifying Traits for Professional and Interpersonal Success

Understand the importance of effective interpersonal communication and traits for professional success.

Explore the significance of Active Listening, Problem Solving, Respect, Decision Making, Empathy, Co-operation and Non-verbal communication for professional success.

LAB 9: Job-Application -Cover Letter

Develop the career writing skills of the learners with special emphasis on their interest in specific job positions, their strengths and what values they will bring to the organisation.

LAB 10: Job-Applications – CV

Produce a polished and impressive CV that can be tailored to each specific job application.

Develop the career writing skills of the learners with special emphasis on Statement of Purpose.

Provide with tools to showcase Unique Selling Points for the specified job description.

LAB 11: Participating in Group Discussion (GD)

Mock Interview on basic questions

LAB 12: Facing an Interview

EVALUATION SYSTEM (CONTINUOUS INTERNAL ASSESSMENT)

Methods	Presentation	Corporate Quiz	Telephonic Conversation	Email Writing	CV	GD	Interview	% of Marks 100(Best 5)
Total	20	20	20	20	20	20	20	100

SESSION PLAN: CAREER COMMUNICATION

S. No.	Topic	Pedagogy	Details	Instructional Hrs.			
				Th	Pract	video	Proj
LA B-1	Introduction to Career Communication	Discussion	The Course introduces students to the resources and skills necessary for a successful job or internship search http://cutmlanguagelab.org/course/view.php?id=2	0	2	0	0
LA B-2	Presentation on Corporate House	Team Presentation on OSLL (Moodle)	Create an awareness and exposure on corporate life and culture. Learners get exposure to corporate life and culture. http://cutmlanguagelab.org/course/view.php?id=2 https://www.youtube.com/watch?v=g-_xABU21Yc	0	1	1	0
LAB-3	Corporate Quiz	Quiz OSLL (Moodle)	This Corporate Quiz is an initiative to bring forth all the updates and insights from various industries. Through this quiz , students will be updated with the current happening in the present Corporate world http://cutmlanguagelab.org/course/view.php?id=2	0	2	0	0
LA B-4	Telephonic Conversation	Role play (Pair Work)	Learners are equipped with basic knowledge and skill practice for improved telephonic communication https://www.youtube.com/watch?v=mmXAqMQeOAI https://www.youtube.com/watch?v=6tfFRD0enV0	0	1	1	0
LA B-5	Email Writing	Doing	Learn the characteristics of successful e- mail messages.Create an effective e-mail message. http://cutmlanguagelab.org/course/view.p	0	1	1	0

			hp?id=2https://www.youtube.com/watch?v=mmXAqMQe0AI				
AB -6	Email Writing	Mini Test OSLL (Moodle)	(Questions from TCS) http://cutmlanguagelab.org/course/view.php?id=2 https://www.youtube.com/watch?v=LTKb5Fexcuk	0	2	0	0

S. No.	Topic	Pedagog	Details	Instructional Hrs.			
				Th	Pract	video	Proj
LAB-7	Learning Etiquette	Demonstration Video Analysis	Understand what etiquette is & why it's important. Provide practical techniques and generally-accepted professional and ethical conduct or behaviour that will help create a favourable impression in social and professional life. http://cutmlanguagelab.org/course/view.php?id=2 https://www.youtube.com/watch?v=ieYuoQ9sMvA	0	1	1	0
LAB -8	Identifying Traits for Professional and Interpersonal Success	Group Activity Video Analysis	Understand the importance of effective interpersonal communication and traits for professional success. Explore the significance of Active Listening, Problem Solving, Respect, Decision Making, Empathy, Co-operation and Non-verbal communication for professional success. http://cutmlanguagelab.org/course/view.php?id=2	0	1	1	0
LAB -9	Job-Application - Cover Letter	Document Makeover	Develop the career writing skills of the learners with special emphasis on their interest in specific job positions, their strengths and what values they will bring to the organisation. http://cutmlanguagelab.org/course/view.php?id=2 https://www.youtube.com/watch?v=37TbhadX0C8	0	2	0	0

FCHU1208 PERSONALITY DEVELOPMENT

<i>Pre - requisites</i>	<i>Course Type</i>	<i>Credits</i>
<i>Nil</i>	<i>Workshop</i>	<i>2</i>

The laboratory aims at the promotion of the strategies for the personality development of the participants. The rationale behind this endeavor is the recognition of the multifaceted influence of the personality of the participants.

A student is required to take up five laboratory tests of 100 marks.

COURSE OBJECTIVE

Project the force of inner self, assert individuality, influence others and power to success.

COURSE OUTCOME

Learners develop a positive attitude and graceful personality.

LIST OF EXPERIMENTS

Lab 1: Self-Discovery/Self-Analysis

Identifying strengths and weaknesses through games and activities

Lab 2: Impression Management

Formation of impression, first and lasting impression, change: warm-up discussion

Lab 3: Body Language and Communication Style Profile Test

Lab 4 : Working on Attitude: Assertive, Aggressive, Passive

Measure your attitude, case study and role plays

Lab 5: Build Your Skills

Interpersonal Communication and Self

Lab 6: Team Building and Teamwork

Ice-breaker, test your team skills, exercise on stages of formation and effective teams

Lab 6: Explore Your Personality

Lab 7 : Motivation and Success

Ted talks, invited talks and success stories

Lab 8: Time Management

Identifying important time wasters, time management exercises

Lab 10 : Stress Management

Case-based discussions to identify causes of stress, and manage stress

Lab 11: Etiquette and Manners

Test your etiquette and manners, practice good manners

Lab 12 : Personality and Career Choice

Matching your career & personality

TEXT BOOKS:

Basic Managerial Skills for All, 9th Edition, E.H. McGrath, S.J.

Personality Development by Harold R. Wallace & L. Ann Masters, 2006.

REFERENCES:

Personality Development by [John Aurther](#) .Reprint, 2009.

[Personality Development - Transform Yourself](#) by [Rajiv K. Mishra](#), 2004.

[Power of One - Personality and Self-Development](#) by [Dr. Abhishek Mishra](#), 2007.

EVALUATION SYSTEM (CONTINUOUS INTERNAL ASSESSMENT)

Methods	Self-introduction in sales pitch	Debate/ Extempore	Presentation (USP)	Group Activity (Communication)	Public Speaking on Current Topics	Case-based Discussions	Motivation Speech	% of Marks 100 (Best 5)
Total	20	20	20	20	20	20	20	100

SESSION PLAN: PERSONALITY DEVELOPMENT

S. No.	Topic	Pedagogy	Details	Instructional Hrs			
				Th	Pract	video	Proj
1	Self-Discovery/Self-Analysis	Activity Based Learning	Game	0	2	0	0
2	Impression Management	Videos and interactions	19 tips to impress others https://www.buzzfeed.com/carolynkylstra/impress-literally-everyone-you-meet?utm_term=.nbz2MKVQJO#.qywdZLkQXQ	0	1	1	0
3	Body Language and Communication Style Profile Test	Understanding of different postures and gestures through online test	http://www.queendom.com/queendom_tests/transfer	0	1	1	0
4	Working on Assertive, Aggressive, Passive	Role Plays and are Encouraged to watch videos	https://www.youtube.com/watch?v=O6eyUUkpoU8 Role plays	0	1	1	0
5	Build Your Skills	Videos	https://www.youtube.com/watch?v=w97dR3OJB1k http://www.investopedia.com/video/play/interpersonal-skills/	0	1	1	0
6	Team Building and Teamwork	Activity Based Learning	Coin Logo Time Required: 5-10 minutes Begin by asking all participants to empty their pockets, purses, and wallets of any coins they may have and place them on the table in front of them. If someone doesn't have any coins or only has very few, others in the room can share their coins with them. Instruct each person to create their own personal logo using the coins in front of them in just one minute. Other materials they may have on them, such as pens, notebooks, wallets, etc. can also be used in creation of the logo. If there is a particularly large group, people can be broken up into teams of 3-6 people and instructed to create a logo that represents them as a team or the whole room can gather to use the coins to create a logo for the organization/group/department/etc. Each	0	1	1	0

			solitary participant can explain their logo to the group or if the room was split into groups, the leader can have each group discuss what led to the team logo and what it says about them. Not only does this activity promote self and mutual awareness, but it also enables participants to get to know each other on a more personal level. http://www.livestrong.com/article/219775-team-building-exercises-for-small-groups/				
7	Explore Your Personality	videos	https://www.16personalities.com/free-personality-test	0	1	1	0
8	Motivation and Success	videos	https://www.youtube.com/watch?v=ILEg5EZw3iQ https://www.youtube.com/watch?v=g-PNJHhf-ag	0	1	1	0
9	Stress Management	Classroom Exercise	Time Wasters Exercise.pdf	0	1	0	0
10	Etiquette and Manners	videos	https://www.youtube.com/watch?v=55cXVve0lpw for table manners https://www.youtube.com/watch?v=VLqKVfSG-bk for interview etiquette. https://www.youtube.com/watch?v=4-8AlriF908 for manners.	0	1	1	0

S. No.	Topic	Pedagogy	Details	Instructional Hrs			
				Th	Pract	video	Proj
11	Personality and Career Choice	Classroom exercise	rs_self-assessment.pdf	0	1	0	0
12	Time Management	Group Activity	<p>How long is a minute?</p> <p>At the beginning of session ask people to close their eyes for 30 seconds and after that to open it. Nobody can watch the clock and don't measure the time. Ask of participants to open their eyes after what they believe has been 30 seconds. Of course, they all open them at different times. Afterwards, we talk about our understanding of time. Even though everyone has an equal (24 hours a day or 30 seconds for exercise), in fact, we experience it and use it in different ways. Some of us experienced it as a short period, other as a long. This always works as a good opener.</p> <p>2) Cover all the clocks in the room, then ask participants to remove their wrist watches and stand up. Instruct them to sit down when they think 1 minute has elapsed after you shout "Start" to begin the countdown. You will be surprised with the results. Just enjoy the fun that follows this activity</p>	0	1	0	0

FCHU1209 SEMINAR AND TECHNICAL WRITING

<i>Pre - requisites</i>	<i>Course Type</i>	<i>Credits</i>
<i>Nil</i>	<i>Workshop</i>	<i>2</i>

Seminar allows students the opportunity to put all of information together. The students are required to prepare technical reports including oral presentations supported by written technical papers. Seminar is designed to assist students in preparing for their career.

COURSE OBJECTIVES

Understand the requirements and ethics of technical writing in the 21st Century workplace.

Work professionally, individually and in a team to produce effective technical documents incorporating verbal, visual, and multimedia materials as necessary.

Communicate effectively by analyzing audience, organizing documents, writing clearly and precisely with no grammar errors and presenting the document with skillful design.

Locate, evaluate, and incorporate pertinent information.

Write clear, intelligent technical reports

Make seminar presentations

COURSE OUTCOMES

Understand how technical communication is used in the workplace.

Understand and use the principles of design in business and technical communication.

Apply useful descriptive language to your technical documents.

Students will gain experience in preparing a technical report including an oral presentation supported by a written technical paper.

MODULE-I: TECHNICAL COMMUNICATION ESSENTIALS

COURSE OUTCOMES

Describe the writing process most useful in today's technical writing environment.

Analyze an audience and consider appropriate writing situations to meet the audience's needs.

Understand the ethics of the workplace and apply those ethics to their technical and business writing.

OUTLINE: Communicating in the Workplace, Technical Writing Process Today, Readers and Contexts of Use, Ethics in the Technical Workplace

MODULE- II: DOCUMENT DESIGN

COURSE OUTCOMES

Create and use graphics that complement your business and technical communication.

OUTLINE: Designing Documents and Interfaces, Creating and Using Graphics

MODULE-III: TECHNICAL COMMUNICATION STRATEGIES AND RESEARCHED REPORT WRITING

COURSE OUTCOMES

Define terms clearly in technical documents.

Explain instructions and processes clearly.

Write clear proposals for business and technical situations.

Research and manage information.

Write an analytical report.

OUTLINE: Researching and Managing Information, Organizing and Drafting, Technical Definitions, Technical Descriptions, Instructions and Documentation, Proposals, Analytical Reports

MODULE-IV: SEMINAR PRESENTATION

COURSE OUTCOME

Students will not only learn from the experience gained in preparing and presenting their seminar, but will have the opportunity to observe and participate in the seminar given by their classmates.

OUTLINE: Technical Report, Seminar Presentation

(Planning, Preparing, Organizing and Seminar Presentation are the 4 stages of this module)

TEXT BOOK:

Gerson, Sharon J. and Gerson, Steven M. (2007). *Technical Writing Process and Product*. Delhi: Pearson Education.

REFERENCES:

Effective Technical Communication, M. Ashraf Rizvi, TMH Publications.

Business Communication Today, Courtland L Bovee, John V Thill & Mukesh Chaturvedi, Pearson Education.

EVALUATION SYSTEM (CONTINUOUS INTERNAL ASSESSMENT)

Methods	Proposal Writing	Report Writing	Organizing Seminar	Document Formatting	Preparing a Technical Paper	Seminar Presentation-I	Seminar Presentation-II	% of Marks 100 (Best 5)
Total	20	20	20	20	20	20	20	100

SESSION PLAN: SEMINAR AND TECHNICAL WRITING

S. No.	Topic	Pedagogy	Details	Instructional Hrs			
				Th	Pract	video	Proj
1	Introduction to Technical Writing	Activity Based Learning	Writing Genres: Technical versus non-technical writings https://www.youtube.com/watch?v=LTDsgd0ytbE	0	1	0	0
2	Preparing to Write	Doing	Audience Analysis Brainstorming Organizing information Link: https://www.youtube.com/watch?v=wxKJT13EhuM	0	1	0	0
3	Gathering information	Google Search	How do we gather information? Ways, techniques and tools	0	2	0	0
4	Focusing on Writing Skills	Workshop	Brainstorming, Drafting, Editing	0	2	0	0
5	Technical Writing Conventions	Analysis and Discussion	Analysis of different case studies	0	1	0	0
6	Reporting	Learning to Learn Analysis and Discussion	FORMAT: Preliminary pages, Summary, Main section, Conclusion, Recommendations References	0	2	0	0

S. No.	Topic	Pedagogy	Details	Instructional Hrs			
				Th	Pract	video	Proj
7	Using and interpreting Graphics	Group work and Discussion	Matching Games : Texts and graphic types	0	2	0	0
8	Document Formatting	Workshop	Layouts Use of MS Word for Documenting Document templates	0	2	0	0

			APA Format (6th) - Microsoft Word 2010 https://www.youtube.com/watch?v=aWT9zgMPviY				
9	Documentation	Workshop	Documenting Sources: https://www.youtube.com/watch?v=-H2fRG_Rtns	0	2	0	0
10	Introduction to Seminar	Discussion	Seminar : Needs and ways of preparation Video : https://www.youtube.com/watch?v=Rz2II40tQuI	0	1	0	0
11	Questioning Skills	Workshop	Asking and Responding to questions in Seminars TED TALK: https://www.youtube.com/watch?v=PkcHstP6Ht0	0	2	0	0
12	Analysis of various Seminars	Videos and Discussion	Analysis of Seminars: Pros and Cons How to make a seminar effective? https://www.youtube.com/watch?v=x7qPAY9JqE4	0	1	1	0
13	Preparing for a Seminar	Group Work	Grouping Selection of topics	0	1	0	0
14	Collection of Information	Workshop	Primary and secondary sources Preparing sample PPTs	0	2	0	0
15	Seminar Presentation-I	Group Work	Demonstration and Discussion	0	2	0	0
16	Seminar Presentation-II		Demonstration and Discussion	0	2	0	0

FCHU1210 PROFESSIONAL ETIQUETTE

<i>Pre - requisites</i>	<i>Course Type</i>	<i>Credits</i>
<i>Nil</i>	<i>Workshop</i>	<i>2</i>

Etiquette begins with meeting and greeting. Good professional etiquettes indicate that you are a mature responsible, adult who can aptly represent any organization. Etiquettes center upon respect. **COURSE**

OBJECTIVES

- To recognize the importance of proper etiquette at workplace*
- To understand the elements and characteristics of proper etiquette*
- To behave professionally and gain respect*
- To develop an action plan to improve professionalism*

COURSE OUTCOMES

At the end of this course students would be able to learn:

- Professional behavior, standards for appearance, action and attitude in a business environment*
- Handle a variety of social and business situation*
- Different styles of communication based on different situations.*

MODULE- I: MEETING AND GREETING ETIQUETTE, OFFICE ETIQUETTE (7hrs)

- Personal Branding and First Impressions
- Introducing yourself and introducing a guest
- Professionalism at office
- Language styles, tone and attitude

MODULE-II: COMMUNICATION EXCELLENCE (7hrs)

- Techno Etiquette
- Phone Etiquette
- Email Etiquette

Social Media Etiquette
MODULE-III: NETWORKING ETIQUETTE (6hrs)

- Business Card Etiquette
- Names
- Titles
- Net Etiquette
- Proper Introductions

MODULE-IV: BUSINESS ETIQUETTE (7)

- Presentation Etiquette
- Meeting Etiquette
- Dining Etiquette
- Global Etiquette

TEXT BOOK:

The New Etiquette, Real Manners for Real People in Real situations- An A-to-Z Guide by Marjabella Young Stewart, St. Martin Griffin.
Soft Skills, Know Yourself and the World, K.Alex.

REFERENCES:

Do's and Taboos of Hosting International Visitors, Roger E. Axtell, John Wiley & Sons, Inc.
Breaking through Culture Shock: What You Need to Succeed in International Business by Elisabeth Marx.
Dos and Taboos of International Trade by Roger E. Axtell, John Wiley & Sons, Inc.
The Art of Writing Effective E-mails, Jayprakash, Sajitha, Himalayan Publications.
International Communication Management-Individual & Organizational Outcomes by Antonio Ragus, Bookboon, 2010.
Business Communication for Success by Scott Mac Lean, Flat World Knowledge, 2010.
Effective Technical Communication, M. Ashraf Rizvi, TMH Publications.

EVALUATION SYSTEM (CONTINUOUS INTERNAL ASSESSMENT)

Methods	Introducing others, Small Talk	Role Play in formal & informal situations	Presentation	Telephonic interview	Email	Mock Meeting	Quiz on Professional Etiquette	% of Marks 100(Best 5)
Total	20	20	20	20	20	20	20	100

LESSON PLAN: PROFESSIONAL ETIQUETTE

S. No.	Topic	Pedagogy	Details	Instructional Hrs			
				Th	Pract	video	Proj
MODULE 1: MEETING & GREETING ETIQUETTE, OFFICE ETIQUETTE							
1	Personal Introduction	Role play on formal situation with proper introduction	http://smallbusiness.chron.com/first-impressions-business-etiquette-2908.html	0	1	0	0
2	Introducing Others	Knowing each other Fish bowl game	http://www.fasset.org.za/downloads/Office_Etiquette_Material/Handbook_Essential_Office_Etiquette.pdf				
3	Basics of Etiquette	Video clips Small skits	http://www.fasset.org.za/downloads/Office_Etiquette_Material/Handbook_Essential_Office_Etiquette.pdf	0	1	0	0

4	Interpersonal Etiquette	Video clips Activity on using speech acts with appropriate body language Guessing game	http://www.fasset.org.za/downloads/Office_Etiquette_Material/Handbook_Essential_Office_Etiquette.pdf	0	1	0	0
5	Professionalism And Front Office Etiquette	Video Clips Role play on front office management on their dream company Quiz	http://careerplanning.about.com/od/workplacesurvival/a/professionalism.htm http://www.octech.edu/sites/www/Uploads/files/TRIO/Professionalism%20in%20the%20Workplace.pdf	0	1	0	0
6	Professional Conduct	Conversational practice and SWOT Analysis in pair/group task	http://www.fasset.org.za/downloads/Office_Etiquette_Material/Handbook_Essential_Office_Etiquette.pdf	0	1	0	0
7	Professionalism And Front Office Etiquette	Video Clips Role play on front office management on their dream company Quiz	http://careerplanning.about.com/od/workplacesurvival/a/professionalism.htm http://www.octech.edu/sites/www/Uploads/files/TRIO/Professionalism%20in%20the%20Workplace.pdf	0	1	0	0
8	Formal & Informal Attire	Communication Game Quiz	http://www.fasset.org.za/downloads/Office_Etiquette_Material/Handbook_Essential_Office_Etiquette.pdf	0	1	0	0
9	Language Etiquette And Attitude	Enactment in different formal situations with appropriate communication styles	http://www.english.wisc.edu/rfyoung/336/attitudes.pdf https://blog.udemy.com/communication-styles/ http://www.english.wisc.edu/rfyoung/336/attitudes.pdf	0	1	0	0
10	Techno Etiquette	Conversational practice and Small skits	http://theedgeexecutivecoaching.com/articles/etiquette/techno-etiquette/# Question & Answers :http://www.workforce.com/articles/q-a-about-techno-etiquette	0	1	0	0
11	Smart Phone Etiquette	Dialogue Exchange Telephonic Quiz	http://www.talkenglish.com/LessonPractise.aspx?ALID=483	0	1	0	0
12	Email Etiquette Social Media Etiquette	Video Clips Written task practice Group work Debate	http://www.businessemail etiquette.com/business-e-mail-etiquette-basics/ http://www.realsimple.com/work-life/work-life-etiquette/manners/social-media-etiquette http://www.moneycrashers.com/social-media-etiquette-tips-personal-business/ Video : https://www.youtube.com/watch?v=RFZwtkoNGrk https://www.youtube.com/watch?v=ootxiibcOWc	0	0	1	0

MODULE II: COMMUNICATION EXCELLENCE (7 HOURS)

S. No.	Topic	Pedagogy	Details	Instructional Hrs			
				Th	Pract	video	Proj
10	Techno Etiquette	Conversational practice and Small skits	http://theedgeexecutivecoaching.com/articles/etiquette/techno-etiquette/# Question & Answers : http://www.workforce.com/articles/q-a-about-techno-etiquette	0	1	0	0
11	Smart Phone Etiquette	Dialogue Exchange Telephonic Quiz	http://www.talkenglish.com/LessonPractice.aspx?ALID=483	0	1	0	0
12	Email Etiquette Social Media Etiquette	Video Clips Written task practice Group work Debate	http://www.businessemailetiquette.com/business-e-mail-etiquette-basics/ http://www.realsimple.com/work-life/work-life-etiquette/manners/social-media-etiquette http://www.moneycrashers.com/social-media-etiquette-tips-personal-business/ Video : https://www.youtube.com/watch?v=RFZwtkoNGrk https://www.youtube.com/watch?v=ootxiibcOWc	0	0	1	0

MODULE-III NETWORKING ETIQUETTE (6HRS)

S. No.	Topic	Pedagogy	Details	Instructional Hrs			
				Th	Pract	video	Proj
13	Netiquette	Written Assignment Drafting Email	http://jillbremer.com/articles/etiquette/techno-etiquette/ http://www.slideshare.net/MarcellineChitolie/techno-etiquette-final-copy	0	1	1	0
14	Business Card Etiquette	Presentations and small group work	http://www.careerealism.com/3-rules-to-smart-business-card-etiquette/	0	1	1	0
15	Forms of Addressing	Written assignment Scrabble and puzzles	http://www.talkenglish.com/LessonPractice.aspx?ALID=483	0	1	1	0

MODULE IV: BUSINESS ETIQUETTE (7 hours)

S. No.	Topic	Pedagogy	Details	Instructional Hrs			
				Th	Pract	video	Proj
16	Presentation Etiquette	Demonstration	http://dianegottsman.com/2013/11/business-etiquette-9-powerful-presentation-tips/ http://dianegottsman.com/2012/07/stand-and-deliver-ten-tips-to-delivering-a-powerful-presentation/	0	1	1	0
17	Meeting Etiquette	Mock Meeting	http://businessculture.org/northern-europe/uk-business-culture/meeting-etiquette/	0	1	1	0

			http://www.fasset.org.za/downloads/Office_Etiquette_Material/Handbook_Essential_Office_Etiquette.pdf				
18	Dinning Etiquette	Activity on-Playing the role of the Host/Hostess, Playing the role of the Guest	Rizvi, ETC, pp.139-164 Soft Skill, Dr.K.Alex-pp-203-219	0	1	1	0

S. No.	Topic	Pedagogy	Details	Instructional Hrs			
				Th	Pract	video	Proj
19	Golden Rules of Global Etiquette	Discussion and Activity	Developing intercultural skill http://www.kwintessential.co.uk/cultural-services/articles/international-business-etiquette.html http://www.kwintessential.co.uk/resources/country-profiles.html http://www.forbes.com/sites/susanadams/2012/06/15/business-etiquette-tips-for-international-travel/ http://www.marcaria.com/international-business-etiquette-customs-and-culture.asp	0	1	1	0
20	Doubt Clearing	One-to-One Interaction	Practice	0	1	0	0
21	Recap	Discussion	Performance Analysis	0	1	0	0

FCHU1211 CREATIVE WRITING

Pre - requisites	Course Type	Credits
Nil	Workshop	2

The aim of the course is to prepare students for careers in a workplace that is information-rich and that increasingly values communication skills and the ability to think creatively and critically. The class time will be devoted to writing workshop, innovation exercises, and the critical appreciation of write-ups. The Creative Writing course will focus on

Reading
Writing Creatively
Presentations

Thus the main objective is to breed a culture of learning where students learn a variety of approaches to creative writing in a cooperative learning environment.

COURSE OBJECTIVES

Develop thinking skills
Acquire basic skills and techniques to develop a suitable practice of creative writing in context
Use a constructive approach to critique his/her own work, as well as work by his/her peers
Organize, prepare and present spoken presentations clearly and expressively

COURSE OUTCOMES

Upon the Completion of the course, a student will
Create Blog/ Online Presence
Submit works for publication
Compose a variety of written responses for different purposes and audiences
Collaborate by sharing ideas, examples and insights, productively and respectfully in informal conversations and discussions.
Students will put into practice the learning into the personal, professional and technical sphere.

MODULE -I: WRITING CREATIVELY (12hrs)

Foundational activities

Introduction to Class Standards
(Workshops, peer conferencing, blogging, reading outside the classroom)
Collaborative Creation of Classroom Philosophy
Basics of Creative Writing

Different forms of expression

Memoirs/Writing the Personal Narratives
Situational Writing/ Writing for the Target Audience
Dialogues, Essay, Poetry Slam
Script Writing
Writing for Blogs
Cooking Up Interview Stories

Writing from visuals

Pictures, Graphs, Images, Diagrams and Designs, Cartoons
Brochures and Newsletters

(This module will be facilitated through creative writing and speaking activities)

MODULE-II: READING AND CRITICAL APPRECIATION (8hrs)

Book

(Independent Study: Two Master Piece)

Article

Movie

(Student Work: Free Choice, Discussion and Oral/ Written Critiquing, Editing/ Revision
Publication/ Sharing, Short Report on Two Authors)

(This module will be facilitated through reading activities and critical appreciation)

MODULE-III: POWER OF LATERAL THINKING TO CREATE NEW IDEAS (7hrs)

General Concepts: Creativity and Lateral Thinking
Using the Technique of Lateral Thinking in Writing
Idea Generation Games and Activities
Six Thinking Hats

(This module will be facilitated through idea generation activities and presentation)

TEXT BOOKS

Creative Writing: A Workbook with Readings- Linda Anderson

Creative Writing- By DevAnjanaNeira

REFERENCES

The Cambridge Companion to Creative Writing by David Morley, Philip Neilsen

Creative Writing- By Adele Ramet

The Creative Writing Mfa Handbook: A Guide for Prospective Graduate Students By Tom Kealey

<https://www.writersstore.com/how-to-write-a-screenplay-a-guide-to-scriptwriting/>

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		Video links Blog writing practice	https://www.youtube.com/watch?v=XZszextv6yE BLOGS https://www.youtube.com/watch?v=t21sKonfylk				
	Cooking Up Interviews		https://www.themuse.com/advice/6-types-of-stories-you-should-have-on-hand-for-job-interviews 1610270959 https://www.themuse.com/advice/the-interview-technique-you-should-be-using				
8	Writing from visuals Pictures, Graphs, Images, Diagrams and Designs, Cartoons Brochures and Newsletters		https://twp.duke.edu/uploads/assets/Using%20Visual%20Rhetoric%20in%20Academic%20Writing.pdf https://www.youtube.com/watch?v=r6ZVGBQYNXE	0	1	0	0

MODULE-II: READING AND CRITICAL APPRECIATION 8 HOURS)

S. No.	Topics	Pedagogy	Details	Instructional Hrs			
				Th	Pract	Vide o	Proj
9	Book (Independent Study: Two Master Piece)		http://www.howtolearn.com/2012/08/different-reading-techniques-and-when-to-use-them/	0	2	0	0
10	Article writing			0	2	0	0
11	Movie Review (Student Work: Free Choice, Discussion and Oral/ Written Critiquing, Editing/ Revision)			0	1	1	0
12	Publication/ Sharing, Short Report on Two Authors		https://www.elsevier.com/authors/book-authors/science-and-technology-book-publishing/overview-of-the-publishing-process	0	2	0	0

MODULE-III: POWER OF LATERAL THINKING TO CREATE NEW IDEAS (7hrs)

S. No.	Topics	Pedagogy	Details	Instructional Hrs			
				Th	Pract	Vide o	Proj
13	General Concepts: Creativity and Lateral Thinking	Role Plays/ Oral Presentations Practice	www.brainstorming.co.uk/tutorials/definitions.html http://www.trainingcoursematerial.com/free-training-articles/creativity-problem-solving-	0	1	1	0

			decision-making-and-lateral-thinking/defining-lateral-thinking-parallel-thinking-creativity-and-innovation Video : https://www.youtube.com/watch?v=H7PyFNzPSVY				
14	Idea Generation Games and Activities	Pair/group activities	http://study.com/academy/lesson/w-hat-is-idea-generation-definition-process-techniques.html	0	1	1	0
15	Six Thinking Hats	Group task	http://www.debonogroup.com/six_thinking_hats.php	0	1	1	0
16	DOUBT CLEARING			0	1	0	0

FCHU1212 ENGLISH FOR COMPETITION (GRE/GMAT/TOEFL/IELTS)

<i>Pre - requisites</i>	<i>Course Type</i>	<i>Credits</i>
<i>Nil</i>	<i>Workshop</i>	<i>2</i>

COURSE OBJECTIVE

Familiarize the learners with the pattern of the TOEFL/GMAT/IELTS/GRE examination and improve overall English skills to face the competitive exams confidently.

COURSE OUTCOME

Learners understand the pattern of the TOEFL, IELTS and GRE examination and apply test-taking strategies in exams.

A student is required to take up five laboratory tests of 100 marks.

LIST OF EXPERIMENTS

1: TOEFL Listening

Developing Listening Comprehension by taking notes after the short recorded conversations.

2: TOEFL Speaking

Developing test taking strategies to face speaking test of TOEFL exam through role play and Mock Interview.

3: TOEFL Reading

Practicing and improving student's confidence in completing the various sections of reading test in TOEFL examination.

4: TOEFL Writing

Learning and enhancing writing skills required for TOEFL writing test.

5: IELTS Listening

Practicing the listening comprehension of the students and handling questions while listening the recorded conversations.

6: IELTS Speaking

Developing test taking strategies to face speaking test of IELTS examination through role plays and mock interviews.

7: IELTS Writing

Summarizing or explaining information presented in a graph, chart, table or diagram.

8: IELTS Reading

Understanding and interpreting the text in its particular use of language, ideas and style.

9: GRE Reading Comprehension

Taking GRE Reading Comprehension examination with confidence utilizing the methods and strategies.

10: GRE SENTENCE COMPLETION

Developing sentence completion strategies through logical thinking.

11: GRE SENTENCE EQUIVALENCE

Learning and developing strategies to deal with sentence equivalence questions.

12: GRE VOCABULARY

Understanding and using appropriate choice of vocabulary in GRE vocabulary section.

13. GRE Vocabulary & Verbal-Sentence Corrections

14. GMAT Verbal-Critical Reasoning

15. GMAT Verbal- Reading Comprehension

(The entire lab will be facilitated through online quizzes, and practice sets available in language lab)

TEXT BOOKS:

NorthStar Building Skills for the TOEFL iBT, High Intermediate Level (Pearson Education).

NorthStar Building Skills for the TOEFL iBT, Intermediate Level (Pearson Education).

McGraw-Hill's New GRE: 2011-2012 Edition

Princeton Review: Cracking the New GRE 2012

REFERENCES:

Longman Preparation Course for the TOEFL Test – iBT Speaking (Pearson Education).

Longman Preparation Course for the TOEFL Test – iBT Listening (Pearson Education).

Longman Preparation Course for the TOEFL Test – iBT Writing (Pearson Education).

Longman Preparation Course for the TOEFL Test – iBT Reading (Pearson Education).

NorthStar Building Skills for the TOEFL iBT, Advanced Level (Pearson Education).

Achieve IELTS Workbook: Intermediate to Upper Intermediate: English for International Education (Achieve IELTS Intermediate/Upper) (Paperback).

Kaplan New GRE Premier 2011-2012

Barron's New GRE 19th Edition Grade

Manhattan GRE

Gruber's Complete GRE Guide 2012

Nova's GRE Prep Course Grade

ETS's Official Guide to the GRE Revised General Test

Barron's GRE Verbal Workbook

Barron's IELTS with Audio CD: International English Language Testing System (Paperback)

Achieve IELTS Teacher's Book: Intermediate to Upper Intermediate: English for International Education (Achieve IELTS Intermediate/Upper) (Paperback)

Step Up to IELTS Self-study Student's Book [STUDENT EDITION] (Paperback)

IELTS Collected Papers: Research in speaking and writing assessment (Studies in Language Testing) (Paperback)

EVALUATION SYSTEM (CONTINUOUS INTERNAL ASSESSMENT)

Methods	Listening & fill-up blanks, short answers, Multiple-choice	JAM/ Questions & Responses	Vocabulary Quiz, Sentence Completion & Re-order paragraphs	Reading Comprehension	Summarize /Data Comment	Essay Writing	Analytical Writing	% of Marks 100 (Best 5)
Total	20	20	20	20	20	20	20	100

SESSION PLAN: ENGLISH FOR COMPETITION

S. No	Topic	Pedagogy	Details	Instructional Hrs			
				Th	Pract	video	Pro t
.							

1	TOEFL Listening	Listening Activity Based Learning	http://www.examenglish.com/TOEFL/toefl_listening.htm	0	1	1	0
2	TOEFL Speaking	Listening and speaking activity	http://www.examenglish.com/TOEFL/TOEFL_Speaking_part5.htm	0	1	1	0
3	TOEFL Reading & Writing	Reading and Writing Practice	http://www.examenglish.com/TOEFL/TOEFL_reading1.htm (Reading) https://www.englishclub.com/esl-exams/ets-toefl-practice-writing.htm . http://www.time4writing.com/toefl/ (Writing)	0	2	0	0
4	IELTS Listening	Listening Practice	http://takeielts.britishcouncil.org/prepare-your-test/free-ielts-practice-tests/listening-practice-test-1	0	1	1	0
5	IELTS Speaking	Speaking Practice	http://takeielts.britishcouncil.org/prepare-your-test/free-practice-tests/speaking-practice-test-1	0	2	0	0
6	IELTS Writing & Reading	Writing & Reading Practice	http://takeielts.britishcouncil.org/prepare-your-test/free-practice-tests/writing-practice-test-1-ielts-academic http://takeielts.britishcouncil.org/sites/default/files/Writing_practice_test_1_IELTS_Academic_questions.pdf (writing) http://takeielts.britishcouncil.org/prepare-test/practice-tests/reading-practice-test-1-academic (Reading)	0	2	0	0
7	GRE Reading Comprehension	Reading Practice	http://gre.graduateshotline.com/reading_comprehension_practice.html#.V2kJDRITXCM https://www.ets.org/gre/revised_general/prepare/verbal_reasoning/reading_comprehension/sample_questions	0	2	0	0
8	GRE Sentence Completion & Sentence Equivalence	Online practice	http://gre.graduateshotline.com/gre_sentence_completion.pl https://www.ets.org/gre/revised_general/prepare/verbal_reasoning/text_completion/sample_questions http://www.examfocus.com/gre/pt/verbal/sentence-equivalence-1.html	0	2	0	0
9	GRE Vocabulary	Online practice	http://gre.graduateshotline.com/	0	2	0	0
10	GMAT Verbal-Sentence Corrections	Online practice	http://freemattest.net/Questions http://www.majortests.com/gmat/sentence_correction.php	0	2	0	0
11	GMAT Verbal-Critical Reasoning	Online practice	http://www.majortests.com/gmat/critical_reasoning_test01	0	2	0	0
12	GMAT Verbal-Reading Comprehension	Online practice	http://www.majortests.com/gmat/reading_comprehension_test01	0	2	0	0

FCHU0210 LIFE SKILLS DEVELOPMENT-I [English]

<i>Pre - requisites</i>	<i>Course Type</i>	<i>Credits</i>
<i>Nil</i>	<i>Practice</i>	<i>2</i>

OBJECTIVES

To provide ample opportunities for practice

To approach reading comprehension questions and improve your vocabulary

OUTCOME

To qualify competitive exams

MODULE I: (24 HOURS)

S. No.	Topic	Pedagogy	Details	Instructional Hrs			
				Th	Pract	video	Proj
1	Reading Comprehension-1 & 2	Workbook Practice	Passage Reading	0	2	0	0
2	Reading Comprehension-3 & 4	Workbook Practice	Passage Reading	0	2	0	0
3	Reading Comprehension-1, 2 & 3	Workbook Practice	Passage Reading	0	2	0	0
4	Reading Comprehension-4,5 & 6	Workbook Practice	Passage Reading	0	2	0	0
5	Vocabulary(10 New Words)	Workbook Practice	Learning 10 new words	0	2	0	0
6	Vocabulary(15 New Words)	Workbook Practice	Learning 15 new words	0	2	0	0
7	Vocabulary(15 New Words)	Workbook Practice	Learning 15 new words	0	2	0	0
8	Vocabulary(20 New Words)	Workbook Practice & Quiz	Learning 20 new words	0	2	0	0
9	Reading Comprehension-1 & 2	Workbook Practice	Passage Reading	0	2	0	0
10	Reading Comprehension-3 & 4	Workbook Practice	Passage Reading	0	2	0	0
11	Reading Comprehension-5 & 6	Workbook Practice	Passage Reading	0	2	0	0
12	Speaking Skills	ACTIVITY	JAM	0	2	0	0
MODULE II: (24 HOURS)							
1	Vocabulary	Workbook Practice	Learning new words	0	2	0	0
2	Vocabulary	Workbook Practice	Learning new words	0	2	0	0
3	Reading Practice	News Reading	Reading Comprehension	0	2	0	0
4	Reading Comprehension-1 & 2	Workbook Practice	Passage Reading	0	2	0	0
5	Reading Comprehension-3 & 4	Workbook Practice	Passage Reading	0	2	0	0
6	Vocabulary	Workbook Practice	Learning new words	0	2	0	0

7	Vocabulary	Workbook Practice	Learning new words	0	2	0	0
8	Vocabulary	Quiz	Learning new words	0	2	0	0
9	Vocabulary	Workbook Practice	Learning new words	0	2	0	0
10	Speaking Skills	GD & Analysis	General Topics	0	2	0	0
11	Reading Comprehension-1 & 2	Workbook Practice	Passage Reading	0	2	0	0
12	Vocabulary-1	Quiz	Learning new words	0	2	0	0
MODULE-3 (24 HOURS)							
1	Reading Comprehension-1 & 2	Workbook Practice	Passage Reading	0	2	0	0
2	Vocabulary-1	Workbook Practice	Learning new words	0	2	0	0
3	Vocabulary-2	Surprise Quiz	Learning new words	0	2	0	0
4	Vocabulary-2	Workbook Practice	Learning new words	0	2	0	0
5	Vocabulary-3	Workbook Practice	Learning new words	0	2	0	0
6	Vocabulary-3	Asking Each Other	Learning new words	0	2	0	0
7	Vocabulary-4	Quiz	Learning new words	0	2	0	0
8	Reading Comprehension-1 & 2	Workbook Practice	Passage Reading	0	2	0	0
9	Reading Comprehension-3 & 4	Workbook Practice	Passage Reading	0	2	0	0
10	Speaking Practice	Activity Based Learning	Extempore/ Communication Game	0	2	0	0
11	Vocabulary-5	Workbook Practice	Learning new words	0	2	0	0
12	Vocabulary-5	Recap & Analysis	Vocabulary Exercises	0	2	0	0

EVALUATION SYSTEM: INTERNAL ASSESSMENT (50) + EXTERNAL ASSESSMENT (50)

Methods	Online Test-I	Online Test-I	Online Test-I	Attendance	Assignment	% of Marks 50
Total	10	10	10	10	10	100

FCHU0211 LIFE SKILLS DEVELOPMENT-II [APTITUDE]

<i>Pre - requisites</i>	<i>Course Type</i>	<i>Credits</i>
<i>Nil</i>	<i>Practice</i>	<i>2</i>

OBJECTIVE

Aptitude and Reasoning Tests are designed to give an objective assessment of a Candidate's ability in numerical as well as analytical

OUTCOMES

Ability skills will be increased

Improved skills to qualify all competitive exams like Banking Exams, Company-based Exams, Railway Exams, GATE Exams

SESSION PLAN: APTITUDE MODULE I: (24 HOURS)

S. No.	Topic	Pedagogy	Details	Instructional Hrs			
				Th	Pract	video	Proj
1	Number System-01	Workbook Practice	Operation on Numbers, Classification of Numbers, Tests of Divisibility	0	2	0	0
2	Number System-01	Workbook Practice		0	2	0	0
3	Number System-02	Workbook Practice	Unit Digit Calculation, Remainder Calculation,	0	2	0	0
4	Number System-02	Workbook Practice		0	2	0	0
5	Practice Test - 01	Practice Test	Practice Test on Number System http://gradestack.com/blogs/short-quiz-on-number-system-for-ctet-2015/	0	2	0	0
6	Lcm & HCF	Workbook Practice	Basics of LCM & HCF	0	2	0	0
7	Lcm & HCF	Workbook Practice	Basics of LCM & HCF	0	2	0	0
8	Practice Test - 02	Practice Test	Practice Test on LCM & HCF	0	2	0	0
9	Average	Workbook Practice	Basics of Average	0	2	0	0
10	Average	Workbook Practice	Basics of Average	0	2	0	0
11	Practice Test - 03	Practice Test	Practice Test on Average	0	2	0	0
12	Practice Test - 04	Practice Test	Practice Test on Number System, LCM & HCF & Average	0	2	0	0

MODULE II: (24 HOURS)

S. No.	Topic	Pedagogy	Details	Instructional Hrs			
				Th	Pract	video	Proj
1	Percentage	Workbook Practice	Basics of Percentage	0	2	0	0
2	Percentage	Workbook Practice	Basics of Percentage	0	2	0	0
3	Practice Test – 05	Practice Test	Practice Test on Percentage	0	2	0	0
4	Ratio & Proportion	Workbook Practice	Basics of Ratio & Proportion	0	2	0	0
5	Practice Test-06	Practice Test	Practice Test on Ratio & Proportion	0	2	0	0
6	Time & Work	Workbook Practice	Basics of Time & Work, Chain Rule	0	2	0	0
7	Time & Work	Workbook Practice	Basics of Time & Work, Chain Rule	0	2	0	0
8	Practice Test – 07	Practice Test	Practice Test on Time & Work	0	2	0	0
9	Pipes & Cistern	Workbook Practice	Basics of Pipes & Cistern	0	2	0	0
10	Time & Distance, Trains	Workbook Practice	Basics of Time & Distance, Trains	0	2	0	0
11		Workbook Practice	Basics of Time & Distance, Trains	0	2	0	0
12	Practice Test – 08	Practice Test	Practice Test on Time & Distance, Trains	0	2	0	0

MODULE-3 (24 HOURS)

S. No.	Topic	Pedagogy	Details	Instructional Hrs			
				Th	Pract	video	Proj
1	Boats & Streams	Class Task	Basics of Boats & Streams	0	2	0	0
2	Profit & Loss	Class Task	Basics of Profit & Loss	0	2	0	0
3	Profit & Loss	Home Task	Basics of Profit & Loss	0	2	0	0
4	Practice Test - 09	Practice Test	Practice Test on Profit & Loss http://gradestack.com/ssc/quants-quiz-on-profit-and-loss-for-ssc-cgl-2015-exam/	0	2	0	0
5	Practice Test - 10	Practice Test	Practice Test on Boats & Streams	0	2	0	0
6	Practice Test - 11	Practice Test	Practice Test on Average, Percentage, Number System, LCM & HCF, Boats & Streams, Average, Profit & Loss, Trains, Time & Distance www.livetest.in	0	2	0	0
7	Practice Test - 12	Practice Test	Practice Test on Average, Percentage, Number System, LCM & HCF, Boats & Streams, Average, Profit & Loss, Trains, Time & Distance https://www.wiziq.com/tests/aptitude-test	0	2	0	0
8	Practice Test - 13	Practice Test	Practice Test on Average, Percentage, Number System, LCM & HCF, Boats & Streams, Average, Profit & Loss, Trains, Time & Distance	0	2	0	0
9	Practice Test - 14	Practice Test	Practice Test on Average, Percentage, Number System, LCM & HCF, Boats & Streams, Average, Profit & Loss, Trains, Time & Distance	0	2	0	0
10	Practice Test - 15	Practice Test	Practice Test on Average, Percentage, Number System, LCM & HCF, Boats & Streams, Average, Profit & Loss, Trains, Time & Distance	0	2	0	0
11	Practice Test - 16	Practice Test	Practice Test on Average, Percentage, Number System, LCM & HCF, Boats & Streams, Average, Profit & Loss, Trains, Time & Distance http://www.freeonlinetest.in	0	2	0	0
12	Practice Test - 17	Practice Test	Practice Test on Average, Percentage, Number System, LCM & HCF, Boats & Streams,	0	2	0	0

			Average, Profit & Loss, Trains, Time & Distance References for online tests: http://www.careerride.com/Online-practice-test.aspx http://www.freeonlinetest.in http://gradestack.com www.livetest.in https://www.wiziq.com/tests/aptitude-test				
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EVALUATION SYSTEM: INTERNAL ASSESSMENT (50) + EXTERNAL ASSESSMENT (50)

Methods	Online Test-I	Online Test-I	Online Test-I	Attendance	Assignment	% of Marks
Total	10	10	10	10	10	100

FCHU0212 LIFE SKILLS DEVELOPMENT – III [REASONING]

Pre - requisites	Course Type	Credits
Nil	Workshop	2

SESSION PLAN: REASONING MODULE I: (24 HOURS)

S. No.	Topic	Pedagogy	Details	Instructional Hrs			
				Th	Pract	video	Proj
1	Number Series	Workbook Practice	BASICS	0	2	0	0
2	Number Series	Workbook Practice	BASICS	0	2	0	0
3	Practice Test - 01	Practice Test	Practice Test on Number Series http://gradestack.com/ssc/reasoning-quiz-on-number-series-for-ssc-exams-3/	0	2	0	0
4	Letter Series	Class Task	BASICS	0	2	0	0
5	Letter Series	Workbook Practice	BASICS	0	2	0	0
6	Practice Test - 02	Practice Test	Practice Test on Letter Series	0	2	0	0
7	Alpha Numeric Series	Workbook Practice	Basics	0	2	0	0
8	Alpha Numeric Series	Workbook Practice	Basics	0	2	0	0
9	Practice Test - 03	Practice Test	Practice Test on Alpha Numeric Series	0	2	0	0
10	Continuous Pattern Series	Workbook Practice	Basics	0	2	0	0

11	Continuous Pattern Series	Workbook Practice	Basics	0	2	0	0
12	Practice Test - 04	Practice Test	Practice Test on Number Series, Letter Series, Alpha Numeric Series & Continuous Pattern Series	0	2	0	0

MODULE II: (24 HOURS)

S. No.	Topic	Pedagogy	Details	Instructional Hrs			
				Th	Pract	video	Proj
1	Percentage	Workbook Practice	Basics of Percentage	0	2	0	0
2	Percentage	Workbook Practice	Basics of Percentage	0	2	0	0
3	Practice Test - 05	Practice Test	Practice Test on Percentage	0	2	0	0
4	Ratio & Proportion	Workbook Practice	Basics of Ratio & Proportion	0	2	0	0
5	Practice Test-06	Practice Test	Practice Test on Ratio & Proportion	0	2	0	0
6	Time & Work	Workbook Practice	Basics of Time & Work, Chain Rule	0	2	0	0
7	Time & Work	Workbook Practice	Basics of Time & Work, Chain Rule	0	2	0	0
8	Practice Test - 07	Practice Test	Practice Test on Time & Work	0	2	0	0
9	Pipes & Cistern	Workbook Practice	Basics of Pipes & Cistern	0	2	0	0
10	Time & Distance, Trains	Workbook Practice	Basics of Time & Distance, Trains	0	2	0	0
11	Time & Distance, Trains	Workbook Practice	Basics of Time & Distance, Trains	0	2	0	0
12	Practice Test - 08	Practice Test	Practice Test on Time & Distance, Trains	0	2	0	0

MODULE-3 (24 HOURS)

S. No.	Topic	Pedagogy	Details	Instructional Hrs			
				Th	Pract	video	Proj
1	Miscellaneous	Workbook Practice	Basics	0	2	0	0
2	Miscellaneous	Workbook Practice	Basics	0	2	0	0
3	Practice Test - 11	Practice Test	Practice Test on Syllogism, Puzzle, Letter & Number Series, Miscellaneous	0	2	0	0
4	Practice Test - 12	Practice Test	Practice Test on Syllogism, Puzzle, Letter & Number Series, Miscellaneous	0	2	0	0

5	Practice Test - 13	Practice Test	Practice Test on Syllogism,Puzzle,Letter & Number Series,Miscellaneous	0	2	0	0
6	Practice Test - 14	Practice Test	Practice Test on Syllogism,Puzzle,Letter & Number Series, Miscellaneous	0	2	0	0
7	Practice Test - 15	Practice Test	Practice Test on Syllogism, Puzzle,Letter & Number Series ,Miscellaneous	0	2	0	0
8	Practice Test - 16	Practice Test	Practice Test on Syllogism,Puzzle,Letter & Number Series,Miscellaneous	0	2	0	0
9	Practice Test - 17	Practice Test	Practice Test on Syllogism,Puzzle,Letter & Number Series,Miscellaneous	0	2	0	0
10	Practice Test - 18	Practice Test	Practice Test on Syllogism,Puzzle,Letter & Number Series,Miscellaneous	0	2	0	0
11	Practice Test - 19	Practice Test	Practice Test on Syllogism,Puzzle,Letter & Number Series,Miscellaneous	0	2	0	0
12	Practice Test - 20	Practice Test	Practice Test on Syllogism,Puzzle,Letter & Number Series,Miscellaneous http://gradestack.com http://www.freeonlinetest.in www.livetest.in	0	2	0	0

EVALUATION SYSTEM: INTERNAL ASSESSMENT (50) + EXTERNAL ASSESSMENT (50)

Methods	Online Test-I	Online Test-I	Online Test-I	Attendance	Assignment	% of Marks
Total	10	10	10	10	10	100

FCMG0101 ECONOMICS

Pre - requisites	Course Type	Credits
Nil	Theory	2

Course Objective:

In today's dynamic economic environment, effective managerial decision making requires timely and efficient use of information. The basic purpose of this course is to provide students with a basic understanding of the economic principles, methodologies and analytical tools that can be used in business decision making problems. It provides an understanding of the economic environment and its impact on strategy formulation. The course also focuses on the impact of economic policies on managerial decision-making by providing an understanding of fiscal policy, and national and global economic issues affecting business.

The language of science (and all analytical thinking) is mathematics. Since economics is a social science, use of some mathematical tools, basically the constrained and un-constrained optimization

techniques will help in measuring and solving the basic economic problems and thus improves decision-making. It becomes difficult and totally un-practicable to solve business (economic) problems logically and systematically without use of mathematics. The basic objective is to solve problems mathematically and interpret the results economically.

Module-1: Micro Economics

Introduction to economics: Scarcity, Choice and Efficiency, Fundamental issues of what, how and for whom to produce to make the best use of economics. Demand for a commodity: Law of demand, Demand schedule and demand curve, Individual and market demand, Change in demand, Consumer behavior: Analysing law of demand through Marshallian utility analysis, Indifference curve technique and Consumer Surplus.

Elasticity of demand: Price Elasticity of demand: Estimation, Types, Elasticity and revenue, Factors affecting price elasticity of demand. Income elasticity, Cross elasticity, Uses of different concepts of elasticity in business decisions.

Analysis of Supply: Law of Supply, Supply schedule and supply curve, Change in supply, Price elasticity of supply, Equilibrium of demand and supply: Equilibrium with demand and supply curves, Effect of a shift of demand and supply curves.

Production Function: Production function with one variable input, Production function with two variable inputs, optimal combination of inputs, Returns to scale

Cost Theory: Types of costs, Production and cost, Short-run cost functions, Long-run cost functions, Economies of scale and scope, Cost-Volume-profit Analysis

Market: Meaning, types and characteristics of different market structure (Perfect competition, Monopoly, Monopolistic competition and Oligopoly)

Module: 2: Macro Economics

National Income Accounting: Circular flow of Income, National Income Concept, Eight variants of national product aggregates, Measurement (Income, Value Added and Expenditure), Real and Nominal GNP, Difficulties in measuring the national income, Uses of National income statistics, Money and Inflation: Demand for and supply of money. Causes and consequences of Inflation. Commercial and central banking: Role and functions of commercial banks and R.B.I., Monetary Policy and Fiscal policy: Objectives and Instruments, Balance of Payment (BoP): Meaning, BoP Account, Disequilibrium in BoP, Measures to correct disequilibrium in BoP, Foreign Exchange: Floating Exchange Rate and Fixed Exchange Rates

Books & Reference:

1. *Managerial Economics in a Global Economy*, by D. Salvatore, Sixth Edition, OUP, 2008
2. *Managerial Economics*, Truett&Truett, Wiley Publication.
3. *Managerial Economics*, by Petersen Craig H. Cris Lewis and S.K. Jain, Pearson, 2007
4. *Modern Micro Economics*, Koutsoyiannis, (1975), A, Macmillan Press
5. *Managerial Economics*, Mehta, P. L (1999), Sultan Chand & Sons
6. *Principles of Microeconomics*, Mankiw, N. G (2006), Cengage Learning
7. *Macroeconomics*, Mankiw, N. G, (2009), Worth Publishers
8. *Macroeconomics, Theory and Policy*, Dwivedy, D.N (2007), Tata McGraw Hill
9. *Macroeconomics*, D'Souza, E (2008), Pearson Education
10. *Macroeconomic Analysis*, Shapiro, E (2003), Galgotia Publications
11. *Environmental Economics in Theory and Practice – Hankey N, Shogren J F, and White B – 1999 – Macmillan Indian Limited*
12. *Indian Economy*, Mishra &Puri (2011), Himalaya Publishing House

FCMG0102 ACCOUNTING AND FINANCE

<i>Pre - requisites</i>	<i>Course Type</i>	<i>Credits</i>
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<i>Nil</i>	<i>Theory</i>	<i>2</i>
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Course Objective:

- a) To familiarise the students with basic terms of accounting, accounting principles, concepts and convention.
- b) To equip the students with various concepts, tools and techniques of Cost accounting as well as Management accounting essential for managerial decision making process.
- c) To aware students overview of Time Value of Money, Working Capital and Stock Market

Course outcomes:

On the successful completion of this paper the students should be able composed the information about:

- Develop a basic understanding of accounting and financial ratio analysis.
- Students will be able to create, balance and deliver a budget and use budget information for planning and decision purposes.
- Undertake various costing techniques and information for planning and decision-making
- Demonstrate time management by understand various financial funding options for project planning and working capital management of an organizations.
- Know how financial markets as well as the global economy are impacting their organization today and how they will impact their organization into the future.

Module 1:

Basic Accounting Concepts and Conventions, Basic Accounting Equation, Accounting Mechanism: Journals, Ledgers, Trial Balance, Basic Financial Statements: Analysis of Items found in Balance Sheet and Income Statement, Ratio Analysis

Module 2:

Cost Concepts and Cost Terms: Financial Accounting vrs. Cost Accounting, Direct and Indirect Costs, Fixed, Variable and Semi-variable Costs, Standard, Budgeted and Actual Costs, Controllable and Non-controllable costs, Preparation of Cost Sheet, Cost-Volume-Profit Analysis: Concept of Marginal Cost and Contribution, Concept of Break Even Analysis, Applications of Marginal Costing

Module 3:

Time Value of Money: Concept, Simple and Compound Interest, Present Value of a Single Amount, Present Value of an Uneven Series, Future Value of an Annuity, Present Value of an Annuity
Working Capital Management: Meaning and Components of Working Capital, Determinants of Working Capital, Profitability-Risk Trade-off, Types of Working Capital, Importance of Working Capital, Operating Cycle: Concept and Estimation
Stock Market: Types of Capital Issues: Initial Public Offer, Follow-on Public Offer, Rights Issues, Preferential Issues, Red-herring Prospectus, Free Pricing of Issues, Greenshoe Option, Lock-in Period, Safety Net, Listing of Securities on Stock Exchanges

Books Recommended:

1. *Accounting for Management—Ashok Sehgal, Taxxman*
2. *Financial Accounting -- A managerial Perspective, R. Narayanswamy, PHI*
3. *Khan & Jain – Management Accounting, TMH.*
4. *Hornrgren ,Datar, Foster- Cost Accounting, Pearson.*
5. *Financial Accounting, Jain/Narang/Agrawal, Kalyani.*
6. *Basic Financial Accounting for Management, Shah, Oxford.*
7. *Financial Management by I. M. Pandey*
8. *Financial Management – Theory and Practice by Chandra*
9. *Financial Management – Text and Problems by Khan & Jain*

FCMG0103 MANAGEMENT PROCESSES AND ORGANIZATIONAL BEHAVIOR

<i>Pre - requisites</i>	<i>Course Type</i>	<i>Credits</i>
<i>Nil</i>	<i>Theory</i>	<i>2</i>

Course Objectives:

Management as a subject of study has brought a new paradigm in managing organizations. The young professionals has to learn and reflect the basic principles of management. Along with it the knowledge of Individual and group behaviour and its impact at the workplace is vital. Organizational Behavior (OB) is a field of study that investigates the impact that individuals, groups, and structure have on behavior within an organization. Then it applies that knowledge to make organizations work more effectively. This course will expose students to gain knowledge on the basic principles of management and organization behavior.

Course Introduction

Management as a subject of study has brought a new paradigm in managing organizations. The young professionals has to learn and reflect the basic principles of management. Along with it the knowledge of Individual and group behaviour and its impact at the workplace is vital. Organizational Behavior (OB) is a field of study that investigates the impact that individuals, groups, and structure have on behavior within an organization. Then it applies that knowledge to make organizations work more effectively. This course will expose students to gain knowledge on the basic principles of management and organization behavior.

Course Content

Unit: I

Emergence of Management as a discipline, Principles of management, (Planning, organizing, staffing and controlling) Contributions to management by Luther Gullick , Henri Fayol and Peter F. Drucker and Introduction: Concept and models of OB, Approaches to OB (Systems, Human resource and Contingency)

Unit: II

Individual System: Learning, Perception, Personality and Motivation,

Unit: III

Social System: Group Dynamics and Leadership.

Books Recommended:

1. Robins & Sanghii; Organizational Behavior, Pearson
2. Luthans ,F; Organizational Behavior-TMH
3. Udai Pareek ; Understanding Organizational Behavior, Oxford
4. Prasad,L.M; Organization behavior, S.Chand.
5. K. Aswathappa; Organization behaviour
6. Prasad.L.M ; Principles of Management,

FCMG0104 PRODUCTION AND OPERATION MANAGEMENT

<i>Pre - requisites</i>	<i>Course Type</i>	<i>Credits</i>
<i>Nil</i>	<i>Theory</i>	<i>2</i>

Course Objective:

The course is designed to acquaint the students with decision making in production and operation function of an organization.

Course Outcomes :

- ✓ Acquire a working understanding of the roles/functions of production management in the context of business enterprise.
- ✓ The learner will have a deep knowledge of the fundamental theory and mathematical principles involved in Production and Operation Management.
- ✓ They can use specialized knowledge in Operations Management to solve business processes.
- ✓ They will be capable of applying these principles to solve relevant production or service system problems.

Module 1:

Operations Management- An Introduction : Primary topics in Operations Management, Operations Function and Transformation process . Manufacturing Strategy and Mass customization, Product Development and Service Design , New Product design, Product life cycle, Process design, Process life cycle

Module 2:

Project scheduling Models: Project Network, Critical path Method (CPM), Programme Evaluation Review Technique (PERT).

Scheduling: Objective of Scheduling, Sequencing, Sequencing model: "n" jobs 1 machine, "n" jobs 2 machines.

Module 3:

Inventory Management: Concept of inventory with independent demand: Inventory cost structure, Deterministic inventory model - EOQ models, instantaneous receipt, Inventory model with discounts.

Module 4:

Quality Management: Concept of quality; Quality of design, Conformance & performance; Cost of poor process performance and quality. Statistical Quality Control - Process Control (X-bar, R & P chart, np chart).

Concept of TQM, Just in Time and Lean Production Basic element in JIT, Pull system, Push system

Books Recommended:

- 1) Chase, Jacobs, Aquilano, Agarwal, - "Operations Management", TMH
- 2) Krajewski, Ritzman, Kansal, - "Operations Management", Pearson
- 3) Everette. Adam Jr., Ronald J. Ebert, - "Production and Operations Management", PHI
- 4) Roberta S. Russell & Bernard W. Taylor III, - "Operations Management", Pearson/ PHI
- 5) Aswathappa & Sridhar Bhat, - "Production and Operations Management", HPH
- 6) Gaither, Frazier- Operations Management

FCMG0105 MARKETING MANAGEMENT

<i>Pre - requisites</i>	<i>Course Type</i>	<i>Credits</i>
<i>Nil</i>	<i>Theory</i>	<i>2</i>

Course Objective:

- a) To familiarize the students with the concepts and theories and strategies of marketing.
- b) To focus on the application of these concepts to various marketing contexts
- c) To focus on the emerging areas of marketing

Course outcomes :

- ✓ The students will understand the various marketing approach in today's competitive scenario.
- ✓ The students will learn the application of various marketing tools for solving business problems

The students will acquire and develop the marketing skills to be a successful marketing person

Module 1:

Introduction to marketing; What is marketing?, Importance of marketing function, Process of marketing, Concepts like need, want, value, satisfaction etc, Elementary idea of marketing mix. Understanding Marketing Environment; Factors affecting marketing environment (PESTEL),Porter’s five forces model, Introduction to market research

Module 2:

Segmentation, Targeting & positioning (STP);What is market segmentation?, Criteria for effective segmentation, Targeting selected markets, Targeting strategies, Positioning , Effective positioning strategies, Positioning of brands and repositioning ,introduction to consumer behavior.

Module 3:

Product Management; Classification of products, Product life cycle (PLC), Brand and branding. Pricing; Meaning & objective, steps in setting the price, pricing policies. Promotion; What is promotion, types of promotion, advertising, sales promotion, integrated marketing communication Place; Marketing channels, Channel conflict management, Distribution system. Introduction to services marketing, Emerging concepts like green marketing, e-marketing & social marketing.

Books Recommended:

1. *Marketing Management: A South Asian Perspective- Phillip Kotler, Kevin Lane Keller, Abraham Koshy and MithileshwarJha, 13th Edition Pearson, Education Publication*
2. *Marketing Mangement: Fourth edition- RajanSaxena*
3. *Positioning: The Battle for Your Mind- Al Ries& Jack Trout, Warner Books USA*

FCMG0108 INTRODUCTION TO RESEARCH

<i>Pre - requisites</i>	<i>Course Type</i>	<i>Credits</i>
<i>Nil</i>	<i>Theory</i>	<i>2</i>

Course Objectives:

1. *To introduce the students about research, methods and techniques.*
2. *To understand the process and apply in other areas.*

Course outcome:

1. *Students will be able to understand the process of doing a research.*
2. *Students will be able to write a research report.*

Course Contents:

Module: I Science and Social Science as Knowledge

Common sense view of Science, Seeing is believing?, Visual Experiences, Relevant Facts, Facts precede theory, Observation, Experiment as an adequate basis of Science, Deductive and inductive logic, falsification-A logical view,

Module: II Process of doing Research

Overview: Problem Definition, hypothesis and its function, Types of Research, Literature Review, Research Design, *Sampling:* Census and sample survey, different types of sample design, *Measurement:* Measurement and scaling techniques, *Methods of Data Collections:* Experimentation,

observation, interview, Survey, case study; *Data Analysis and Interpretation*: Qualitative and quantitative data, data presentation, central tendency and dispersion, association, test of significance.

Module: III Report Writing and Presentation

Significance of report writing, different steps in report writing, layout of research report & Types of Report, Presentation, Ethics in Report Writing.

Books Recommended

1. Ranjit Kumar, 2011, *Research Methodology: A Step by Step Guide*, Sage South Asia Publication.

FCMG0113 INDIAN SOCIETY AND CULTURE

<i>Pre - requisites</i>	<i>Course Type</i>	<i>Credits</i>
<i>Nil</i>	<i>Theory</i>	<i>2</i>

Course Objectives:

- a) Develop an understanding social environment
- b) Develop an understanding of cultural environment
- c) Understanding the linkages among social, cultural and business environment

Course outcomes :

- Students would develop an idea about the socio-cultural environment in which they would be working as scientists, researchers and entrepreneurs.
- More specifically, they would get an appreciation of how societal and cultural issues interface with technology and science in the context of overall development of the country.
- Attempt is also made to familiarise students with the science and technology policies that would benefit modern India.

Course Contents:

Module 1: Introduction to Indian Society

Indian Society - Roots of Indian Society , Social Structure – Rural and Urban Contexts, Social Institutions in Indian Society, Caste, Tribe, Dalits and Other Excluded Groups, Power and Conflicts

Module 2: Introduction to Culture in Indian Society

Culture in Ancient, Medieval and Modern India, Languages and Literature in India, Culture Change and its Impact on Indian Society

Module 3: Social Movements

Reformers and Radicals – Rammohan Roy, Syed Ahmed Khan, JotiroPhule, Gopal Krishna Gokhale, BalGangadharTilak, TarabaiShinde, DayanandaSaraswati and Vivekananda Nurturing a Nation – M. K. Gandhi, RabindraNath Tagore, B R Ambedkar, Mohammad Ali Jinnah, EV Ramaswami, Jawaharlal Nehru, RammanoharLohia, Jayaprakash Narayan, Verrier Elwin Peasant, Tribal, Women and Environment movement

Module 4: Social Issues in Modern India

Poverty, Gender Inequality, Disparity and Social Exclusion: SC, ST, Women, Child, Challenged

Module 5: Science, Technology and Society

Science, Technology and Development Linkage, Appropriate Technology, Science and Technology Policy

Books Recommended:

1. *Indian Society and Culture: Continuity and Change* – by N. Hasnain
2. *Social and Cultural History of India* – O.M. Prakash
3. *Makers of Modern India* – RamachandraGuha

FCMG1201 DISASTER MANAGEMENT

<i>Pre - requisites</i>	<i>Course Type</i>	<i>Credits</i>
<i>Nil</i>	<i>Theory</i>	<i>2</i>

**B. Tech BASKET- III
(2017)
Course Structure**

Course Code	Course Title	Course Type	Credits	Prerequisite	Department offering
ENFC0105	<i>Introduction to Aerospace Engineering (NEW)</i>	<i>Theory</i>	<i>3</i>	<i>Nil</i>	
ENFC0102	<i>Material Sciences (NEW)</i>	<i>Theory</i>	<i>3</i>	<i>Nil</i>	<i>ME</i>
FCEN0101	<i>Chemical Process Calculations</i>	<i>Theory</i>	<i>3</i>	<i>FCEN0402 Industrial Chemistry</i>	<i>Chemical</i>
FCEN0102	<i>Basic Electronics</i>	<i>Theory</i>	<i>3</i>	<i>Nil</i>	<i>ECE</i>
FCEN0103	<i>Signals & Systems</i>	<i>Theory</i>	<i>3</i>	<i>Nil</i>	<i>ECE</i>
FCEN0104	<i>Digital Electronic Circuits</i>	<i>Theory</i>	<i>3</i>	<i>Nil</i>	<i>ECE</i>
FCEN0105	<i>Basic Electrical Engineering</i>	<i>Theory</i>	<i>3</i>	<i>Nil</i>	<i>EEE</i>
FCEN0106	<i>Electrical Machines – I</i>	<i>Theory</i>	<i>3</i>	<i>Nil</i>	<i>EEE</i>
FCEN 0107	<i>Analog and Digital Electronics</i>	<i>Theory</i>	<i>3</i>	<i>Nil</i>	<i>EEE</i>
FCEN0108	<i>Workshop Technology</i>	<i>Theory</i>	<i>3</i>	<i>Nil</i>	<i>Mechanical</i>
FCEN0109	<i>Engineering Mechanics</i>	<i>Theory</i>	<i>3</i>	<i>Nil</i>	<i>Mechanical</i>
FCEN0110	<i>Thermal Engineering</i>	<i>Theory</i>	<i>3</i>	<i>Nil</i>	<i>Mechanical</i>
FCEN0111	<i>Earth System Science</i>	<i>Theory</i>	<i>3</i>	<i>Nil</i>	<i>Mining</i>
FCEN0112	<i>Introduction to Mining</i>	<i>Theory</i>	<i>3</i>	<i>Nil</i>	<i>Mining</i>
FCEN0113	<i>Mine Development</i>	<i>Theory</i>	<i>3</i>	<i>Nil</i>	<i>Mining</i>
FCEN0114	<i>Mine Surveying I</i>	<i>Theory</i>	<i>3</i>	<i>Nil</i>	<i>Mining</i>

FCEN0115	<i>Introduction to Biotechnology</i>	<i>Theory</i>	3	<i>Nil</i>	<i>Biotech</i>
FCEN0116	<i>Introduction to Biophysics</i>	<i>Theory</i>	3	<i>Nil</i>	<i>Biotech</i>
FCEN0117	<i>Biosafety, bioethics, IPR and Patents</i>	<i>Theory</i>	2	<i>Nil</i>	<i>Biotech</i>
FCEN0118	<i>Computer Fundamental and Organization</i>	<i>Theory</i>	3	<i>Nil</i>	<i>CSE (MACT & CTIS)</i>
FCEN0119	<i>Operating System Building Blocks</i>	<i>Theory</i>	3	<i>Nil</i>	<i>CSE (MACT & CTIS)</i>

Practice Courses

Course Code	Course Title	Course Type	Credits	Prerequisite	Department offering
ENFC0208	Aerodynamics Laboratory(New)	Practice	2	Nil	Aerospace
ENFC0203	Introduction to Robotics(New)	Practice	2	Nil	ME
FCEN0201	Introduction to Internet Technology	Practice	3	Nil	CSE
FCEN0202	Basic Electronics Laboratory	Practice	2	Nil	ECE
FCEN0203	Signals and Systems Laboratory	Practice	2	Nil	ECE
FCEN0204	Digital Electronic Circuits Laboratory	Practice	2	Nil	ECE
FCEN0205	Electronics Workshop – I	Practice	2	Nil	ECE
FCEN0206	Basic Electrical Engineering Lab	Practice	2	FCEN0105 Basic Electrical Engineering (C-orequisite)	EEE
FCEN0207	Electrical Workshop Practice	Practice	2	Nil	EEE
FCEN0208	Basic Electrical Simulation Lab	Practice	2	Nil	EEE
FCEN0209	Electrical Machines-I Lab	Practice	2	FCEN0106 Electrical Machines - I (Corequisite)	EEE
FCEN0210	Analog and Digital Electronics Lab	Practice	2	Nil	EEE
FCEN0211	Automation Lab (PLC)	Practice	2	FCEN0102 Basic Electronics	EEE
FCEN0212	Geometric Drawing	Practice	2	Nil	Mechanical
FCEN 0213	Workshop Technology Practice	Practice	2	Nil	Mechanical
FCEN0214	Mining Surveying	Practice	2	Nil	Mining
ENFC0207	Mobile App. Development for Android(New)	Practice	2	Nil	CSE

Project Courses

Course Code	Course Title	Course Type	Credits	Prerequisite	Department offering
FCEN0304	Electrical Load Survey	Project	2	Nil	EEE

Theory cum Practice Courses

Course Code	Course Title	Course Type	Credits	Prerequisite	Department offering
ENFC0401	Engineering Metrology and Measurements(New)	Theory+ Practice	3	Nil	ME
FCEN0401	Basic Fluid Mechanics	Theory + Pract	5	Nil	Civil
FCEN0402	Introduction to Programming in C	Theory + Pract	5	Nil	CSE
FCEN0403	Object Oriented Programming Using C++	Theory + Pract	5	Nil	CSE
FCEN0404	Database Management System	Theory + Pract	5	Nil	CSE
FCEN0405	Mechanical Unit Operations	Theory + Pract	5	Nil	Chemical
FCEN0406	Building Materials & Construction	Theory + Pract	4	Nil	Civil
FCEN0407	Basic Surveying	Theory + Pract	4	Nil	Civil
FCEN0408	Principles of Biochemistry	Theory + Pract	5	Nil	Biotech
FCEN0409	Cell Biology	Theory + Pract	5	Nil	Biotech
FCEN0410	Introduction to Web Technology	Theory + Pract	4	Nil	CSE-CTIS
FCEN0411	Data Structures and algorithms	Theory+ pract	4	Nil	CSE (MACT & CTIS)
FCEN0412	Designing enterprise network	Theory+ pract	5	Nil	CSE (MACT & CTIS)
FCEN0413	Installation and configuration of Linux desktop	Theory+ pract	4	Nil	CSE-MACT
FCEN0414	Information Security – I	Theory+ pract	4	Nil	CSE-CTIS
ENFC0411	Python Programming(New)	Theory+	3	Nil	CSE

		<i>Pract</i>			
<i>ENFC0417</i>	<i>Sensors & IOT(New)</i>	<i>Theory + Pract</i>	<i>3</i>	<i>Nil</i>	<i>ECE</i>
<i>ENFC0412</i>	<i>Programming for Problem solving – Java(New)</i>	<i>Theory + Pract</i>	<i>3</i>	<i>Nil</i>	<i>CSE</i>

Project cum Practice Courses

Course Code	Course Title	Course Type	Credits	Prerequisite	Department offering
<i>ENFC0601</i>	<i>Product Development(New)</i>	<i>Practice + Project</i>	<i>3</i>	<i>Nil</i>	<i>ME</i>
<i>FCEN0603</i>	<i>Electrical Circuit Drawing (AutoCAD)</i>	<i>Pract.+ Proj.</i>	<i>2</i>	<i>Nil</i>	<i>EEE</i>
<i>ENFC1401</i>	<i>Programming Internet of Things(New)</i>	<i>Workshop</i>	<i>2</i>	<i>Nil</i>	<i>CSE</i>
<i>ENFC1402</i>	<i>Build Your Own Computer(New)</i>	<i>Workshop</i>	<i>2</i>	<i>Nil</i>	<i>CSE</i>
<i>ENFC1403</i>	<i>Cloud Computing Applications(New)</i>	<i>Workshop</i>	<i>2</i>	<i>Nil</i>	<i>CSE</i>
<i>ENFC1404</i>	<i>Software Development Methodologies(New)</i>	<i>Workshop</i>	<i>2</i>	<i>Programming Basics</i>	<i>CSE</i>

SYLLABUS

Introduction to Aerospace Engineering

Subject Name	Code	Type of course	T-P-P (Credit)	Prerequisite
Introduction to Aerospace Engineering	ENFC0105	Theory	3-0-0(3)	Nil

1. Objective

- ✓ To familiarize with the Basic Concepts of Flying, Aircraft Structures, Systems, Instruments and Power Plants used in Airplanes.

2. Course Outcome

- ✓ To Identify the Component of Flight and Suitable Materials for Aircraft Structure.
- ✓ To Perform Basic Calculation on Mechanics using Newton Law for Lift, Drag and Moment.

3. Evaluation Systems

Internal Examination	Component	% of Marks	Method of Assessment
	Midterm Test	30	Written examination
	Assignment	5	Submission of assignment
	Learning record	5	Report and presentation
External Examination		60	Written examination
Total		100	

4. Course Outline

Module I (08 Hrs)

History of Flight: Early flying vehicles by Wright brothers, hot air balloons, Classification of flight vehicles, biplanes and monoplanes, developments in aerodynamics airplanes and Helicopters, Components of an airplane and their functions.

Module II (06 Hrs)

Basics of Aeronautics: Physical properties and structure of the atmosphere, temperature, pressure and altitude relationships.

Module III(08 Hrs)

Newton's law of motions applied to aeronautics - evolution of lift, drag and moment. aerofoils, mach number, subsonic, transonic, supersonic, hypersonic flows.

Module IV(06 Hrs)

Airplane Structures and Materials: General types of construction, monocoque and semi-monocoque constructions, typical wing and fuselage structure.

Module V (06 Hrs)

Airplane Structures and Materials: Materials used in aircraft metallic and non-metallic materials, use of aluminium alloy, titanium, stainless steel and composite materials.

Module VI (06 Hrs)

Systems and Instruments: Conventional control, Powered controls, Basic instruments for flying, typical systems for control actuation.

Module VII(08 Hrs)

Power Plants: Basic ideas about piston, turboprop and jet engines - use of propeller and jets for thrust production - comparative merits, principles of operation of rocket, types of rockets and typical applications, exploration into space.

References

Text Books:

1. J.D. Anderson, Introduction to Flight, McGraw Hill
2. A.C. Kermode, Mechanics of Flight, Himalayan Book

Reference Books:

1. E.H.J. Pallet, Aircraft Instruments & Principles, Pitman & Co

Online Source: NPTEL, You tube

Material Sciences

Subject Name	Code	Type of course	T-P-P (Credit)	Prerequisite
Material Sciences	ENFC0102	Theory	3-0-0(3)	Nil

1. Objective

- To study classification and properties of materials used in day to day life
- To understand the material application and it's need.

2. Course outcome

- Students will able to identify materials for engineering use.
- Students will able to select best materials for a specific design and production.

3. Evaluation Systems

Internal Examination	Component	% of Marks	Method of Assessment
	Midterm/Class Test	30	Written Examination
	Assignment-2	05	Report and Presentation
	Learning Record	05	Report
External Examination		60	Written Examination
Total		100	

4. Course Outline

Module I (8 Hrs)

Steel, Stainless Steel & Types, HSLA Steels, Dual Phase Steels, Tool and Die Steels. Nonferrous Alloys- Aluminium & Alloys, Copper & Alloys, Zinc & alloys, Nickel & Alloys, Magnesium Alloys, Titanium Alloys, Super Alloys.

Module II (7 Hrs)

Polymer- Thermosetting, Thermoplastics; Elastomers- Natural & Synthetic Rubber; Composites Material- Classification Based on Matrix and Topology, Particle Reinforced Composites, Fiber Reinforced Composites. Structural Composites, Constituents of Composites, MMC, PMC and FRP. Ceramic Composites, Geosynthetics, Pre-stressed Hollow Concrete Panel, Carbon Composites Fullerenes, C64, Bucky Ball Structures, Graphene.

Module III (5 Hrs)

Prefabricated Materials: Types and Applications, Autoclaved Aerated Concrete (AAC), Cellular Lightweight Concrete (CLC).

Module IV (8 Hrs)

Electrical & Magnetic Materials: Classifications, Properties, Advantages & Applications, Photo Voltaic Material, Dielectric Materials.

Module V (6 Hrs)

Solar Cell and Super Conductivity, Ferro Electricity, Electro-active Polymers, Piezoelectric Material, Magneto Electric Materials, Electrorheological Fluids.

Module VI (6 Hrs)

Fiber Optic Sensors, Photoconductivity; Introduction to Nano-materials, CNTs Production Process and Uses, Fibers Production and Uses.

Module VII (8Hrs)

Smart Material, Shape Memory Alloys, Piezoelectric Ceramics, Biomaterials, Bioactive Glass & Ceramic, Polymer & Composite, UHTC, Soft Materials, Energy Materials.

Text Books:

1. Materials Science and Engineering, W D Callister, 2014, 2nd Edition, Wiley India Private Limited, India.

Reference Books:

1. Material Science and Engineering, V Raghavan, 2013, 5th Edition, PHI publication, India.
2. Material Science and Engineering, S Chawla, 2011, 1st Edition, Dhanpat Rai & co Private Ltd., India.

1. Session Plan

Topic coverage and Internal Test	No. of Sessions (in hrs.)	Activity (lecture, tutorial, lab practice, field studies/field -trip, Workshop etc.)	Assignment (Project, assignment, field study, seminar, etc.)	Suggested Reading (Book, Video, Online source, etc.)

Module I

Steel	01	Lecture	field study	<ol style="list-style-type: none"> 1. nptel.ac.in/courses/113104059/lecture_pdf/Lecture%201.pdf 2. Materials Science and Engineering, W D Callister, 2014, 2nd Edition, Wiley India Private Limited, India. 3. https://www.youtube.com/watch?v=917JqonyoKA https://www.youtube.com/watch?v=sc24cSZJQcg 4. https://www.youtube.com/watch?v=hTw9LVMBLns
Stainless Steel & Types	01	Lecture	field study	<ol style="list-style-type: none"> 1. https://en.wikipedia.org/wiki/Stainless_steel 2. Materials Science and Engineering, W D Callister, 2014, 2nd Edition, Wiley India Private Limited, India. 3. http://nptel.ac.in/courses/113104059/
HSLA Steels, Dual Phase steels	01	Lecture		<ol style="list-style-type: none"> 1. https://www.metalsupermarkets.com/what-is-hsla-steel/ 2. https://en.wikipedia.org/wiki/High-strength_low-alloy_steel 3. https://mme.iitm.ac.in/vsarma/mm5025/TRIP-DP-TWP-Notes.pdf 4. https://www.worldautosteel.org/steel-basics/steel-types/dual-phase-dp-steels/
Tool and Die Steels	01			<ol style="list-style-type: none"> 1. https://www.hitachi-metals.co.jp/e/products/auto/ml/pdf/yss_tool_steels_d.pdf 2. http://www.substech.com/dokuwiki/doku.php?id=tool_and_die_steels
Aluminium & Alloys	01	Lecture		<ol style="list-style-type: none"> 1. https://materialsdata.nist.gov/.../Aluminum%20and%20Aluminum%20Alloys%20Davis 2. nptel.ac.in/.../16%20-%20Properties%20and%20Applications%20of%20Materials.pdf 3. nptel.ac.in/courses/112104203/12 4. Raghavan, V, Material science and Engineering, 2013, 5th Edition, PHI publication, India.
Copper & Alloys	02	Lecture		<ol style="list-style-type: none"> 1. Material science and Engineering, V Raghavan, 2013, 5th Edition, PHI publication, India.

				2. nptel.ac.in/courses/103106109/.../Lecture%202%20Material%20of%20construction.pdf .
Magnesium Alloys, Titanium Alloys, Super Alloys	01	Lecture		<ol style="list-style-type: none"> 1. W D Callister, Materials Science and Engineering, 2014, 2nd Edition, Wiley India Private Limited, India. 2. https://www.sciencedirect.com/topics/materials-science/aluminum-magnesium-alloys 3. https://uknowledge.uky.edu/cgi/viewcontent.cgi?article=1036&context=cme_etds 4. nptel.ac.in/courses/113105057/25 5. http://megamex.com/superalloys.html
Module II				
Polymer-Thermosetting, Thermoplastics	02	Lecture	field study	<ol style="list-style-type: none"> 1. nptel.ac.in/courses/112107086/13 2. nptel.ac.in/courses/112104229/15 3. W D Callister, Materials Science and Engineering, 2014, 2nd Edition, Wiley India Private Limited, India.
Elastomers-Natural & Synthetic Rubber	01	Lecture		1. W D Callister, Materials Science and Engineering, 2014, 2nd Edition, Wiley India Private Limited, India.
Classification based on matrix and topology, Particle Reinforced Composites, Fiber Reinforced Composites	01	Lecture		<ol style="list-style-type: none"> 1. W D Callister, Materials Science and Engineering, 2014, 2nd Edition, Wiley India Private Limited, India. 2. https://onlinecourses.nptel.ac.in/noc18_me03 3. nptel.ac.in/downloads/112104168 4. http://nptel.ac.in/courses/101104010
Structural Composites, Constituents of Composites	01	Lecture		1. nptel.ac.in/courses/112108150/pdf/PPTs/MTS_12_m.pdf
MMC, PMC and FRP	01	Lecture	field study	<ol style="list-style-type: none"> 1. http://nptel.ac.in/courses/112107086/22 2. http://nptel.ac.in/courses/113105028/32
Ceramic Composites, Geosynthetics,	01	Lecture	field study	<ol style="list-style-type: none"> 1. nptel.ac.in/courses/112107085/module6/lecture6/lecture6.pdf 2. nptel.ac.in/courses/112104122/22

Pre-stressed Hollow Concrete Panel, Carbon Composites Fullerenes, C64, Bucky ball Structures, Grapheme				
Module -III				
Prefabricated Materials: Types and Applications	02	Lecture	field study	<ol style="list-style-type: none"> 1. https://www.youtube.com/watch?v=ixNre1dGyp0 2. http://www.hollowcore.com.au/ 3. https://en.wikipedia.org/wiki/Fullerene
Autoclaved Aerated Concrete (AAC), Cellular Lightweight Concrete (CLC).	03	Lecture	field study	<ol style="list-style-type: none"> 1. https://www.cogentoa.com/article/10.1080/23312009.2015.1026638.pdf 2. www.understandingnano.com/what-is-buckyball-c60.html 3. https://en.wikipedia.org/wiki/Autoclaved_aerated_concrete 4. textofvideo.nptel.ac.in/105102012/lec41.pdf 5. nptel.ac.in/courses/105102088/27 6. https://www.youtube.com/watch?v=uwbFxUXG2cM
Module IV				
Electrical & Magnetic Materials: Classifications, Properties, Advantages & Applications, Dielectric Materials	08	Lecture		<ol style="list-style-type: none"> 1. nptel.ac.in/courses/115104088/42 2. V Raghavan, Material science and Engineering, 2013, 5th Edition, PHI publication, India.
Module V				
Photo Voltaic Material, Semi conductivity, Solar Cell and Super Conductivity	03	Lecture	field study	<ol style="list-style-type: none"> 1. nptel.ac.in/courses/113106062/Lec19.pdf 2. nptel.ac.in/courses/113105025/40 3. nptel.ac.in/courses/113104012/34
Ferro electricity, Electro-active polymers	01	Lecture		<ol style="list-style-type: none"> 1. https://en.wikipedia.org/wiki/Electroactive_polymers 2. https://www.azom.com/article.aspx?ArticleID=13516

Piezoelectric Material , Magneto Electric Materials, Electrorheological Fluids	02	Lecture		1.nptel.ac.in/courses/113104005/69 2.nptel.ac.in/courses/112107088/module1/lecture28/lecture28.pdf
Module -VI				
Fiber optic Sensors, Photoconductivity	02	Lecture	field study	1. nptel.ac.in/courses/112104158/lecture39.pdf 2. https://onlinecourses.nptel.ac.in/noc18_ph06
Introduction to Nano-Materials, CNTs Production Process and Uses	02	Lecture	field study	1. http://www.nptel.ac.in/courses/103103033/38 2.nptel.ac.in/courses/118104008/ 3.nptel.ac.in/courses/103103026/42 4. https://www.cheaptubes.com/carbon-nanotubes-history-and-production-methods-2/ https://www.youtube.com/watch?v=CuqS8GSpC-4
Fiber Production and Uses.	02	Lecture	field study	1. https://www.youtube.com/watch?v=IIVveb58PCo
Module -VII				
Smart Material, Shape Memory Alloys	02	Lecture		1. nptel.ac.in/courses/112104173/Mod_1_smart_mat Lec_5.pdf 2.W D Callister, Materials Science and Engineering, 2014, 2nd Edition, Wiley India Private Limited, India.
Piezoelectric Ceramics	02	Lecture		1. https://www.youtube.com/watch?v=qXLStQQxHzU
Biomaterials, Bioactive glass & Ceramic, Polymer & Composite	02	Lecture		1. https://www.youtube.com/watch?v=XqFSIG6WKO0 2. https://www.youtube.com/watch?v=yZKdFVAJcrE 3. https://www.youtube.com/watch?v=s5mDUrF8YuQ
UHTC	01	Lecture		1. https://www.youtube.com/watch?v=A-pd3ia8Y4g 2. https://www.youtube.com/watch?v=XIIkWlh1nYQ 3.ceramics.org/wp-content/uploads/2011/08/applications-uhtc-johnson.pdf 4. https://en.wikipedia.org/wiki/Ultra-high-temperature_ceramics

Soft Materials, Energy Materials	01	Lecture		1. https://www.youtube.com/watch?v=HdwFkEV8dek 2. https://www.youtube.com/watch?v=Od4g5kcWsu0 3. https://www.youtube.com/watch?v=IipCijBHeQ https://www.youtube.com/watch?v=f5RwX_plgw
Total	48 Hrs			

FCEN0101CHEMICAL PROCESS CALCULATIONS

<i>Pre – requisites</i>	<i>L+T+P</i>	<i>Credits</i>
FCBS0402 Industrial Chemistry	3+1 + 0	3

OBJECTIVE:

To teach concept of degree of freedom and its application to solution of mass and energy balance equations for single and network of units and introduce to process simulators.

OUTCOME:

This course gives an idea to the students, an introduction to chemical engineering calculations, establish mathematical methodologies for the computation of material balances, energy balances and to present an overview of industrial chemical processes.

Module I

BASIC CHEMICAL CALCULATIONS

Units and Dimensions - Basic and derived units –Use of model units in calculations – Methods of expression –Compositions of mixture and solutions. Gas Calculations Ideal and real gas laws –Gas constant –Calculations of pressure, volume and temperature using ideal gas law –Use of partial pressure and pure component volume in gas calculations –Applications of real gas relationship in gas calculation.

MATERIAL BALANCE

Stoichiometric principles –Application of material balance to unit operations like distillation – Evaporation, crystallisation, drying etc., –Material balance with chemical reaction –Limiting and excess reactants –Recycle –Bypass and purging –Unsteady state material balances.

Module II

HUMIDITY AND SATURATION

Properties of atmospheric air –Humidity of air –Calculation of absolute humidity, molal humidity, relative

humidity and percentage humidity –Use of humidity in condensation and drying –Psychrometric

chart, dew point –Wet and dry bulb thermometry. FUELS AND

COMBUSTION

Determination of composition by Orsat analysis of products of combustion of solid, liquid and gas fuels –Calculation of excess air from Orsat technique, problems on sulphur and sulphur burning compounds –Theoretical flame temperature.

Module III

ENERGY BALANCE

Thermo Physics Heat capacity of solids, liquids, gases and solutions –Use of mean heat capacity in heat calculations –Problems involving sensible heat and latent heats –Evaluation of enthalpy. Thermo Chemistry Standard heat of reaction, heats of formation, combustion, solution, mixing etc.,

–Calculation of standard heat of reaction –Effect of pressure and temperature on heat of reaction –Energy balance for systems with and without chemical reaction –Unsteady state energy balances.

TEXT BOOKS:

2. Bhatt, B.I. and Vora, S. M., "Stoichiometry", 4th Edition
3. Hougen, O.A., Watson, K.M. and Ragatz, R.A., "Chemical Process Principles", Vol. I, CBS Publishers & Distributors, 1995.

REFERENCES:

1. Venkataramani, V. and Anantharaman, N., "Process calculations",
2. Himmelblau, D., "Basic Principles and Calculations in Ch
3. Chohey, N.P. and Hicks, Engineering T.G., "Handbook Calculations", Edition, McGraw of Hill Chemical Inc. 1984.2
4. K.V.Narayanan, B.Lakshmi pathy, "Stoichiometry and Process C

FCEN0102 BASIC ELECTRONICS

<i>Pre - requisites</i>	<i>L+T+P</i>	<i>Credits</i>
<i>Nil</i>	<i>3+1 + 0</i>	<i>3</i>

Course Objectives: The objectives of this subject are to
Learn Fundamentals of electronic devices.
Design and Applications of electronic circuits.

Course Outcomes:

Upon successful completion of this subject, students should be able to:
Identify the applications and functions of electronics in Engineering.
Recognize basic electronic components and devices used for different electronic functions.
Use basic techniques for analyzing analogue and digital electronic circuits.
Design analogue and digital electronic circuits at block level.
Manage the tools in a basic electronics laboratory and use electronic simulation.

Module-1 (15 Hours) Semiconductor Physics and Junction Diode

Characteristics:

Various properties of Conductor, Semiconductor & Insulator, n and p –type semiconductors, Mass Action Law, Continuity Equation, Hall Effect, Comparison of Si & Ge Semiconductor, Fermi level in intrinsic and extrinsic semiconductors, Open-circuited, forward bias & reverse bias of p-n junction diode, Energy band diagram of PN diode, Drift & Diffusion Current, Mobility & Conductivity, Diode equation, Volt-ampere characteristics of p-n diode, Temperature dependence of VI characteristic, Transition and Diffusion capacitances, Breakdown Mechanisms in Semiconductor (Avalanche and Zener breakdown), Zener diode characteristics, Characteristics of Tunnel Diode with the help of energy band diagrams, Varactor Diode, LED And photo diode, **(topics will be delivered through Class room teaching + Hands on Practice based experiments)**

Module- II (12 Hours) Rectifiers, Filters and Regulators:

Half wave rectifier, ripple factor, full wave rectifier, Application of p-n diode as clipper, clamper. Types of filter, Inductor filter, Capacitor filter, L- section filter, PI- section filter, Multiple L- section and Multiple PI-section filter. Simple circuit of a regulator using Zener diode, Series and Shunt voltage regulators. **topics will be delivered through Class room teaching + Hands on Practice based experiments)**

Module- III (15 Hours) BJT and FET Characteristics:

Bipolar Junction Transistor, Types, Construction & study of currents in a Transistor, Input and Output characteristics of transistor in Common Base(CB), Common Emitter(CE), and Common collector(CC) configurations, comparison of CE, CB, CC transistor configuration, Relation between Alpha, Beta & Gamma, JFET characteristics (Qualitative and Quantitative discussion), , MOSFET characteristics (Enhancement and depletion mode), Symbols of MOSFET, Introduction to SCR and UJT, Thermal run away, Thermal stability, (**topics will be delivered through Class room teaching + Hands on Practice based experiments)**)

Text Books:

1. *Electronic Devices and Circuits*–J.Millman, C.C.Halkias, and SatyabrathaJit Tata McGraw Hill, 2nd Ed., 2007.
2. *Electronic Devices and Circuits* –R.L. Boylestad and Louis Nashelsky, Pearson/Prentice Hall, 9th Edition, 2006.

Reference Books:

1. *Electronic Devices and Circuits* –T.F. Bogart Jr., J.S.Beasley and G.Rico, Pearson Education, 6th edition, 2004.
2. *Principles of Electronic Circuits* –S.G.Burns and P.R.Bond, Galgotia Publications, 2nd Edn., 1998.
3. *Microelectronics*–Millman and Grabel, Tata McGraw Hill, 1988.
4. *Electronic Devices and Circuits*–Dr. K. Lal Kishore, B.S. Publications, 2nd Edition, 2005.
5. *Electronic Devices and Circuits*- Prof GS N Raju I K International Publishing House Pvt .Ltd 2006

Module I

S. no.	Topic	Pedagogy	Details	Instructional Hrs			
				Theory	Practice	video	Project
1	Review of semi conductor Physics –n and p –type semi conductors (Text Book 1: 1.1, 1.2, 1.3)	CRT	Chalk & talk	1	0	0	0
2	Mass Action Law, Continuity Equation	CRT	PPT mode	2	0	0	0
3	Hall Effect, Fermi level in intrinsic and extrinsic semiconductors Physical operation of p-n junction Diodes	CRT	Chalk & talk	2	0	0	0
4	Terminal Characteristics of Junction Diodes (The Forward Bias Region, The Reverse Bias Region, The Breakdown Region) (Text Book 1: 3.2)	CRT	PPT mode	1	0	0	0
5	The current components in p-n diode, Law of junction, Diode equation (Text Book 1: 3.5)	CRT	PPT mode	2	0	0	0
6	Volt-ampere characteristics of p-n diode, Temperature dependence of VI characteristic, Transition and Diffusion capacitances, Step graded junction (Text Book 1: 3.6)	CRT+PR A	Component Level Design for	2	0	0	0
	Operation in the Reverse Breakdown Region Zener						

7	Diodes (Specifying and Modeling the Zener Diode, Use of the Zener as a Shunt Regulator, Temperature Effects, A Final Remark) (Text Book 1: 3.4)	CRT+PR A	Practice	1	0	0	0
8	Tunnel Diode, (Text Book 1: 3.8.3), Light-Emitting Diodes (LEDs) (Text Book 1: 3.8.4)	CRT	Chalk & talk	2	0	0	0
9	Varactor Diode, LED (Text Book 1: 3.8.5, 3.8.6)	CRT		1	0	0	0
10	LCD And photo diode (Text Book 1: 3.8.7,3.8.8)	CRT+PR A	Component Level Design for Practice	1	0	0	0
Module II		Sub total		15	0	0	0
11	Half wave rectifier, ripple factor (Text Book 1: 4.1,4.2)	CRT+PR A	Component Level Design for	3	0	0	0
12	Full wave rectifier, ripple factor (Text Book 1: 4.3,4.3)			3	0	0	0

13	Rectifier with Filters (Inductor filter ,Capacitor filter, L-section filter ,PI section filter), Multiple L-section and Multiple PI-section filter.		Practice	3	0	0	0
14	Simple circuit of a regulator using zener diode, Series and Shunt voltage regulators (Text Book 1: 4.11)			3	0	0	0
Module III		Sub total	12	0	0	0	
15	Simplified Structure and Modes of Operation (Text Book 1: 5.1.1), Operation of npn transistor in the Active Mode (Text Book 1: 5.1.2), Operation of pnp transistor in the Active Mode (Text Book 1: 5.1.6)	CRT	PPT MODE	2	0	0	0
16	Current Voltage Characteristics (Circuit Symbols and Conventions, Graphical Representation of transistor characteristics (Text Book 1: 5.2)	CRT	PPT MODE	1	0	0	0
17	Dependence of i_c on the Collector Voltage-The Early Effect, The Common Emitter Characteristics, Transistor Breakdown (Text Book 1: 5.3)	CRT	Chalk & talk	2	0	0	0

Module III

S. No.	Topic	Pedagogy	Details	Instructional Hrs			
				Theory	Practice	video	Project
18	BJT as an amplifier and as a switch (Large Signal Operation –The Transfer Characteristic, Amplifier Gain, Graphical Analysis, Operation as a Switch) (Text Book 1: 5.3)	CRT+PR A	Component Level Design for Practice	2	0	0	0
19	Input and Output characteristics of transistor in Common Base(CB), Common Emitter(CE), and Common collector(CC) configurations,	CRT+PR A		2	0	0	0
20	Relation between Alpha, Beta and Gama (Text Book 1: 5.3)	CRT	PPT MODE	1			
21	MOSFET characteristics (Enhancement and depletion mode), Symbols of MOSFET	CRT+PR A	Component Level Design for Practice	2	0		
22	Comparison of Transistors (Text Book 1: 6.7)	CRT	Chalk & talk	1			
23	Introduction to SCR and UJT (Text Book 1: 7.2)	CRT		1			
24	Thermal run away, Thermal stability,	CRT		1			
				15	0	0	0

FCEN0103 SIGNALS AND SYSTEMS

<i>Pre – requisites</i>	<i>L+T+P</i>	<i>Credits</i>
<i>Nil</i>	3+ 0 + 0	3

Course Objectives:

The objectives of this subject are to

*To introduce the student to the idea of signals, system analysis and its characterization.
To provide a foundation to numerous other courses that deal with signal and system concepts directly or indirectly: viz: communication, control, instrumentation etc.*

Course Outcomes:

Upon successful completion of this subject, students should be able to:

Understand about various types of signals, classify them, analyze them, and perform various operations on them.

Understand about various types of systems, classify them, analyze them and understand their response behavior.

Appreciate use of transforms in analysis of signals and system. Carry simulation on signals and systems for observing effects of applying various properties and operations.

Create strong foundation of communication and signal processing to be studied in the subsequent semester.

Module –I (14+4 hours) Continuous-Time and Discrete-Time Signals and Systems:

Continuous and discrete time signals: Some Elementary Continuous-time and Discrete-Time signals. Classification of Signals –Periodic and a periodic even –odd –energy and power signals –Deterministic and random signals –Causal and non causal signals and anti causal signals -- complex exponential and sinusoidal signals ---Simple Manipulations of Continuous and discrete time signals. **(Topics will be covered through CRT & Practice)**

Continuous-Time Systems: Mathematical equation governing LTI Continuous-Time systems, Block diagram and signal flow graph representation, response of LTI Continuous-Time system in time domain, classification of Continuous-Time systems, convolution of Continuous-Time signals. **(Topics will be covered through CRT & Tutorial)**

Discrete-Time Systems: Input-Output Description, Block Diagram Representation, Classification, Interconnection; Analysis of Discrete-Time LTI Systems: Techniques, Response of LTI Systems, Properties of Convolution, Causal LTI Systems, Stability of LTI Systems; Discrete-Time Systems Described by Difference Equations; Implementation of Discrete-Time Systems; Correlation of Discrete-Time Signals: Cross correlation and Autocorrelation Sequences, Properties. **(Topics will be covered through CRT & Tutorial)**

Module –II (09 Hours) The Continuous-Time Fourier Series:

Basic Concepts and Development of the Fourier Series, Calculation of the Fourier Series, Properties of the Fourier Series. **(Topics will be covered through CRT & Tutorial)** The Continuous-Time Fourier Transform:

Basic Concepts and Development of the Fourier Transform, Properties of the Continuous-Time Fourier Transform. **(Topics will be covered through CRT & Tutorial)**

Discrete time Fourier transform(DTFT) :The discrete time Fourier transform of Aperiodic signal, Convergence of Fourier transform, the Fourier transform of signal with poles on unit circle, frequency domain and time domain signal properties,properties of DTFT **(Topics will be covered through CRT & Tutorial)**

Module- III

(15 Hours)

The Laplace transforms and its application to system analysis:

The Laplace Transform: Region of convergence, properties of Laplace transform, poles and zeros of rational

functions of s, Inverse Laplace transform by partial fraction method and convolution method, Analysis of LTI Continuous-Time system, stability in s-domain, **(Topics will be covered through CRT & Practice)**

The Z Transform and Its Application to the Analysis of LTI Systems:

The Z-Transform: The Direct Z-Transform, The Inverse Z-Transform; Properties of the Z-Transform; Rational Z-Transforms: Poles and Zeros, Pole Location and Time-Domain Behavior for Causal Signals, The System Function of a Linear Time-Invariant System; Inversion of the Z-Transforms: The Inversion of the Z-Transform by Power Series Expansion, The Inversion of the Z-Transform by Partial-Fraction Expansion; The One-sided Z Transform: Definition and Properties, Solution of Difference Equations. **(Topics will be covered through CRT & Practice)**

Text Books:

1. *Digital Signal Processing –Principles, Algorithms and Applications* by J. G. Proakis and D. GManolakis, 4th Edition, Pearson.

Chapter 1 (1.2), Chapter 2 (2.1, 2.2, 2.3, 2.4, 2.5, 2.6.1, 2.6.2) , Chapter 3 (3.1, 3.2, 3.3, 3.4.2, 3.4.3, 3.6.1, 3.6.2) , Chapter 4 (4.1, 4.2.3, 4.2.4, 4.2.5, 4.2.8, 4.3, 4.4)

2. *Fundamentals of Signals and Systems* - M. J. Roberts, TMH Chapter 8 (8.3, 8.4, 8.7) , Chapter 10 (10.3, 10.6)

3. *Signals and Systems –A NagoorKani, TMH*

Chapter 1 [1.1, 1.2, 1.3, 1.4, 1.5 (for Module-1)], Chapter 2 [2.1,2.2,2.3,2.4,2.5,2.6,2.7,2.8,2.9, 2.10(for module-1)], Chapter 3 [3.1, 3.2, 3.3, 3.4, 3.5,3.6,3.7(for module-3)], Chapter 4 [4.1, 4.2, 4.3, 4.4, 4.5, 4.6, 4.7, 4.9, 4.10, 4.11, 4.12

(for Module-2)], Chapter 6 [6.1 to 6.6, 6.8 to 6.9, 6.12, 6.13 (for Module-1); 6.7 (for module-3)], Chapter 7 [7.1 to 7.6 (for module-3)], Chapter 8 [8.1 to 8.4 (for module-2)] **Reference**

Book:

1. *Signals and Systems* - P. R. Rao, TMH.
2. *Signals and Systems---* Alan V. oppenheim and Alan S. Willsky, PHI
3. *Signals and Systems* by Chi-Tsong Chen, Oxford
4. *Principles of Signal Processing and Linear Systems*, by B.P. Lathi, Oxford
5. *Principles of Linear Systems and Signals*, by B.P. Lathi, Oxford

Web resources:

1. *Signals and Systems* by Prof. T.K.Basu, IIT Kharagpur, <http://nptel.ac.in/courses/108105065/>
2. *Signals and Systems*, Prof. K.S. Venkatesh, IIT Kanpur <http://nptel.ac.in/courses/117104074/>
3. *Digital Signal Processing*, Prof. S.C.Dutta Roy, IIT Delhi, <http://nptel.ac.in/courses/117102060/>
4. MIT(ocw.mit.edu).

List of Open Source Software/learning website:

Software: SCILAB

Learning Website: NPTEL Videos

MIT open course ware website

Module I

S. No	Topic	Pedagogy	Details	Instructional Hrs			
				Theor y	Practic e	video	Projec t
	Continuous-Time and Discrete-Time Signals and Systems:						
1	Some Elementary Continuous-time and Discrete-Time Signals	CRT		1	0	0	0
2	Classification of Signals –Periodic and a periodic even –odd –energy and power signals –Deterministic and random signals –Causal and non causal signals and anti causal signals -- complex exponential and sinusoidal signals ---	CRT		3	0	0	0
3	Simple Manipulations of Continuous and discrete time signals.	Practi ce	Using SCILAB / MATLA B	0	2	0	0

			Simulation				
4	Continuous-Time Systems: Mathematical equation governing LTI Continuous-Time systems, Block diagram and signal flow graph representation,	CRT		2	0	0	0
5	response of LTI Continuous-Time system in time domain, classification of Continuous-Time systems,	CRT		2	0	0	0
6	convolution of Continuous-Time signals. Discrete-Time Systems: Input-Output Description, Block Diagram Representation, Classification, Interconnection;	CRT		2	0	0	0
7	Analysis of Discrete-Time LTI Systems: Techniques, Response of LTI Systems, Properties of Convolution, Causal LTI Systems, Stability of LTI Systems;	CRT		2	0	0	0
8	Discrete-Time Systems Described by Difference Equations;	CRT		1	0	0	0
	Implementation of Discrete-Time Systems;	CRT		1	0	0	0
10	Correlation of Discrete-Time Signals: Cross correlation and Autocorrelation Sequences, Properties.	Practice	Using SCILAB / MATLAB Simulation	0	2	0	0
				14	4	0	0

Module II

S. NO.	Topic	Pedagogy	Details	Instructional Hrs			
				Theory	Practice	video	Project
The Continuous-Time Fourier Series:							
11	Basic Concepts and Development of the Fourier Series,	CRT		1	0	0	0
12	Calculation of the Fourier Series,	CRT		1	0	0	0
13	Properties of the Fourier Series.	CRT		1	0	0	0
The Continuous-Time Fourier Transform:							
14	Basic Concepts and Development of the Fourier Transform,	CRT		1	0	0	0
15	Properties of the Continuous-Time Fourier Transform	CRT		2	0	0	0
Discrete time Fourier transform(DTFT):							
				Theory	Practice	video	Project
16	The discrete time Fourier transform of Aperiodic signal,	CRT		1	0	0	0
17	Convergence of Fourier transform, the Fourier transform of signal with poles on unit circle,	CRT		1	0	0	0
18	frequency domain and time domain signal properties, properties of DTFT	CRT		1	0	0	0
				9	0	0	0

Module III

S. No.	Topic	Pedagogy	Details	Instructional Hrs			
				Theory	Practice	video	Project
	The Laplace transforms and its application to system analysis:						

19	The Laplace Transform: Region of convergence,	CRT		1	0	0	0
20	properties of Laplace transform, poles and zeros of rational functions of s,	CRT		2	0	0	0
21	Inverse Laplace transform by partial fraction method and convolution method,	CRT		1	0	0	0
22	Analysis of LTI Continuous-Time system, stability in sdomain,	CRT		1	0	0	0
The Z-Transform and Its Application to the Analysis of LTI Systems:							
23	The Z-Transform: The Direct Z-Transform,	CRT		1	0	0	0
24	The Inverse Z-Transform;	CRT		1	0	0	0
25	Properties of the Z-Transform;	CRT		2	0	0	0
26	Rational Z-Transforms: Poles and Zeros, Pole Location and Time-Domain Behavior for Causal Signals,	CRT		1	0	0	0
27	The System Function of a Linear Time-Invariant System;	CRT		1	0	0	0
28	Inversion of the Z-Transforms: The Inversion of the Z-Transform by Power Series Expansion,	CRT		1	0	0	0
29	The Inversion of the Z-Transform by Partial-Fraction Expansion;	CRT		1	0	0	0
30	The One-sided Z-Transform: Definition and Properties, Solution of Difference Equations.	CRT		2	0	0	0
				15	0	0	0

FCEC0104 DIGITAL ELECTRONICS CIRCUITS

<i>Pre - requisites</i>	L+T+P	Credits
Nil	3+ 0 + 0	3

Course Objectives:

The objectives of this subject are to

Learn basic concepts on various digital designs

Implementation and simulation of various digital circuits through Hardware description languages.

Course Outcomes:

Upon successful completion of this subject, students should be able to:

Minimize the circuit complexity.

Design and implement different combinational and sequential circuit

Develop new digital design. Design high speed memories.

MODULE - I: (14 hours) Number System and Codes

Binary Number base Conversations, Octal and Hexadecimal numbers, Complements, Signed Binary Numbers, Binary Codes- BCD Codes, Gray Code, ASCII Character Code, Codes for serial data transmission and storage.

(topics will be delivered through Class room teaching)

Boolean Algebra and Logic Gates

Axiomatic definition of Boolean algebra. Basic theorems and properties of Boolean algebra, Boolean functions; Canonical and Standard forms; min-terms and max-terms standard forms; min-terms and max-terms, standard forms , Digital Logic Gates, multiple inputs. **(topics will be delivered through Class room teaching+**

Handson Practice based experiments) Gate Level Minimization:-

The Map Method, K Maps, input five variables, Produ and NOR implementation. AND –OR invent, OR-AND invent implementation, Ex-OR function, Parity generation and checking. **(topics will be delivered through Class room teaching+ Hands on Practice based experiments)**

MODULE - II: (14 hours) Combinational Logic

Combinational Circuits, Analysis and Design Procedure; Binary Adder-Sub tractor, Decimal Adder, Binary Multiplier, Magnitude Comparator, Decoders, Encoders, Multipliers, HDL for Combinational Circuits. **(topicswill be delivered through Class room teaching + Hands on Practice based experiments)****SynchronousSequential Logic**

Sequential Circuit, Latches, Flip-flop, Analysis of Clocked sequential Circuits, HDL for Sequential Circuits,

State Reduction and Assignment. Design Procedure. **(topics will be delivered through Class room teaching+ Handson Practice based experiments)**

MODULE - III: (14 hours) Registers and Counters

Shift Register, Ripple Counters, Synchronous Counters Asynchronous Counter, Ring Counters, and Modulo-N Counters. **(topics will be delivered through Class room teaching+ Hands on Practice based experiments)****Hardware**

Description Language

Introduction to HDL, Structure of HDL coding, Analysing basic gates using HDL, HDL for various Boolean circuits and techniques (Boolean algebra, gate level minimization, comparators, code converters), HDL for various Synchronous, Sequential Circuits and Applications. **(topics will be delivered through Simulation usingsoftware tool)**

Memory and Programmable Logic

Random Access Memory (RAM), Memory Decoding, Error detection and Correction, Read only Memory, Programmable Array Logic, Sequential Programmable Devices. **(topics will be delivered through Class roomteaching)**

Text Book

1. *Digital Design, 3rd Edition* by M. Morries Mano, Pearson Edu. India (Ch: 1, 2, 3, 4, 5, 6, 7, 8)
2. *Fundamentals Of Digital Circuits, A. Anand Kumar, 3rd Edition, PHI learning, ISBN: 978-81-203-5052-6*
3. *Circuit Design and Simulation with VHDL, second edition* By Volnei A. Pedroni, ISBN-13: 978-8120343016

Reference Books:

1. *Digital Principles and Applications, 6th Edition, Donald P. Leach, Albert Paul Malvino and GoutamSaha, Tata McGraw Hill Publishing Company Ltd., New Delhi.*
2. *Digital Fundamentals, 5th Edition, T.L. Floyd and R.P. Jain, Pearson Education, New Delhi.*
3. *Digital Electronics, Principles and Integrated Circuit, Anil K. Jain, Wiley India Edition* 4. *Digital Design – Principle & Practice, 3rd Edition* by John F. Wokerly, Pub. Pearson Education.

Module I

S. No.	Topic	Pedagogy	Details	Instructional Hrs			
				Theory	Practice	video	Project
	Introduction & Overview of Digital Electronics, Binary number, base conversations, Octal & Hexadecimal numbers						

1	Key topics: - Introduction to binary, octal & hexadecimal numbers, binary to decimal, octal & hexadecimal conversion, Decimal to binary, octal & hexadecimal conversion. Reference:-MM –1.2 to 1.4, JFW-2.1 to 2.4	CRT		2	0	0	0
2	Complements, signed binary numbers. Key topics:-1's complement, 2' complement, 10's compl binary numbers and related problems. Reference: - MM –1.5 to 1.6, JFW- 2.5 to 2.9	CRT		2	0	0	0

Module I (Contd...)

S. No.	Topic	Pedagogy	Details	Instructional Hrs			
				Theory	Practice	video	Project
3	Binary codes –BCD codes, Gray code, ASCII character code, code for serial data transmission and storage. Key topics:-Weighted & non –weighted codes, Binary to BCD & gray code conversion, and related problems. Reference: - MM –1.7 to1.8, JFW-2.10 to 2.11	CRT		1	0	0	0

No.							
15	Binary adder , subtractor, Key topics: - Introduction to combinational circuits, Logic diagram, designing procedures, Half adder & subtractor , Full adder & subtractor, BCD adders. Reference : - MM-4.1 to 4.5 , JFW-4.2 , JFW- 5.10.1 to 5.10.4	CRT + Practice	Component Level Design	2	3	0	0
16	Binary multiplier Key topics :- Implementation of 2-bit & 4-bit Multiplication using Adders/ IC- 74283(Binary adders) Block diagram, Reference: - MM-4.6, 4.7 JFW-5.11	CRT		2		0	0
17	Magnitude comparator. Key topics :- Mathematical modeling of 4-bit Magnitude comparator. Reference :- MM-4.6,4.7 JFW- 5.11	CRT + Practice	Component Level Design	2	2	0	0
18	Decoders, encoder Key topics: - Introduction to 3 to 8, 2 to 4 line decoder, Parity encoder, Boolean function implementation using Decoders, encoder, Reference : - MM-4.8 to 4.10, JFW- 5.4.1 to 5.7.4	CRT		2	0	0	0
19	Multiplexer	CRT + Practice	Component Level Design	1	3	0	0
	Key topics: - n to 1 line multiplexer , Boolean function implementation using multiplexer, DeMux Reference :- MM-4.8 to 4.10, JFW- 5.4.1 to 5.7.4						
20	Sequential circuits: Latches. Key topics :- Introduction sequential circuits, S-R latch, , D latch: Truth table, Logic diagram, Excitation Table.	CRT + Practice	Component Level Design	1	2	0	0
21	Sequential circuits: Flip flop Key topics : - J-K Flip-flop, T flip-Flop, D Flipflop: Truth table, Logic diagram, Excitation Table. Reference : - MM-5.1 to 5.2, JFW- 7.2 to 7.2.5	CRT + Practice	Component Level Design	1	2	0	0
22	Analysis of clocked sequential circuits: State reduction and assignment, Key topics: - State equation, state table, state Diagram Reference: - MM-5.4-5.6, JFW- 7.4.1 to 7.4.6,7.9	CRT		3	0	0	0
				14	16		

Topic

Pedagogy

Details

Instructional Hrs

Module III

S. no.	Topic	Pedagogy	Details	Instructional Hrs			
				Theory	Practice	video	Project
23	Shift register. Key topics :-Introduction to registers, Shift register: Serial in, parallel in, serial out, parallel out, shift right, shift left, Universal shift resistors . Reference : - MM–6.1 to 6.2, JFW- 8.5 to 8.5.2	CRT		2	0	0	0
24	Ripple counters. Key topics :- Introduction to binary ripple counter , state diagram, timing diagram Reference : - MM–6.3, JFW - 8.5.5	CRT		2	0	0	0
25	Synchronous counter Key topics :-Binary counter, Up-down binary counter, BCD counter with parallel load. Reference : - MM–6.4	CRT		2	0	0	0

Module III (Contd...)

S. no.	Topic	Pedagogy	Details	Instructional Hrs			
				Theory	Practice	video	Project
26	Ring counters. Key topics :- Ring counter & Johnson counter : Timing Diagram Reference : - MM –6.5, JFW- 8.5.6 to 8.5.7	CRT		1	0	0	0
27	Module –N counters. Key topics :- designing of mod counters. Reference : - MM 6.4	CRT		1	0	0	0
28	Introduction to HDL, HDL for various Boolean circuits and techniques (gate level minimization, comparators, code converters)	Practice	VERILOG Programming (Software: xilinx)	0	3	0	0
29	HDL for combinational circuits. Key topics :- Gate level modeling , Data flow modeling , behavioral modeling . Reference : - MM –4.11	Practice		0		0	0
30	HDL description of Design, examples. Key topics : Structural description of Multiplier and Multiplexers Reference : - MM –8.5	Practice		0	3	0	0
31	HDL for registers & counter. Key topics :- HDL for synchronous counter & ripple counter . Reference : - MM –6.6, JFW- 8.5.10	Practice		0		0	0
32	Random Access Memory Reference : - MM –7.1,, JFW- 10.1 to 10.2	CRT		1	0	0	0
33	Memory decoding. Key topics :- coincident decoding , address multiplication. Reference : - MM –7.2, 7.3, JFW- 10.3 to 10.4	CRT		1	0	0	0
34	Error detection & correction. Key topics :- Hamming code, single error correction, double error detection. Reference : - MM –7.4	CRT		1	0	0	0
35	Read only memory Key topics :-Internal logic of RAM, combinational circuit implementation, types of ROMs, Reference : - MM –7.5 to 7.6, JFW- 10.1.1 to 10.1.6	CRT		1	0	0	0
36	programmable array logic. Key topics :- conditional PLD, PAL with 4 inputs & 4 outputs. Reference : - MM –7.5 to 7.6, JFW- 10.1.1 to 10.1.6	CRT		1	0	0	0
37	Sequential programmable devices. Key topics :-Sequential programmable logic device (SPLD), complex programmable logic device (CPLD), field programmable gate array(FPGA). Reference : - MM –7.8, JFW- 10.5	CRT		1	0	0	0
				14	6	0	0

FCEN0105 Basic Electrical Engineering

<i>Pre - requisites</i>	<i>L+T+P</i>	<i>Credits</i>
Nil	3+ 0 + 0	3

Course Objectives:

- *Impart a basic knowledge of electrical quantities such as current, voltage, power, energy and frequency to understand the impact of technology in a global and societal context.*
 - *Provide working knowledge for the analysis of basic D.C. and A.C. circuits used in electrical and electronic devices.*
 - *Develop selection skill to identify the type of generators or motors required for particular application.*
 - *Highlight the importance of transformers in transmission and distribution of electric power.*
 - *Emphasize the effects of electric shock and precautionary measures.*
 - *Improve the ability to function on multi-disciplinary teams. **Course Outcomes:***
- After studying this course, students will be able to:*
- *Understand electrical circuit concepts*
 - *Understand electromagnetic and electromagnetic induction*
 - *Understand DC Machines*
 - *Understand single and three phase A.C circuits, and Understand AC machines and measuring instruments*

Module-1 (16 Hours)

Introduction to Electrical Engineering : Essence of electricity, Electric field; electric current, potential and potential difference, Emf, electric power, ohm's law

Sources, Source Conversion, Induced EMF, Energy Stored in Inductor & Capacitor.(PPT & Animated videos) DC Networks: Laws and Theorems applicable to DC networks (KCL & KVL, Node voltage & Mesh current

analysis, Delta-Star & Star-Delta conversion, Superposition principle in R-L and R-C circuits with DC excitation, Simple problems. (e-content& simulations using PSICE)

Magnetic Circuits: Introduction to Electromagnetism, B-H curve, Permeability, Reluctance, Solution of simple magnetic circuits, Hysteresis and Eddy current loss. (Class room teaching)

D.C. Machines: Construction, Classification and Principle of operation of DC machines, EMF equation of DC generator, Speed Equation of DC Motor. (Class room teaching & videos)

Module-2 (16 Hours)

Single-Phase AC Circuits: Single-phase EMF Generation, Waveform and Phasor Representation, Average and Effective value of sinusoids, Peak factor & Form factor, Complex Impedance and Power using j-operator, Power factor. (Class room teaching & videos)

Three-Phase AC Circuits: Comparison between single-phase and three-phase systems, Three-phase EMF Generation, Line and Phase quantities in star and delta networks, Power and its measurement in three-phase balanced circuits. (Class room teaching)

Single-Phase Transformers: Construction and principle of operation, EMF Equation, Transformation ratio, Practical and Ideal transformers. (Class room teaching)

Module-3 (13 Hours)

Induction Motors: Introduction to Three-phase and Single-phase Induction Motors, Concept of Slip, Slip-Torque characteristics (no derivations). (Class room teaching e-content)

Measuring Instruments: Introduction, PMMC Ammeters and Voltmeters with extension of range, Moving-Iron Ammeters and Voltmeters, Dynamometer type Wattmeter, Energy meter. (Class room teaching & e-content)

Text Books:

1. D. C. Kulshreshtha, "Basic Electrical Reference Engineering" ,

Books:

1. Hughes, "Electronical & Technology", Ninth Edition (Revised Education,).
2. D.C. Kulshreshtha, "Basic Electrical Engineering", Tata
3. Rajendra Prasad, "Fundamentals-Hall of India, Electrical Engineering"

Sl No.	Topic	pedagogy	Instruction hrs.			
			Theory	Practice	video	Project
01	Introduction to Electrical Engineering : Essence of electricity, Electric field; electric current, potential and potential difference	CRT	1	0	0	0
02	Emf, electric power, oh	CRT www.youtube.com/watch?v=iLzfe_HxrWI	1	0	0	0
03	basic circuit components, Ideal and Practical Sources	CRT	1	0	0	0
04	Source Conversion	CRT	1	0	0	0
05	Induced EMF	CRT	1	0	0	0
06	Energy Stored in Inductor & Capacitor	CRT	1	0	0	0
07	DC Networks: Laws and Theorems applicable to DC networks (KCL & KVL	PRACTICE	0	2	0	0
08	Node voltage	PRACTICE	0	2	0	0
09	Mesh current analysis	PRACTICE	0	2	0	0
10	Delta-Star & Star-Delta conversion	CRT www.youtube.com/watch?v=igvqOyJYAoA	1	0	0	0
11	Superposition principle	PRACTICE	0	2	0	0
12	Thevenin's Norton theorem &	PRACTICE	0	2	0	0
13	Transients in R-L and R-C circuits with DC excitation	PRACTICE	0	2	0	0
14	Simple problems	TUTORIAL	1	0	0	0
15	Magnetic Circuits: Introduction to Electromagnetism, B-H curve	CRT	1	0	0	0
16	Permeability, Reluctance, Solution of simple magnetic Circuits	CRT	1	0	0	0
17	Hysteresis and Eddy current loss	CRT	1	0	0	0
18	D.C. Machines: Construction	CRT USING VIDEOS	1	0	0	0
19	Classification and Principle of operation of DC machines, EMF equation of DC generator,	CRT USING VIDEOS www.youtube.com/watch?v=Jh167TEECBk	1	0	0	0
20	Speed Equation of DC Motor	CRT USING VIDEOS				

MODULE- II

Sl No.	Topic	pedagogy	Instruction hrs.			
			Theory	Practice	video	Project
01	Single-Phase AC Circuits: Single-phase EMF Generation, Waveform and Phasor Representation	CRT USING VIDEOS	2	0	0	0

02	Average and Effective value of sinusoids, Peak factor & Form factor	CRT USING VIDEOS	2	0	0	0
03	Complex Impedance and Power using j-operator, Power factor.	CRT USING VIDEOS	2	0	0	0

MODULE-II(Contd...)

SI NO.	Topic	pedagogy	Instruction hrs.			
			Theory	Practice	video	Project
04	Three-Phase AC Circuits: Comparison between singlephase and three-phase systems, Three-phase EMF Generation	CRT USING VIDEOS www.youtube.com/watch?v=fGPdPKMSpv8	2	0	0	0
05	Line and Phase quantities in star and delta networks, Power and its measurement in three-phase balanced circuits.	CRT	2	0	0	0
06	Single-Phase Transformers: Construction and principle of operation,	CRT	2	0	0	0
07	EMF Equation, Transformation ratio	CRT	2	0	0	0
08	Practical and Ideal transformers	CRT	2	0	0	0

MODULE--III

01	Induction Motors: Introduction to Three-phase and Single-phase Induction Motors, Concept of Slip	CRT	2	0	0	0
02	Concept of Slip, Slip-Torque characteristics	CRT	1	0	0	0
03	Measuring Instruments: Introduction, PMMC Ammeters and Voltmeters with extension of range	CRT	2	0	0	0
04	Moving-Iron Ammeters and Voltmeters	CRT	1	0	0	0
05	Dynamometer type Wattmeter, Energy meter		2	0	0	0

FCEN0106 Electrical Machines- I

Pre - requisites	L+T+P	Credits
Nil	3+ 0 + 0	3

Course Objectives:

- To introduce the students about the principles of electromagnetism applicable to dc and ac machines.
- To familiarize the students about fundamentals laws that governs the operation of generator and its application. -To introduce the students about construction and associated with starting of dc motor.
- To analyse the behaviour and performance of dc machine under different operating conditions. -To make student understand about various three phase transformer connections.

Course Outcomes:

On successful completion of this course, students will be able to:

- Distinguish the constructional similarity and dissimilarity between various dc and ac machine.
- Demonstrate appropriate behaviours and knowledge of electrical machines when working with the class room teaching and lab experience.
- Students will be able to prepare professional quality graphical presentations of laboratory data and computational results.
- Students will demonstrate an understanding of the fundamental control practices associated with AC

and DC machines.

-In the lab, at least for 50% experiments, students will write a software programme for logic (mathematical equation).

Module-I (14 Hrs): DC Generator

Dc Generators: Armature winding- Lap and wave, Simplex and duplex(Autocad), Method of excitation, Classification, Derivation of emf,, Process of commutation, Armature reaction, Interpoles, Compensating winding and equalizer rings(***class room teaching***)

Dc Generator Characteristics: Characteristics for Separately Excited DC Generator (No-Load and Load), Conditions for Self Excitation, Critical Resistance and Critical Speed, Characteristics for Self Excited DC Shunt Generator (No-Load and Load), Process of building up of voltage, Causes of failure of voltage build-up and remedies, Voltage Regulation, Parallel Operation of DC Shunt Generators and DC Series Generators. (***class room teaching+ Practice in electrical machine lab***)

Module-II (15 Hrs) : DC Motor

Dc Motor Characteristics: Characteristic for Speed Armature Current, Torque Armature Current and Speed Torque of (i) Separately Excited DC Motor, (ii) DC Shunt Motor, (iii) DC

Series Motor, and (iv) DC Compound Motor, Comparison between Different types of DC Motors and their Application. (Lecture & practice)

Dc Motor Starting And Performance Characteristics: Starting of DC Shunt, Series and Compound Motors, Condition for maximum power, Speed Control of DC Shunt and Series

Motors, Classification of Losses, Efficiency Evaluation from Direct and Indirect Methods (i) Brake Test

(Direct method), (ii) Swinburne's Test (Indirect method).(***class room teaching+ practice in electrical machine lab.***)

MODULE-III (13 Hrs): Transformer

Single phase transformer: Phasor Diagrams at No-Load and Load Conditions, Equivalent Circuit, Determination of Parameters From Tests (Open Circuit Test and Short Circuit Test, Back to Back test), Per unit calculation, Polarity test, Voltage regulation, all day efficiency.(***class room teaching+ practice in electrical machine lab.***)

Three Phase Transformers: Three-phase transformer connections- Star-star, Two Single-Phase Transformers connected in Open Delta (V-Connection) and their rating, T-Connection (Scott Connection) of Two Single-Phase Transformers to convert Three-Phase balanced supply to Two-Phase balanced supply. Delta-delta, Star-delta, Delta-star, Zig-zag connections.Scott connection, Open delta connection. (***class room teaching+ practice in electrical machine lab***) Auto Transformers (***class room teaching***)

Text Book:

1. *Electrical Machines* –D P Kothari and I J Nagrath –Tata McGraw Hill. **Reference Book(s):**
2. *Electrical Machinery* –P S Bimbhra –Khanna Publishers.
3. *Electrical Machines* –P.K.Mukherjee & S.Chakravorti–Dhanpat Rai Publications
4. *Electrical Machines-I* - B.L.Theraja- S.Chand Publications

Module I

S. No.	Topic	Pedagogy	Details	Instructional Hrs			
	DC GENERATOR			Theory	Practice	video	Project
1	Generator construction and principle of operation ,Armature winding- (Lap and wave, Simplex and duplex)	CRT	https://www.youtube.com/watch?v=iRVKAb_hs5A	1	0	1	0
2	Method of excitation, Classification of dc Generator	CRT	e-content	1	0	0	0
3	Derivation of emf equation of dc generator	CRT	e-content	1	0	0	0
4	Process of commutation	CRT	e-Content	1	0	0	0

5	Armature reaction, Interpoles, Compensating winding and equalizer rings.	CRT	e-Content & https://www.youtube.com/watch?v=Sp4O_7xoLIE	1	0	1	0
6	Characteristics for Separately Excited DC Generator (No-Load and Load), Conditions for Self Excitation, Critical Resistance and Critical Speed.	CRT + PRACTICE	E-content & Practice In Electrical Machine Lab And Graphically Find Out Critical Speed and Critical Resistance	1	1	0	0
7	Characteristics for Self Excited DC Shunt Generator (No-Load and Load), Process of building up of voltage)	CRT + PRACTICE	E-Content & Practice In Electrical Machine Lab And Graphically Find Out INTERNAL AND EXTERNAL CHARACTERISTICS	1	1	0	0
9	Causes of failure of voltage build-up and remedies, Voltage Regulation	CRT	e-Content	1	0	0	0
10	Parallel Operation of DC Shunt Generators and DC Series Generators	CRT + practice	Practice In Electrical Machine Lab	1	1	0	0

Module II

S. No.	Topic	Pedagogy	Details	Instructional Hrs			
				Theory	Practice	Video	Project
11	Characteristic for Speed~Armature Current, Torque~Armature Current and Speed~Torque of (i) Separately Excited DC Motor, (ii) DC Shunt Motor, (iii) DC Series Motor, and (iv) DC Compound Motor, Comparison between Different types of DC Motors and their Application.	CRT	e-content	3	0	0	0
12	Dc Motor Starting And Performance Characteristics: Starting of DC Shunt, Series and Compound Motors	CRT + Practice	E-Content Along With Practice In Electrical Machine Lab	2	1	0	0
13	Condition for getting maximum power	CRT	e-content	1	0	0	0
14	Speed Control of DC Shunt and Series Motors	CRT + Practice	e-Content & Practice In Electrical Machine Lab	3	1	0	0
15	Classification of Losses	CRT	e-content	1	0	0	0
16	Efficiency Evaluation from Direct and Indirect Methods (i) Brake Test (Direct method), (ii) Swinburne's Test (Indirect method), (iii) Regenerative/Hopkinson Test	CRT + PRACTICE	e-Content & Practice in electrical machine lab.(all tests)	1	2	0	0
<u>Module III</u>							
TRANSFORMER							

17	Single Phase Transformer: Phasor Diagrams at NoLoad and Load Conditions,	CRT	e-content	1	0	0	0
18	Equivalent circuit of transformer	CRT	e-content	1	0	0	0

19	Determination of Parameters From Tests (Open Circuit Test and Short Circuit Test, Back to Back test), Per unit calculation, Polarity test, Voltage regulation, all day efficiency.	CRT + practice	e-Content & Practice in electrical machine lab. (all tests)	1	2	0	0
20	Three Phase Transformers: Three-phase transformer connections- Star-star, Two SinglePhase Transformers connected in Open Delta (V Connection) and their rating, T Connection (Scott Connection) of Two SinglePhase Transformers to convert Three-Phase balanced supply to Two-Phase balanced supply	CRT	e-content	3	0	0	0
21	Delta-delta, Star-delta, Delta-star, Zig-zag connections. Scott connection, Open delta connection,	CRT	e-content	2	0	0	0
22	Auto Transformers	CRT	e-content	1	0	0	0

FCEN 0107 Analog and Digital Electronics

Pre –requisites	L+T+P	Credits
Nil	3+ 0 + 0	3

Course Objectives:

- To make the students understand the various electronics circuit by using semiconductor devices. -To train the students to analysis different amplifier (small signal & large signal).
- To train the students such a way that, it will help them to realise the practical circuit in easy manner.

Course Outcomes:

- On successful completion of this course, students will be able to: -Construct small analog and digital electronics circuit.
- Design circuit parameter, so that it will give better performance in complicated electronics circuit.

MODULE –I (10 Hours)

1. Diode Circuits: Zener Diode as Voltage Regulator, Diode Circuits with Time-Varying Sources, Switching Characteristics of a Diode, Special Purpose Diodes. **(class room teaching+ Lab practice) (Multisim)**
2. Small Signal Amplifier: BJT, FET small signal models, AC Gain, Input and Output Impedances, Some Special Circuits, Darlington Pairs and Feedback Pairs, Frequency Response of Single Stage RC Coupled Amplifiers and Multistage Transistor Amplifiers. **(class room teaching)**

MODULE –II (20 Hours)

3. Large Signal Amplifiers: Classification, Class-A and Class-B Power Amplifiers Complimentary and Symmetry Amplifiers, Class-C Amplifiers. **(class room teaching + Lab practice) (Multisim)**
4. Feed Back Amplifiers and Oscillators: Feedback Concepts, Types of Feedback Circuits, Effects of Negative Feedback Circuits, Unijunction Oscillator and PLL. **(class room teaching)**
5. Operational Amplifier: Basic Operational Amplifier, Differential Amplifier, Basic Operational Amplifier Circuits, Application of OPAMPs, Linear Application of OPAMPs, OPAMP Filters. **(classroomteaching + Lab practice) (Multisim)**
6. Combinational Circuits: Introduction to Digital Electronics Circuits, K-maps and their Simplification, Adder, Subtractors, Digital Comparator Circuits, Parity Checkers/Generators, Multiplexers and Decoders, Demultiplexers/Decoders, Programmable Logic Arrays. **(class room teaching + Practiceusing software)(LogiSim)**
7. Sequential Circuits and Systems: Introduction, Memory Cells and Flip-Flops, Registers, Counters, Asynchronous Counters, State Diagrams**(class room teaching)Text Books:**
 1. *Electronics: Analog and Digital, I.J. Nagrath, PHI Learning Pvt. Ltd., New Delhi.*
 2. *Digital Design Principle& Practice, 3rd Edition by John F. Wokerly, Pub. Pearson Education*

Reference Books:

1. *Millman's Electronic Devices and Circuits, 2ndEdition Education Pvt. Ltd., New Delhi.*
2. *Electronic Devices and Circuit Theory, 9th/10thEdition R.L. Boylestad and L. Nashelsky, Pearson Education, New Delhi.*
3. *Digital Fundamentals, 5thEdition, T.L. Floyd and R.P. Jain, Pearson Education, New Delhi.*
4. *Fundamentals of Digital Circuits, 2ndEdition, A. Anand Kumar, PHI Learning Pvt. Ltd., New Delhi.*

Module I

S. No.	Topic	Pedagogy	Details	Instructional Hrs			
				Theory	Practice	video	Project
1	Diode Circuits: Zener Diode as Voltage Regulator, Special Purpose Diodes	CRT	https://www.youtube.com/watch?v=d4zO39K_ce8 black board	1	0	1	0
2	Diode Circuits with Time-Varying Sources, Switching Characteristics of a Diode	CRT+P RA	black board hardware practice	1	1	0	
3	Small Signal Amplifier: BJT, FET small signal models, AC Gain, Input and Output Impedances, Some Special Circuits, Darlington Pairs and Feedback Pairs, Frequency Response of Single Stage RC Coupled Amplifiers and Multistage Transistor	CRT	https://www.youtube.com/watch?v=c1lafpmv13M https://www.youtube.com/watch?v=tz62tq_KEc	5	0	1	0

				om/watch?v=QO5FgM7MLGg black board						
Module II										
4	Large Signal Amplifiers: Classification, Class-A and Class-B Power Amplifiers Complimentary and Symmetry Amplifiers, Class-C Amplifiers	CRT + PRAC		https://www.youtube.com/watch?v=vyjJFRIT7w https://www.youtube.com/watch?v=nLMC8j8ys4 HARDWARE practice (CLASS-A Amplifier)	4	1	1	0		
5	Feed Back Amplifiers and Oscillators: Feedback Concepts, Types of Feedback Circuits, Effects of Negative Feedback Circuits, Unijunction Oscillator and PLL	CRT		black board	7	0	0	0		
6	Operational Amplifier. Basic Operational Amplifier, Differential Amplifier, Basic Operational Amplifier Circuits, Application of OPAMPs, Linear Application of OPAMPs, OPAMP Filters	CRT+ PRAC		black board Hardware based	5	2	0	0		

Module III

7	Conditional Circuits: Introduction To Digital Electronics Circuits, K-maps and their Simplification, Adder, Subtractors, Digital Comparator Circuits, Parity Checkers/Generators, Multiplexers And Decoders, Demultiplexers/Decoders, Programmable Logic Arrays.	CRT		black board & simulation using Logisim	4	2	0	0		
8	Sequential Circuits and Systems: Introduction, Memory Cells And FlipFlops, Resistors, Counters, Asynchronous Counters, State Diagrams	CRT		black board	4	0	0	0		
Total					33	4	3	0		

FCEN0108 WORKSHOP TECHNOLOGY

Pre-requisites	Course type	Credits
NIL	Theory	3

Course Objectives:

1. To learn about basic manufacturing processes such as casting, forming, joining Course Outcomes:

On successful completion of this course, students will be able to:

1. Can suggest suitable manufacturing technique for given component.

Module-I (24 Hrs): Introduction to Work Holding Devices and Manufacturing Tools

Work holding, Tool Holding Devices, measuring and cutting tools for Carpentry, Fitting, Plumbing
 Work holding, Tool Holding Devices, measuring and cutting tools for Blacksmith & Welding. Carpentry:
 Making simple joints: a) Half-lap b) Mortise joints. Carpentry: Job using Wood Turning Lathe –
 Stepped Pulley, cot leg Fittings: Making of simple mating profiles a) VEE b) Dovetail c) Half round
 joints. Basic Pipe Fittings

, Sanitary Fittings, Water Meter Installation. (Most of the topics will be through learn by doing and laboratory mode)

Module-II (20 Hrs): Introduction to Casting and Welding

Casting Terminology- Sand Moulding Practice, Moulding Materials Patterns- Types, Allowances
 Melting Practice (Cupola, electrical furnace) Introduction to Welding, Brazing & Soldering Oxy
 Acetylene Gas Welding-Process, Techniques Arc Welding- Process, Techniques, Defects. Lap
 Joint, Butt Joint, T-Joint, V joint MIG, TIG and spot welding. (Most of the topics will be through learn
 by doing and laboratory mode)

MODULE-III (14 Hrs): Introduction To Forming

Cold & Hot Working of Metals- Black Smithy, Forging and forging tools Black-smithy:
 Converting round rod into Square Ring, Converting round rod into square S-Hook Cold & Hot
 Working of Metals- Extrusion, Drawing Cold & Hot Working of Metals- Sheet metal Operations,
 tools, Preparation of Square Tray. (Most of the topics will be through learn by doing and
 laboratory mode)

TEXT BOOKS:

1. Workshop Technology Vol. I & II, S.K. Hazra Chaudhary, A.K. Hazra Chaudhary, Asian Book Comp., New Delhi.
2. Production Engineering - P.C. Sharma, S. Chand
3. Workshop Practice : R.K. Rajput, Laxmi Publication

REFERENCE BOOKS:

1. Workshop Technology, Vol. 1, 2 & 3 –W.A.J. Chapman, WAJ, Edward Arnold.
2. Workshop Technology (Vol. 1 and 2) –B. S. Raghuvanshi, Dhanpath Rai and Sons, New Delhi.

Module

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S. N.	Topic	Pedagogy	Details	Instructional Hrs			
				Th. +Tutorial	Practice	video	Project
1	Work holding, Tool holding devices, measuring and cutting tools for carpentry, fitting, plumbing	CRT & PRA		1	2	1	0
2	Work holding, Tool holding devices, measuring and cutting tools for black smithy & welding	CRT & PRA		1	2	1	0
3	Carpentry: Making simple joints: a) Halflap b) Mortise joints	PRA & PRO		1	2	0	1
4	Carpentry: Job using wood turning lathe –Stepped Pulley, cot leg	PRA &		1	2	0	1

5	Fittings: Making of simple mating profiles a) VEE b) Dovetail c) Half round joints.	PRA & PRO		1	2	0	1
6	Basic pipe fittings, Sanitary fittings, Water meter installation	CRT & PRA		1	2	1	0
Sub total		24		06	12	3	3

Module II

S. No.	Topic	Pedagogy	Details	Instructional Hrs			
				Theory	Practice	video	Project
	Introduction To Casting And Welding						
1	Casting Terminology- Sand Moulding Practice, Moulding Materials	CRT & PRA		1	1	0	0
2	Patterns- Types, Allowances	CRT & PRA		1	1	0	0
3	Melting Practice (Cupola, electrical furnace)	CRT & PRA		2	1	0	0
4	Introduction to Welding, Brazing & Soldering	CRT & PRA		2	0	0	0
5	Oxy Acetylene Gas Welding- Process, Techniques	PRA & PRO		0	1	0	1

6	Arc Welding- Process, Techniques, Defects	PRA		0	1	0	0
7	Lap Joint, Butt Joint, T-Joint, V joint	PRA & PRO		1	1	0	2
8	MIG, TIG and spot welding	PRA & PRO		0	2	0	2
Sub total		20		7	08	0	5

Module III

S. No.	Topic	Pedagogy	Details	Instructional Hrs			
				Theory	Practice	video	Project
1	Introduction To Forming Cold & Hot Working of Metals- Black Smithy, Forging and forging Tools	PRA & PRO		1	2	0	1
2	Black-smithy: Converting round rod into Square Ring, Converting round rod into square S-Hook	PRA & PRO		0	2	0	1
3	Cold & Hot Working of Metals- Extrusion, Drawing	CRT		3	0	0	0
4	Cold & Hot Working of Metals- Sheet metal Operations, tools, Preparation of Square Tray	CRT & PRA & PRO		1	2	0	1
Sub total		14		5	6	0	3

FCEN0109 ENGINEERING MECHANICS

Pre-requisites	Course type	Credits
NIL	Theory	3

Course objectives:-

1. This course teaches students about the effect of forces during static and dynamic Conditions.
2. It gives insight about friction, virtual work and forces in the trusses
3. To determine axial forces, shear forces, and bending moments.
4. To study the bending phenomenon in beams and stress developed in them.

Course outcomes:-

1. To provide the student with a thorough understanding of concept, drawing and free body diagrams.

2. *Able to draw SF and BM diagram of a loaded beam*

- Identify the stress developed in beams due to bending.

Module-I (20 Hrs):

Concurrent and non-concurrent forces on a plane: Principle of statics, composition and resolution of forces, free body diagram, equilibrium of concurrent coplanar forces, Lami's theorem, moment and principle of moment, types of supports and support reactions, equilibrium of general case of forces in a plane. **(The topic will be through class room teaching)**

Center of gravity- General case of parallel forces in a plane, centre of parallel forces in a plane, centroid and centre of gravity, centroid of composite plane figures and curves, distributed forces in a plane. **(The topic will be through class room teaching)**

Friction: Types of friction, laws of friction, angle of friction, coefficient of friction, angle of repose, equilibrium of bodies on rough inclined planes, equilibrium of ladder. **(The topic will be through class room teaching)**

Module-II (17 Hrs):

Moment of Inertia: Rectangular and polar moment of inertia, radius of gyration, parallel axis theorem and perpendicular axis theorem, moment of inertia of plane composite figures and material bodies.

(The topic will be through class room teaching and experiments)

Plane trusses: Classification of truss, assumptions, method of joints and method of sections. **(The topic will be through class room teaching and ANSYS software)**

Principle of virtual work: Equilibrium of ideal systems, application to practical problems. **(The topic will be through class room teaching)** **MODULE-III (15 Hrs):**

Shear Force and Bending Moment: Types of beams—Concept of shear force and bending moment—S.F and B.M diagrams for cantilever, simply supported and overhanging beams subjected to point loads, U.D.L., uniformly varying loads and combination of these loads, point of contra flexure, relation between S.F., B.M and rate of loading at a section of a beam. **(The topics will be through class room teaching and ANSYS software)** **Flexural Stresses in beams:** Theory of simple bending, assumptions, flexure formula, determination bending stresses, section modulus for various beam sections, neutral axis. **(The topics will be through class room teaching and ANSYS software)**

Shear stresses in beams: Shear stress at a section, shear stress distribution for different sections. **(The topics will be through class room teaching)**

Text books:

- Engineering Mechanics by S Timoshenko, D.H Young and J.V.Rao, Revised 4th edition (Special Indian Edition), McGraw Hill.
- Engineering Mechanics, S.S. Bhavikatti, New Age International Publisher
- Strength of Materials, R. K. Bansal, Laxmi Publications

Reference books:

- Engineering Mechanics of Solids, by Egor P. Popov, Pearson Publication
- Mechanics of Materials, R.C. Hibbeler, Pearson Publication
- Engineering Mechanics, D.S. Kumar, S.K. Kataria and Sons **Module I**

S. No.	Topic	Pedagogy	Details	Instructional Hrs
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				Theory +Tutorial	Practice	video	Project
1	Concurrent and non-concurrent forces on a plane: Principle of statics	CRT		2	0	0	0
2	Composition and resolution of forces	CRT		2	0	0	0
3	Free body diagram, equilibrium of concurrent coplanar forces, Lam	CRT		2	0	0	0
4	Moment and couple, V Moment	CRT		1	0	0	0
5	Types of supports and support reactions	CRT		2	0	0	0
6	Equilibrium of general case of forces in a plane	CRT		2	0	0	0
7	Center of gravity- General case of parallel forces in a plane, centre of parallel forces in a Plane	CRT		1	0	0	0
8	Centroid of composite plane figures and curves	CRT		3	0	0	0
9	Distributed forces in a plane	CRT		1	0	0	0
10	Friction: Types of friction, laws of friction, angle of friction, coefficient of friction, angle of repose	CRT		2			
11	Equilibrium of bodies on rough inclined planes, equilibrium of ladder	CRT		2			
	Sub total		20	20	0	0	0

Module II

S. No.	Topic	Pedagogy	Details	Instructional Hrs			
				Theory	Practice	video	Project
1	Moment of Inertia: Rectangular and polar moment of inertia, radius of Gyration	CRT		2	0	0	0

2	<i>Parallel axis theorem and perpendicular axis theorem</i>	<i>CRT</i>		2			
3	<i>Moment of inertia of plane composite figures and material bodies</i>	<i>CRT</i>		4	0	0	0
4	Plane trusses: <i>Classification of truss, Assumptions</i>	<i>CRT</i>		1	0	0	0
5	<i>Method of joints and method of sections</i>	<i>CRT</i>		4	0	1	0
6	Principle of virtual work: <i>Equilibrium of ideal systems</i>	<i>CRT</i>		1			
7	<i>Application to practical problems</i>	<i>CRT</i>		2			

	Sub total	17		16	0	1	0
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Module III

S. No.	Topic	Pedagogy	Details	Instructional Hrs			
				Theory	Practice	video	Project
1	Shear Force and Bending Moment: Types of beams	CRT		1	0	0	0
2	Concept of shear force and bending moment – S.F and B.M diagrams for cantilever, simply supported and overhanging beams subjected to point loads, U.D.L., uniformly varying loads and combination of these loads	CRT+ ANSYS simulation		3	0	1	0
3	Point of contra flexure, relation between S.F., B.M and rate of loading at a section of a beam	CRT		1	0	0	0
4	Flexural Stresses in beams: Theory of simple bending, assumptions, flexure formula	CRT+ ANSYS simulation		2	0	1	0
5	Flexure formula, determination bending stresses, section modulus for various beam sections, neutral axis	CRT		3	0	0	0
6	Shear stresses in beams: Shear stress at a section	CRT+ ANSYS simulation		1	0	1	0
7	Shear stress distribution for different Sections	CRT		1	0	0	0
	Sub total	15		12	0	3	0

FCEN0110 THERMAL ENGINEERING

<i>Pre –requisites</i>	<i>Course type</i>	<i>Credits</i>
NIL	Theory	3

COURSE OBJECTIVES:

To make the student understand

1. *To be able to state various laws of thermodynamics and to define heat, work, thermal efficiency and the difference between various forms of energy*
2. *To be able to identify and describe energy exchange processes (in terms of various forms of energy, heat and work)*
3. *To be able to apply the steady-flow energy equation or the First Law of Thermodynamics to a system of thermodynamic components (heaters, coolers, pumps, turbines, pistons, etc.) to estimate required balances of heat, work and energy flow.*
4. *The importance of reversibility in the maximization of the efficiency of an engine*

COURSE OUTCOMES:

1. *Students will be able to prepare energy balance sheet*
2. *Will be able to understand various processes of thermodynamic cycles*
3. *Will be familiar with the steam table which will further help them in advanced thermodynamics for understanding power cycles*
4. *Capability to determine thermodynamic efficiency of various energy related processes*

MODULE-I (18 Hours)

Basic concepts and definition: Scope of Thermodynamics, Macroscopic and Microscopic approaches; Types of Systems, Properties, State and its representation on a property diagram, Process and its representation, point and path function; Reversible and Irreversible processes; Thermodynamic equilibrium and quasi-static processes, Zeroth Law of Thermodynamics and temperature, Measurement of temperature and calibration of thermometers, the ideal gas temperature scale. **(The topic is taught through PPT presentation and practice)**

Energy Transfer: Work Transfer (definition and calculation), Different modes of work, Displacement Work for various processes, Free expansion; Heat Transfer. **(The topic is taught through class room teaching)** **First Law of Thermodynamics:** Formal statement (using cyclic processes), First law for processes of fixed masses (closed systems) and introduction of internal energy as a thermodynamics property, Introduction of enthalpy as a thermodynamic property; Definition of specific heats and their use in calculation of internal energy and enthalpy with emphasis on ideal gases. Application of First Law to control volumes; Nozzle, Diffuser, Compressor, Turbine, Throttling device, Heat Exchanger (only steady flow need be considered). **(Application of First Law to control volumes will be through video presentation)**

MODULE-II (18 Hours)

Second Law of Thermodynamics: Limitations of First law, Kelvin-Planck and Clausius statements of Second Law, corollaries, Heat engine, Refrigerator and heat Pump, Clausius inequality.

Entropy: Definition, Principles of increase of entropy, Change of entropy of perfect gas in various

processes.

Properties of pure substances: p-v, p-T, T-S, h-S diagram for steam, different types of steam, Introduction to steam tables with respect to specific volume, pressure, temperature, enthalpy and entropy. **(Properties of pure substances will be through class room teaching & video presentation)**

MODULE-III (18 Hours)

IC engines: Introduction, Working of IC engines. Classification of IC engines, 2-Stroke and 4-Stroke engines, petrol and diesel engines, engine nomenclature. **(Topics related to IC engines will be through Practice & video presentation)**

Gas Power Cycles: Carnot Cycle, Air standard cycles-Otto, Diesel, Dual Combustion.

Vapour Power Cycles: Introduction Power cycles, The Carnot vapour cycle and its limitations, The Rankine cycle, Means of increasing the Rankine cycle efficiency, The reheat cycle, The regenerative feed heating cycle. **(Topics related to Gas & Vapour power cycles will be through class room teaching & video presentation)**
Introduction to Gas Turbine Cycles- Open & Closed Cycle. **(Topics related to gas turbine will be through video presentation)**

TEXT BOOKS:

1. *Engineering Thermodynamics, P.K. Nag, Tata McGraw Hill Companies*
2. *Thermodynamics: An Engineering Approach, Y.A Cengel, M. A Boles, Tata McGraw Hill Companies.*

REFERENCE BOOKS:

1. *Fundamentals of Thermodynamics*, C. Borgnakke, R. E. Sonntag, WILEY Publication.

Module I

S. No.	Topic	Pedagogy	Details	Instructional Hrs			
				Theory +Tutorial	Practice	video	Project
1							
2	Basic concepts and definition: <i>Scope of Thermodynamics, Macroscopic and Microscopic approaches</i>			1	0	0	0
3	<i>Types of Systems, Properties, State and its representation on a property diagram, Scope of Thermodynamics, Process and its representation</i>	CRT		2	0	0	0
4	<i>Reversible and Irreversible processes; Thermodynamic equilibrium and quasi-static processes</i>	CRT & Video presentation		1	0	1	0
5	<i>Zeroth Law of Thermodynamics and temperature, Measurement of temperature</i>	CRT & PRA		1	1	0	0
6	Energy Transfer: <i>Work Transfer, Heat Transfer</i>	CRT		2	0	0	0
7	First Law of Thermodynamics: <i>Formal statement (using cyclic processes, First law for processes of fixed masses(closed systems) and introduction of internal energy</i>	CRT & Video presentation		2	0	2	0
8	<i>Definition of specific heats with emphasis on ideal gases</i>	CRT		2	0	0	0
9	<i>Application of First Law to control volumes; (only steady flow need be considered).</i>	CRT & Video presentation		2	0	1	0

	Sub total	18	13	1	4	0
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Module II

S. No.	Topic	Pedagogy	Details	Instructional Hrs		
				Practice	video	Project
1	Second Law of Thermodynamics: Limitations of First law, KelvinPlanck and Clausius statements of Second Law, Corollaries	CRT		0	0	0
2	Clausius inequality	CRT		0	0	0
3	Heat engine, Refrigerator and heat Pump	CRT & PRA		1	0	0
4	Entropy: Definition, Principles of increase of entropy	CRT		0	0	0
5	Change of entropy of perfect gas in various processes	CRT		0	0	0
6	Properties of pure substances: p-v, p- T, T-S, h-S diagram for steam	CRT & Video presentation		0	4	0
7	Different types of steam	CRT		0	0	0
8	Introduction to steam tables with respect to specific volume, pressure, temperature, enthalpy and entropy	CRT		0	0	0
	Sub total	18		1	4	0

Module III

S. No.	Topic	Pedagogy	Details	Instructional Hrs			
				Theory	Practice	video	Project
1	IC engines: Introduction, Working of IC engines	PRA & Video presentation		0	1	1	0
2	Classification of IC engines, 2-Stroke and 4-Stroke engines, petrol and	PRA		0	2	0	0

	<i>diesel engines, engine nomenclature.</i>						
3	Gas Power Cycles: Carnot Cycle	<i>CRT</i>		1	0	0	0
4	<i>Air standard cycles-Otto, Diesel, Dual Combustion.</i>	<i>CRT</i>		2	0	0	0

5	Vapour Power Cycles: Introduction Power cycles, The Carnot vapour cycle and its limitations	CRT & Video presentation		2	0	1	0
6	The Rankine cycle, Means of increasing the Rankine cycle efficiency	CRT		2	0	0	0
7	The reheat cycle	CRT		1	0	0	0
8	The regenerative feed heating cycle	CRT		1	0	0	0
9	Introduction to Gas Turbine Cycles Open & Closed Cycle.	CRT & Video presentation		2	0	2	0
	Sub total	18		11	3	4	0

FCEN0111 EARTH SYSTEM SCIENCE Credits 3[3 0 0] Pre-requisites : Nil

Credit 3

Space Science: Solar System, Age of the Earth, Origin of Solar system. Meteors and Meteorites.

Earth Dynamics: Interior of the Earth, Composition of the Earth, Seismic waves, Seismograph, Plate Tectonics, Basics of Earthquake Engineering, Landslides, Volcanoes.

Geological Oceanography: Sea waves, Tides, Ocean currents, Geological work of seas and oceans, Tsunami and its causes, Warning system and mitigation.

Hydrogeology: Water table, Aquifer, Groundwater fluctuations and groundwater composition, Hydrologic cycle.

Glaciology: Glacier types, Different type of glaciers, Landforms formed by glacier.

Geological bodies and their structures: Rock, mineral, batholiths, dyke, sill, fold, fault, joint, unconformity.

Earth's Atmosphere: Structure and composition of atmosphere, Atmospheric circulation, Geological work of wind, Greenhouse effect and global warming, Carbon dioxide sequestration. Steps to maintain clean and pollution free atmosphere with governing laws, precautionary measures against disasters.

Biosphere: Origin of life, Evolution of life through ages, Geological time scale, biodiversity and its conservation.

Natural Resources: Renewable and non-renewable resources, Mineral and fossil fuel resources and their geological setting, mining of minerals and conservation, effect of mining on surface environment.

Recommended Books:

1. Earth's Dynamic – W. Kenneth Systems and Eric H. Christiansen
2. Exploring Earth: An introduction to Physical Geology – John P. Davidson
3. Holmes Principles of Physical Geology – A. Holmes (Revised Ed. Doris L. Holmes)
4. A Textbook of

Geology
–P K Mukherjee

5. Earth System Science from biogeochemical cycles to global changes –M. Jacobson, R.J. Charlson, H. Rodhe and G.H. Orians (2002)
6. Fundamentals of Geophysics –W. Lowrie.

FCEN0112 INTRODUCTION TO MINING [3 0 0]

Pre-requisites: Nil

Credit 3 Mining-

Definition and economic importance; Mine –definition, different types and classification; Mine life cycle; Mineral deposit –different types and their classification; Mineral resources of India; Modes of entry to a mine –shaft, incline, decline, adit and box-cut.

Overview of surface mining:

Types of surface mines, unit operations, basic bench geometry, applicability & limitations and advantages & disadvantage **Overview of underground mining:**

Different coal mining methods and their applicability & limitations; Different metal mining methods and their applicability & limitations; Basic concepts of transportation, ventilation, illumination and support in underground mines.

FCEN0113 MINE DEVELOPMENT [3 0 0]

Pre-requisites : Nil

Credit 3

Opening-up of Deposits: Choice of mode of entry- adit, shaft, decline and combined mode, their applicability, number and disposition.

Vertical and Inclined Shafts: Location, shape, size, and organization of shaft sinking, construction of shaft collar, shaft fittings.

Shaft Sinking Operations: Ground breaking and muck disposal- tools and equipment, lining; ventilation, lighting and dewatering; sinking in difficult and water-bearing ground.

Insets: Design, excavation and lining.

Mechanized Sinking: Simultaneous sinking and lining; slip - form method of lining; high speed sinking.

Shaft Boring: Methods and equipment.

Special Attributes: Widening and deepening of inclined and vertical shafts; staple shafts, raised shafts.

Main Haulage Drifts and Tunnels: Purpose, shape, size and location; excavation ground breaking, muck disposal, ventilation and supporting.

High Speed Drifting/Tunneling: Application of mechanized methods; road headers and tunnel boring machines.

Recent Developments in shaft sinking and drifting/tunneling.

Layouts of pit-top and pit-bottom, Coal Handling Plant, Bunkers and Railway Sidings

FCEN0114 MINE SURVEYING - I [3 0 0]

Pre-requisites : Nil

Credit 3

Surveying: Definition, objective, classification and principles of surveying.

Linear Measurement: Instruments for measuring distances; ranging and taping survey lines; Chain surveying – principle, field work, off-sets, booking and plotting, obstacles in taping.

Angular Measurement: Bearing of lines; Rectangular coordinate system; Essentials of the micro-optic theodolite; Measurement of horizontal and vertical angles; Temporary and permanent adjustments; Theodolite traversing; Computation of co-ordinates; Adjustment of traverse; Temporary and permanent adjustments.

Leveling: Definition & terminology; Leveling instruments types - tilting, auto set and digital levels; Leveling staves; Different types of leveling - differential, profile, cross-sectional and reciprocal leveling; Booking and reduction methods; Underground leveling; Temporary and permanent adjustments of levels.

Total Station: Principle of electronic measurement of distance and angles; construction and working with Total Station; Errors; Application and recent developments in Total Station.

Plane Table Surveying: Methods **Contours:** Concepts; Characteristics of contour; Contour Interval; Methods of contouring and uses of contours.

FCEN0115 INTRODUCTION TO BIOTECHNOLOGY (3 0 0 3)

Pre-requisites : Nil Credit 3

OBJECTIVES

■ To introduce students basic knowledge about biotechnology

MODULE I: Biochemistry 15

Component of the cell, structure and biochemical functions, Biomolecules-Carbohydrates, lipids, proteins,

Nucleic acids, Structure and classification of enzymes

MODULE II Cell Biology 15

Eukaryotic, Prokaryotic cells, Cell cycle –Mitosis and Meiosis, Cell fractionation and flow cytometry.

Molecular Biology

Introduction to nucleic acids: Nucleic acids as genetic material, Structure and physicochemical properties of

elements in DNA and RNA, Biological significance of differences in DNA and RNA.

MODULE III 15

Immunology :Cells of immune system, Development, maturation, activation and differentiation of T cells and B cells, Phagocytosis process

Biotechnology Applications: Industrial production, Drug discovery and development

TOTAL: 45 PERIODS

The students will be able to understand fields of Biotechnology and their specialized functions.

· They will acquire precise knowledge of various aspects of a living cell, its

structure, genetics and gene interactions and immune system.

· Also the students will get knowledge about Biotechnology application in industry and health care field.

TEXT BOOKS

1. Lehninger A.L., Nelson D.L. and Cox M.M. Principles of Biochemistry. CBS publishers and distributors.
2. Murray R.K., Granner D.K., Mayes P.A. and Rodwell V.W. Harpers Biochemistry.

Appleton and Lange ,Stanford ,Conneticut.

3. Satyanarayana,ry”U .Books“Biochemist&Allied (P) Ltd., 2005.
4. Lodish, Harvey etal., “ Molecular Cell Biology,” 6t
5. Alberts, Bruce, “Molecular Biology of Cell”, 5th Ed
6. Satyanarayana, U. “Biotechnology”td.,2005. Books & Allied (P
7. Friefelder, David. “Molecular Biology.” Narosa Publ

REFERENCE

1. Lewin’s GENES XI, Published by Jones & Bartlett Lea
2. Kuby J, Immunology, WH Freeman & Co., 7th Edition 2012.

FCEN0116 INTRODUCTION TO BIOPHYSICS (3 0 0 3)

Credits 3

Prerequisite: Nil

OBJECTIVES

1. Learn the structures of biological molecules
2. To understand the concept of structural analysis
3. Learn the techniques for analysis and determination of structure of biomolecules

MODULE 1: Structures of Biological macromolecules 17

Levels of structures in proteins, nucleic acids and polysaccharides - primary, secondary, tertiary and quaternary structures

Conformational analysis of proteins

Polypeptide chain geometries, internal rotation angles, Ramachandran plot, potential energy calculations, forces that determine protein structure –hydrogen bonding, hydrophobic interactions, ionic interactions, disulphide bonds –prediction of protein structure.

MODULE 2 : Conformational analysis of Nucleic acid 12

General characteristics of nucleic acid structure –geometric –Glycosidic bond –

rotational isomers, ribose puckering–backbone rotation angles and steric hindrances
–forces stabilizing ordered forms –base pairing and base stacking

MODULE 3: Technoques for the study of Biological structures 16

Electron Microscopy, Ultracentrifuge, Viscometry, Molecular –sieve chromatography, electrophoresis, NMR and EPR. X-Ray crystallography, X-ray fiber diffraction, light scattering, Neutron scattering **Total hours: 45**

TEXT BOOK:

Biophysical Chemistry, Cantor and Schimmel, part I and II, W.H. Freeman and co

FCEN0117 BIOSAFETY, BIOETHICS, IPR & PATENTS (2 0 0 2) Credits 2 Prerequisite Nil OBJECTIVES

1. To introduce the biosafety regulations and ethical concepts in biotechnology
2. To emphasize on IPR issues and need for knowledge in patents in biotechnology

MODULE I: Bioethics and Biosafety 12

Bioethics –Necessity of Bioethics, different paradigms of Bioethics –National & International. Ethical issues against the molecular technologies.

Biosafety–Introduction to biosafety and health hazards concerning biotechnology. Introduction to the concept of containment level and Good Laboratory Practices (GLP) and Good Manufacturing Practices (GMP).

MODULE 2: Patent and Patent Laws 10

Objectives of the patent system - Basic principles and general requirements of patent law biotechnological inventions. Introduction to Indian Patent Law. World Trade Organization and its related intellectual property provisions. Intellectual/Industrial property and its legal protection in research, design and development. Patenting in Biotechnology, economic, ethical and depository considerations.

MODULE 3: Intellectual Property Rights 8

Intellectual property rights-TRIP- GATT-International conventions patents and methods of application of patents-Legal implications-Biodiversity and farmer rights.

TOTAL 30

REFERENCES:

1. Beier, F.K., Crespi, R.S. and Straus, T. Biotechnology and Patent protection-Oxford and IBH Publishing Co. New Delhi.
2. Sasson A, Biotechnologies and Development, UNESCO Publications.
3. Singh K, Intellectual Property rights on Biotechnology, BCIL, New Delhi
4. Regulatory Framework for GMOs in India (2006) Ministry of Environment and Forest,

5. Cartagena Protocol on Biosafety (2006) Ministry of Environment and Forest, Government of India, New Delhi

FCEN 0118 Computer Fundamental and Organization

Code	Course Title	Course Type	Credits	Pre-requisite	T-P-Pr
FCEN 0118	Computer Fundamental and Organization	Theory	3	Nil	3-0-0

Learning Objectives:

The basic knowledge of how a computer works is very important for any fresh networking or operating system professional. The functional knowledge of a computers working and its main building parts are paramount. The computers of today may come with variety of features but the basic working principles remain the same. Students will explore the fundamentals of organization of a computer and the principles and building units of a computer (its hardware). Also, they will be introduced to the basics of networking and MS Office.

Course Outcomes:

Student will able to know about Basic knowledge about computers. Fundamental hardware components that make up

a computer's hardware and Word the processing role and electronic of each spreadsheet of. An overview these of MSWORD, MSEXCEL and MSPOWER POINT. Attain the knowledge about basics of Networking

Syllabus

Unit I: General Features of a Computer(12hrs)

General features of a computer, Generation of computers, Personal computer, workstation, mainframe computer and super

computers. Computer applications –data processing, information processing, commercial, office automation, industry and

engineering, healthcare, education, graphics and multimedia.

Unit II: Computer Organization (6hrs)

Computer organization, central processing unit, computer memory –primary memory and secondary memory. Secondary storage devices –Magnetic and optical media. Input and output units. OMR, OCR, MICR, scanner, mouse, modem.

Unit III: Computer Hardware and Software (11hrs)

Computer hardware and software. Machine language and high level language. Application software, computer program,

operating system. Computer virus, antivirus and computer security. Elements of MS DOS and Windows OS. Computer

arithmetic, Binary, octal and hexadecimal number systems. Algorithm and flowcharts, illustrations, elements of a database

and its applications

Basic Gates (Demorgans theorems, duality theorem, NOR, NAND, XOR, XNOR gates), Boolean expressions and logic diagrams, Types of Boolean expressions

UNIT IV: MS Office (4hrs)

Word processing and electronic spread sheet. An overview of MSWORD, MSEXCEL and MSPOWER POINT

UNIT V: Introduction to Networking (6hrs)

Network of computers.Types of networks, LAN, Intranet and Internet.Internet applications. World Wide Web, E-mail, browsing and searching, search engines, multimedia applications.

Books for Reference:

1. Alexis Leon and Mathews Leon (1999): Fundamentals of information Technology, Leon Techworld Pub.
2. Jain, S K (1999) : Information Technology "O" level
3. Jain V K (2000) "O" Level Personal Computer softwa
4. Rajaraman, V (1999): Fundamentals of Computers, Prentice Hall India
5. Hamacher, Computer Organization McGrawhill
6. Alexis Leon: Computers for everyone. Vikas, UBS
7. Anil Madaan : Illustrated Computer Encyclopedia. Dreamland Pub
8. Sinha. Computer Fundamentals BPB Pub.

Pedagogy

S I N Practi cal	Topic	Teaching Method	Refere nce/To ol	Instructional Hours	
				Theor	y
1	General features of a computer, Generation of computers, Personal computer, workstation,.	Class Room Teaching + PPT		3	0
2	mainframe computer and super computers			2	0
3	Computer applications – data processing, information processing, commercial, office automation, industry and engineering, healthcare, education, graphics and multimedia.			2	0
4	Computer organization, central processing unit, computer memory			3	0
5	–primary memory and secondary memory.			3	0
6	Secondary storage devices –Magnetic and optical media. Input and output units. OMR, OCR, MICR, scanner, mouse, modem.			3	0
7	Computer hardware and software. Machine language and high level language.			3	0
8	Application software, computer program, operating system. Computer virus, antivirus and computer security. Elements of MS DOS and Windows OS.			3	0
9	Computer arithmetic, Binary, octal and hexadecimal number systems. Algorithm and flowcharts, illustrations, elements of a database and its applications			5	0
10	Word processing and electronic spread sheet. An overview of MSWORD, MSEXCEL and MSPOWER POINT			4	0
11	Network of computers. Types of networks, LAN, Intranet and Internet.		3	0	
12	Internet applications. World Wide Web, E-mail, browsing and searching, search engines, multimedia applications.		3	0	
Total				39	0

FCEN0119 Operating System Building Blocks (Theory) Credit 3 T-P-Pr (3-0-0)

Code	Course Title	Course Type	Credits	Pre-requisite	T-P-Pr
FCEN0119	Operating System Building Blocks	Theory	3	Nil	3-0-0

Course Objectives:

The operating system is the most important program that runs on a computer. Every general-purpose computer must have an operating system to run other programs. Operating systems perform basic tasks, such as recognizing input from the keyboard, sending output to the display screen, keeping track of files and directories on the disk, and controlling peripheral devices such as disk drives and printers. This course covers the concept of operating system and its applications.

Course Outcome:

After learning the fundamental concepts in Operating system including how OS has evolved over the years and different components of OS, students will continue to more significant functions of OS like Process management, storage and memory management etc. This will provide the necessary information for students to extract maximum benefits out of the OS while developing programs, working with applications and etc.

Syllabus

Unit I: Introduction to Operating System (6 Hrs.)

Objectives and Functions of OS, Evolution of OS, OS Structures, OS Components, OS Services, System calls, System

programs, Virtual Machines.

Unit II: Process Management –Processes and Threads (8 Hrs.)

Processes: Process concept, Process scheduling, Co-operating processes, Operations on processes, Inter process

communication, Communication in client-server systems. Threads: Introduction to Threads, Single and Multi-threaded

processes and its benefits, User and Kernel threads, Multithreading models, Threading issues. CPU Scheduling: Basic

concepts, Scheduling criteria, Scheduling Algorithms, Multiple Processor Scheduling, Real-time Scheduling, Algorithm

Evaluation, Process Scheduling Models.

Unit III: Process Management –Synchronization and Deadlocks (8 Hrs.)

Process Synchronization: Mutual Exclusion, Critical –section problem, Synchronization hardware, Semaphores, Classic

problems of synchronization, Critical Regions, Monitors, OS Synchronization, Atomic Transactions. Deadlocks: System

Model, Deadlock characterization, Methods for handling Deadlocks, Deadlock prevention, Deadlock Avoidance, Deadlock

Detection, Recovery from Deadlock.

Unit IV: Storage Management (10 Hrs.)

Memory Management: Logical and physical Address Space, Swapping, Contiguous Memory Allocation, Paging, Segmentation with Paging. Virtual Management: Demand paging, Process creation, Page Replacement Algorithms,

Allocation of Frames, Thrashing, Operating System Examples, Page size and other considerations, Demand segmentation.

File-System Interface: File concept, Access Methods, Directory structure, File- system Mounting, File sharing, Protection and consistency semantics. File-System Implementation: File-System structure, File-System Implementations, Directory Implementation, Allocation Methods, Free-space Management, Efficiency and Performance, Recovery. Disk Management: Disk Structure, Disk Scheduling, Disk Management, Swap-Space Management, Disk Attachment, stable- storage Implementation

Unit V: Protection and Security (7hrs)

Protection: Goals of Protection, Domain of Protection, Access Matrix, Implementation of Access Matrix, Revocation of Access Rights, Capability- Based Systems, Language –Based Protection. Security: Security Problem, User Authentication, One –Time Password, Program Threats, System Threats, Cryptography, Computer –Security Classifications

Reference Books:

1. Operating System Concepts and design by Milan Milonkovic, II Edition, McGraw Hill 1992.
2. Operation System Concepts by Tanenbaum, 2nd Edition, Pearson Education.
3. Operating System by Silberschatz / Galvin / Gagne, 6th Edition,WSE (WILEY Publication)
4. Operating System by William Stallings, 4th Edition, Pearson Education.
5. Operating System by H.M.Deitel , 2nd Edition,Pearson Education
6. Operating System by Abraham Silberschatz and peter Baer Galvin, 8th Edition, Pearson Education 1989 (Chapter 1,3.1,3.2,3.3,3.4,3.6,4,5,6 (Except 6.8,6.9), 7, 8,9,10,11,13, (Except 13.6) 19 (Except 19.6),20(Except 20.8, 20.9), 22,23).
7. Operating Systems by Nutt, 3/e Pearson Education 2004

Pedagogy

S I. N O	Topic	Teaching Method	Refer ence/ Tool	Instructional Hours	
				Theo ry	Prac tice
	Operating System Building Blocks				
1.	Introduction to Operating System: Objectives and Functions of OS, Evolution of OS, OS Structures, OS Components, OS Services, System calls, System programs, Virtual Machines.			6	

2.	<p>Process Management –Processes and Threads: Processes: Process concept, Process scheduling, Co-operating processes, Operations on processes, Inter process communication, Communication in client-server systems. Threads: Introduction to Threads, Single and Multi-threaded processes and its benefits.</p>	Class Room Teaching +PPT	4	
3.	<p>User and Kernel threads, Multithreading models, Threading issues. CPU Scheduling: Basic concepts, Scheduling criteria, Scheduling Algorithms, Multiple Processor Scheduling, Real-time Scheduling, Algorithm Evaluation, Process Scheduling Models.</p>		4	
4.	<p>Process Management – Synchronization and Deadlocks: Process Synchronization: Mutual Exclusion, Critical – section problem, Synchronization hardware, Semaphores, Classic problems of synchronization, Critical Regions, Monitors, OS Synchronization, Atomic Transactions. Deadlocks: System Model, Deadlock characterization, Methods for handling Deadlocks, Deadlock prevention, Deadlock</p>		3	
5.	<p>Avoidance, Deadlock Detection, Recovery from Deadlock. Storage Management: Memory Management: Logical and physical Address Space, Swapping, Contiguous Memory Allocation, Paging, Segmentation with Paging. Virtual Management: Demand paging, Process creation, Page Replacement</p>		5	
6.	<p>Algorithms, Allocation of Frames, Thrashing, Operating System Examples. Page size and other considerations, Demand segmentation. File-System Interface: File concept, Access Methods, Directory structure, File- system Mounting, File sharing, Protection and consistency</p>	Class Room Teaching + PPT	4	
7.	<p>semantics. File-System Implementation: File-System structure, File-System Implementations, Directory Implementation, Allocation Methods, Free-space Management, Efficiency and Performance, Recovery. Disk Management: Disk Structure, Disk Scheduling, Disk Management, Swap-Space</p>		3	
8.	<p>Management, Disk Attachment, stable storage Implementation.</p>		3	
9.	<p>Protection and Security: Protection: Goals of Protection, Domain of Protection, Access Matrix, Implementation of Access Matrix,</p>	Class Room Teaching + PPT	3	

10.	Revocation of Access Rights, Capability- Based Systems, Language – Based Protection. Security: Security Problem, User Authentication, One –Time Password, Program Threats, System Threats, Cryptography, Computer –Security ClassificationsObjective review.	4
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11.	Total	39	0
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Aerodynamics Laboratory

Subject Name	Code	Type of course	T-P-P	Prerequisite
Aerodynamics Laboratory	ENFC0208	Practice	0-2-0(2)	Nil

1. Objective

• To Predict Different Aerodynamic Propulsion in Aero Applications
--

2. Course Outcome

• Ability to Use the Fundamental Dynamics Principles in Aircraft Applications.
--

3. Evaluation Systems

Internal Examination	Component	% of Marks	Method of Assessment
	Experiments	40	Lab work
	Learning record	10	Report and presentation
External Examination		50	Lab work
Total		100	

4. List of Experiments

1. Application of Bernoulli's Equation – venturimeter and orifice meter.
2. Frictional loss in laminar flow through pipes.
3. Frictional loss in turbulent flow through pipes.
4. Calibration of a subsonic Wind tunnel.
5. Determination of lift for the given airfoil section.
6. Pressure distribution over a smooth circular cylinder.
7. Pressure distribution over a rough circular cylinder.
8. Pressure distribution over a symmetric aerofoil.
9. Pressure distribution over a cambered aerofoil.
10. Flow visualization studies in subsonic flows.
11. Calculation of drag over smooth cylinder
12. Calculation of drag over rough cylinder

6. List of Equipment for a Batch of 30 Students

S.N.	Name of Equipment	Quantity	Experiment No.
1	Venturimeter	1	1
2	Orificemeter	1	1
3	Pipe friction apparatus	1	2, 3
4	Subsonic Wind tunnel	1	4, 5, 6, 7, 8, 9, 10, 11, 12
5	Models(aerofoil, rough and smooth cylinder, flat plate)	1	5, 6, 7, 8, 9

Introduction to Robotics

Subject Name	Code	Type of course	T-P-P (Credit)	Prerequisite
Introduction to Robotics	ENFC0203	Practice	0-2-0(2)	Geometric Drawing

1. Objectives

- To Provide An Overview To Students On Various Types of Industrial Robots and Their Configurations.
- To Educate The Students on Use Of DELMIA To Carryout Simulation Exercises of Various Types of Robotic Arms Suiting to Specific Applications.

2. Course Outcome

- Students Will Have Knowledge and Skill To Program Industrial Robots For Performing Various Tasks.
- Students Will Be Able To Undertake Simulation Exercises Of Various Types Of Robotic Arms As A Pre-Requisite Leading To A Safe, Cost Effective, Reliable And Optimum Design.

3. Evaluation Systems

Internal Examination	Component	% of Marks	Method of Assessment
	Midterm Test		
	Assignment		
	IPR	50	Lab work, report
	Project		
	Quiz		
External Examination	EPR	50	Lab work & Report
Total		100	

4. List of Experiments (45 Hours)

1. DELMIA: Simulated Models of Various Types Industrial Robots & Its Architecture.
2. DELMIA: Simulation of Activities Like: Pick and Place, Coordinated Movement, Spot Welding and Arc Welding.
3. DELMIA: Designing Own Robotic Arm with Insight to Robot Kinematics.
 - i) A Prismatic Robotic Arm.
 - ii) A Revolute Joint Robotic Arm.
 - iii) Articulated Robotic Arm
 - iv) Spherical Robotic Arm

4. Robot Programming: Use of Brabofor Pick and Place Actions.
5. An Understanding of Different Sensors, Their Operation and Application. Demonstration of Use of Sensors for At Least 3 Applications of Robot.
6. Commanding A Robot To Achieve Tasks On The Basis Of Sensor Information, A Description Of Motors, And How Their Velocity Is Set, And Other Robotic Actuators.

5. Reference

Text Books:

1. M.P. Groover, Industrial Robotics, Second Edition, TMH Publishers.
2. S.R. Deb and S. Deb, Robotics Technology and Flexible Automation, Second Edition, TMH Publishers.

Reference Books:

1. Y Koren, Robotics for Engineers, TMH Publishers.

Online Source:

6. Session Plan

Sl. No	Topic coverage and Internal Test	No. of Sessions (in hr)	Activity	Assignment	Suggested Reading (Book, Video, Online source, etc.)
1	Demonstration of various robotic arms available in DELMIA	3	Lab Demonstration	Collection of tutorials related various Robotic Arms	DELMIA help file
2	Robotic architecture. Demonstration of prismatic, revolute and SCARA	6	Lab Demonstration	Development of Robotic Arm in DELMIA & Demonstration of Application.	DELMIA help file
3	Robotic architecture. Demonstration of articulated robotic arm and Spherical robotic arm	3	Lab Demonstration	Development of Robotic Arm in DELMIA & Demonstration of Application.	DELMIA help file
4	Demonstration of application in spot welding and arc welding	3	Lab Demonstration	Development of Robotic Arm in DELMIA &	DELMIA help file

				Demonstration of application.	
5	Demonstration of application in assembly line operation.	3	Lab Demonstration	Development of robotic arm in DELMIA & Demonstration of application.	DELMIA help file
6	Robotic Programming practice to do pick and place action.	3	Lab practice	Development of programs to do other actions like writing on the white board, Erasing the same with wiper. At least 3 such Activities	Brabo Manual
7	Demonstration of assignment Exercises	3	Lab practice	Recording of all assignments	BraboManual
8	Demonstration of application of sensors, At least 3 sensor based applications	3	Lab practice	Identifying different types of sensors that can be used in robot arm application	
9	Demonstration of use of sensors	3	Lab practice		
10	Demonstration of sensors to actuate motors and its speed control	3	Lab Practice		
11	Demonstration of sensors to actuate motors and its speed control	6	Lab Practice	A Mini project of designing to making a movement to robotic arm	
12	A mini Project Demonstration	6			
	Total (hours)	45			

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Developed on: June 2018

FCEN0201 INTRODUCTION TO INTERNET TECHNOLOGY

Course Nature: Practice

Credit: 5

Course Objectives:

1. To introduce the concepts of Internet and Impact of Internet in human life.
2. To introduce the basic concepts of web designing.
3. To make the students understand the web designing languages like HTML, CSS and Java Script.
4. To train the students on the methods of designing the responsive sites.
5. To make the students understand various concepts related web design. Course Outcomes:

On successful completion of this course, students will be able to: 1. Design a complete responsive, attractive, static website.

Module-I (12 Hrs): INTERNET AND HTML BASICS

(A) **Internet Technology:** Basic Concepts of Internet, How it Works ?, Browser Types, Server Types, Site Advantages, Skills Required, Tools Required, Domain Names, Site Construction, Hosting

Concepts, Ecommerce Hosting, Site Backup, Site Statistics, Site Popularity, Free Graphics. **(Most**

of the topics will be through presentation and live demonstration)

(B) **HTTP:** Home, Overview, Parameters, Messages, Requests, Responses, Methods, Status Codes, Header Fields, Caching, URL Encoding, Security, Message Examples, HTTPs. **(Most of the topics will be through presentation and live demonstration)**

(C) **HTML:** Overview, Basic Tags, Elements, Attributes, Formatting, Phrase Tags, Meta Tags, Comments, Images, Tables, Lists, Text Links, Image Links, Email Links, Frames, Iframes,

Blocks, Backgrounds, Colors, Fonts, Forms, Embed Multimedia, Marquees, Header, Style Sheet, Javascript, Layouts. **(Most of the topics will be through presentation and live demonstration)**

Module-II (20 Hrs) : HTML5 & CSS3

(A) **HTML5:** Overview, Syntax, Attributes, Events, Web Forms 2.0, SVG, MathML, Web Storage, WebSQL, Server-Sent Events, Web Socket, Canvas, Audio & Video, Geolocation, Microdata, Drag & drop, Web Workers, IndexedDB, Web Messaging, Web CORS, Web RTC. . **(Most of the topics will be through presentation and live demonstration)**

(B) **CSS:** Introduction, Syntax, Selectors, Backgrounds, Text, Fonts, Links, Lists, Tables, Box Model, Border, Outline, Margin, Padding, Dimension, Display, Position, Float, Align, Combinators, Pseudo-class, Pseudo-element, Navigation Bar, Image Gallery, Image Opacity, Image Sprites, Media Types, Attr Selectors, Rounded Corners, Border Images, Backgrounds, Colors, Gradients, Shadows, Text, Fonts, 2D Transforms, 3D Transforms, Transitions, Animations, Multiple Columns, User Interface, Box Sizing. Viewport, Grid View, Media Queries,

(C) Images, Videos,

Frameworks. **(Most of the topics will be through presentation and live demonstration)**

MODULE-III (20 Hrs) : JAVASCRIPT & BOOTSTRAP

(A) **JavaScript:** Overview, Syntax, Enabling, Placement, Variables, Operators, If...Else, Switch Case, While Loop, For Loop, For...in, Loop Control, Functions, Events, Cookies, Page Redirect, Dialog Boxes, Void Keyword, Page Printing, Objects, Number, Boolean, Strings, Arrays, Date, Math, RegExp, HTML DOM, Error Handling, Validations, Animation, Multimedia, Debugging, Image Map, Browsers. . **(Most of the topics will be through presentation and live demonstration)**

(B) **Bootstrap:** Introduction, Environment Setup, Grid System, CSS Overview, Typography, Code, Tables, Forms, Buttons, Images, Helper Classes, Responsive utilities, Glyphicons, Drop downs, Button Groups, Button Drop downs, Input Groups, Navigation Elements, Navbar, Breadcrumb,

Pagination, Labels, Badges, Jumbotron, Page Header, Thumbnails, Alerts, Progress Bars, Media Object, List Group, Panels, Wells, Bootstrap Plugins. . **(Most of the topics will be through presentation and live demonstration)**

TEXT BOOKS:

1. *Web Warrior Guide to Web Design Technologies*, Don Gosselin, Joel Sklar & others, Cengage Learning
2. *Teach yourself web technology*, Ivan Bayross, BPB Publication
3. *Web Programming: Building Internet Applications*, Chris Bates, Wiley Dreamtech
4. *Web Technologies*, Uttam K Roy, Oxford
5. *Web Technology: A developer perspective*, Gopalan & Akilandeswari, PHI

Module I

S. No.	Topic	Pedagogy	Details	Instructional Hrs			
				Theory + Tutorial	Practice	video	Project
Internet Technology:		Most of the topics will be through presentation and Live demonstration					
1	Basic Concepts of Internet, How it Works?			0	0	0	
2	Browser Types, Server Types, Site Advantages, Skills Required, Tools Required,			1	0	0	
3	Domain naming Server and Domain Naming System,			1	0	0	
4	Site Construction Basics			0	0	0	

5	Web Server			0	0	0
6	Control Panel and Hosting methods			1	0	0
HTTP:						
7	Home, Overview, Parameters, Messages, Requests, Responses, Methods, Status Codes, Header Fields, Caching, URL Encoding, Security, Message Examples, HTTPs			1	0	0
HTML:						
8	Overview, Basic Tags, Elements, Attributes, Formatting, Phrase Tags, Meta Tags, Comments, Images, Tables, Lists, Text Links, Image Links,			2	0	0
9	Email Links, Frames, Iframes, Blocks, Backgrounds, Colors, Fonts,			2	0	0
10	Forms,			2	0	0
11	Embed Multimedia, Marquees, Header, Style Sheet, Javascript, Layouts			2	0	0
Sub Total:				12	0	0

Module II

S. No.	Topic	Pedagogy	Details	Instructional Hrs			
				Theory	Practice	video	Project
HTML5:							
1	Overview, Syntax, Attributes, Events, Web Forms 2.0, SVG, MathML, Web Storage, Web SQL,	Most of the topics will be through presentation and live demonstration		0	1	0	0
2	Server-Sent Events, Web Socket,		0	1	0	0	
3	Canvas, Audio & Video, Geolocation, Microdata,		0	1	0	0	
4	Drag & drop, Web Workers, IndexedDB,		0	1	0	0	
5	Web Messaging, Web CORS, Web RTC		0	1	0	0	
CSS3:							
6	Introduction, Syntax, Selectors, Backgrounds,		0	2	0	0	
7	Text, Fonts, Links, Lists, Tables, Box Model, Border, Outline, Margin, Padding, Dimension,		0	2	0	0	
8	Display, Position, Float, Align, Combinators, Pseudo-class, Pseudoelement,			2	0	0	
9	Navigation Bar, Image Gallery, Image Opacity, Image Sprites, Media Types,		0	2	0	0	
10	Rounded Corners, Border Images, Backgrounds, Colors, Gradients, Shadows,		0	2	0	0	
11	Text, Fonts, 2D Transforms, 3D Transforms, Transitions, Animations,		0	1	0	0	
12	Multiple Columns, User Interface, Box Sizing, Viewport, Grid View,			2			
13	Media Queries, Images, Videos, Frameworks		0	2	0	0	
Sub Total:					20	0	0

Module III

S. No.	Topic	Pedagogy	Details	Instructional Hrs			
				Theory +Tutorial	Practice	video	Project
JavaScript							
	Overview, Syntax, Enabling, Placement, Variables, Operators,	Most of the topics will be through presentation and Live demonstration		0	1	0	0
	If...Else, Switch Case, While Loop, For Loop, For...in,			0	1	0	0
	Loop Control, Functions, Events,			0	2	0	0
	Cookies, Page Redirect, Dialog Boxes, Void Keyword, Page Printing,			0	1	0	0
	Objects, Number, Boolean, Strings, Arrays, Date, Math,			0	2	0	0
	RegExp, HTML DOM, Error Handling, Validations,			0	2	0	0
	Animation, Multimedia, Debugging, Image Map, Browsers			0	1	0	0
Bootstrap:							
	Introduction, Environment Setup, Grid System, CSS Overview,			0	1	0	0
	Typography, Code, Tables, Forms, Buttons, Images, Helper Classes,			0	1	0	0
	Responsive utilities, Glyphicons, Drop downs, Button Groups,			0	2	0	0
	Button Drop downs, Input Groups, Navigation Elements,			0	2	0	0
	Navbar, Breadcrumb, Pagination, Labels, Badges,			0	1	0	0
	Jumbotron, Page Header, Thumbnails,			0	1	0	0
	Alerts, Progress Bars,						
	Media Object, List Group, Panels, Wells, Bootstrap Plugins			0	2	0	0
Sub Total:							
				0	20	0	0

FCEN0202 BASIC ELECTRONICS LABORATORY

PRACTICE **Credits: 02** **Hours: [36]**

Course Objectives:

The objectives of this Laboratory are to

- 1. Identify schematic symbols and verifying the characteristics of electronic devices e.g. Diode, Zener Diode, LED, BJT, JFET and MOSFET etc.*
- 2. Design, analysis and verification of electronic circuits e.g. Rectifiers, Clipper, Clamper, Filters, Amplifiers and Operational Amplifiers etc.*

Course Outcomes:

Upon successful completion of this laboratory, students should be able to:

- 1. Get the exposure of electronics engineering which allows training students with good scientific and engineering breadth so as to comprehend, analyze, design, and create novel products and solutions for the real life problems.*
- 2. Apply this knowledge under supervision to solve engineering problem with core field.*
- 3. Get the knowledge of foundation course for further study.*

List of Experiments

1. Identification of basic electronic components & familiarization with bread board and measuring instruments
2. Study and use of Function generator & Oscilloscope to generate & view waveforms and also measure its amplitude and frequency.
3. Verification of the V-I characteristics of forward & reverse biased PN-junction diode.
4. Verification of the V-I characteristics of forward & reverse biased of Zener diode.
5. Implementation of Half wave and full wave rectifier without and with capacitor filter. Tracing of waveforms, Measurement of DC load voltage, AC load voltage & ripple factor values.
6. Implementation of clipper circuits using PN-junction diode. Tracing of waveforms at the clipper circuits output.
7. Plot and verify the input and output characteristics of BJT in Common Emitter Configuration.
8. Plot and verify the input and output characteristics of BJT in Common Base Configuration.
9. Implementation of DC biasing circuit of BJT and measurement of DC voltages and currents
10. Verification of the drain characteristics of JFET
11. Plot and verify the transfer characteristics of F.E.T and calculate various J.F.E.T parameters
12. RC based low pass filter and high pass filter design

FCEN0203 SIGNALS & SYSTEMS LABORATORY

PRACTICE

Credits:02

Hours [36]

Course Objectives:

The objectives of this Laboratory are to

1. *Introduce the concepts and techniques associated with the understanding of signals and systems.*
2. *Familiarize with techniques suitable for analyzing and synthesizing both continuous-time and discrete time systems and provide with an appreciation of applications for the techniques and mathematics used in this course.*

Course Outcomes:

Upon successful completion of this laboratory, students should be able to:

1. *Determine the response of an LTI system using convolution and classical methods. Analyze system properties based on impulse response.*
2. *Determine and analyze the responses of LTI system to periodic signals using Fourier series. **List***

of Experiments

1. Introduction to MATLAB/SCILAB programming
2. A) Generation of various types of waveforms (sine, cosine, square, triangular etc.)
B) Plot unit step, unit ramp, unit impulse
C) Study and analysis of different types of systems.
3. Computation of Energy and power of a given signal
4. A) Linear convolution of sequences
B) Computation of autocorrelation of a sequence, cross correlation of two sequences
5. Computation of the power spectral density of a sequence using SCILAB/MATLAB 6. Analysis of Fourier series and Transforms of different waveforms using SCILAB/MATLAB
7. Computation of Laplace Transform of different types of signal.
8. Computation of Z-transform of given signals.
9. Computation of DTFT of different types of signals.
10. Finding of stability of a LTI system

Tools to be used: MATLAB / SCILAB

Reference Books:

1. *Digital Signal Processing: A MATLAB-Based Approach –Vinay K. Ingle and John G. Proakis, Cengage Learning.*
2. *Fundamentals of Digital Signal Processing using MATLAB –Robert J. Schilling and Sandra L. Harris, Cengage Learning.*

FCEN0204 DIGITAL ELECTRONIC CIRCUITS LABORATORY

PRACTICE

Credits: 02

Hours: [36]

Course Objectives:

The objectives of this Laboratory are to:

1. Provide basic concepts on various digital designs through hands on practice.
2. Simulation platform for various digital circuits through Hardware description languages.

Course Outcomes:

Upon successful completion of this laboratory, students should be able to:

1. Develop new digital design
2. Design high speed memories through HDL programming.

List of Experiments

1. Verification of truth table of different digital logic gates: AND, OR, NAND, NOR, EX-OR, EX-NOR, NOT.
2. Design and implementation of Half Adder, Full Adder, Half Subtractor and Full subtractor using various logic gates.
3. Design, implement and test a given combinational circuit design example with (i) NAND Gates only (ii) NOR Gates only and (iii) using minimum number of Gates.
4. Gate-level minimization: Two level and multi level implementation of Boolean functions.
5. Combinational Circuits: design, assemble and test: code converters, a. gray code to binary and 7 segment display.
6. Implementation of combinational logic circuits with multiplexers and de-multiplexers.
7. Flip-Flop: implementation and verification of SR, D & J-K flip-flops.
8. Shift Registers: Design and investigate the operation of all types of shift registers with a. parallel load.
9. Counters: Design, assemble and test various ripple and synchronous counters - decimal a. counter, Binary counter with parallel load.
10. Clock-pulse generator: design, implement and test using 555 timer.
11. Mini Project: Binary Multiplier: design and implement.

Using VHDL:-

12. Verilog/VHDL simulation and implementation of Experiments 1, 2, 3, 6 & 7.

FCEN0205 ELECTRONICS WORKSHOP-I

PRACTICE

Credits: 02

Hours: [42]

Course Objectives:

The objectives of this Laboratory are to:

1. Understand and conceptually visualize the theoretical concepts of different components covered in the basic electronics.
2. Understand the use and application of surface mount technology in the manufacture of an electronic circuit and its hands on practice.

Course Outcomes:-

Upon successful completion of this laboratory, students should be able to:

1. Identify different tools and electronic components
2. Use and solder the electronic components on a Varo board with proper polarity to design simple circuits

List of Experiments

1. Identify the various tools & write down their uses.
Material required: various tools -Wire Cutter.Wire Stripper -Various types of Pliers-Vice.-Crimping Tools (RJ-11/RJ-45) -Screw-Drivers -Testers
2. Identify the various type of connector used in various Gadgets & Instruments/Equipments
Material Required :1. USB connector and cable, 2. Audio Cables and Connectors (3.5mm headphone jack, Digital Optical Audio), 3. Video Cables (VGA cable, DVI to VGA, S-Video cables, VGA to S-Video cables), 4. Audio and Video Cables (RCA Connector Cables, HDMI Cables, Display Port), 5.Data Cables (Fire wire IEEE 1394, eSATA Cables), 6. Networking Related Cables (Phone RJ11 Cable, Ethernet Cable)
3. Solder the joint connection of wires and check it. De-solder it and Re-solder.
Materials required: soldering iron. Solder wire, Flux, Desoldering Pump
4. Study of basic electronics components - Resistors and Capacitors (Find out the values from color bands/written values and compare it with measured values using multimeter)
Material required: Varioustypes of resistors, Capacitors and multimeter.
5. Study of basic electronics components - Identify the terminals of a Diode and its Polarity, Identify the terminals of a Transistor and its Type (n-p-n or p-n-p)
Material Required: Diode, Transistor, Multimeter, connecting wire
6. Study of Electrical wiring.
Material Required: Switch Board, Switches, Plugs, Electric Bulb, Fuse, Regulator, Two way switch, Wires
7. Design of rectifier circuit with filter, variable resistor, voltage regulator.
Material Required: Transformer (230-18), diodes, capacitor, variable resistor, voltage regulator for 5 volt and 12 volt.
8. Study of BJT as switch.
Material Required: Transistor, Resistors, Diode, Relay, LED
Study and use of Relay (design a simple relay circuit).
Material Required: Transistor, Resistors, Diode, Relay, LED
10. Check the continuity of a printed line on a PCB using Multi-meter. Study of different types of boards for electronics circuit design.
Material Required: PCB (single layer, double layer and multi layer) and Varo Board
11. Survey of optoelectronics devices (LED, Photo diode, photo transistor, LDR, Opto-isolator).
Materialrequired: different types of optoelectronics devices, data sheets.
12. Study of CRO, function generator & Measurement of voltage, frequency and Phase Angle.
13. Study of different types of transformer with different power supply (step down in particular if Step up transformer is not possible)

ECEN0206 Basic Electrical Engineering Laboratory

Credits: 02

Total Hours: 42

Course Objectives:

- Provide working knowledge for the analysis of basic D.C. and A.C. circuits used in electrical and electronic devices.

Course Outcomes:

- Understand DC Machines
- Understand single and three phase A.C circuits.
- Understand AC machines and measuring instruments.

List of Experiments

1. Connection & Measurement of power consumption of a fluorescent lamp.
2. Measurement of armature & field resistances of a D.C Compound Machine.
3. Connection & Testing of 1- \emptyset Energy Meter.
4. Calculation of No-Load losses of a 1- \emptyset Transformer.
5. Study of 1- \emptyset induction motor or fan motor.
6. Determination of OCC (Open Circuit Characteristics) of D.C Shunt Generator.
7. Starting of 3- \emptyset induction motor by star-delta- Δ) (Ystarter or DOL starte
8. Calculation of current, voltage, power & power factor of series RLC circuit excited by 1- \emptyset A.C Supply.
9. Starting & Speed Control of D.C Shunt motor by (i) Field flux control method & (ii) armature voltage control method.
10. V-I Characteristics of Incandescent lamp.
11. Verification of Thevenin's theorem.
12. Study of DC motor using three point starter.

S. No.	Topic	Pedagogy	Details	Instructional Hrs			
				Theory + Tutorial	Practice	Video	Project
1	Connection & Measurement of power consumption of a fluorescent lamp	PRAC	Hands on Practice	1	2	0	0
2	Measurement of armature & field resistances of a D.C Compound Machine	PRAC	Hands on Practice	1	2	0	0
3	Connection & Testing of 1- \emptyset Energy Meter	PRAC	Hands on Practice	1	2	0	0
4	Calculation of No-Load losses of a 1- \emptyset Transformer	PRAC	Hands on Practice	1	2	0	0

5	Study of 1- \emptyset induction motor or fan Motor	PRAC	<i>Hands on Practice</i>	1	2	0	0
6	Determination of OCC (Open Circuit Characteristics) of D.C Shunt Generator	PRAC	<i>Hands on Practice</i>	1	2	0	0
7	Starting of 3- \emptyset induction motor by star-delta- Δ) (Ystarte Starter	PRAC	<i>Hands on Practice</i>	1	2	0	0
8	Calculation of current, voltage, power & power factor of series RLC circuit excited by 1- \emptyset A.C Supply	PRAC	<i>Hands on Practice</i>	1	2	0	0
9	Starting & Speed Control of D.C Shunt motor by (i) Field flux control method & (ii) armature voltage control method	PRAC	<i>Hands on Practice</i>	1	2	0	0
10	V-I Characteristics of Incandescent Lamp	PRAC	<i>Hands on Practice</i>	1	2	0	0
11	Verification of	PRAC	<i>Hands on Practice</i>	0	2	0	0
12	Study of DC motor using three point starter	PRAC	<i>Field Visit</i>	0	3	0	0

FCEE0207 Electrical Workshop Practice

Credits: 02

Total Hours: 42

Course Objective:

- To develop special skills required for repairing small electrical domestic appliances, making joints and carrying out work and detecting faults etc. in electrical equipments and circuits.

Course outcomes:

After successful completion of the course, student will be able to

- *identify and understand importance of various electrical and electronics components*
- *understand basic construction and operation of various laboratory equipments*
- *develop basic relay contactor logic and operation of electric control panel*
- *perform basic maintenance and troubleshooting of house hold equipments, energy saving etc.*

List of Experiments1. To study safety precautions for electrical

engineering, draw the electrical symbol and general electrical house wiring.

2. To study the various types of accessories and tools.

3. Working of fuse and circuit breaker.
4. To setup a series, parallel and staircase wiring using the given lamps.
5. To study Earth-wire connection and Earth-wire measurement in electrical wiring.
6. To set-up residential house wiring using switches, socket, fuse, junction box, energy meter etc.
7. Fault analysis of residential house wiring.
8. Study of multimeter, voltmeter, ammeter, wattmeter (both AC&DC)
9. Connection & fault analysis in Domestic appliances (Fan, electric iron, fluorescent tube).
10. Study of Industrial wiring in the workshop and study of bimetallic relay.
11. Study of a 11 0.4 KV transformer substation
12. PCB design

S. No.	Topic	Pedagogy	Details	Instructional Hrs			
				Theory + Tutorial	Practice	Video	Project
1	To study safety precautions for electrical engineering, draw the electrical symbol and general electrical house wiring.	PRAC	Hands on Practice	1	2	0	0
2	To study the various types of accessories and tools.	PRAC	Hands on Practice	1	2	0	0
3	Working of fuse and circuit breaker.	PRAC	Hands on Practice	1	2	0	0
4	To setup a series, parallel and staircase wiring using the given lamps.	PRAC	Hands on Practice	1	2	0	0
5	To study Earth-wire connection and Earth-wire measurement in electrical wiring.	PRAC	Hands on Practice	1	2	0	0
6	To set-up residential house wiring using switches, socket, fuse, junction box, energy meter etc.	PRAC	Hands on Practice	1	2	0	0
7	Fault analysis of residential house Wiring	PRAC	Hands on Practice	1	2	0	0

8	Study of multimeter, voltmeter, ammeter, wattmeter (both AC&DC)	PRAC	Hands on Practice	1	2	0	0
9	Connection & fault analysis in Domestic appliances (Fan, electric iron, fluorescent tube).	PRAC	Hands on Practice	1	2	0	0
10	Study of Industrial wiring in the workshop and study of bimetallic relay.	PRAC	Hands on Practice	1	2	0	0
11	Study of basic of a computer and Accessories	PRAC	Hands on Practice	0	2	0	0
12	Study of a 11 0.4 KV transformer Substation	PRAC	Field Visit	0	3	0	0

FCEN0208 Basic Electrical simulation Lab

Credits: 02
42

Total Hours:

Course Objectives:

- To make the students understand the various electrical circuit in software approach.
- To train the students such a way that, it will help them to realise the practical circuit in easy manner.

Course Outcomes:

On successful completion of this course, students will be able to:

- Construct and analyse a practical circuit without having practical knowledge.
- Design circuit parameter, so that it will give better performance in complicated electrical network.

List of experiments:

1. Simulation of DC & AC Circuits
2. DC & AC Transient response of R-L Series network
3. DC & AC Transient response of R-C Series network
4. DC & AC Transient response of R-L-C Series network
5. Mesh Analysis
6. Nodal Analysis
7. Simulation of Norton and Superposition theorem
8. Star Delta Transformation
9. Clipper designing and finding out the i/p and o/p waveforms.
10. Clamper designing and finding out the i/p and o/p waveforms

11. Half wave and full wave rectifier designing and finding out the i/p and o/p waveforms.
 12. Transformer

S. No.	Topic	Pedagogy	Details	Instructional Hrs			
				Theory	Practic	video	Projec
	Lists of experiments			+Tutoria	e		t
1	Simulation of DC & AC Circuits.	PRAC	Software Practice (Matlab)	0	2	0	0

2	DC & AC Transient response of R-L Series network.	PRAC	Software Practice (Matlab)	0	2	0	0
3	DC & AC Transient response of R-C Series network.	PRAC	Software Practice (Matlab)	0	2	0	0
4	DC & AC Transient response of R-L-C Series network.	PRAC	Software Practice (Matlab)	0	2	0	0
5	Mesh Analysis	PRAC	Software Practice (Matlab)	0	2	0	0
6	Nodal Analysis	PRAC	Software Practice (Matlab)	0	2	0	0
7	Simulation of Norton and Superposition theorem.	PRAC	Software Practice (Matlab)	0	2	0	0
8	Star Delta Transformation	PRAC	Software Practice (Matlab)	0	2	0	0
9	Clipper designing and finding out the i/p and o/p waveforms.	PRAC	Software Practice (Matlab)	0	2	0	0
10	Clamper designing and finding out the i/p and o/p waveforms.	PRAC	Software Practice (Matlab)	0	2	0	0
11	Half wave and full wave rectifier designing and finding out the i/p and o/p waveforms.	PRAC	Software Practice (Matlab)	0	2	0	0
12	Transformer	PRAC	Software Practice (Matlab)	0	2	0	0

FCEN0209 Electrical Machines-I Lab

Credits: Total Hours: 42

Course Objectives:

- To introduce about construction and associated parts of different machines.
- To analyse the behaviour and performance of dc machine under different operating conditions. -To make student understand about various three phase transformer connections.

Course Outcomes:

On successful completion of this course, students will be able to:

- Distinguish the constructional similarity and dissimilarity between various dc and ac machine. - Demonstrate appropriate behaviours and knowledge of electrical machines when working with the class room teaching and lab experience.
- In the lab, at least for 50% experiments, students will write a software programme. for logic(mathematical equation).

List of Experiments

1. Determination of critical resistance & critical speed from no load test of a DC Shunt generator.
2. Plotting of external and internal characteristics of a DC shunt generator.
3. Determination of efficiency of DC machine by direct loading.
4. Determination of efficiency of DC machine by
5. Determination of Efficiency and Voltage Regulation by Open Circuit and Short Circuit test on single phase transformer.
6. Speed control of DC Motor by Ward-Leonard Method.
7. Study of current, voltage & frequency of a 1-ph transformer & to calculate voltage and current of the transformer using CRO.
8. Polarity test and Parallel operation of two single phase transformers.
9. Back to back test of a single phase transformer.
10. Load characteristics of DC (i) self (ii) separately excited DC generator.
11. Calculation of earth resistivity of industrial earthing.
12. Separation of core losses of a DC machine.

S. No.	Topic	Pedagogy	Details	Instructional Hrs			
				Theory +Tutorial	Practice	video	Project
1	Determination of critical	PRAC	Software				

	resistance & critical speed from no load test of a DC Shunt generator			Practice(Matlab)	0	2	0
2	Plotting of external and internal characteristics of a DC shunt generator	PRAC		Software Practice(Matlab)	0	2	0
3	Determination of efficiency of DC machine by direct loading	PRAC		Software Practice(Matlab)	0	2	0
4	Determination of efficiency of DC machine by Swinburn	PRAC		Software Practice(Matlab)	0	2	0
5	Determination of Efficiency and Voltage Regulation by Open Circuit and Short Circuit test on single phase transformer	PRAC		Software Practice(Matlab)	2	0	0
6	Speed control of DC Motor by Ward-Leonard Method	PRAC		Software Practice(Matlab)	2	0	0
7	Study of current, voltage & frequency of a 1-ph transformer & to calculate voltage and current of the transformer using CRO	PRAC		Software Practice(Matlab)	0	2	0
8	Polarity test and Parallel operation of two single phase transformers	PRAC		Software Practice(Matlab)	2	0	0
9	Back to back test of a single phase transformer	PRAC		Software Practice(Matlab)	0	2	0
10	Load characteristics of DC (i) self (ii) separately excited DC generator	PRAC		Software Practice(Matlab)	2	0	0
11	Calculation of earth resistivity of industrial earthing	PRAC		Software Practice(Matlab)	2	0	0
12	Separation of core losses of a DC machine	PRAC		Software Practice(Matlab)	0	2	0

FCEN0210 Analog & Digital Electronics Lab

Credits: 02 Total Hours: 42

Course Objectives:

-To make the students understand the various electronics circuit by using semiconductor devices in practical mode.

-To train the students to analysis different amplifier (small signal & large signal) in practical mode. -To train the students such a way that, it will help them to realise the practical circuit in easy manner.

Course Outcomes:

On successful completion of this course, students will be able to: -Construct analog and digital electronics circuit.

-Design circuit parameter, so that it will give better performance in complicated electronics circuit.

List of experiments:

1. Switching characteristics of Diode
2. Switching characteristics of transistor
3. Switching characteristics of thyristor
4. Design & fabrication of Analog DC power supply
5. Verifications of Boolean function using logic gate
6. Use of NAND gate as universal gate
7. Use of NOR gate as universal gate
8. Verifications of multiplexer and de-multiplexer using ICs
9. Study of FLIP-FLOP
10. Design of 4 bit CPU, which can perform different operations

S. No.	Topic	Pedagogy	Details	Instructional Hrs			
				Theory +Tutorial	Practice	video	Project
	Lists of experiments						
1	Switching characteristics of Diode	PRAC	Hardware Practice	0	2	0	0
2	Switching characteristics of transistor	PRAC	Hardware Practice	0	2	0	0
3	Switching characteristics of thyristor	PRAC	Hardware Practice	0	2	0	0

4	Design & fabrication of Analog DC power supply.	PRAC	Hardware Practice	0	2	0	0
5	Verifications of Boolean function using logic gate	PRAC	Hardware Practice	0	2	0	0
6	Use of NAND gate as universal gate	PRAC	Hardware & simulation Practice	0	2	0	0
7	Use of NOR gate as universal gate	PRAC	Hardware & simulation Practice	0	2	0	0
8	Verifications of multiplexer and de-multiplexer using ICs	PRAC	Hardware & simulation Practice	0	2	0	0
9	Study of FLIP-FLOP	PRAC	Hardware & simulation Practice	0	2	0	0
10	Design of 4 bit CPU, which can perform different operations	PRAC	Simulation	0	2	0	0

FCEN0211 Automation Lab (PLC)

Credits: 02
42

Total Hours:

Course Objective

Experimenting the theory by

-Prepare the students competency in the area of Automation.

-Prepare students having good balance between analytical skills and hands-on Skills

- Prepare students with multi-disciplinary

*competency **Course Outcomes:** On successful completion of this course, students will be able to:*

-Use a number of PLC programming languages to develop control solutions. - Describe the input output interface circuits and their role in the PLC's reliability.

LIST OF EXPERIMENTS

1. Study hardware and software used in PLC

2. Implementation of Logic gates
3. Develop a ladder program for DOL starter
4. Develop an application using On-Delay timer.
5. Develop an application using OFF Delay Timer
6. Develop an application using UP/DOWN counter
7. Implementation of PLC Arithmetic instructions
8. Study of PID controller instruction for a pilot plant
9. Study of open loop control system using PLC
10. Study of closed loop control system using PLC

Reference Book(s):

1 .E.A. Parr 2003, *Programmable Controllers-An Engineer's, Third Ed., Guide*, Newnes Oxford OX28DP, England [ISBN: ISBN:0-7506-5757-X]

2. Richard Cox 2001, *Technician's Guide To , Fifth Program Ed.*, Thomsonable Con Delmar Learning Albany, NY 12212-5015 [ISBN: ISBN:0-7668-1427-0]

S.NO	Topic	Pedagogy	Details	Instructional Hrs			
				Theory	Practice	video	Project
1	Study hardware and software used in PLC	PRACTICE		0	3	0	0
2	Implementation of Logic gates	PRACTICE	<i>Through hardware & software</i>	0	3	0	0
3	Develop a ladder program for DOL starter	PRACTICE	<i>Through hardware & software</i>	0	3	0	0
4	Develop An application using On-Delay timer.	PRACTICE	<i>Through hardware & software</i>	0	3	0	0
5	Develop An application using OFF Delay Timer	PRACTICE	<i>Through hardware & software</i>	0	3	0	0
6	Develop an application using UP/DOWN counter	PRACTICE	<i>Through hardware & software</i>	0	3	0	0
7	Implementation of PLC Arithmetic instructions	PRACTICE	<i>Through hardware & software</i>	0	3	0	0
8	Study of PID controller instruction for a pilot plant	PRACTICE	<i>Through software MATLAB</i>	0	3	0	0
9	Study of open loop control system using PLC	PRACTICE	<i>Through hardware & software</i>	0	3	0	0
10	Study of closed loop control system using PLC	PRACTICE	<i>Through hardware & software</i>	0	3	0	0

FCEN0212 GEOMETRICAL DRAWING LAB

Pre –requisites	Course type	Credits
NIL	Practice	2

Course Objectives:

At the end of Session, participants are able to learn:

1. Advanced solutions for conceptual design, 3D modelling, and documentation.
2. To do product design, industrial design and styling 3D Surface Model,
3. To perform Assembly design & template based design ,
4. To Create Kinematics with visual analysis and validation which will give you high quality performance insights for product decisions.
5. To perform Manufacturing and generating of different views from a 3D model.

Course Outcomes:

On successful completion of this course, students will be able to:

1. At the end of Session, participants are able to create :
2. 3D Solid Model,
3. 3D Surface Model,
4. Assembly of parts,
5. Creating Kinematics,
6. Manufacturing and generating of different views from a 3D model.

Module-I (12 Hrs): Part Modelling

Creation of simple solids, Parametric modelling, Booleans and Functional Modelling, Rendering **(All of the topics will be through learn by doing and laboratory mode)**

MECHANICAL/CIVIL/ ELECTRICAL BRANCH STUDENTS ARE REQUIRED TO DO PROJECTS RELATED TO THEIR OWN BRANCH

Module-II (12Hrs) : Assembly Modelling

Simple Assembly, Constraints, Digital Mockup

(All of the topics will be through learn by doing and laboratory mode) MECHANICAL/CIVIL/ ELECTRICAL BRANCH STUDENTS ARE REQUIRED TO DO PROJECTS RELATED TO THEIR OWN BRANCH

MODULE-III (14 Hrs) : Drafting

Creation of layout, Part Drawing, Detailed drawing

(All of the topics will be through learn by doing and laboratory mode) MECHANICAL/CIVIL/ ELECTRICAL BRANCH STUDENTS ARE REQUIRED TO DO PROJECTS RELATED TO THEIR OWN BRANCH

Note: Platform is Solid works / Catia /Pro-E

TEXT BOOKS:

1. CAD CAM, M.P. Groover
2. Geometrical Modelling, M.E. Morteson

Module I

S. No.	Topic	Pedagogy	Details	Instructional Hrs			
				Theory +Tutorial	Practice	video	Project
	Part Modelling						
1	Creation of simple solids	PRA		0	2	0	0
2	Parametric modeling	PRA		0	4	0	0
3	Booleans and Functional Modelling	PRA		0	4	0	0
4	Rendering	PRA		0	2	0	0
	Sub total			00	12	0	0

Module II

S. No.	Topic	Pedagogy	Details	Instructional Hrs			
				Theory	Practice	video	Project
	Assembly modeling						
1	Simple Assembly	PRA		0	4	0	0
2	Constraints	PRA		0	4	0	0
3	Digital Mockup	PRA		0	4	0	0
	Sub total			0	12	0	0

Module III

S. No.	Topic	Pedagogy	Details	Instructional Hrs			
				Theory	Practice	video	Project
	Drafting						
1	Creation of layout	PRA		0	4	0	0

2	Part Drawing	PRA		0	4	0	0
3	Detailed drawing	PRA		0	4	0	2
	Sub total			00	12	0	2

FCEN 0213 WORKSHOP TECHNOLOGY PRACTICE

Pre –requisites	Course type	Credits
NIL	Practice	2

Learning Objectives: To know various tool, work loading devices in carpentry, fitting, joining, sheet metal forming and plumbing.

Course Outcomes: Can manufacture simple components.

(Two jobs from each trade are to be done)

Module I

Carpentry:

1. Handling of carpentry tools: Practice in marking, sawing, planing and chiseling to size
2. Making simple joints: a) Half-lap b) Mortise joints.
3. Job using Wood Turning Lathe –Stepped Pulley.

Fitting:

1. Use of fitting tools: practice in marking, fitting to size
2. making of simple mating profiles
 - a) VEE b) Dovetail c) Half round joints.

Module II Welding:

1. Introduction to Tools & Welding Equipment
 - a) Edge Preparation for Various Joints: Lap Joint, Butt Joint, T-Joint
2. Brazing & Soldering (Demonstration)

House Wiring:

1. Parallel or series connection of two bulbs
2. To control two lamps by two independent switches located at two different places
3. To prepare a House wiring circuit with PVC conduit wiring system including 5Amps , 15Amps socket , fluorescent lab, MCB and Energy meter.

Module III Plumbing:

1. Introduction to Plumbing Tools

2. Basic Pipe Fittings
3. Sanitary Fittings
4. Water Meter Installation **Black-smithy:**
 1. Introduction to Forging & Forging Tools- Use (Demonstration)
 2. Converting round rod into Square Ring
 3. Converting round rod into square S-Hook

FCEN0214 Mining SURVEYING LAB [0 0 2]

Study and sketch the linear measuring instruments & carrying out Chain Surveying; Prismatic Compass and carrying out Compass Traversing; Vernier theodolite & angle measurement by Repetition Method; Angle measurement by Reiteration Method using Micro-optic theodolite; Study and sketch of a Tilting level & carrying out Fly Leveling; Study and sketch of Auto level & carrying out Profile Leveling; Study and sketch of 1" Theodolite and angle measurement; Plane Table Surveying by Radiation Method and Contouring; Study and sketch of Total Station and measurement of angles, distance and determination of coordinates and RL using Total Station; Preparation of grid and plotting the field data.

Mobile App Development for Android

Subject Name	Code	Type of course	T-P-P (Credit)	Prerequisite
Mobile App Development for Android	ENFC0207	Practice	0-2-0(2)	Programming for Problem Solving – Java

1. Objective

✓ Learn to develop Android mobile Apps

2. Course outcome

✓ Develop Android mobile Apps using Kotlin

3. Evaluation Systems

Internal Examination	Component	% of Marks	Method of Assessment
	Midterm Test	<i>NIL</i>	Written examination
	Assignment	<i>NIL</i>	Report and Presentation
	Experiments (Internal)	<i>50</i>	Practice work, report and viva voce
	Project	<i>NIL</i>	Report and presentation
	Quiz	<i>NIL</i>	Surprise/preannounced ones
External Examination	Semester	<i>NIL</i>	Written examination
	Practice	<i>50</i>	Practice test with viva-voce

Total		100	
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✓ **Android App projects to work on along with practice (Non-exhaustive list)**

1. Quiz Android App
 - a) Without online database connectivity
 - b) With online database connectivity
2. Course Recommendation Android App
3. Smart Messaging Android App
4. Dictionary Android App
5. Online Shopping Android App
6. Voting System Android App
7. Reminder Application Android App
8. Sentence Framer Android App
9. PC Control over the Internet Android App
10. Password Based Remote Door Open System Android App
11. Wi-Fi Library Book Locator Android App
12. Pick and Place Robotic Arm Android App
13. **Course outline**

Module – I (6 hrs.)

Introduction to Android OS, Development environment (Android Studio, Kotlin)

Module – II (10 hrs.)

Android application basics (Activity, Service, Content provider, Broadcast receiver, Intents)

Module – III (8 hrs.)

User Interface – Layouts, Widgets, Event handling, Notifications

Module – IV (8 hrs.)

Data Storage – Shared preference, Internal storage, External storage

Module –V (8 hrs.)

Data Storage – SQLite, Content provider

Module – VI (12 hrs.)

Networking – Android network overview and management, Socket and HTTP, Wi-Fi and Bluetooth, GPS; Handler, AsyncTask

Module – VII (8 hrs.)

Multimedia – Voice recording, Image capturing, Drawing & animatio

Text Books:

1. Eunice Adutwumwaa Obugyei, Natarajan Raman, Learning Kotlin by building Android Applications, Packt Publishing Limited, June 2018
2. Antonio Leiva, *Kotlin for Android Developers*. Leanpub, 2018.

Reference Books:

1. Ed Burnette, *Hello, Android: Introducing Google's Mobile Development Platform*. O'Reilly, 2010.
2. Pradeep Kothari, *Android Application Development, Black Book*. Kogent Learning Solutions Inc, 2014.
3. G. Blake Meike, *Programming Android*. O'Reilly, 2011.
4. Michael Burton, *Android App Development for Dummies*. John Wiley & Sons, 2015.

Online Sources:

1. <https://developers.google.com/training/android/>
2. <https://developer.android.com/kotlin/>
3. <https://kotlinlang.org/docs/tutorials/kotlin-android.html>
4. <http://www.vogella.com/tutorials/android.html>
5. <https://www.tutorialspoint.com/android/>

4. Session Plan

Topic coverage and Internal Test	No. of Sessions (in hrs.)	Activity (, tutorial, lab practice, field studies/field-trip, Workshop etc.)	Assignment (Project, assignment, field study, seminar, etc.)	Suggested Reading (Book, Video, Online source, etc.)
Module – I (6 hrs.)				
Introduction to Android OS, Development environment (Android Studio)	2	Lab practice	Experiment	Book, Online source: www.codeproject.com/Articles/803424/Article-Introduction-to-Android-OS
Introduction to Kotlin	4	Lab practice	Experiment	Book, Online source: https://kotlinlang.org/docs/tutorials/kotlin-android.html
Module – II (12 hrs.)				
Android application basics (Activity, Service)	4	Lab practice	Experiment, Assignment	Book, Online source: in.udacity.com/interview-skill-certification/android-basics-user-interface--ud834
Android application basics (Content provider, Broadcast receiver)	4	Lab practice	Experiment, Assignment	Book, Online source: in.udacity.com/interview-skill-certification/android-basics-user-interface--ud834
Android application basics (Intents)	2	Lab practice	Experiment, Assignment	Book, Online source: in.udacity.com/interview-skill-certification/android-basics-user-interface--ud834
Module – III (8 hrs.)				
User Interface– Layouts	2	Lab practice	Experiment	Book, Online source: developer.android.com/guide/topics/ui
Widgets, Event handling, Notifications	6	Lab practice	Experiment, Assignment	Online source
Module – IV (8 hrs.)				
Data Storage – shared preference	4	Lab practice	Experiment	Online source: developer.android.com/guide/topics/data/data-storage
Internal storage, External storage, SQLite, Content	4	Lab practice	Experiment, Assignment	Book, Online source

<i>provider</i>				
Module – V (8 hrs.)				
<i>SQLite</i>	4	<i>Lab practice</i>	<i>Experiment , Assignment</i>	<i>Book, Online source: developer.android.com/guide/topics/data/data-storage</i>
<i>Content provider</i>	4	<i>Lab practice</i>	<i>Experiment , Assignment</i>	<i>Book, Online source: developer.android.com/guide/topics/data/data-storage</i>
Module – VI (12 hrs.)				
<i>Networking – Android network overview and management</i>	2	<i>Lab practice</i>	<i>Assignment</i>	<i>Book, Online source: www.vogella.com/tutorials/AndroidNetworking/article.html</i>
<i>Socket and HTTP, Wi-Fi and Bluetooth, GPS.</i>	4	<i>Lab practice</i>	<i>Experiment</i>	<i>Book, Online source</i>
<i>Handlers, AsyncTask</i>	6		<i>Experiment</i>	<i>Book, Online source</i>
Module – VII (8 hrs.)				
<i>Multimedia – Voice recording, image capturing, basic drawing & animation</i>	4	<i>Lab practice</i>	<i>Experiment , Assignment</i>	<i>Online source: https://www.javatpoint.com/playing-audio-in-android-example</i>
<i>Basic drawing & animation</i>	4	<i>Lab practice</i>	<i>Experiment , Assignment</i>	<i>Book, Online source</i>
Total (hrs.)	60			

FCEN0304 Electrical Load Survey

Credits: 02 Total Hours: 42

1. Conceptual development about load forecast as a tool for planning capacity addition by various utilities and stakeholders and to serve as a guideline to plan growth of industries & infrastructural development
 2. Area Load Survey : For project report choose a semi-urban area i.e, an area with mixed load. Based on the field study design an electrical installation considering the existing as well as expected load growth during the next 5 years.

Data to be collected for all consumer categories in the project area:

Domestic & Commercial (Number of Consumers, Electrical Energy Consumption per consumer), Public Lighting, Public Water Works (Estimated connected electric load (kW) and the average electricity consumption per Kilo-watt of connected load (kWh / kW) i.e. Hours of operation), Irrigation

(Numbers of Pump Set / Tube wells, Capacity of pump sets, Hours of operation, Electrical Energy Consumption), Lift Irrigation Scheme(Major), Industrial (L.T Industries, H.T. Industries with a demand less than 1 MW, H.T, Industries with a demand of 1 MW and above), Railway Traction, Bulk Non-Industrial HT Supply,

Total Electrical Energy Consumption at Consumer

Electrical Energy Requirement at Generating End, Annual Electric Load Factor, Maximum Demand Factor category wise, Draw a load curve considering(variation during different hours of the day, Daily maximum and minimum value of the load, Seasonal Variation, peak of the load during a year, Draw an average load curve), Decide additional capacity requirement of lines and substations, Choose appropriate location mark it in the map, Prepare an estimate for investment, Prepare the cost benefit analysis including loss reduction and revenue inflow, Submit this report to a competent authority as a consulting engineer.

3. Methodology for forecasting adopted in India currently for 17th EPS: partial end use methodology for forecasting electricity demand for short and medium term i.e. time series analysis and end use method, extrapolation technique based on growth rates for long term electricity demand forecasting, forecast demand of electricity using econometric model, considering demand influencing factors for which econometric indicators were available and also taking into account the projected growth rates of different sectors of the economy.

4. Annual electricity demand forecast in terms of electrical energy requirement in MU and peak electric load in MW at Power Station Bus bars of electricity utilities for each State, Union Territory, Region and All India

Engineering Metrology and Measurements

Subject Name	Code	Type of course	T-P-P (Credit)	Prerequisite
Engineering Metrology and Measurements	ENFC0401	Theory + Practice	1-2(3)	Nil

1. Course Objective

- ✓ To Make Students Familiar with the Measuring Systems, and the Standard of Measurements. Learns about Basic Measurement Devices.
- ✓ Understanding the Basic Measurement Systems in the Real Time Engineering Applications.
- ✓ Enables Students to Work in Quality Control and Quality Assurances Divisions Industries.

Course Outcomes

- ✓ Selecting Suitable Measuring Instruments for Basic and Typical Applications in the Industries.
- ✓ Analyze Measurement Requirement.
- ✓ Can Choose Transducer & Sensors for Products.

2. Evaluation Systems

Internal Examination	Component	% of Marks	Method of Assessment
	ITR/Cass Test	20	Best of 2 (Written Test)
	IPR	30	Lab Work & Report
External Examination	ETR	30	Written Examination
	EPR	20	Lab Work & Report
Total		100	

3. Course Outline

Module I: (6 Hours)

Introduction to Metrology; Importance and Need for Measurements and Metrology; Need for Inspection; Precision & Accuracy; Errors in Measurement.

Practice: (Laboratory Mode- Learn by Doing)

Calibration of Measuring Instruments Using Slip Gauge Blocks.

Module II: (9 Hours)

Limit System; Limits Fits & Tolerances; Allowances; Hole Basis & Shaft Basis Systems; Interchangeability; Gauge Design. (Class room Teaching and videos)

Practice: (Laboratory Mode- Learn by Doing)

1. Introduction to Metrology Laboratory (Steel Rule, Tape, Right Angle, Protractor, Surface Plate).
2. Gauges- Filler, Radius, Thread, Wire, Snap & GO-NOGO.

Module III: (9 Hours)

Standards of Measurement; Dial Indicators; Vernier Apparatus; Micrometers; Comparators (Mechanical, Electrical, Pneumatic).

Practice: (Laboratory Mode- learn by Doing)

3. Vernier Caliper- Inside, Outside, Depth Measurement & Height Gauge.
4. Micrometers, Outside, Inside Micrometer & Depth Micrometer.
5. Three Points Bore Micrometer

Module IV: (10 Hours)

Measurement of Angles & Tapers using Bevel Protractor; Angle Gauges; Sine Bars; Flatness Spirit Level & Surface Plate.

Practice: (Laboratory Mode- learn by Doing)

6. Sine Bar/Bevel Protractor-Measurement of Angles.
7. Flatness Test Using Sprit Level.
8. Use of Dial Indicators-in-lathe.

Module V: (9 Hours)

Gear Tooth Metrology; Inspection & Alignment Tests. Transducers; Variable Resistance Transducer; LVDT; Comparative Transducer; Piezoelectric Transducer; Photo Voltaic Cells; Devices for Pressure Measurement- Dead Weight Tester; Bourdon Tube Pressure Gauge; Diaphragm and Bellow Gauges. (Topics will be covered by explaining and followed by practice mode)

Practice: (Laboratory Mode- Learn by Doing)

9. Gear Tooth Metrology, Inspection & Alignment Tests.

Module VI: (10 Hours)

Low Pressure Measurements; Force Measuring Using Proving Rings; Torque Measuring Using Dynamometers; Strain Measurements; Profile Projector; Tool Maker's Microscope; Optical Flats; Laser Interferometers; Autocollimators.

Practice: (Laboratory Mode- Learn by Doing)

10. Optical Flat Use & Surface Plate Test Using Spirit Level & Dial Gauge.

11. Measurement of Template Using Profile Projector.

Module VII: (12 Hours)

Assessment of Surface Roughness; Machining Symbols for Surface Finish; Measuring Instruments; Tally-Surf; Screw Thread Measurement- Terminology; Precision Instruments Based on Laser Principles- Laser Interferometer Application; Coordinate Measuring Machine (CMM).

Practice: (Laboratory Mode- Learn by Doing)

12. Surface Finish by Taylor's Apparatus –LVDT.

13. Measurement of Tool angle in Tool Maker’s Microscope.

14. Repeat Laboratory-1 or Test.

(50% of the topics will be covered by “Learn by Doing” principle and few video presentations)

6. Reference:

Text books:

1. Gupta, I C, A Text Book of ENGINEERING METROLOGY.2016. 8th Edition, Reprint, Dhanpat Rai Publication, New Dehi-110002
2. Narayana, K L, Engineering Metrology.2014. Third Edition, Scitech Publication(India) Privet Limited

Reference Books:

- ✓ Mahajan, M, A Text Book of Metrology. 2010. DhanpatRai& Co (P) Ltd,ISBN 13: 978-817700051

7. Session Plan

Topic coverage and Internal Test	No. of Sessions (in hrs.)	Activity (lecture, tutorial, lab practice, field studies/field-trip, Workshop etc.)	Assignment (Project, assignment, field study, seminar, etc.)	Suggested Reading (Book, Video, Online source, etc.)
Module I				
Introduction to metrology Importance and need for measurements and metrology	1	lecture	Assignment	https://www.youtube.com/watch?v=xcvN11HHY9o https://www.youtube.com/watch?v=qXhOWXShH1w Mahajan, M, A Text Book of Metrology. 2010. DhanpatRai& Co (P) Ltd,ISBN 13: 978-817700051
Need for Inspection	1	lecture	Assignment	https://www.youtube.com/watch?v=YYr

				njEo90fs Mahajan, M, A Text Book of Metrology. 2010. DhanpatRai& Co (P) Ltd,ISBN 13: 978-817700051
Precision & Accuracy	1	lecture	Assignment	https://www.youtube.com/watch?v=b38hFWvEjwI Mahajan, M, A Text Book of Metrology. 2010. DhanpatRai& Co (P) Ltd,ISBN 13: 978-817700051
Errors in Measurement	1	lecture	Assignment	https://www.youtube.com/watch?v=cGdbQeRSYTc Mahajan, M, A Text Book of Metrology. 2010. DhanpatRai& Co (P) Ltd,ISBN 13: 978-817700051
Practice				
1. Calibration of measuring Instruments using slip gauge blocks	2	practice		
Module II				
Limit System, Limits Fits & Tolerances	2	lecture	Assignment	https://www.youtube.com/watch?v=zxyERl8KnnM&list=PL0uwpDY0Y8Q2aoPhDuEZLI1PVuKKUGb90 https://www.youtube.com/watch?v=zxyERl8KnnM&list=PL0uwpDY0Y8Q2aoPhDuEZLI1PVuKKUGb90&index=1 Mahajan, M, A Text Book of Metrology. 2010. DhanpatRai& Co (P) Ltd,ISBN 13: 978-817700051
Allowances, Hole Basis & Shaft Basis Systems, Interchangeability	1	lecture	Assignment	https://www.youtube.com/watch?v=APT7hf5Wv0&list=PL0uwpDY0Y8Q2aoPhDuEZLI1PVuKKUGb90&index=4 Mahajan, M, A Text Book of Metrology. 2010. DhanpatRai& Co (P) Ltd,ISBN 13: 978-817700051
Design of Gauges- GO, NOGO	2	lecture	Assignment	https://www.youtube.com/watch?v=uNOZTmhsH1w https://www.youtube.com/watch?v=mZHHdim3hOY Mahajan, M, A Text Book of Metrology.

				2010. DhanpatRai& Co (P) Ltd,ISBN 13: 978-817700051
Practice				
2.Introduction to Metrology Laboratory(1hr) + Steel Rule, Tape, Right Angle Protractor, Surface Plate	2	Practice	field study	
3.Gauges- Filler ,Radius, Thread, Wire, Snap, GO-NOGO	2	Practice	field study	
Module III				
Standards of Measurement	1	lecture	Assignment	Mahajan, M, A Text Book of Metrology. 2010. DhanpatRai& Co (P) Ltd,ISBN 13: 978-817700051
Dial Indicators, Vernier caliper & Micrometer	1	lecture	Assignment	https://www.youtube.com/watch?v=FqSJhY_ltc https://www.youtube.com/watch?v=vkPlzmalvN4 https://www.youtube.com/watch?v=StBc56ZifMs Mahajan, M, A Text Book of Metrology. 2010. DhanpatRai& Co (P) Ltd,ISBN 13: 978-817700051
Comparators Mechanical, Electrical, Pneumatic	1	lecture	Assignment	Mahajan, M, A Text Book of Metrology. 2010. DhanpatRai& Co (P) Ltd,ISBN 13: 978-817700051
Practice				
4.Vernier Caliper- inside, outside, depth measurement, Height Gauge	2	Practice	Field Study	
5.Micrometers, Outside & Inside Micrometer, Depth Micrometer	2	Practice	Field Study	
6.Three point Bore Micrometer	2	Practice	Field Study	

Module IV				
Angular Measurements Measurement of Angles & Tapers using Bevel Protractor, Angle Gauges, Sine bars	3	lecture	Assignment	https://www.youtube.com/watch?v=oJFUI_FHlio https://www.youtube.com/watch?v=F/uCEeipdCw https://www.youtube.com/watch?v=u-PLC3uKICM
Spirit Level, Surface Plate	1	lecture	Assignment	https://www.youtube.com/watch?v=H-F2C5F78aw
Practice				
7.Sine Bar/Bevel Protractor- Measurement of Angles	2	Practice		
8.Flatness test using Sprit Level	2	Practice		
9.Use of Dial Indicators-in –Lathe.	2	Practice		
Module V				
Gear Tooth Metrology	2	lecture	Assignment	https://www.youtube.com/watch?v=fb278VIHICU
Inspection & Alignment Tests	1	lecture	Assignment	https://www.youtube.com/watch?v=utZVv7QvRt8
Transducers, Variable Resistance Transducer, LVDT, comparative transducer, piezoelectric transducer, photo voltaic cells.	2	lecture	Assignment	https://youtu.be/vuVFbKxsxds
Devices for pressure measurement- dead weight tester, bourdon tube pressure gauge, diaphragm and	1	lecture	Assignment	

bellow gauges.				
Practice				
10.Gear Tooth Metrology, Inspection & Alignment tests	3	Practice		
Module VI				
Low Pressure Measurements	1	lecture	Assignment	
Force Measuring Using Proving Rings. Torque Measuring Using Dynamometers, Strain Measurements	2	lecture	Assignment	
Profile Projector, Tool Maker's Microscope, Optical Flats. application.	1	lecture	Assignment	https://www.youtube.com/watch?v=HG09GXaeZFc https://www.youtube.com/watch?v=hqsVXA5S2xM https://www.youtube.com/watch?v=5JE7BV-XkSk
Laser Interferometers	1	lecture	Assignment	https://www.youtube.com/watch?v=UA1qG7Fjc2A
Autocollimators	1	lecture	Assignment	https://www.youtube.com/watch?v=XHEywuzl9sA
Practice				
11.Optical Flat Use & Surface Plate test using Spirit Level & Dial Gauge	2	Pratice	Field study	
12.Measurement of template using Profile Projector	2	Practice	Field Study	
Module VII				
Assessment of Surface Roughness,	1	lecture	Assignment	https://www.youtube.com/watch?v=omh

Machining Symbols for Surface Finish, Measuring Instruments, Tally-Surf,				oWIs2d-M https://www.youtube.com/watch?v=VyePASErr5Q
Screw Thread Measurement-Terminology, Determination of Effective Diameter Using Two, three Wire Method	2	lecture	Assignment	https://www.youtube.com/watch?v=N4pjgJMmk3A https://www.youtube.com/watch?v=LjQt6ISFISg
Coordinate measuring machine (CMM)	1	lecture	Assignment	https://www.youtube.com/watch?v=844UiRBVxIY
Practice				
11.Surface Finish by Taylor's Apparatus	2	Practice	field study	
13.Measurement of Tool angle in Tool Maker's Microscope	2	Practice	Field Study	
14.Repeat Laboratory-1	2	Practice	field study	
15. Repeat Laboratory-2	2	Practice	field study	
Total Hours	65			

Engineering Metrology and Measurements

Subject Name	Code	Type of course	T-P-P (Credit)	Prerequisite
Engineering Metrology and Measurements	ENFC0401	Theory + Practice	1-2(3)	Nil

4. Course Objective

- To Make Students Familiar with the Measuring Systems, and the Standard of Measurements. Learns about Basic Measurement Devices.
- Understanding the Basic Measurement Systems in the Real Time Engineering Applications.

- Enables Students to Work in Quality Control and Quality Assurances Divisions Industries.

5. Course Outcomes

- Selecting Suitable Measuring Instruments for Basic and Typical Applications in the Industries.
- Analyze Measurement Requirement.
- Can Choose Transducer & Sensors for Products.

6. Evaluation Systems

Internal Examination	Component	% of Marks	Method of Assessment
	ITR/Cass Test	20	Best of 2 (Written Test)
	IPR	30	Lab Work & Report
External Examination	ETR	30	Written Examination
	EPR	20	Lab Work & Report
Total		100	

7. Course Outline

Module I: (6 Hours)

Introduction to Metrology; Importance and Need for Measurements and Metrology; Need for Inspection; Precision & Accuracy; Errors in Measurement.

Practice: (Laboratory Mode- Learn by Doing)

Calibration of Measuring Instruments Using Slip Gauge Blocks.

Module II: (9 Hours)

Limit System; Limits Fits & Tolerances; Allowances; Hole Basis & Shaft Basis Systems; Interchangeability; Gauge Design. (Class room Teaching and videos)

Practice: (Laboratory Mode- Learn by Doing)

15. Introduction to Metrology Laboratory (Steel Rule, Tape, Right Angle, Protractor, Surface Plate).

16. Gauges- Filler, Radius, Thread, Wire, Snap & GO-NOGO.

Module III: (9 Hours)

Standards of Measurement; Dial Indicators; Vernier Apparatus; Micrometers; Comparators (Mechanical, Electrical, Pneumatic).

Practice: (Laboratory Mode- learn by Doing)

17. Vernier Caliper- Inside, Outside, Depth Measurement & Height Gauge.

18. Micrometers, Outside, Inside Micrometer & Depth Micrometer.

19. Three Points Bore Micrometer

Module IV: (10 Hours)

Measurement of Angles & Tapers using Bevel Protractor; Angle Gauges; Sine Bars; Flatness Spirit Level & Surface Plate.

Practice: (Laboratory Mode- learn by Doing)

20. Sine Bar/Bevel Protractor-Measurement of Angles.

21. Flatness Test Using Sprit Level.

22. Use of Dial Indicators-in-lathe.

Module V: (9 Hours)

Gear Tooth Metrology; Inspection & Alignment Tests. Transducers; Variable Resistance Transducer; LVDT;

Comparative Transducer; Piezoelectric Transducer; Photo Voltaic Cells; Devices for Pressure Measurement- Dead Weight Tester; Bourdon Tube Pressure Gauge; Diaphragm and Bellow Gauges. (Topics will be covered by explaining and followed by practice mode)
Practice: (Laboratory Mode- Learn by Doing)

23. Gear Tooth Metrology, Inspection & Alignment Tests.

Module VI: (10 Hours)

Low Pressure Measurements; Force Measuring Using Proving Rings; Torque Measuring Using Dynamometers; Strain Measurements; Profile Projector; Tool Maker’s Microscope; Optical Flats; Laser Interferometers; Autocollimators.
Practice: (Laboratory Mode- Learn by Doing)

24. Optical Flat Use & Surface Plate Test Using Spirit Level & Dial Gauge.

25. Measurement of Template Using Profile Projector.

Module VII: (12 Hours)

Assessment of Surface Roughness; Machining Symbols for Surface Finish; Measuring Instruments; Tally-Surf; Screw Thread Measurement- Terminology; Precision Instruments Based on Laser Principles- Laser Interferometer Application; Coordinate Measuring Machine (CMM).
Practice: (Laboratory Mode- Learn by Doing)

26. Surface Finish by Taylor's Apparatus –LVDT.

27. Measurement of Tool angle in Tool Maker’s Microscope.

28. Repeat Laboratory-1 or Test.

(50% of the topics will be covered by “Learn by Doing” principle and few video presentations)

6. Reference:

Text books:

3. Gupta, I C, A Text Book of ENGINEERING METROLOGY.2016. 8th Edition, Reprint, Dhanpat Rai Publication, New Dehi-110002
4. Narayana, K L, Engineering Metrology.2014. Third Edition, Scitech Publication(India) Privet Limited

Reference Books:

- Mahajan, M, A Text Book of Metrology. 2010. DhanpatRai& Co (P) Ltd,ISBN 13: 978-817700051

7. Session Plan

Topic coverage and Internal Test	No. of Sessions (in hrs.)	Activity (lecture, tutorial, lab practice, field studies/field-trip, Workshop etc.)	Assignment (Project, assignment, field study, seminar, etc.)	Suggested Reading (Book, Video, Online source, etc.)
Module I				

Introduction to metrology Importance and need for measurements and metrology	1	lecture	Assignment	https://www.youtube.com/watch?v=xcvN11HHY9o https://www.youtube.com/watch?v=qXhOWXShH1w Mahajan, M, A Text Book of Metrology. 2010. DhanpatRai& Co (P) Ltd,ISBN 13: 978-817700051
Need for Inspection	1	lecture	Assignment	https://www.youtube.com/watch?v=YYrnjEo90fs Mahajan, M, A Text Book of Metrology. 2010. DhanpatRai& Co (P) Ltd,ISBN 13: 978-817700051
Precision & Accuracy	1	lecture	Assignment	https://www.youtube.com/watch?v=b38hFWvEjwI Mahajan, M, A Text Book of Metrology. 2010. DhanpatRai& Co (P) Ltd,ISBN 13: 978-817700051
Errors in Measurement	1	lecture	Assignment	https://www.youtube.com/watch?v=cGdbQeRSYTc Mahajan, M, A Text Book of Metrology. 2010. DhanpatRai& Co (P) Ltd,ISBN 13: 978-817700051
Practice				
1. Calibration of measuring Instruments using slip gauge blocks	2	practice		
Module II				
Limit System, Limits Fits & Tolerances	2	lecture	Assignment	https://www.youtube.com/watch?v=zxyER18KnnM&list=PL0uwpDY0Y8Q2aoPhDuEZLI1PVuKKUGb90 https://www.youtube.com/watch?v=zxyER18KnnM&list=PL0uwpDY0Y8Q2aoPhDuEZLI1PVuKKUGb90&index=1 Mahajan, M, A Text Book of Metrology. 2010. DhanpatRai& Co (P) Ltd,ISBN 13: 978-817700051
Allowances, Hole Basis & Shaft Basis Systems,	1	lecture	Assignment	https://www.youtube.com/watch?v=APT7hf5Wv0&list=PL0uwpDY0Y8Q2aoPhDuEZLI1PVuKKUGb90&index=4 Mahajan, M, A Text Book of Metrology.

Interchangeability				2010. DhanpatRai& Co (P) Ltd,ISBN 13: 978-817700051
Design of Gauges- GO, NOGO	2	lecture	Assignment	https://www.youtube.com/watch?v=uN0ZTmhsH1w https://www.youtube.com/watch?v=mZHHdim3hOY Mahajan, M, A Text Book of Metrology. 2010. DhanpatRai& Co (P) Ltd,ISBN 13: 978-817700051
Practice				
2.Introduction to Metrology Laboratory(1hr) + Steel Rule, Tape, Right Angle Protractor, Surface Plate	2	Practice	field study	
3.Gauges- Filler ,Radius, Thread, Wire, Snap, GO-NOGO	2	Practice	field study	
Module III				
Standards of Measurement	1	lecture	Assignment	Mahajan, M, A Text Book of Metrology. 2010. DhanpatRai& Co (P) Ltd,ISBN 13: 978-817700051
Dial Indicators, Vernier caliper & Micrometer	1	lecture	Assignment	https://www.youtube.com/watch?v=FqSJhY_lctc https://www.youtube.com/watch?v=vkPlzmalvN4 https://www.youtube.com/watch?v=StBc56ZifMs Mahajan, M, A Text Book of Metrology. 2010. DhanpatRai& Co (P) Ltd,ISBN 13: 978-817700051
Comparators Mechanical, Electrical, Pneumatic	1	lecture	Assignment	Mahajan, M, A Text Book of Metrology. 2010. DhanpatRai& Co (P) Ltd,ISBN 13: 978-817700051
Practice				
4.Vernier Caliper- inside, outside, depth measurement, Height	2	Practice	Field Study	

Gauge				
5.Micrometers, Outside & Inside Micrometer, Depth Micrometer	2	Practice	Field Study	
6.Three point Bore Micrometer	2	Practice	Field Study	
Module IV				
Angular Measurements Measurement of Angles & Tapers using Bevel Protractor, Angle Gauges, Sine bars	3	lecture	Assignment	https://www.youtube.com/watch?v=oJFUI_FHlio https://www.youtube.com/watch?v=F/uCEeipdCw https://www.youtube.com/watch?v=u-PLC3uKICM
Spirit Level, Surface Plate	1	lecture	Assignment	https://www.youtube.com/watch?v=H-F2C5F78aw
Practice				
7.Sine Bar/Bevel Protractor- Measurement of Angles	2	Practice		
8.Flatness test using Sprit Level	2	Practice		
9.Use of Dial Indicators-in –Lathe.	2	Practice		
Module V				
Gear Tooth Metrology	2	lecture	Assignment	https://www.youtube.com/watch?v=fb278VIHICU
Inspection & Alignment Tests	1	lecture	Assignment	https://www.youtube.com/watch?v=utZVv7QvRt8
Transducers, Variable Resistance Transducer, LVDT, comparative transducer, piezoelectric	2	lecture	Assignment	https://youtu.be/vuVFbKxsds

transducer, photo voltaic cells.				
Devices for pressure measurement- dead weight tester, bourdon tube pressure gauge, diaphragm and bellow gauges.	1	lecture	Assignment	
Practice				
10.Gear Tooth Metrology, Inspection & Alignment tests	3	Practice		
Module VI				
Low Pressure Measurements	1	lecture	Assignment	
Force Measuring Using Proving Rings. Torque Measuring Using Dynamometers, Strain Measurements	2	lecture	Assignment	
Profile Projector, Tool Maker's Microscope, Optical Flats. application.	1	lecture	Assignment	https://www.youtube.com/watch?v=HG09GXaeZFc https://www.youtube.com/watch?v=hqsVXA5S2xM https://www.youtube.com/watch?v=5JE7BV-XkSk
Laser Interferometers	1	lecture	Assignment	https://www.youtube.com/watch?v=UA1qG7Fjc2A
Autocollimators	1	lecture	Assignment	https://www.youtube.com/watch?v=XHEywuzl9sA
Practice				
11.Optical Flat Use & Surface Plate test using Spirit Level & Dial Gauge	2	Pratice	Field study	

12.Measurement of template using Profile Projector	2	Practice	Field Study	
Module VII				
Assessment of Surface Roughness, Machining Symbols for Surface Finish. Measuring Instruments, Tally-Surf,	1	lecture	Assignment	https://www.youtube.com/watch?v=omh_oWIs2d-M https://www.youtube.com/watch?v=VyePASErr5Q
Screw Thread Measurement- Terminology, Determination of Effective Diameter Using Two, three Wire Method	2	lecture	Assignment	https://www.youtube.com/watch?v=N4pjJMmk3A https://www.youtube.com/watch?v=LjQt6ISFISg
Coordinate measuring machine (CMM)	1	lecture	Assignment	https://www.youtube.com/watch?v=844UiRBVxIY
Practice				
11.Surface Finish by Taylor's Apparatus	2	Practice	field study	
13.Measurement of Tool angle in Tool Maker's Microscope	2	Practice	Field Study	
14.Repeat Laboratory-1	2	Practice	field study	
15. Repeat Laboratory-2	2	Practice	field study	
Total Hours	65			

FCEN0401 BASIC FLUID MECHANICS

[5 0 0]

Module-I: FLUID KINEMATICS AND FLUID DYNAMICS (16 Hrs):

Recapitulation of Fluid Properties and Hydrostatics (Not for external examination)

- (A) Principle of conservation of mass - Continuity equation in differential form for three dimensional flow in Cartesian co-ordinates. Rotational & Irrotational flows - Irrotationality condition. Continuity equation for one dimensional flow.
(Most of the topics will be through video presentation)
- (B) **Fluid Dynamics:** Euler's equation of motion flow-Principle along of conservation a stream l of energy through integration-Bernoulli's of E-Practical Principle equation a applications of- Kinematics Bernoulli's of free jets. **(Topics Principle on practical applications will be through practice and field demonstration)**
- (C) **Flow Measurement in pipes and channels:** Pitot tube, Prandtl tube, Flow meters and Weirs. Flow through orifices and mouthpieces **(All the topics will be through practice and field measurement)**
- (D) **Principle of Conservation of momentum:** Impulse momentum equation. Application of momentum principle for forces on pipe bends and reducers. (Simple problems on pipe bends and reducers in x-y plane) **(Most of the topics will be through class room teaching with a project on pipe bends.)**

Module-II: STEADY FLOW THROUGH PIPES (14 Hrs)

- (E) **Laminar Flow:** Laminar and turbulent flow characteristics, Reynolds experiment, Reynolds number -Laws of laminar and turbulent friction. Laminar flow through circular pipes - Hagen Poiseuille equation for loss of head. **(Topics related to laminar flow & turbulent flow and Reynolds experiment will be through Multimedia presentation)**
- (F) **Turbulent flow through pipes:** Darcy - Weisbach equation for loss of head. Hydro-dynamically Smooth and rough boundaries (Velocity distributions for smooth & rough boundaries to be appraised and not to be included in external examination), Relative roughness - Laminar sub-layer. Variation of friction factor with Reynolds number and relative roughness **(Topics related. Moody' to pipe friction and determination of friction factor will be through practice mode. Pipe design problems will be through Project mode using pipe analysis software.)**
- (G) **Practical problems in pipe flows:** Minor losses in pipes, Pipes in series and parallel - Equivalent pipe. Branched pipes - HGL and TEL. Simple Pipe. Reservoir problems and Syphon. Network Problems. Power transmission through a pipe and power transmission through a nozzle. **(Most of the topics will be through project mode)**

MODULE-III: DIMENSIONAL ANALYSIS AND MODEL TESTING (12 Hrs)

- (H) **Fundamental Concepts of Dimensional Analysis:** Importance of Dimensional Analysis & Model Study- Units and Dimensional Formulae for Various Engineering Quantities- Dimensional Homogeneity. Non-dimensional Parameters- Raleigh's-Buckingham's Method- Omitted π and Theorem Superfluous variables. Capillary Rise, Drag on Cylinder, Resistance of a Ship, Discharge over a Sharp Crested Weir, Fall Velocity of a Sphere, Head Characteristics of a Pump, Thrust on a Propeller.

(I) **Similarity Laws:** Concepts of Similarity- Geometric, Kinematic and Dynamic Similarities- Important Dimensionless Numbers- Reynolds Number, Froude Number, Mach Number, Euler Number, Weber Number - Similarity Laws- Reynolds law and Froudes law - Modelling Criteria- Distorted Models and River models. Practical applications of modelling and similarity.

Text Books:

1. *Hydraulics and Fluid mechanics: P.N.MODI & S.M.SELH,*
2. *Fluid mechanics: A.K.JAIN, Khanna publishers*
3. *Fluid Mechanics* <http://www.eolss.net/eolsssamplechapters/c07/e2-15-01-01/E2-15-01-01-TXT-03.aspx> 4. <http://www.msubbu.in/ln/fm/>

PEDAGOGY

Note:

- 1) **Project hrs shown are not part of class room teaching. Students to carry out the assigned project and submit for evaluation.**
- 2) **Evaluation - External 50 Marks Internal 50 Marks.**
- 3) **Internal evaluation of Practical work - Will be based on the day to day work at practice sessions and project works submitted.**
- 4) **External evaluation of Practical work - Will be by an external examiner.**
- 5) **Internal evaluation of work carried through projects - Will be part of the regular evaluation. No separate external evaluation for topics under project mode.**

MODULE - I

S. No.	Topic	Pedagogy	Video links / Software	Instructional Hrs			
				Th	Video	Proj.	Pract
<i>Fluid Kinematics & Fluid Dynamics: (Theory - 18 Hrs Practice - 12 Hrs)</i>							
(A)	Fluid Kinematics: Lagrangian and Eulerian description of fluid flow- Different types of fluid flow - One, two and three dimensional flows, Uniform & non-uniform flows, Steady & unsteady flows, Compressible & incompressible flows and Laminar & turbulent flows.	CRT + Video	See List Below for Video Links	1	1	0	0
	<i>Fluid Kinematics (Continued):</i> Description of flow pattern - Stream line, Streak line, Path line. Stream surface and stream tube.	CRT + Video		1	1	0	0
	<i>Fluid Kinematics (Continued):</i> Principle of conservation of mass - Continuity equation in differential form for three dimensional flow in Cartesian co-ordinates.	CRT		2	0	0	0
	<i>Fluid Kinematics (Continued):</i> Continuity equation in differential form for three dimensional flow in Cartesian coordinates. Rotational & Irrotational flows - Irrotationality condition.	CRT		1	1	0	0
	<i>Fluid Kinematics (Continued):</i> Continuity equation for one dimensional flow.	CRT		1	0	0	0
(B)	Fluid Dynamics: Euler's equationline for ideal flow -	CRT		2	0	0	0
	<i>Fluid Dynamics (Continued):</i> Principle of conservation of energy through integration line - Bernoulli's Principle	CRT		2	0	0	0
	<i>Fluid Dynamics (Continued):</i> Practical applications of Bernoulli's Principle.	CRT		0	0	2	2

	<i>Fluid Dynamics (Continued): Kinematics of free jets</i>		1	0	2	1
(C)	Flow Measurement in pipes and channels: Pitot tube, Prandtl tube, Flow meters and Weirs.	CRT + Proj, + Pract.	1	0	1	9
(D)	Principle of Conservation of momentum: Impulse momentum equation. Application of momentum principle for forces on pipe bends and reducers.	CRT + Video + Proj.	1	1	1	0
		Sub total	13	4	6	12

MODULE - II

S. No.	Topic	Pedagogy	Video links / Software	Instructional Hrs			
				Th	Video	Proj	Pract
	<i>Steady Flow through Pipes: (Theory - 18 Hrs Practice Hrs - 9)</i>						
(E)	Laminar Flow: Laminar and turbulent flow characteristics, Reynolds experiment, Reynolds number - Laws of laminar and turbulent friction.	CRT + Video	See List Below for Video Links	1	1	0	0
	<i>Laminar Flow (Contd): Laminar flow through circular pipes Hagen Poiseuille equation for loss of head</i>	CRT		1	0	0	0
(F)	Turbulent flow through pipes: Darcy - Weisbach equation for loss of head.	CRT + Pract.		1			3
	<i>Turbulent Flow through Pipes (Contd): Hydro-dynamically Smooth and rough boundaries, Relative roughness.</i>	CRT + Video + Proj.		1	1	1	0

MODULE - III

S. No.	Topic	Pedagogy	Video links / Software	Instructional Hrs			
				Th	Video	Proj	Pr
	<i>Turbulent Flow through Pipes (Contd): Laminar sub-layer. Variation of friction factor with Reynolds number and relative roughness.</i>	CRT + Proj.		2	0	1	0
	<i>Moody's chart and Pipe des</i>	CRT + Proj.		2	0	2	0
(G)	Practical problems in pipe flows: Minor losses in pipes, Pipes in series and parallel - Equivalent pipe. Branched pipes	CRT + Proj. + Pract.		1	0	1	3
	<i>Practical Problems (Contd): HGL and TEL. Reservoir problems and Syphon.</i>	CRT + Proj.		1	0	3	0
	<i>Practical Problems (Contd): Pipe Networks</i>	CRT + Proj.		1	0	3	0
	<i>Practical Problems (Contd): Power transmission through a pipe and power transmission through a nozzle.</i>	CRT		1	0	0	0

S. No.	Topic	Pedagogy	Video links / Software	Instructional Hrs			
				Th	Video	Proj	Pract
	Steady Flow through Pipes: (Theory + Tutorials - 22 Hrs Practice Hrs - 9)						
(H)	Fundamental Concepts of Dimensional Analysis: Importance of Dimensional Analysis & Model Study- Units and Dimensional Formulae for Various Engineering Quantities.	CRT	See List Below for Video Links	1	1	0	0
	<i>Fundamental Concepts of Dimensional Analysis (Contd): Dimensional Homogeneity. Non-dimensional Parameters-</i>	CRT		2	0	0	0
	<i>Raleigh's-Buckingham's Method π Theo</i>	CRT		1	0	0	0
	<i>Fundamental Concepts of Dimensional Analysis (Contd): Omitted and Superfluous Variables</i>						
	<i>Application of Concepts of Dimensional Analysis for Practical Cases: Capillary Rise, Drag on Cylinder, Resistance of a Ship, Discharge over a Sharp Crested Weir, Fall Velocity of a Sphere, Head Characteristics of a Pump, Thrust on a Propeller.</i>	CRT + Project		2	0	1	0
(I)	Similarity Laws: Concepts of Similarity- Geometric, Kinematic and Dynamic Similarities.	CRT + Video		1	1	0	0
	<i>Similarity (Contd): Important Dimensionless Numbers- Reynolds Number, Froude Number, Mach Number, Euler Number, Weber Number.</i>	CRT		1	0	0	0
	<i>Similarity (Contd): Similarity Laws - Reynolds law and Froudes law.</i>	CRT		2	n	n	n
	<i>Similarity (Contd): Modelling Criteria- Distorted Models and River models.</i>	CRT + Project		1	0	2	0
	<i>Similarity (Contd): Practical applications of modelling and similarity.</i>	CRT + Project		2	0	2	0
Sub total				13	2	5	0

Video Links

Bernoulli Equation: <https://www.youtube.com/watch?v=brN9citH0RA>

<https://www.youtube.com/watch?v=bC8v6hIXnSk> <https://www.youtube.com/watch?v=UJ3-Zm1wblQ>

<https://www.youtube.com/watch?v=oUd4WxjoHKY>

<http://www.efm.leeds.ac.uk/CIVE/FluidsLevel1/Unit03/T4.html> Flow Measurement:

Venturi Meter Fabrication :	:	https://www.youtube.com/watch?v=Zpux9MvvDmw
Venturi Efect	:	https://www.youtube.com/watch?v=H3TcLoapJBo
	:	http://www.wermac.org/specials/venturiflowmeter.html
Flow over Weirs	:	https://www.youtube.com/watch?v=oXYHe-DGyVE
Flume demo	:	https://www.youtube.com/watch?v=awsnbnlijy78
Weirs	:	https://www.youtube.com/watch?v=Ax38XN_XqCU
V-Notch	:	https://www.youtube.com/watch?v=2dZfln7CUos
Reynolds Experiment	:	

https://www.google.co.in/url?sa=t&rct=j&q=&esrc=s&source=web&cd=1&cad=rja&uact=8&ved=0ahUKEwi95tTyzevMAhXMQY8KHTYSCpYQuAIIHDAA&url=https%3A%2F%2Fwww.youtube.com%2Fwatch%3Fv%3DoApDhs4xtaY&usq=AFQjCNHBzFOQZmxeLQ-J2f3m4Jq_kNy5yA:

<https://www.youtube.com/watch?v=1wNmtle6qkE:> https://www.youtube.com/watch?v=0ThQ_nD97hY

<https://www.google.co.in/url?sa=t&rct=j&q=&esrc=s&source=web&cd=31&cad=rja&uact=8&ved=0ahUKEwj7tsKx0evMAhVFpo8KHdu4AL44HhAWCBowAA&url=https%3A%2F%2Fwww.studyblu.com%2Fnotes%2Fnote%2Fn%2Flecture-4-flowthroughpipelinespdf%2Ffile%2F3676950&usq=AFQjCNEU9-DkCQ1MOQVWRvxBTEZmvrLlew> Pipe Friction Expt :

http://uorepc-nitk.vlabs.ac.in/exp1/index.html#AVPlayerID_65ed5c82

Visiflow Applet :

<http://www.ce.utexas.edu/gishydro/ferdi/webedu/visiflow/visiflow.html> http://www.lmfa.ec-lyon.fr/perso/Valery.Botton/english/acoustic_streaming_bis.html

<https://www.physicsforums.com/threads/experimental-fluid-mechanics-videos-series.113713/>

FCEN0402 INTRODUCTION TO PROGRAMMING IN C

Pre – requisites	Course Type	Credits
Nil	Theory + Pracice	5

Course Objectives:

1. To provide basic knowledge of programming tools and techniques.
2. To familiarize the programming environment and syntax of C programming.
3. To understand the working of basic programming constructs.
4. To learn different powerful concepts that can be applied in project development.
5. To develop art of writing efficient programs. **Course Outcomes:**

1. The students will be able to apply programming skills to problem solving.
2. The student will able to write 150 to 200 line programs without any error. 3. At the end of the session the students can come out with a mini project applying their programming skills.

Module I:

(23Hours)

(A) Problem solving techniques: Algorithm, flow chart; Structure of C program, Character set, Identifiers, Keywords, Data Types, Constants and Variables, Input-output statements, relational and logical operators, increment and decrement operators, conditional operator, bit-wise operators, assignment operators, expressions, type conversions, conditional expressions, precedence and order of evaluation, statements and blocks, if and switch statements, loops:-while, do-while and for statements, break, continue, goto. **(Most of the topics will be**

Module II:

(30 Hours)

(B) Arrays-concepts, declaration, definition, accessing elements, two-dimensional and multi-dimensional arrays, applications of arrays. Designing structured programs:-Functions, parameter passing, user defined functions, recursive functions, storage classes-extern, auto, register, static, scope rules. pointers-

S. No.	Topic	Pedagogy	Details	Instructional Hrs				
				Theory	Practice	video	Project	
1	Problem solving techniques: Algorithm	CRT & Learn by example	Class Assignment on algorithm writing	1	0	0	0	
2	Problem solving techniques: flow chart		Class Assignment on flow chart writing	1	0	0	0	
3	Structure of C program	CRT	Familiarize with the programming editors	1	1	0	0	
4	Character set, Identifiers	CRT, Quiz	Quiz session	1	0	0	0	
5	Keywords, Data Types	CRT, Q & A	Q & A Session	1	0	0	0	
6	Constants and Variables, Input-output statements	CRT & PRA	Practice problems	1	1	0	0	
7	relational and logical operators, increment and decrement operators			1	1	0	0	
8	conditional operator, bit-wise operators, assignment operators,			1	1	0	0	
9	expressions, type conversions			1	1	0	0	
10	conditional expressions, precedence and order of evaluation			1	1	0	0	
11	statements and blocks, if and switch statements			CRT, PRA & learn by problem solving	2	1	0	0
12	loops:-while, do-while				1	1	0	0
13	for statements, break, continue, goto	1	1		0	0		
			Sub total	14	9	0	0	

concepts, initialization of pointer variables, pointers and function arguments, address arithmetic, Character pointers and functions, pointers to pointers, pointers and multidimensional arrays, dynamic memory management functions, command line arguments. Most of the topics will be through powerpoint presentation and practice mode)

Module III:

(27 Hours)

(B) Derived types-structures-declaration, definition and initialization of structures, accessing structures, nested structures, arrays of structures, structures and functions, pointers to structures, self referential structures, unions, typedef, bit fields, C program examples. Input and output-concept of a file, text files and binary files, streams, standard I/O, Formatted I/O, file I/O operations. Most of the topics will be through power point presentation and practice mode)

(C) **Text Books:**

1. E. Balaguruswamy "Programming in C", Tata McGraw Hill 3rd
2. Y. Kanetkar, "Let - 9th edition C",. BPB Publications

Reference:

1. H. Scheldt, "C The Complete Reference", Tata McGraw Hi

Module I

Module II

S. No.		Pedagogy	Details	Instructional Hrs			
				Theory	Practice	video	Project
1	Arrays-concepts	CRT, Quiz	Quiz session	1	0	0	0
2	Declaration, definition	CRT, Q & A	Q & A Session	1	0	0	0
3	accessing elements	CRT, PRA & learn by problem solving	Practice Programs	1	1	0	0
4	two-dimensional arrays			1	1	0	0
5	multi-dimensional arrays			1	1	0	0
6	applications of arrays	CRT, Learn by example		1	1	0	0
7	Designing structured programs:-Functions	CRT, PRA , PRO & learn by problem solving		1	0	0	2
8	parameter passing, user defined functions	CRT, PRA		1	1	0	0
9	recursive functions	CRT, PRA & learn by problem solving		1	1	0	0
10	storage classes-extern, auto, register, static, scope rules	CRT, PRA & QA	Q & A Session	1	1	0	0
11	pointers-concepts, initialization of pointer variables	CRT, PRA & learn by problem solving	Practice Programs	1	1	0	0
12	pointers and function arguments, address arithmetic, Character pointers and functions	CRT, PRA		2	1	0	0
13	pointers to pointers, pointers and multidimensional arrays	CRT, PRA		2	1	0	0
14	dynamic memory management functions, command line arguments	CRT, PRA		2	1	0	0
	<u>Module III</u>		Sub total	17	11	0	2
1	Derived types-structures-declaration	CRT, Q & A	Q & A Session	1	0	0	0
2	structures and functions,	CRT, PRA	Practice Programs	2	2	0	0
3	C program examples.	PRA		0	2	0	0
4	definition and initialization of structures, accessing structures	CRT, PRA		1	1	0	0

5	nested structures, arrays of structures	CRT, PRA	2	1	0	0
6	pointers to structures, self-referential structures,	CRT, PRA	1	1	0	0
7	unions, typedef, bit fields	CRT, PRA, Quiz	1	1	0	0
8	Input and output–concept of a file	CRT, PRA	1	1	0	0
9	text files and binary files, streams	CRT, PRA	1	1	0	0
10	standard I/O, Formatted I/O	CRT, PRA	1	1	0	0
11	file I/O operations	CRT, PRA	2	1	0	0
12	Mini Project	PRO	0	0	0	2
		Sub total	13	12	0	2

FCEN0403 OBJECT ORIENTED PROGRAMMING USING C++

Pre - requisites	Course Type	Credits
Nil	Theory + Pracice	5

Course Objective As a result of successful completion of this course, the students will:

1. Get a clear understanding of object-oriented concepts.
2. Understand object oriented programming through C++.
3. Understand the concept of classes and objects, inheritance, polymorphism.

Course outcome Upon successful completion of this course, students should be able to:

1. Students will able to write 150 to 200 lines programs without any error.
2. The student will understand the advantage of object oriented program over structured oriented program.

Module-I (25 hours)

(A) Introduction to object oriented programming: object oriented concepts (Class, object, encapsulation, aggregation, inheritance and polymorphism). How to write a C++ program. Data types, expressions, operators, control structures. Functions: definition, parameter passing, inline function, function overloading. Classes: data members, function members, static data members, constant members function, and friend function. **Most of the topics will be through power point presentation and practice mode)**

Module-II (30 hours) (A) More about classes: Constructors, destructors, friend classes, nested classes, local classes, this pointer, namespaces. Overloading: Operator overloading (binary, unary, String Concatenation, increment, decrement), operator overloading using friend function (Stream operators). Type conversion (Using constructor, Operator function). Inheritance: Derived classes, member accessibility, forms of inheritance, virtual base classes. Polymorphism: Pointers to objects, virtual functions, Abstract class, virtual destructors. **Most of the topics will be through power point presentation and practice mode)**

Module - III (20 hours)

(A) Streams & Files: streams, hierarchy of stream classes. Unformatted I/O operators, formatted i/operations manipulators, user defined manipulators, exception handling. Templates, Standard template Library. **Most of the topics will be through power point presentation and practice mode)**

Text Books:

1. E. Balguruswamy, "Object Oriented Programming with

Module III		Sub total	12	18	0	0
		<i>PPT</i>				
13	Streams & Files: streams, hierarchy of stream classes. Unformatted I/O operators, formatted i/o Operations	Program Demonstration practice Lab	2	4	0	0
14	Manipulators: user defined manipulators,		2	2	0	0
15	exception handling		2	4	0	0
16	Templates: Standard template Library.		2	2	0	0
		Sub total	8	12	0	0

FCEN0404 DATABASE MANAGEMENT SYSTEM

Pre – requisites	Course Type	Credits
Nil	Theory + Pracice	5

Course Objectives:

1. To introduce the fundamental concepts of database systems and their importance in practical life.
2. To introduce the basic concepts necessary for designing, using, and implementing database systems and applications.
3. To make the students understand the principles behind relational database management systems including the database environment, the relational model, relational languages (SQL).
4. To make students able to develop simple SQL queries. Course Outcomes:

On successful completion of this course, students will be able to:

1. Understand, appreciate and effectively explain the underlying concepts of database technologies
2. Solve simple database problems related to manipulating data present in the database by writing SQL Queries.
3. Design and implement a relational model for a given problem-domain.

Module-I (14 Hrs): INTRODUCTION TO DATABASES

- (A) **Introduction to Database Systems and File Based Systems:** Database Systems, Common uses of Database Systems, File Based Approach, Limitations of File Based Approach, File-oriented Systems vs. Database Systems (Most of the topics will be through power point presentation: Demonstration of Fileoriented System and Database System)
- (B) **Database Approach:** Database, Database Management System (DBMS), Database Application Programs, Components of DBMS Environment, Advantages and Disadvantages of DBMS. (Most of the topics will be through power point presentation)
- (C) **Roles in Database Environment:** Data and Database Administrators (DBA), Database Designers, Application Developers, End-Users. (Most of the topics will be through power point presentation)

models, Network and Object Oriented Data models, Mapping E-R model to Relational model. **(Most of the topics will be through practice mode)**

(G) **Normalization:** Normal forms: 1NF, 2NF, 3NF **(Most of the topics will be through practice mode)**

MODULE-III (30 Hrs): RELATIONAL MODEL AND SQL

(H) **Terminologies of Relational Model:** Relational Data Structure, Mathematical Relations, Database Relations, Properties of Relations, Relational Keys, Representing Relational Database Schema.

(I) **Integrity Constraints and Views:** Nulls, Entity Integrity, Referential Integrity, General Constraints, Views, Purpose of Views.

(J) **SQL: Introduction:** Objectives of SQL, Writing SQL Command.

(K) **SQL: Data Definition:** Data Definition, Creating a Database, Table Operations (Create, Alter, and Drop), Creating an Index, Removing an Index.

(L) **SQL: Data Manipulation:** Simple Queries, Sorting Results (Order By), Aggregate Functions, Join, Grouping Results (Group By)

(M) **Query-By-Example:** Introduction to QBE, Building Select queries using QBE.

TEXT BOOKS:

1. *Database Systems By Thomas M. Connolly and Carolyn E. Begg - Pearson Education-4th, edition (Chapters: 1, 2, 3, 5, 6, 7.1, 7.2, 11, 13)*
2. *Fundamentals of Database System By Elmasari & Navathe - Pearson Education-5th, Edition.*

REFERENCE BOOKS:

1. *An introduction to Database System - Bipin Desai, Galgotia Publications*
2. *Database System: concept, Design & Application - S.K.Singh (Pearson Education)*
3. *Fundamentals of Database Management System –Gillenson, Wiley India*
4. *Database System Concepts - Sudarshan, Korth (McGraw-Hill Education) -6th, edition*

Module I

S. No.	Topic	Pedagogy	Details	Instructional Hrs			
				Theory	Practice	Video	Project
	INTRODUCTION TO DATABASES:						
1	Introduction to Database Systems and File Based Systems: Database Systems, Common uses of Database Systems,	PPT presentation	PPT	2	0	0	0
2	File Based Approach, Limitations of File Based Approach, File-oriented Systems vs. Database Systems.	PPT presentation, Demonstration, Practice	PPT, Demonstration of File oriented System and Database System, Examples	2	2	0	0
3	Database Approach: Database, Database Management System (DBMS), Database Application Programs, Components of DBMS Environment,	PPT presentation	PPT	5	0	0	0

(Comtd...)

S. No.		Pedagogy	Details	Instructional Hrs			
				Theory	Practice	video	Project
11	E-R models,						
12	Relational models,		PPT, Demonstration, Learn by Doing, Practice Assignments	1	2		
13	Network and Object Oriented Data models,		PPT presentation	2			
14	Mapping E-R model to Relational model		PPT, Demonstration	2	5		
15	Normalization: Normal forms: 1NF, 2NF, 3NF		Learn by Doing, Practice Assignments	3	1		
RELATIONAL MODEL AND SQL			Sub total	21	13	0	0
16	Terminologies of Relational Model: Relational Data Structure, Mathematical Relations, Database Relations, Properties of Relations, Relational Keys, Representing Relational Database Schema.	PPT presentation, Demonstration, Practice	PPT, Demonstration, Learn by Doing,	4	2		
17	Integrity Constrains and Views: Nulls, Entity Integrity, Referential Integrity, General Constraints, Views, Purpose of Views		Practice Assignments	2	3		
18	SQL: Introduction: Objectives of SQL, Writing SQL Command			1	2		
19	SQL: Data Definition: Data Definition, Creating a Database, Table Operations (Create, Alter, and Drop), Creating an Index, Removing an Index.						
20	SQL: Data Manipulation: Simple Queries, Sorting Results (Order By), Aggregate Functions, Join, Grouping Results (Group By)						
21	Query-By-Example: Introduction to QBE, Building Select queries using QBE						
Sub total							

FCEN0405 MECHANICAL UNIT OPERATIONS

Pre –requisites	L+T+P	Credits
NA	3+2 + 0	5

OBJECTIVE:

The students will learn characterization of solids, size reduction, techniques of solid fluid separation and mixing.

OUTCOME:

1. The students would understand about solids, their characterization, handling and various Processes involving solids.
2. The students will have knowledge on basic theory, calculations and Machinery involved in various solid handling operations.

MODULE - I

General characteristics of solids, different techniques of size analysis, shape factor, surface area determination, estimation of particle size. Screening methods and equipment, screen efficiency, ideal and actual screens.

Laws of size reduction, energy relationships in size reduction, methods of size reduction, classification of equipments, crushers, grinders, disintegrators for coarse, intermediate and fine grinding, power requirement, work index; size enlargement - principle of granulation, briquetting, pelletisation, and flocculation. **(Topics related to size reduction experiment (Ball mill, Jaw crusher, smooth roll crusher will be through laboratory)**

MODULE - II

Gravity settling, sedimentation, thickening, elutriation, double cone classifier, rake classifier, bowl classifier. Centrifugal separation - continuous centrifuges, super centrifuges, design of basket centrifuges; industrial dust removing equipment, cyclones and hydro cyclones, electrostatic and magnetic separators, heavy media separations, floatation, jigging

Theory of filtration, Batch and continuous filters, Flow through filter cake and filter media, Compressible and incompressible filter cakes, filtration equipments - selection, operation and Design of filters and optimum cycle of operation, filter aids. **(Topics related to filtration , sedimentation cyclone separator experiment will be through practice mode)**

MODULE - III

II Mixing and agitation - Mixing of liquids (with or without solids), mixing of powders, selection of Suitable mixers, power requirement for mixing. Storage and Conveying of solids - Bunkers, Silos, bins and hoppers, transportation of solids in bulk, conveyer selection, different types of Conveyers and their

performance characteristics. **(Topics related to transportation and storage tanks will be through practice mode)**

TEXT BOOKS:

FCCE0406 BUILDING MATERIALS and CONSTRUCTION

Pre –requisites	Course type	Credits
Nil	Theory +Practice	4

Course Objectives: The objectives of this course is to

- Provide knowledge about development, production, standardisation of cost- effective innovative building materials and construction technologies in housing and building sector. Show the role of materials in construction.
- Demonstrate the different bonding of bricks
- Impart the knowledge on various methods of construction for conventional civil engineering structures. Provide the knowledge about maintenance of buildings.

Course Outcomes: At the end of this course the students will be able to

- Select proper constructional materials specific to the structure to be built.
- Decide on the type of foundation required for a specific structure.
- Select the proper type of brick bonds for a wall.
- Know about the construction of brick masonry and stone masonry and their causes of failure
Know about the grade and strength of concrete.
- Supervise the construction works using - brick, stone, concrete, tile, mosaic, terrazzo, asphalt
- Know about the methods of plastering and the materials used
- Know about different types of stairs and their essential requirements

Module I (26 Hrs)

Bricks: Brick as a construction material and its importance, materials suitable for manufacture of bricks, methods of brick manufacture, types of bricks, qualities of a good brick, testing of Bricks, uses of bricks.

Stone: Introduction, classification, composition and characteristics, useful Indian stone, method of quarrying and dressing

Cement: Classification, chemical composition, Manufacturing of cement, hydration, tests for cement, uses of cement, types of cement, Mortar: Definition, composition and uses of mortar.

Concrete: Quality of mixing water, Workability, Factors affecting workability, Measurement of workability, Segregation, Bleeding, Uniformity of mixing, Mixing time, vibration of concrete, concrete mix design, admixtures, Grade and strength of Concrete.

Module II (16 Hrs)

Foundation: Types of foundation, spread foundations, pile foundations, pier foundations, excavation of foundation
Brick Masonry: Terminology used, Materials used, Causes of failure of brick masonry, Types of bonds, Brick laying, Joints in brick work, Reinforced brickwork, Joint between old and new masonry, Maintenance of brick work.

Stone Masonry: Terminology used, Materials used, Cutting and dressing of stones, Types of stone masonry, Rubble and Ashlar, General principles of construction, Joints of stone, Stone lining, maintenance of stone work, Artificial stones. Cavity walls: Purpose and method of construction.

Module III (11 Hrs)

Damp Proofing: Causes and effects, materials used for damp proofing, methods of preventing Dampness, Damp Proof Course.

Stairs: Terms used types of stairs, essential requirements, wooden stairs, concrete stairs, and metal stairs.

Flooring: Types of flooring and their construction- brick, stone, concrete, tile, mosaic, terrazzo, asphalt Plastering: Definition. Materials used for plastering, types of plastering, methods of plastering, defects and remedial measures in plastering.

Maintenance of Buildings: Causes and prevention of cracks in building, special repair of buildings, annual maintenance.

Text Books:

1. "Engineering Materials" by S. C. Rangwala et al., Charot
2. "Engineering Materials . and C. Rangwalabuildingetal., Charotar Publishingconstruction"House by S
3. "Material of Construction ", D.N.Ghose, TMH Publishing C

Reference Books:

1. "Properties of concrete" by A M Neville, Low Price Editi
2. "Building Construction" by S P Arora.
3. "Building Materials" by S.K.Duggal, TMH Publication
4. A text book of Building Construction by S K Sharma and B.K Kaul, S Chand & Company Limited
5. Building Construction", Sushil Kumar, Standard Publisher

Module I

S. No.	Topic	Pedago gy	Deta ils	Instructional Hrs			
				Theory	Practice	video	Project
	Bricks: Brick as a construction material and its importance Ref:T.B.:1,pp-58	CRT	1				
	Materials suitable for manufacture of bricks Ref:T.B.:1,pp-59,60	CRT	1				
	Methods of brick manufacture Ref:T.B.:1, pp- 52 to 57, 59 to 63	CRT	Video			1	
	Types of bricks & Qualities of a good brick Ref:T.B.:1,pp-77,78,74	CRT	1				
	Testing & uses of Bricks Ref:T.B.:1, pp -76 to 78	PRA			3		
	Stone: Introduction & Classification Ref:T.B.:1,pp -10 to 13	CRT	1				
	Uses of stones, method of quarrying Ref:T.B.:1, pp - 17,24	CRT	1				
	Method of dressing Ref:T.B.:1, pp - 32 to 34	CRT	1				
	Cement:						

	Classification, chemical composition Ref:T.B.: 1 ,pp - 109, 110	CRT	1			
	Manufacturing of cement Ref:T.B.:1, pp -113 to 117	CRT	1			
	Hydration of cement, Tests for cement, Uses of cement, Types of cement Ref:T.B.:1, pp -121 to 132	CRT+P RA		6		
	Mortar: Definition, composition and uses of mortar Ref:T.B.:1,pp - 138,142,147	PRA		3		
	Concrete: Quality of mixing water, Workability, Factors affecting workability, Measurement of workability Ref:T.B.:1,pp -160 to 162	CRT+P RA		3		
	Segregation, Bleeding, Uniformity of mixing, Mixing time, vibration of concrete Ref:T.B.:1	CRT	1			
	Concrete mix design, admixtures, Grade and strength of Concrete.Ref:T.B.:1	CRT	1			
			10	15	1	0

Module II

S. no.	Topic	Pedago gy	Det ails	Instructional Hrs			
				Theory	Practice	video	Project
	Foundation: Ref.: RB5pp -37,56,79 Types of foundation, spread foundations, pile foundations, pier foundations,	CRT	1				
	Excavation of foundation - Brick masonry						
	Terminology used Material used Failure of brick masonry Ref.: RB5pp -67,230	CRT	1				
	Types of bonds Brick Laying Joints in brick work Ref:R.B.5 pp -235 to 237, 239 to 243, 249	PRA		3			
	Reinforced brickwork Joint between old and new masonry, Maintenance of brick work Ref.: RB5pp -258	CRT	1				
	Stone Masonry:						
	Terminology used, Materials used, Ref.: RB5pp 00,201,202,203,204,205,206,207	CRT	1				
	Cutting and dressing of stones, Ref.:	CRT	1				

	Types of stone masonry, Rubble and Ashlar, Ref.: RB5pp -218 to 223	CRT	1				
	General principles of construction Ref.: RB5pp -216	CRT	1				
	Joints of stone, Stone lining, Ref.: RB5pp -2214	CRT	1				
	Maintenance of stone work Artificial stones Ref.:R.B. 5 Sushil Kumar.	CRT	1				
	Cavity walls Purpose Method of construction. Ref.: RB5pp-176,177,178,179,180	CRT	1				
	Test on aggregate						
	Fineness modulus of fine aggregates Fineness modulus of coarse aggregates Crushing value of coarse aggregate Test on mortar	PRA		3			
				10	6	0	0

Module III

S. No.	Topic	Pedagogy	Details	Instructional Hrs			
				Theory	Practice	video	Project
	Damp Proofing: Ref.: RB5pp- 151,153,154 Causes and effects, materials used for damp proofing	CRT		1			
	Damp Proofing: Ref.: RB5pp-151 Methods of preventing Dampness, Damp Proof Course.	CRT		1			
	Stairs Ref.: RB5pp-296 to 303 Terms used types of stairs	CRT		1			
	Stairs Ref.:R.B.: 5 Sushil KumaR pp-304,309,310 Essential requirements, Wooden stairs, Concrete stairs, Metal stairs.	CRT		1			
	Flooring: Ref.:R.B.: 5 Sushil Kumar pp-281 Types of flooring	CRT		1			
	Flooring Ref.: RB5pp-283 Construction of brick, Construction of stone,	CRT		1			
	Flooring Ref.: RB5pp-287,284 Construction of concrete, Construction of tile,	PRO					6
	Flooring Ref.: RB5pp-289,290,292 Construction of mosaic	PRO					

	<i>Construction of terrazzo</i>							
	<i>Construction of asphalt</i>							

Plastering: Ref:R.B: 5 Sushil Kumar pp-483,488,487 Definition. Materials used for plastering, Types of plastering	CRT		1			
Plastering: Ref.: RB5pp-484,485 Methods of plastering	CRT		1			
Plastering: Ref:T.B.: 1 Sushil Kumar pp-489,490 Defects and remedial measures in plastering.	CRT		1			
Maintenance of Buildings: Causes and prevention of cracks in building Ref.: RB5pp-701,702,703,704,705,706,707,708	CRT		1			
Maintenance of Buildings: Ref:R.B. 5 Sushil Kumar Special repair of buildings, annual maintenance.	CRT		1			
			11	0	0	6

FCEN0407 BASIC SURVEYING

Pre - requisites	Course Type	Credits
Nil	Theory + Pracice	4

Course objectives:

1. To make students able to apply knowledge of mathematics, science, and engineering to understand the measurement techniques and equipment used in land surveying.
2. To make students able to measure horizontal distances across clear landscape or across obstacles using surveying instruments like chain, tape etc.
3. To make students able to measure different elevation points
4. To enable students to sketch contour maps of the given topography using dumpy levelling instruments.

Course Outcomes:

On successful completion of course students will be able to

1. Apply math, science, and technology in surveying activities.
2. Measure horizontal distances across clear landscape and across obstacles.
3. Measure horizontal angles between geographical entities.
4. Plot given geographical area on drawing sheet.
5. Preparation of contour maps using Theodolite and Total station
6. Measure altitude of points at different elevation.
7. Function effectively as team members (or team leaders)

Module I (22hr)

Introduction to Surveying

Introduction to surveying: Classification, Basic Principle, List of Instruments used in surveying.

Linear measurement and chain survey: Use of various types of chains and tapes, measurement of correct length of lines, direct and indirect ranging, chaining along sloping ground. Obstacle in chaining, errors and their elimination. Compass surveying.

Module II (16hrs)

Levelling: Use of dumpy level and levelling staff. Temporary and Permanent adjustment of dumpy level, Reduction of levels by height of instrument and rise and fall method. Curvature and refraction error, sensitiveness of level tube, reciprocal levelling, levelling difficulties and common errors

Module III (17hrs)

Contouring: Characteristics, methods and types of contouring (topographical map study) Preparation of contours using auto level/Dumpy level through Surfer software

Text Books:

1. "A Text Book-I", of Surveying. K. Duggal, TMH Publisher chapters 2,3,6,
 2. Surveying- Vol-1, B.C. Punmia Chapters 4,5,6,9,11
- Reference Books:**
3. Surveying and Levelling Vol-1, T. P. Kanetkar and S. V. Kulkarni
 4. Surveying Vol-1 by R Agor

Module I

S. No.	Topic	Pedagogy	Details	Instructional Hrs			
				Theory	Practice	video	Project
1	Linear measurements and Angular measurements						
1	Introduction to surveying: Classification, Basic Principle, List of Instruments used in surveying	CRT		1	0	0	0
2	Linear measurement and chain survey: Use of various types of chains and tapes, measurement of correct length of lines	CRT		1	0	0	0
3	direct and indirect ranging, chaining along sloping ground	CRT & PRA	Field survey	1	2	0	0
4	Obstacle in chaining			3	6	0	0
	Compass surveying	CRT		1		0	0
5	Open traversing and closed traversing using prismatic compass	CRT & PRA	Field survey	0	4	0	0
6	Determination of closing errors by graphical and filed method			1	2	0	0
	<u>Module II</u> Levelling	Sub total	22	8	14	0	0
1	Levelling: Use of dumpy level and levelling staff. Temporary and Permanent adjustment of dumpy level	CRT & PRA	Filed survey	1	2	0	0
2	Reduction of levels by height of instrument			1	2	0	0
3	Reduction of levels by rise and fall			1	2	0	0
4	Fly levelling and check levelling	PRA		0	4	0	0
5	Curvature and refraction error	CRT		1	0	0	0
6	Sensitiveness of level tube, reciprocal levelling	CRT & PRA		1	0	0	0
7	levelling difficulties and common errors	CRT		1	0	0	0
	<u>Module III</u>	Sub total	16	6	10	0	0
1	Contouring: Characteristics	CRT		1	0	0	0
2	Methods and types of contouring	CRT		1	2	0	0
3	Topographical map study			0	4	0	0
4	Preparation of contours using auto level/Dumpy level through Surfer software	CRT & PRA	Field survey & surfer software	1	8	0	0
	Sub total	17		3	14	0	0

Prerequisite: Nil

OBJECTIVES

develop understanding and provide scientific basics of the life processes at the molecular level and explain the structure, function and inter-relationships of biomolecules and their deviation from normal and their consequences for interpreting and solving clinical problems.

Module I: Biochemical Organization And Bioenergetics 13

Scope of clinical biochemistry, component of the cell, structure and biochemical functions, membrane structure and functions, transport through biological cell membrane, the concept of free energy, determination of change in free energy from equilibrium constant and reduction potential, bioenergetics and biological oxidation – general concept of oxidation and reduction, electron transport chain, oxidative phosphorylation, uncouplers and theories of biological oxidation and oxidative phosphorylation.

Module II: Biomolecules 17

Carbohydrates: classification, properties. starch, glycogen, dextrin, inulin, cellulose, metabolism of carbohydrates, gluconeogenesis, glycogenolysis, glycolysis. citric acid cycle and its biological significance, role of sugar in nucleotide biosynthesis and pentose phosphate pathway.

Lipids: Classification, properties. sterols, essential fatty acids, eicosanoids, phospholipids, sphingolipids, metabolism of lipids, - oxidation and biosynthesis of ketone fatty bodies, cholesterol, acids, α, β porphyrin biosynthesis, metabolism of bile pigments.

Amino acids and nucleic acids: Classification, properties, biosynthesis of amino acids and proteins, essential amino acids, metabolism of amino acids and proteins, Nitrogen balance.

Nucleic acids: genetic code, nucleic acids, and structure of DNA and RNA, purine biosynthesis and pyrimidine biosynthesis.

Module III Macromolecules, Vitamins, Hormones, Enzymes 15

Physical and chemical properties, structure of haemoglobin, immunoglobulins and nucleoprotein, classification and their properties, occurrence, functions, requirements, deficiency manifestations and role of vitamins as coenzyme, chemical nature and properties, hormones, Nomenclature, enzyme kinetics, Michelles-Menten equation, classification and their properties, mechanism of action, enzyme inhibition, coenzyme significance and enzymes of clinical importance.

TEXTBOOKS:

1. Lehninger A.L., Nelson D.L. and Cox M.M. Principles of Biochemistry. CBS publishers and distributors
2. Murray R.K., Granner D.K., Mayes P.A. and Rodwell V.W. Harpers Biochemistry. Appleton and Lange, Stanford, Conneticut.
3. Thomas M. Devlin. Textbook of Biochemistry with clinical correlations. Wiley Liss Publishers

REFERENCES:

1. Burtis & Ashwood W.B. Tietz Textbook of Clinical chemistry. Saunders Company
2. Lubert Stryer W.H. Biochemistry. Freeman and company, New york.
3. Donald Voet & Judith G. Voet. Biochemistry. John Wiley and Sons, Inc.

FCEN0409 CELL BIOLOGY Credits 5 Prerequisite: Nil

OBJECTIVES

1. To study cell structure and functions of organelle functions
2. Exposure on transportations through cell membrane
3. To focus on different receptors and model of signaling
4. To introduce the concept of cell signaling

MODULE 1: Cell Structure and function 15

Origin and evolution of cells, molecular composition of cells, central role of enzymes, metabolic energy, biosynthesis of cell constituents, cell membrane, Nucleus, Endoplasmic reticulum, Golgi apparatus and Lysosomes, Bioenergetics and Metabolism –Mitochondria, chloroplasts, Peroxisomes.

MODULE II: Cell Division 15

Cell cycle –Mitosis, Meiosis, Molecules controlling cell cycle, Extra cellular matrix, role of matrix in cell enthore : Gap junctions, Tight junctions, Plasmodesmata.

Trnapt across cell membrane

Passive and Active Transport, Permeases, Ion channels, ATP pumps. Na^+ / K^+ / Ca^{2+} pumps uniport, symport antiporter system. Ligand gated / voltage gated channels, Agonists and Antagonists.

MODULE III Signal Trnaduction 15

Receptors –extracellular signaling, Cell surface / cytosolic receptors and examples, Different classes of receptors antocrine / paracrine / endocrine models, Secondary messengers molecules.

The Development and causes of cancer, tumour viruses, oncogenes, prevention and treatment.

Total Hours: 45

TEXT BOOK:

The Cell: A molecular approach by Geoffrey M.Cooper.ASM Press, Pages:673

REFERENCE BOOKS:

1. *Molecular Biology of the Cell Edition 4*, Roberts, Keith Alberts, Bruce Johnson, Alexander Raff, Martin Walter,

Peter Lewis, Julian, Garland

2. *Molecular Cell Biology*, Lodish, Harvey Krieger, Monty Kaiser, Chris A. Berk, Arnold, W H

**FCEN0410 Introduction to Web Technology (Theory +Pract)
Credit 4**

Code	Course Title	Course Type	Credits	Pre-requisite	T-P-Pr
FCEN0410	Introduction to Web Technology	Theory+ Practice	4	Nil	3-1-0

Course Objective

This course is intended to teach the basics involved in publishing content on the World Wide Web. the fundamentals of how the Internet and the Web function, a basic understanding of graphic production with a specific stress on creating graphics for the grounding introduction to more advanced topics such as programming and scripting. This will also expose students to the basic tools and applications used in Web publishing.

The student will be able to Analyze a web page and identify its elements and attributes.Create web pages using XHTML and Cascading Style Sheets.Build dynamic web pages using JavaScript (Client side programming).Create XML documents and Schemas.Build interactive web applications using AJAX.

Syllabus

Unit 1: Introduction to Web (8hrs)

What is Web?, What is WWW, Web site - Static and Dynamic web site, Web application - Client-server, Web development

Technologies- Html, CSS, Js , XML, Servlet & JSP, PHP and Ajax.

Unit 2: HTML (7hrs)

Introduction to Html, Html structure, Html Editors, Html element/tag & attributes, Designing simple page - Html tag, Head

tag, Body tag; More Html tags - Anchor tag, Image tag, Table tag, List tag, Frame tag, Div tag ; Html forms - Input type,

Text area, Select , Button.

Unit 3: CSS (6hrs)

Introduction to CSS, Syntax, Selectors ,Embedding CSS to Html, Formatting fonts, Text & background colour, Borders &

boxing.

Unit 4: JavaScript (9hrs)

Introduction to JS, Embedding JS into Html, Variables, Data types, Operators, Conditional statements, Looping statements,

Strings, Arrays, Math Object, Date Object, Functions, Objects, Event Handling.

Unit 5: XML (9hrs)

Introduction to XML, Difference b/w Html & XML, XML editors, XML Elements & Attributes XML DTD, XML Schema,

XML DOM.

Reference Books:

HTML, XHTML & CSS Bible, Brian Pfaffenberger, Steven M.Schafer, Charles White, Bill Karow- Wiley Publishing Inc, 2010

HTML Black Book by Steven Holzner

Web Design with HTML, CSS, JavaScript and jQuery Set by Jon Duckett

Beginning Java Script with DOM scripting and Ajax By Christian Heilmann- Apress Publisher, 2010

Learning PHP & My SQL, Michele Davis, Jon Philips- O'Reilly Publisher, 2009

PHP Cook book By: David Sklar, Adam Trachtenberg- O'Reilly Publisher, 2008

Introduction to Web Technology Lab

List of Programs:

1. Create a simple web page using HTML
2. Create and HTML page with a table and a set of ordered and unordered list.
3. Use CSS in the above web page
4. Design a web page for a company XYZ
5. Develop a static web page that shows basic animation
6. Develop a web page for an audio company
7. Develop a dynamic web page
8. Develop a dynamic web page using DHTML and CSS
9. Consider a company ABC which is into selling movie CDs. Develop a web page for the company.
10. Create a web site in which you can navigate from one page to another
11. Create a dynamic web page for a college
12. Organize a set of data using XML

Pedagogy

Sl · N o.	Topic	Teaching Method	Instructional Hours		
			Theory	Practical	
	Introduction to Web Technology				
1	What is Web?, What is WWW, Web site - Static and Dynamic web site,	Class Room Teaching+ PPT	3	0	
2	Web application - Client-server, Web development Technologies- Html, CSS, Js , XML, Servlet & JSP, PHP and Ajax.	Class Room Teaching+ PPT	3	0	
3	Introduction to Html, Html structure, Html Editors, Html element/tag & attributes, Designing simple page - Html tag, Head tag, Body tag; More Html tags - Anchor tag, Image tag, Table tag, List tag,	Class Room Teaching+ Lab Practice	3	3	
4	Frame tag, Div tag ; Html forms - Input type, Text area, Select , Button.		3	3	
5	Introduction to CSS, Syntax, Selectors		3	3	
6	Embedding CSS to Html Formatting fonts Text & background colour, Borders & boxing.		3	3	
7	Introduction to JS, Embedding JS into Html, Variables, Data types,		3	3	
8	Operators, Conditional statements, Looping statements, Strings, Arrays, Math Object, Date Object, Functions, Objects		3	3	
10	Event Handling		Class Room Teaching+ PPT	3	0
11	Introduction to XML, Difference b/w Html & XML			3	0
12	XML editors, XML Elements	Class Room Teaching+ Lab Practice	3	3	
13	Attributes XML DTD, XML Schema, XML DOM		3	3	
		Total	30	24	

FCEN0411 Data Structures and algorithms (Theory+ Practice) Credit 4 L-T-P (3-0-1)

Unit I: Introduction to Data structures

Definition,

Classification of data structures: primitive and non primitive, Elementary data organization, Time and space complexity of an algorithm (Examples), String processing. Dynamic memory allocation and pointers: Definition of dynamic memory allocation, Accessing the address of a variable, Declaring and initializing pointers, Accessing a variable through its pointer, Meaning of static and dynamic memory allocation, Memory allocation functions: malloc(), calloc(), free() and realloc(). Recursion: Definition, Recursion in C (advantages), Writing Recursive programs –Binomial coefficient, Fibonacci, GCD.

Unit II: Searching and Sorting

Basic Search Techniques: Sequential search: Iterative and Recursive methods, Binary search: Iterative and Recursive methods, Comparison between sequential and binary search. Sort: General background and definition, Bubble sort, Selection sort, Insertion sort, Merge sort, Quick sort

Unit III: Stack and Queue

Stack Definition, Array representation of stack, Operations on stack: Infix, prefix and postfix notations, Conversion of an arithmetic expression from Infix to postfix, Applications of stacks. Queue: Definition, Array representation of queue, Types of queue: Simple queue, Circular queue, Double ended queue (deque) , Priority queue , Operations on all types of Queues

Unit IV: Linked List

Definition, Components of linked list, Representation of linked list, Advantages and Disadvantages of linked list. Types of linked list: Singly linked list, doubly linked list, Circular linked list, Operations on singly linked list: creation, insertion, deletion, search and display.

Unit V: Tree Graphs and their Applications:

Definition : Tree, Binary tree, Complete binary tree, Binary search tree, Heap Tree terminology: Root, Node, Degree of a node and tree, Terminal nodes, Non-terminal nodes, Siblings, Level, Edge, Path, depth, Parent node, ancestors of a node. Binary tree: Array representation of tree, Creation of binary tree. Traversal of Binary Tree: Preorder, Inorder and postorder. Graphs, Application of Graphs, Depth

First search, Breadth First search.

Books for References:

1. *Weiss, Data Structures and Algorithm Analysis in C, II Edition, Pearson Education, 2001*
2. *Lipschutz: Schaum's outline-Hillseries Data structur*

3. Robert Kruse *Data Structures and program designi*
4. Trembley and Sorenson *Data Structures*
5. E. Balaguruswamy *Programming in ANSI C.*
6. Bandyopadhyay, *Data Structures Using C Pearson Education, 1999*
7. Tenenbaum, *Data Structures Using C. Pearson Education, 200*
8. Kamthane: *Introduction to Data Structures in C. Pearson Education 2005.*
9. Hanumanthappa M., *Practical approach to Data Structures, Laxmi Publications, Fire Wall media 2006*
10. Langsam, Ausenstein Maoshe & M. Tanenbaum Aaron *Data Structures using C and C++ Pearson Education*

List of Programs

Part A

1. Use a recursive function to find GCD of two numbers.
2. Use a recursive function to find the Fibonacci series.
3. Use pointers to find the length of a string and to concatenate two strings.
4. Use pointers to copy a string and to extract a substring from a given a string.
5. Use a recursive function for the towers of Hanoi with three discs.
6. Insert an integer into a given position in an array.
7. Deleting an integer from an array.
8. Write a program to create a linked list and to display it.
9. Write a program to sort N numbers using insertion sort.
10. Write a program to sort N numbers using selection sort.

Part B

1. Inserting a node into a singly linked list.
2. Deleting a node from a singly linked list.
3. Pointer implementation of stacks.
4. Pointer implementation of queues.
5. Creating a binary search tree and traversing it using in order, preorder and post order.
6. Sort N numbers using merge sort.

Pedagogy

		Teaching	Refer	Instructional
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No.		Method	Tool	Hours	
				Thy	Pral
	Data Structures and algorithms				
1.	Definition, Classification of data structures: primitive and nonprimitive, Elementary data organization, Time and space complexity of an algorithm (Examples),	Class room teaching+		2	0
2.	String processing. Dynamic memory allocation and pointers: Definition of dynamic memory allocation, Accessing the address of a variable, Declaring and initializing pointers, Accessing a variable through its pointer,		Lab Practice		4
3.	Meaning of static and dynamic memory allocation, Memory allocation functions: malloc(), calloc(), free() and realloc(). Recursion: Definition, Recursion in C (advantages),	Class Room Teaching+ ppt		2	0
4.	Writing Recursive programs – Binomial coefficient, Fibonacci, GCD.			2	0
5.	Basic Search Techniques: Sequential search: Iterative and Recursive methods, Binary search: Iterative and Recursive methods, Comparison between sequential and binary search.			2	0
6.	Sort: General background and definition, Bubble sort, Selection sort, Insertion sort,	Class Room Teaching+		2	3
7.	Merge sort, Quick sort			2	3
8.	Stack Definition, Array representation of stack, Operations on stack: Infix, prefix and postfix notations,		Lab Practice		2
9.	Conversion of an arithmetic expression from Infix to postfix,	Class Room Teaching+		2	0
10.	Applications of stacks.	PPT		2	0
11.	Queue: Definition, Array representation of queue, Types of queue: Simple queue, Circular queue, Double ended queue (deque) , Priority queue , Operations on all types of Queues	Class Room Teaching+ Lab Practice		2	2
12.	Definition, Components of linkedlist, Representation of linked list, Advantages and Disadvantages of linked list.	Class Room Teaching+ PPT		2	0
13.	Types of linked list: Singly linked list, doubly linked list, Circular linked list, Operations on singly linked list: creation, insertion, deletion, search and display	Class Room Teaching+		4	3
14.	Definition : Tree, Binary tree, Complete binary tree, Binary search tree, Heap Tree terminology: Root, Node, Degree of a node and tree, Terminal	Lab Practice		4	3

	nodes, Non-terminal nodes, Siblings, Level, Edge,			
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	Path, depth, Parent node, ancestors of a node.			
15.	Binary tree: Array representation of tree, Creation of binary tree. Traversal of Binary Tree: Preorder, Inorder and postorder. .		2	2
16.	Graphs, Application of Graphs, Depth First search, Breadth First search		2	3
Total			39	24

FCEN0412 Designing Enterprise Network (Theory+ Practice) Credit 5 L-T-P (3-1-1)

Unit I: Networking Fundamentals

The TCP/IP and OSI Networking Models, Fundamentals of Ethernet LANs, Fundamentals of WANs, Fundamentals of IPv4 Addressing and Routing, Fundamentals of TCP/IP Transport and Applications

Unit II: Ethernet LANs and Switches

Building Ethernet LANs with Switches, Cisco LAN Switches, Configuring Ethernet Switching.

Unit III: IP Version 4 Addressing and Subnetting

Perspectives on IPv4 Subnetting, Analyzing Classfull IPv4 Networks, Analyzing Subnet Masks, Analyzing Existing Subnets, Implementing IP Version 4: Operating Cisco Routers, Configuring IPv4 Addresses and Routes, Implementing Ethernet

Virtual LANs, Troubleshooting Ethernet LANs, Spanning Tree Protocol Concepts, Troubleshooting LAN Switching

Unit IV: LAN Routing

Configure IPv4 Routing, Configure and Verify Host Connectivity, Advanced IPv4 Addressing Concepts, Describe the boot process of Cisco IOS routers; Operation status of a serial interface; Manage Cisco IOS files; Routing and Routing Protocols; OSPF (multi-area); EIGRP (single AS); Passive Interface

Unit V: IPv4 Services and IP Version 6

Basic IPv4 Access Control Lists, Advanced IPv4 ACLs and Device Security, Network Address Translation, Recognize high availability (FHRP); Describe SNMP v2 and v3, IPV6 addressing **Reference**

Books:

1. CCNA Cisco Certified Network Associate: Study Guide (With CD) 7th Edition (Paperback), Wiley India, 2011 **Text Books:**
2. CCENT/CCNA ICND1 640-822 Official Cert Guide 3 Edition (Paperback), Pearson, 2013

3. Routing Protocols and Concepts CCNA Exploration Companion Guide (With CD) (Paperback), Pearson, 2008
4. CCNA Exploration Course Booklet : Routing Protocols and Concepts, Version 4.0 (Paperback), Pearson, 2010

DESIGNING ENTERPRISE NETWORKS –Lab

1. Switch Configuration - Basic Commands
2. Switch Configuration - Switch Port Security
3. Router - Configuration
4. Configuration of IP Address for a Router
5. Setting up of Passwords
6. PPP Encapsulation, PPP PAP Authentication, PPP CHAP Authentication
7. Configuration of Static and Dynamic Routing
8. Configuration of Default Route
9. Implementation of EIGRP
10. Implementation of OSPF
11. VLAN Configuration
12. Switch Troubleshooting
13. Configuration of Access-lists - Standard & Extended ACLs
14. Cisco Discovery Protocol
15. DHCP, DHCP Relay & DHCP Exclusions
16. Configuring Logging to a Remote Syslog Server

FCEN0413 Installation and configuration of Linux Desktop

Code	Course Title	Course Type	Credits	Pre-requisite	T-P-Pr
FCEN0413	Installation and configuration of Linux Desktop	Theory+ Practice	4	Basic computer knowledge	3-1-0

Course Objectives:

The course provides an overview of the Linux Operating System, geared toward new users as an exploration tour and getting started guide. This unit provides examples to help the learners get a better understanding of the Linux system. The unit also provides the guidelines for the learners to take up vendor certifications. The unit explores the basics of Linux, the underlying management of the Linux operating system and its network configuration. The complete system services of Linux is explained along with the troubleshooting.

Course Outcome:

To enable the students to have a hands on practical exposure to the Linux Red Hat Enterprise and make them prepared for the RHCE Certification.

Syllabus

Unit I: Linux Introduction (9hrs)

Introduction to

Multi user System, History of UNIX, Features & Benefits, Versions of UNIX, Features of UNIX File System,, Commonly Used Commands like who, pwd, cd, mkdir, rm, rmdir, ls, mv, ln, chmod, cp, grep, sed, awk ,tr, yacc etc. getting Started (Login/Logout) . Creating and viewing files using cat, file comparisons, View files, disk related commands, checking disk free spaces.

Exploring Linux Flavors

to various

Introduction

Linux flavors. , Debian and rpm packages, Vendors providing DEBIAN & RPM distribution & Features. Ubuntu.History, Versions, Installation, Features, Ubuntu one. Fedora: History, Versions, Installation, Features.

Unit II: The Unix File System (7hrs)

Inodes - Structure of a regular file –Directories - Conversion of a path name to an inode -Super block - Inode assignment to a new file - Allocation of disk blocks. System calls for the file System: Open –Read - Write - Lseek –Close - File creation - Creation of special files - Changing directory and root - changing owner and mode –stat and fstat - pipes - Dup - Mounting and Un mounting file systems - Link and Un link.

Unit III: Unix Process Management(6hrs) The Structure of Processes: Process States and Transitions - Layout of system memory - Context of a process. Process Control: Process Creation –Signals –Process Termination –Invoking other programs –PID & PPID –Shell on a Shell.

Unit IV: (7hrs)

VI editor

Vi Editor: Introduction to Text Processing, Command & edit Mode, Invoking vi, deleting & inserting Line, Deleting & Replacing Character, Searching for Strings, Yanking, Running Shell Command Macros, Set Window, Set Auto Indent, Set No. Communicating with Other Users: who, mail, wall, send, mesg, ftp.

Unit V: (10hrs)

System Administration

Common administrative tasks, identifying administrative files configuration and log files, Role of system administrator, Managing user accounts-adding & deleting users, changing permissions and ownerships, Creating and managing groups, modifying group attributes, Temporary disabling of monitoring system performance - file security & Permissions, becoming super user using su.

Getting system information with uname, host name, disk partitions & sizes, users, kernel, installing and removing packages with rpm command

Books for Reference

1. The Design of Unix Operating System, Maurice J. Bach, Pearson Education, 2010
2. Advance UNIX, a Programmer's Guide, S. Prata, BPB
3. Unix Concepts and Applications, Sumitabh Das, 2010
4. The UNIX Programming Environment, B.W. Kernighan & R. Pike, Prentice Hall of India. 2009
5. Guide to UNIX Using LINUX, Jack Dent Tony Gaddis, Vikas/ Thomson Pub. House Pvt. Ltd. 2010

List of Programs

1. Execute 25 basic commands of UNIX.
2. Basics of functionality and modes of VI Editor.
3. WAP that accepts user name and reports if user is logged in.
4. WAP which displays the following menu and executes the option selected by user:
1. ls 2. Pwd 3.ls -l 4. ps -fe
5. WAP to print 10 9 8 7 6 5 4 3 2 1 .
6. WAP that replaces all "*.txt" file names with "*".
7. WAP that echoes itself to stdout, but backwards.
8. WAP that takes a filename as input and checks if it is executable, if not make it executable.
9. WAP to take string as command line argument and reverse it.
10. Create a data file called employee in the format given below:

- a. EmpCode Character
- b. EmpName Character
- c. Grade Character
- d. Years of experience Numeric
- e. Basic Pay Numeric

\$vi employee

A001	ARJUN	E1	01	12000.00
A006	Anand	E1	01	12450.00
A010	Rajesh	E2	03	14500.00
A002	Mohan	E2	02	13000.00
A005	John	E2	01	14500.00
A009	Denial Smith	E2	04	17500.00
A004	Williams	E1	01	12000.00

Perform the following functions on the file:

- a. Sort the file on EmpCode.
- b. Sort the file on
 - (i) Decreasing order of basic pay
 - (ii) Increasing order of years of experience.
- c. Display the number of employees whose details are included in the file.
- d. Display all records with 'smith' a part of employ
- e. Display all records with EmpName starting with 'B
- f. Display the records on Employees whose grade is E2 and have work experience of 2 to 5

years.

g. Store in 'file 1' the names of all employees whos

h. Display records of all employees who are not in grade E2.

Pedagogy

S I . N o	Topic	Teaching Method	Refere nce/To OI	Instructional Hours	
				Theo ry	Pract ical
	Installation and configuration of Linux Desktop				

.					
1	Introduction to Multi user System, History of UNIX, Features & Benefits, Versions of UNIX, Features of UNIX File System,	Class Room Teaching + PPT		2	0
2	Commonly Used Commands like who, pwd, cd, mkdir, rm, rmdir, ls, mv, ln, chmod, cp, grep, sed, awk ,tr, yacc etc	Class Room Teaching + Lab Practice		2	3
3	getting Started (Login/Logout) . Creating and viewing files using cat, file comparisons, View files, disk related commands, checking disk free spaces.			2	3
4	Introduction to various Linux flavors. , Debian andrpm packages, Vendors providing DEBIAN & RPM distribution & Features. Ubuntu. History, Versions, Installation, Features, Ubuntu one. Fedora: History, Versions, Installation, Features. _			3	3
5	Inodes - Structure of a regular file –Directories - Conversion of a path name to an inode -Super block - Inode assignment to a new file - Allocation of disk blocks. System calls for the file System: Open –Read - Write - Lseek – Close - File creation - Creation of special files -	Class Room Teaching + ppt Lab Practice		4	3
6	Changing directory and root - changing owner and mode –stat and fstat - pipes- Dup - Mounting and Un mounting file systems - Link and Un link	Class Room Teaching + Lab Practice		3	3
7	The Structure of Processes: Process States and Transitions - Layout of system memory - Context of a process. _____	Class Room Teaching + PPT		2	0
8	Process Control: Process Creation –Signals – Process Termination			2	0
9	Invoking other programs –PID & PPID –Shell on a Shell			2	0
10	Vi Editor: Introduction to Text Processing, Command & edit Mode, Invoking vi, deleting & inserting Line,			3	0
11	Deleting & Replacing Character, Searching for Strings, Yanking, Running Shell Command Macros, Set Window, Set Auto Indent, Set No.			2	0
12	Communicating with Other Users: who, mail, wall, send, mesg, ftp			2	0

System Administration

1 3	Common administrative tasks, identifying administrative files configuration and log files, Role of system administrator, Managing user			4	3
	accounts-adding & deleting users, changing permissions and ownerships,	Class Room Teaching + Lab Practice			
1 4	Creating and managing groups, modifying group attributes, T accounts, creating and mounting file system, checking and monitoring system performance -	Class Room Teaching + Lab Practice		2	2
1 5	file security & Permissions, becoming super user using su. Getting system information with uname, host name, disk partitions & sizes, users, kernel, installing and removing packages with rpm command	Class Room Teaching + Lab Practice		4	3
TOTAL				39	23

**FCEN 0414 Information Security-I (Theory+ Practice)
Credit 4**

T-P-Pr (3-1-0)

Code	Course Title	Course Type	Credits	Pre-requisite	T-P-Pr
FCEN 0414	Information Security-I	Theory+ Practice	4	Nil	3-T-0

Course Objectives : The course primarily covers the Types of Threats, Vulnerabilities, Risks and various terminologies in Information Security. It explains the formation of Security policy at various levels inside the Organization and provides the definition Procedures, Standard and Guidelines. The units emphasize the need of Performing Asset Classification and Declassification, Retention and Disposal of Information Asset also it identifies the various levels of Authorization for access Viz., Owner, Custodian and User. The course covers the different types of Access Controls and Physical security measures to safeguard the Assets and conclusively, it deals with the Digital Rights Management also covering the concepts of Common Authentication protocols and Real world Protocols. This course enables the students to understand the concepts of IT security, Threats, Vulnerabilities, Impact and control measures. And also to get familiarized with Asset management along with the objective to create awareness in Digital Rights management.

Course Outcome:

To enable the students to have a hands on practical exposure towards Configuration and Security of Windows7, Password Cracking Techniques, Windows Registry, Firewall, Kelogger, Monitoring security.

Syllabus

Unit I: (6hrs)

Introduction:

Security Definition, Why Security, Security and its need, Current Trends and Statistics, Basic Terminology, The C I A of Security the Relation: Security functionality and Ease of Use Triangle.

Unit II : (11hrs)

USER IDENTITY AND ACCESS MANAGEMENT

User identity and Access Management: Authentication, Account Authorization, Validation, Access Control and Privilege management. Hashing and Cryptography- Encryption and Decryption

Unit III: (11hrs)

SYSTEM AND SERVER SECURITY

System Security, Desktop & Server Security, Firewalls, Password cracking Techniques, Key-logger, viruses and worms, Malwares & Spy wares, Windows Registry

Unit IV: INTERNET SECURITY (6hrs)

Internet Security: LAN Security, Email Security, Hacking attacks, preventive measures.

Unit V: RISK ASSESSMENT AND CYBER LAWS(6hrs)

Vulnerability Assessment, Penetration Testing, Cyber Laws

TEXT BOOK:

1. Information Systems Security: Security Management, Metrics, Frameworks And Best Practices - Nina Godbole, ISC2 Press, 2010

REFERENCE BOOK:

1. Information Security Management Handbook, Volume 4 - Micki Krause, ISC2 Press, 2007

List of Programs

1. System Security Configuration in Windows 7 I
2. System Security Configuration in Windows 7 II
3. Password based Authentication process
4. Hashes and message digests calculation using has calculators
5. Service Management of Windows 7 for prevention of attacks
6. Password cracking tool usage
7. Event logger analysis
8. Windows Registry analysis
9. Securing LAN using firewall
10. DOS attacks and its prevention
11. Install a key logger , capture useful information and analyze.
12. Usage of vulnerability assessment tool (nmap / wireshark) and analyze the results.

Pedagogy

S I . N o .	Topic	Teaching Method	Referenc e/To ol	Instructional Hours	
				Theor y	Practi cal
	Information Security-I				
1	Security Definition, Why Security, Security and its need, Current Trends and Statistics, Basic Terminology	Class Room		3	0
2	The C I A of Security the Relation: Security functionality and Ease of Use Triangle.	Teaching + PPT		3	0
3	User identity and Access Management: Authentication, Account Authorization, Validation,	Class Room Teaching + Lab Practice		3	3
4	Access Control and Privilege management. Hashing	Class Room Teaching + PPT		3	0
5	Cryptography, Encryption and Decryption	Class		5	3
6	System Security, Desktop & Server Security, Firewalls,			3	3

		Teaching			
7	Password cracking Techniques, Key-logger, viruses and worms, Malwares & Spy wares.	+ Lab		5	3
8	Windows Registry	Practice		3	3
9	Internet Security: LAN Security,	Class Room Teaching		3	0
		PPT			
	Email Security, Hacking attacks, preventive measures	Class Room Teaching		3	3
	Vulnerability Assessment, Penetration Testing,	+ Lab		3	3
	Cyber Laws	Practice Class Room Teaching		3	0
		+ PPT			
TOTAL				39	21

Python Programming

Subject Name	Code	Type of course	T-P-P (Credit)	Prerequisite
Python Programming	ENFC0411	Theory + Practice	1-2-0 (3)	Nil

1. Objective

- ✓ Learn problem solving using object-oriented concepts
- ✓ Implement object oriented programming using Python

2. Course outcome

- ✓ Use object oriented concept to solve problems
- ✓ To quickly and easily draw plot or visualize the information through visualization Technique
- ✓ Write an error free program of minimum 200 lines of code

3. Evaluation Systems

<i>Internal</i>	<i>Component</i>	<i>% of Marks</i>	<i>Method of Assessment</i>
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Examination	Midterm Test	20	Written examination
	Assignment		Report and Presentation
	Experiments	30	Practice work, report
	Project		Report and presentation
	Quiz		Surprise/ preannounced ones
External Examination		30	Written examination
	Practice	20	Practice test with viva-voce
Total		100	

Projects

1. To create a text editor application
2. To create a Graphics Equalizers for Audio system
3. To a GUI based Calculator
4. Moving Ball Game
5. Students Phone Book
6. Result Analysis by GUI interface
7. Students Admission Analysis by GUI Interface

4. Course outline

Module-I (8 Hrs):

Familiarization of Python: Features and Installation, Setting up Path, Working with Python Basic Syntax, Variable and Data types, Basic operators, Numbers, Array, Tuples, Dictionary, Date and Time

Module-II (12 Hrs):

String Manipulation: Accessing Strings, Basic Operations, String slices

List: Accessing lists, Operations, Working with lists List (Functions)

Decision Making Statement: Boolean Expressions, if-else Statement, Nested if Else Statement, elif Statement, Switch Statement

Module-III (10 Hrs):

Iteration Statement: The while Statement, for Statement, Nested Loops, Break and Continue statement

Functions Operation: Types of Function, Function Arguments, Pass by reference vs value, Recursion Function

Module-IV (9 Hrs):

Object Oriented Concept: OOP Terminologies, Defining Classes, Creating Objects, Regular expressions, Constructors, Inheritance and Overloading

Module-V (8 Hrs):

Files Operation: Create Text & Binary Files, Different modes of opening a file, Reading and Writing into Files, File Positions

Module-VI (14 Hrs):

GUI Programming: Example GUI Program, Environment Variables, Label, Message Widget, Text Area, Button, Radio Button, CheckBox, Listbox/ DropDown Box, Frames, Menu Widget, Menu Button Widget, Scrollbar, Forms: GET method and POST method, Sliders (Tkinter), Uploading files, Database access, Sending email

Module-VII (14 Hrs):

Data Visualization: Visualization Libraries, Data frame: Data types, Attributes, methods (mean(), median(), std(), var(), cor(), min()/ max(), describe()), groupby method, Selecting Column, Filtering, Selecting row and column, Missing values, Data read from excel, CSV and txt file

Plotting: Basic plot(), Histogram, Bar Plot, Box Plots, Area Plot, Scatter Plot, Pie Chart

5. References

Text Books:

1. Fabrizio Romano, Learn Python Programming - Second Edition, Packt Publishing Limited, June 2018
2. Mark Lutz , Learning Python, O’Reilly 5th edition
3. Dr. R. Nageswara Rao, Core Python Programming, Dreamtech 2nd edition
4. Kirthi Raman, Mastering Python Data Visualization, PACKT publishing 2015

Reference Books:

Wes McKinney , “Python for Data Analysis, O’Reilly 2nd edition 2017

Online Source:

1. Michael Dawson, Python Programming for the Absolute Beginner, Premier Press (ebook)

6. Session Plan

Topic coverage and Internal Test	No. of Sessions (in hrs.)	Activity (lecture, tutorial, lab practice, field studies/field-trip, Workshop etc.)	Assignment (project, assignment, field study, seminar, etc.)	Suggested Reading (Book, Video, Online source, etc.)
Module-I (8 Hrs)				
Features and Installation, Setting up Path, Working with Python Basic Syntax, Variable and Data types	4	Lecture, lab practice	Assignment	TBI

Numbers, Array, Tuples, Dictionary, Date and Time	4	Lecture, practice	lab	Assignment	TB1
Module-II (12 Hrs)					
String Manipulation: Accessing Strings, Basic Operations, String slices	2	Lecture, practice	lab	Experiments	TB1, Online source
List: Accessing lists, Operations, Working with lists List (Functions).	3	Lecture, practice	lab	Experiments	TB1, Online source
Decision Making Statement: Boolean Expressions, if-else Statement	4	Lecture, practice	lab	Experiments	TB1, Online source
Nested if Else Statement, elif Statement, Switch Statement.	3	Lecture, practice	lab	Experiments	TB1, Online source
Module-III (10 Hrs)					
Iteration Statement: The while Statement, for Statement,	2	Lecture, practice	lab	Experiments	TB1, TB2
Nested Loops, Break and Continue statement.	3	Lecture, practice	lab	Experiments	TB1, TB2
Functions Operation: Types of Function, Function Arguments, Pass by reference vs value, Recursion Function.	5	Lecture, practice	lab	Experiments	TB1, TB2
Module-IV (9 Hrs)					
Object Oriented Concept: OOPS Terminologies, Defining Classes, Creating Objects,	3	Lecture, practice	lab	Experiments	TB1, Online source
Regular expressions, Constructors.	3	Lecture	lab	Experiments	TB1, TB2

		<i>practice</i>			
Inheritance and Overloading.	3	<i>Lecture, practice</i>	<i>lab</i>	<i>Experiments</i>	<i>TB1, TB2</i>
Module-V (8 Hrs)					
Files Operation: Create Text & Binary Files, Different modes of opening a file.	4	<i>Lecture, practice</i>	<i>lab</i>	<i>Experiments</i>	<i>TB1, TB2</i>
Reading and Writing into Files, File Positions.	4	<i>Lecture, practice</i>	<i>lab</i>	<i>Experiments</i>	<i>TB1, TB2, Online sources</i>
Module-VI (14 Hrs)					
Example GUI Program, Environment Variables, Label	2	<i>Lecture, practice</i>	<i>lab</i>	<i>Project, Assignment</i>	<i>TB2, TB3</i>
Message Widget, Text Area, Button, Radio Button, CheckBox	4	<i>Lecture, practice</i>	<i>lab</i>	<i>Project, Assignment</i>	<i>TB2, TB3</i>
Listbox/DropDown Box, Frames, Menu Widget, Menu Button Widget, Scrollbar,	4	<i>Lecture, practice</i>	<i>lab</i>	<i>Project, Assignment</i>	<i>TB2, TB3</i>
Forms: GET method and POST method, Sliders (Tkinter), Uploading files, Database access, Sending email.	4	<i>Lecture, practice</i>	<i>lab</i>	<i>Project, Assignment</i>	<i>TB2, TB3</i>
Module-VII (14 Hrs)					
<ul style="list-style-type: none"> • Data Visualization: • Visualization Libraries, • Data frame: Data types 	2	<i>Lecture, practice</i>	<i>lab</i>	<i>Project, Assignment</i>	<i>TB2, TB3</i>

Attributes, groupby method, Selecting Column, Filtering, Selecting row and column, Missing values, Data read from excel, CSV and txt file.	4	Lecture, practice	lab	Project, Assignment	TB2, TB3
<ul style="list-style-type: none"> · Filtering, Selecting row · and column, Missing values, Data read from excel, CSV and txt file. 	4	Lecture, practice	lab	Project, Assignment	TB2, TB3
Plotting: Basic plot(), Histogram, Bar Plot, Box Plots, Area Plot, Scatter Plot, Pie Chart.	4	Lecture, practice	lab	Project, Assignment	TB2, TB3
Total (hrs): 75 Hours					

Sensors and IOT

Subject Name	Code	Type of Course	T-P-Pr (Credit)	Prerequisite
Sensors and IOT	ENFC0417	Theory & Practice	2-1-0(3)	NIL

1. Objective:

The objective of this subject is:

- To learn what “Internet of Things”, is.
- To introduce the implementation of web-based services on IOT devices.

2. Course Outcome:

Upon successful completion of this subject students should be able to:

- Write codes for the various interfacing of sensors, and how to access them through web.
- They will be able to make the smart controlling even smarter.
- They can float the data from sensors into the web or Google drive and can access the anywhere in a relatively secured manner.

3. Evaluation Systems:

Internal Examination	Component	% of Marks	Method of Assessment
	Midterm Test	20	Written examination

	Assignment		Report and Presentation
	Attendance		
	Experiments	30	Lab work, report
	Project		Report and presentation
	Quiz		Surprise/preannounced ones
External Examination		30	Written examination
		20	Lab Examination
Total		100	

4. Course Outline:

Module I (15 Hours)

[3 hrs. Theory + 12 hrs. Practice]

Introduction to Sensors (Description and Working principle): What is sensor? Types of sensors, URM 37 Sensor (Ultrasonic Sensor), Electro-Mechanical Switches, IR, PIR, Laser, Accelerometers, MQ2, MQ3, Temperature and Humidity Sensors (DHT-11), Stress Sensors, Load Sensors, Force Sensors, Wi-Fi modules.

Introduction to IOT: Background, what is IOT, what device makes it to IOT, IOT platforms, what IOT means for the developer, challenges of IOT.

Practice

1. Interfacing and testing the Ultrasonic Module, Relay and Infra-Red Module.
2. Interfacing and testing PIR, Laser LED, and Accelerometer.
3. Interface the LPG sensor, Monoxide sensor, Temperature and Humidity sensor.
4. Interfacing and testing stress sensor, load sensor, force sensor, Wi-Fi modules.

Module II (12 Hours)

[2 hrs.Theory + 10 hrs. Practice]

Connecting an Arduino to the Web: Introduction, setting up the Arduino development environment, Options for Internet connectivity with Arduino, interacting with basic sensors, interacting with basic actuators, configuring your Arduino board for the IoT.

Practice

5. Installing the Arduino IDE.
6. Learning the steps to interface the Controller board to the system through the interface.
7. Connecting the Arduino to the Internet.
8. Interacting of various sensors to the internet through the controller board.
9. Interfacing actuators to the Controller board and control through the internet.

Module III (5 Hours)

[1 hrs.Theory + 4 hrs. Practice] **Data extraction from**

Web: Grabbing the content from a web page, Sending data to the web, troubleshooting basic Arduino issues

Practice

10. Extracting data from a web page.
11. Sending data to a web page

Module IV (10 Hours)

[2 hrs.Theory + 10 hrs. Practice]

Internet Data Monitoring: Introduction, Internet of Things platforms for Arduino, Posting the sensor data online, Retrieving your online data, Securing your online data, Monitoring sensor data from a web based dashboard, Monitoring several Arduino boards at once, Troubleshooting issues with web data monitoring.

Practice

12. Posting the data to the internet through internet on-line.
13. Monitor the sensor output from a remote computer through Internet.
14. Parallel monitoring multiple controller boards connected to the internet.

Module V (7 Hours)

[3 hrs.Theory + 4 hrs. Practice]

Interacting with Web Services: Introduction, Discovering the Temboo platform, Tweeting from an Arduino board, Posting updates on Facebook, Automation with IFTTT, Sending push notifications

Practice

15. Posting an update to Facebook
16. Sending a Push notification through the controller by Internet

Module VI (15 Hrs.)

[1 hrs.Theory + 14 hrs. Practice]

Interacting with Web Services: Sending text message notifications, Storing data on Google Drive, Troubleshooting issues with web services.

Practice

17. Sending a text notification through Internet.
18. Control Light and Fan via Internet. (prototyped as LEDs)
19. Operate a DC motor to simulate the opening and closing of door using servo motor.

Module VII (11 Hours)

[3 hrs.Theory + 8 hrs. Practice]

Machine-to-Machine Interactions: Introduction, Types of IoT interaction, Basic local M2M interactions, Cloud M2M with IFTTT, M2M alarm system, Automated light controller, Automated sprinkler controller, Troubleshooting basic M2M issues.

Practice

20. Operate the smoke detector from internet.
21. Extract the reading of Temperature, Humidity and Monitoring through internet.
22. Automating the control of Light, Sprinkler.
23. Operate the robot through internet which has facility of communication to and fro through web and the sensor data.

5. Reference

Text Books:

1. Internet of Things with Arduino Cookbook, Marco Schwartz, ISBN 978-1-78528-658-2
2. Internet of Things- A Hands on Approach, Arshdeep Bahga and Vijay Madiseti , Universities Press , 2015.

Reference:

1. <https://www.arduino.cc/reference/en>.
2. Internet of Things with Arduino: Build Internet of Things Projects Using the Arduino Platform, Marco Schwartz.

6. Session Plan:

<i>Topic coverage and Internal Test</i>	<i>No. of Sessions (in hrs.)</i>	<i>Activity (Lecture, tutorial, lab practice, field studies/field -trip, Workshop etc.)</i>	<i>Assignment (Projects, assignment, field study, seminar, etc.)</i>	<i>Suggested Reading (Book, Video, Online source, etc.)</i>
Module I [3 hrs. Lecture + 12 hrs. Practice]				
What is Sensor? Types of sensors.	1	Lecture	Assignment	Text Book-1, Reference Book-1,2
URM 37 Sensor (Ultrasonic Sensor), Electro-Mechanical Switches, IR.	1	Lecture	Assignment	Text Book-1, Reference Book-1,2
Interfacing and testing the URM 37, Relay, IR Module.	4	Practice		
PIR, Laser, Accelerometers, MQ2, MQ3, Temperature and Humidity Sensors (DHT-11).	1	Lecture	Assignment	Text Book-1, Reference Book-1,2
Interfacing and testing PIR, Laser, Accelerometer, MQ2, MQ3, DHT-11	4	Practice		
Stress Sensors, Load Sensors, Force Sensors, Wi-Fi Modules.	1	Lecture	Assignment	Text Book-1, Reference Book-1,2
Interfacing and testing stress sensor, load sensor, force sensor, Wi-Fi modules.	4	Practice		
Background, What is IOT, What device makes it to IOT, IOT platforms, what IOT means for the developer.	1	Lecture	Assignment	Text Book-1, Reference Book-1,2
Module II [2 hrs. Lecture + 10 hrs. Practice]				
Introduction, Setting up the Arduino development environment.	2	Practice		
Interacting of various sensors to the internet through the controller board.	4	Practice		
Interacting with basic actuators, Configuring your Arduino board for the IoT.	4	Practice		
Module-III [1 hrs. Lecture + 4 hrs. Practice]				

Grabbing the content from a web page, sending data to the Web, Troubleshooting basic Arduino issues.	1	Lecture	Assignment	Text Book-1, Reference Book-1,2
Extracting data from a web page.	2	Practice		
Sending data to a web page.	2	Practice		
Module IV [2 hrs. Lecture + 8 hrs. Practice]				
Introduction, Internet of Things platforms for Arduino	1	Lecture	Assignment	Text Book-1, Reference Book-1,2
Posting the sensor data online, retrieving your online data, and Securing your online data, Monitoring sensor data from a web-based dashboard.	4	Practice		
Monitoring several Arduino boards at once, Troubleshooting issues with web data monitoring.	1	Lecture	Assignment	Text Book-1, Reference Book-1,2
Parallel monitoring multiple controller boards connected to the internet.	4	Practice		
Module V [3 hrs. Lecture + 4 hrs. Practice]				
Introduction, Discovering the Temboo platform, Tweeting from an Arduino board. Tweeting from an Arduino board	2	Lecture	Assignment	Text Book-1, Reference Book-1,2
Posting updates on Facebook, Automation with IFTTT, Sending push notifications.	1	Lecture	Assignment	Text Book-1, Reference Book-1,2
Posting updates on Facebook, Sending push notifications	4	Practice		
Module-VI [1 hrs. Lecture +14 hrs. Practice]				
Sending text message notifications, Storing data on Google Drive.	2	Practice		
Troubleshooting issues with web services.	1	Lecture	Assignment	Text Book-1, Reference Book-1,2
Control Light & Fan from the internet.	4	Practice		
Remote controlled door (opening & closing) using servo Motor.	4	Practice		
Smoke detector and Remote control room temperature from internet.	2	Practice		
Extract the reading of Temperature, Humidity and Monitoring through internet.	2	Practice		

Module VII [3 hrs. Lecture + 8 hrs. Practice]				
Introduction, Types of IoT interaction, Basic local M2M interactions.	1	Lecture	Assignment	Text Book-1, Reference Book-1,2
Cloud M2M with IFTTT, M2M alarm system, Troubleshooting basic M2M issues.	1	Lecture	Assignment	Text Book-1, Reference Book-1,2
Automated light controller, Automated sprinkler controller,	4	Practice		
Introduction, choosing a robotic platform, Building a mobile robot, Configuring your mobile robot, Basic robot control, Using distance sensors, Controlling your robot from anywhere, Troubleshooting basic robotic issues.	1	Lecture	Assignment	Text Book-1, Reference Book-1,2
Operate the robot through internet which has facility of communication to and fro through web and the sensor data.	4	Practice		
Total (hrs.)	75	15 hrs. Lecture	+ 60 hrs. Practice	

Programming for Problem solving- Java

Subject Name	Code	Type of course	T-P-P	Prerequisite
Programming for Problem solving- Java	ENFC0412	Theory + Practice	1-2-0(3)	Nil

1. Objective

- ✓ Learn problem solving using object-oriented concepts
- ✓ Implement object oriented programming using Java
- ✓ Analyze several alternative solutions to determine the best approach

2. Course outcome

- ✓ Able to use object oriented concept to solve problems

· Write an error free program of minimum 200 lines of code

3. Evaluation System

<i>Internal Examination</i>	<i>Component</i>	<i>% of Marks</i>	<i>Method of Assessment</i>
	Midterm Test	20	Written examination
	Assignment	NIL	Report and Presentation
	Experiments	30	Practice work, report
	Project	NIL	Report and presentation
	Quiz	NIL	Surprise/preannounced ones
<i>External Examination</i>		30	Written examination
		20	Practice Exam with viva voce
<i>Total</i>		100	

Projects:

1. Simple Currency Converter
2. Designing a Calculator
3. Generating the mark sheet of a student
4. Create a phone directory and search a number
5. Create a tic tac toe game
6. Developing a library maintenance system
7. Desktop applications
8. Exam System (Without Database)
9. Create Country MAP and Different banners

Course outline

Module-I (10Hrs):

Problem Solving Techniques: Ask Questions, Look for things that are familiar, solve by analogy, Means-Ends Analysis, Divide and Conquer, The building block approach, Merging solutions, Mental Block: The Fear of Starting, Object Oriented Problem Solving, and Case Study.

Programming: Programming Language, Skeleton, Compilation, Interpretation, and Execution of Program.

Object-Oriented Programming: Object Oriented Concepts, Java Programming Environment, Feature of Java, Elements of Java Program: Identifier, Naming Conventions, Build-in Type, Variable, Operators, Control Statements, Loops, Typecasting, Arrays,

Module-II(15 Hrs):

Classes: Concept of Objects and Classes, Using Methods, Local Variables, Instance Variables, Constructor, Overloading Constructor, Overloading Methods, Garbage Collection, The Finalize Method, Static, Final and this Keyword.

Inheritance and Polymorphism: Basics, Access Modifier, The super Keyword, Method Overriding, Dynamic Method Dispatch, Abstract Classes, Inner Classes.

Module-III (10 Hrs):

Packages: Packages, Access Protection, Importing Package

Interfaces: Interface, Implementing Interfaces.

Module-IV (10 Hrs):

StringHandling: String, String Buffer, String Builder.

Excepting Handling: Fundamentals, Checked and Unchecked Exceptions, Using Try, Catch, MultipleCatches, Throw, Throws, Finally, Java's Built-In Exceptions, User-Defined Exception.

Module-V (10 Hrs):

Multi-Threading: Java Thread Lifecycle Model, Thread Priorities, Synchronization, Creating Threads, Using Different Thread Methods, Wrapper Classes, Clone (java.lang), Collection API, Vectors (java.util).

Module-VI (10 Hrs):

Java.IO: I/O Streams, Serialization

AWT: AWT Classes, Window Fundamental, Component, Container, Panel, Window, Frame, Canvas, Control Fundamentals, Layout Managers.

Module-VII (10 Hrs):

Event Handling: Delegation Event Model, Event Classes, Event Listener Interfaces, and Adapter Classes, Handling Events by Extending AWT Components.

Text Books:

Mark Lassoff, Java Programming for Beginners, Packt Publishing Limited, October 2017

Walter Savitch, "Java-An Introduction to Problem Solving & Programming", 8th edition, Pearson, 2017

Herbert Schildt, "Java Complete Reference", 10th edition, in McGraw-Hill Education, 2017

Reference Books:

Dr. Edward Lavieri, Peter Verhas, Mastering Java 9, Packt Publishing Limited, October 2017

Nell Dale, Chip Weems, "Programming and problem solving with Java", in Jones and Bartlett, 2008

Bhave&. Patekar, "Programming with Java" in Pearson Education, 2008

H.M. Deitel& Paul J. Deitel, "Java How to Program" in PHI, 9th Edition, 2012

Online Source: javatpoint.com,

http://www.corejavaguru.com

https://www.w3schools.in/java-tutorial/

Session Plan

<i>Topic coverage and Internal Test</i>	<i>No. of Sessions (in hrs.)</i>	<i>Activity (lecture, tutorial, lab practice, field studies/field-trip, Workshop etc.)</i>	<i>Assignment (project, assignment, field study, seminar, etc.)</i>	<i>Suggested Reading (Book, Video, Online source, etc.)</i>
<i>Problem Solving Techniques: Ask Questions, Look for things that are familiar, solve by analogy, Means-Ends Analysis, Divide and Conquer, The building block approach, Merging solutions, Mental Block: The Fear of Starting, Object Oriented Problem Solving, and Case Study</i>	<i>4</i>	<i>Lecture</i>		<i>Book</i>
<i>Installation of JDK, Configure runtime environment and Visualizing Java programming Environment (architecture)</i>	<i>1+1</i>	<i>Practice</i>		
<i>What is Programming,</i>	<i>1</i>	<i>Lecture</i>	<i>Assignment</i>	<i>Book</i>

<i>Programming Language, Skeleton, Compilation, Interpretation, and Execution of Program</i>				
<i>Constructing skeleton of Java Program, Object Oriented Concepts, Java Programming Environment, Feature of Java</i>	2+2	<i>Lecture, Practice</i>	<i>Assignment</i>	<i>Book</i>
<i>Share and execute India Map & CUTM Banner Sharing and Execute Calculator program</i>	2	<i>Practice</i>	<i>Assignment</i>	
<i>Elements of Java Program: Identifier, Naming Conventions, Build-in Type, Variable, Operators, more example</i>	2	<i>Practice</i>	<i>Assignment</i>	<i>Book</i>
<i>Conditional statement, looping statement,</i>	2	<i>Practice</i>	<i>Assignment</i>	<i>Book</i>
<i>Sharing and Execute calculate grade of students</i>	2	<i>Practice</i>		
<i>Concept of Objects and Classes, Using Methods, Local Variables, Instance Variables, Constructor, Overloading Constructor With Examples</i>	2+2	<i>Lecture, Practice</i>	<i>Assignment</i>	<i>Book</i>
<i>Overloading Methods, Garbage Collection, The</i>	2	<i>Practice</i>	<i>Assignment</i>	<i>Book</i>

<i>Finalize Method, Static, Final and this Keyword</i>				
<i>Sharing and Execute area of shapes</i>	<i>1</i>	<i>Practice</i>		
<i>Inheritance and Polymorphism: Basics, Access Modifier, The super Keyword, Method Overriding, Dynamic Method Dispatch</i>	<i>1+2</i>	<i>Lecture, Practice</i>	<i>Assignment</i>	<i>Book</i>
<i>Abstract Classes, Inner Classes</i>	<i>1+2</i>	<i>Lecture, Practice</i>	<i>Assignment</i>	<i>Book</i>
<i>ToDo list where you can calculate the completed task vs. pending tasks.</i>	<i>1</i>	<i>Practice</i>		
<i>Packages, Access Protection, Importing Package, Interface, Implementing Interfaces</i>	<i>1+4</i>	<i>Lecture, Practice</i>	<i>Assignment</i>	<i>Book</i>
<i>StringHandling: String, StringBuffer, StringBuilder</i>	<i>1+2</i>	<i>Lecture, Practice</i>	<i>Assignment</i>	<i>Book</i>
<i>Create a phone directory and search for a number.</i>	<i>1</i>	<i>Practice</i>		

<i>Excepting Handling: Fundamentals, Checked and Unchecked Exceptions, Using Try, Catch, Multiple Catches, Throw, Throws, Finally, Java's Built-In Exceptions, User- Defined Exception</i>	<i>1+4</i>	<i>Lecture, Practice</i>	<i>Assignment</i>	<i>Book</i>
<i>Create a tic tac toe game</i>	<i>1</i>	<i>Practice</i>		
<i>java.io: I/O streams, Serialization</i>	<i>1+4</i>	<i>Lecture, Practice</i>	<i>Assignment</i>	<i>Book</i>
<i>Producer/Consumer Problem</i>	<i>1</i>	<i>Practice</i>		
<i>Multi-Threading: Java Thread Lifecycle Model, Thread Priorities, Synchronization, Creating Threads, using Different Thread Methods</i>	<i>1+2</i>	<i>Lecture, Practice</i>	<i>Assignment</i>	<i>Book</i>
<i>Wrapper Classes, Clone (java.lang), Collection API, Vectors (java.util)</i>	<i>1+2</i>	<i>Lecture, Practice</i>	<i>Assignment</i>	<i>Book</i>
<i>Developing a library maintenance system.</i>	<i>1</i>	<i>Practice</i>		
<i>Event Handling: Delegation Event Model, Event Classes, Event</i>	<i>1+2</i>	<i>Lecture, Practice</i>	<i>Assignment</i>	<i>Book</i>

<i>Listener Interfaces, and Adapter Classes, Handling Events by Extending AWT Components</i>				
<i>AWT: AWT Classes, Window Fundamental, Component, Container, Panel, Window, Frame, Canvas, Control Fundamentals, Layout Managers</i>	2+6	<i>Lecture, Practice</i>	<i>Assignment</i>	<i>Book</i>
Total (Hrs)	75	(Theory -24 hrs + Practice -51 hrs =75)		

FCEN0603 Electrical Circuit Drawing (AutoCAD)

Credits: 02
42

Total Hours:

Course Objective

-To make student analyze the electrical system through computer simulation using software packages (AutoCAD)

Course Outcomes:

-Students should able to create an electrical wiring diagram by using AutoCAD software.

List of Experiments

1. Introduction to AutoCAD Electrical, Drawing Files, Electrical Components and Wires
2. Symbol creation
3. General lay out of a power system network.
4. Simple house wiring (1-phase): light, fan
5. Simple house wiring (3-phase): light, fan, AC, geezer, 3-phase motor
6. Agricultural pump-set wiring (star-delta) with panel wiring.
7. Workshop panel wiring for machine lab

8. Four wheeler electrical wiring
9. Forklift wiring harness
10. Substation lay out drawing with 4 incomer and 4 outgoing (Khordha Substation or nearby substation)
11. CIT new substation layout (schneider) or JITM Substation
12. Differential protection of transformer
13. Layout drawing of a power plant

				<i>Theor y</i>	<i>Practic e</i>	<i>Video</i>	<i>Project</i>
1	Introduction to AutoCAD Electrical, Drawing Files, Electrical Components and Wires	PRAC	AutoCAD	1	2	0	0
2	Symbol creation	PRAC	AutoCAD	1	2	0	0
3	General lay out of a power system network.	PRAC	AutoCAD	1	2	0	0
4	Simple house wiring (1-phase): light, Fan	PRAC	AutoCAD	1	2	0	0
5	Simple house wiring (3-phase): light, fan, AC, geezer, 3-phase motor	PRAC	AutoCAD	1	2	0	0
6	Agricultural pump-set wiring (stardelta) with panel wiring.	PRAC	AutoCAD	1	2	0	0
7	Workshop panel wiring for machine lab	PRAC	AutoCAD	1	2	0	0
8	Four wheeler electrical wiring	PRAC	AutoCAD	1	2	0	0
9	Forklift wiring harness	PRAC	AutoCAD	1	2	0	0
10	Substation lay out drawing with 4 incomer and 4 outgoing (Khordha Substation or nearby substation)	PRAC	AutoCAD	1	2	0	0
11	CIT new substation layout (schneider) or JITM Substation	PRAC	AutoCAD	1	2	0	0
12	Differential protection of transformer	PRAC	AutoCAD	1	2	0	0
13	Layout drawing of a power plant	PRAC	AutoCAD	1	2	0	0
	Sub Total			13	26	0	0

Product Development

Subject Name	Code	Type of course	T-P-P	Prerequisite
Product Development	ENFC0601	Practice + Project	0-2-1(3)	Nil

1. Objectives

- ✓ To educate the students on various stages of development of design of a product beginning from intent-to-actual design.
- ✓ Educate the students on usage of design software like ENOVIA, SIMULIA.

2. Course Outcome

- ✓ Students will have knowledge and skills to undertake design projects through making design decisions and evolve design of a product using the theoretical knowledge and hands-on-experience provided on design software.

3. Evaluation Systems

Internal Examination	Component	% of Marks	Method of Assessment
	Midterm Test		
	Assignment		
	Experiments		
	I PRO	40+10	Lab work & Report
	Quiz		
External Examination	E PRO	50	Project & Report
Total		100	

4. Course Outline

Module I (08 Hours)

Intent, Impact, Import & Use of Core Mechanical Principles for Concept Design, Engineering Design, Problems Engineering can Solve, How to Identify Opportunities for Design, Needs Assessment & Problem Definition.

Module II (10 Hours)

Defining Requirements & Problem Definition, Analytical Process Hierarchical Analysis, Developing Possible Design Solutions, Making Design Decisions.

Module III (08 Hours)

Introduction to CAD Process through 3D Experience Free Modeling, Modeling & Managing Subassemblies in the Robot

Module IV (09 Hours)

Modeling a Lathe Machine. Introduction to PLM through ENOVIA, Steps Involved in Controlling the Product Updates in ENOVIA.

Module V (20 Hours)

Introduction to FEA in Industry, Pre-Processing Using SIMULIA.

Module VI (15 Hours)

Understanding the Mathematical Modeling for Product in Physical Behavior

Module VII (15 Hours)

Introduction to Design of Experiments, How to Use SIMULIA to Make an Incremental Design Decision. Type of Engineering Analysis.

E-content: Peer Learning Experience by Dassault Systemes.

Text Books:

1. Chitale, A K, Product Design & Manufacturing, 2013, 6th Edition, PHI publication, India.
2. Ulrich, K T, Eppinger, S D, Product Design & Development, 2016, 5th edition, Tata McGraw-Hill Companies, Inc.

Reference Books:

- Kumar, P, Product Design - Creativity, Concepts & Usability, 2011, 2nd Edition, PHI publication, India.

7. Session Plan

Topic coverage and Internal Test	No. of Sessions (in hours.)	Activity (lecture, tutorial, lab practice, field studies/field-trip, Workshop etc.)	Assignment (project, assignment, field study, seminar, etc.)	Suggested Reading (Book, Video, Online source, etc.)
Module-I				
Intent, Impact, Import, Use of core Mechanical Principles for concept Design, What is Engineering Design, Problems Engineering can solve, How to identify opportunities for design, Needs Assessment & Problem Definition,	08	Tutorial	Project	
Module-II				
Defining requirements & Problem Definition, Analytical Process Hierarchical Analysis, Developing a possible design Solutions, Making Design Decisions.	10	Tutorial	Project	

Module-III				
Introduction to CAD Process through 3D Experience free modeling, Modeling & managing subassemblies in the Robot,	08	Tutorial , Practice	Project	
Module-IV				
Modeling a Lathe Machine. Introduction to PLM through ENOVIA, Steps involved in controlling the product updates in ENOVIA.	09	Tutorial , Practice	Project	
Module-V				
Introduction to FEA in Industry, Pre-processing using SIMULIA, Understanding the Mathematical modeling for Product in physical behavior, Introduction to design of experiments, How to use SIMULIA to make a incremental design decision. Type of Engineering analysis. Projects such as Disc Brake analysis by DOE, Door trim Substrate by DOE, MBD of Suspension by DOE.	20	Practice, tutorial	Project	
Module-VI				
Consumer Sentimental Analysis, Behavior Loyalty Metric, Emotional Loyalty Metric, Understanding decision making dashboards in NetVibes,	15	Lecture, Practice	Project	
Interpreting the Real time social data, Creation of different metric for business condition in Net Vibes, Automate Business logic to respond.	15	Lecture, Practice	Project	
Total (hours)	85			

Programming Internet of Things

Subject Name	Code	Type of course	T-P-P(Credit)	Prerequisite
Programming Internet of Things	ENFC1401	Workshop	0-2-0(2)	

1. Objective

- ✓ To familiarize the students with IoT (Internet of Things) and their applications
- ✓ To make students learn devices, programming and technology for IOT

2. Course outcome

- ✓ Interface different sensors with Raspberry Pi and perform experiments
- ✓ Students will work together in teams
- ✓ Develop an IoT project which can be showcased at the end of the course

3. Evaluation Systems

Internal Examination	Component	% of Marks	Method of Assessment
	Midterm Test	<i>NIL</i>	Written examination
	Assignment	<i>NIL</i>	Report and Presentation
	Experiments (Internal)	<i>50</i>	Practice work, report and viva-voce
	Project	<i>50</i>	Report and presentation
	Quiz	<i>NIL</i>	Surprise/preannounced ones
External Examination	Semester	<i>NIL</i>	Written examination
	Practice	<i>NIL</i>	Practice test with viva-voce
Total		<i>100</i>	

Course outline

All the students shall be distributed in teams for project development. They will choose the project at the beginning of the course. A team shall not consist more than 4 members.

Module I: (20 Hours)
 Internet of Things: Definition and Characteristics of IoT, Physical Design of IoT – IoT Protocols, IoT communication models, IoT Communication APIs, IT enabled Technologies, Communication protocols
 Domain Specific IoTs: Home, City, Environment, Energy, Retail, Logistics, Agriculture, Industry, Health and Lifestyle.

Embedded Systems: Introduction, Sensors and Actuators, Different types of Sensors
Module II: (20 Hours)
 Raspberry Pi: Configuration of OS on to Raspberry Pi, Commands used in Raspberry Pi coding (Linux), Raspberry Pi pin descriptions.

Experiments like the following will be performed:
 Simple LED Blink Example, Simple Pattern of LED, Complex Pattern of LED, Simple Automated Light System using LDR, Simple project on Temperature Sensor using LCD display, LED action via Bluetooth.

Module III: (20 Hours)
 Experiments like the following will be performed:
 Ultra Sonic Sensor of Distance Finder, Data Logger with Temperature Sensor and LDR, Cloud Access and Storage of Sensor Data, IR Module Interfacing, PIR Module Interfacing, Relay Module Interfacing. Network setup WIFI/LAN, LED blinking using Pi, Web Monitoring of Sensor outputs through API keys, Sensor based automated E-Mail Sending through Pi.

Reference Books:

Maneesh Rao, Internet of Things with Raspberry Pi 3, Packt Publishing Limited, April 2018
McEwen Adrian and Cassimally Hakim, Designing the Internet of Things, Wiley Publication, 2013.
Bahga Arshdeep and Madiseti Vijay, Internet of Things - A Hands-on Approach, Universities Press, 2015.
Richardson Matt & Wallace Shawn, Getting Started with Raspberry Pi, O'Reilly (SPD), 2014.

Session Plan

Topic coverage and Internal Test	No. of Sessions (in hrs.)	Activity (lecture, tutorial, lab practice, field studies/field-trip, Workshop etc.)	Assignment (project, assignment, field study, seminar, etc.)	Suggested Reading (Book, Video, Online source, etc.)
Module-I (Practice-28 hours)				

<i>Introduction to Internet of Things – Definition and Characteristics of IoT, Physical Design of IoT – IoT Protocols</i>	<i>4</i>	<i>practice</i>	<i>Assignment</i>	<i>RB-1, RB-2, RB-3</i>
<i>IoT communication models, IoT Communication APIs, IoT enabled Technologies, Communication protocols</i>	<i>4</i>	<i>practice</i>	<i>Assignment</i>	<i>RB-1, RB-2, RB-3</i>
<i>Domain Specific IoTs – Home, City, Environment, Energy, Retail, Logistics, Agriculture, Industry, health and Lifestyle</i>	<i>4</i>	<i>practice</i>	<i>Assignment + Experiments</i>	<i>RB-1, RB-2, RB-3</i>
<i>Embedded Systems – Introduction, the basics of sensors and actuators</i>	<i>4</i>	<i>practice</i>	<i>Assignment + Experiments</i>	<i>RB-1, RB-2, RB-3</i>
<i>Different types of sensors</i>	<i>4</i>	<i>practice</i>	<i>Assignment + Experiments</i>	<i>RB-1, RB-2, RB-3</i>

Module-II (Practice- 28 hours)				
<i>Introduction to Raspberry Pi, Configuration of OS on to Raspberry Pi</i>	<i>4</i>	<i>practice</i>	<i>Assignment + Experiments</i>	<i>RB-1, RB-2, RB-3</i>
<i>Commands used in Raspberry Pi coding (Linux), Raspberry Pi pin descriptions</i>	<i>4</i>	<i>practice</i>	<i>Assignment + Experiments</i>	<i>RB-1, RB-2, RB-3</i>
<i>Simple LED Blink Example, Simple Pattern of LED</i>	<i>4</i>	<i>practice</i>	<i>Assignment + Experiments</i>	<i>RB-1, RB-2, RB-3</i>
<i>Complex Pattern of LED, Simple Automated Light System using LDR</i>	<i>4</i>	<i>practice</i>	<i>Assignment + Experiments</i>	<i>RB-1, RB-2, RB-3</i>
<i>Simple project on Temperature Sensor using LCD display, LED action via Bluetooth</i>	<i>4</i>	<i>practice</i>	<i>Assignment + Experiments</i>	<i>RB-1, RB-2, RB-3</i>
Module-III (Practice- 34 hours)				
<i>Ultra Sonic Sensor of Distance Finder, Data Logger with Temperature Sensor</i>	<i>4</i>	<i>practice</i>	<i>Assignment + Experiments</i>	<i>RB-1, RB-2, RB-3</i>

<i>and LDR</i>				
<i>Cloud Access and Storage of Sensor Data, IR Module Interfacing</i>	<i>4</i>	<i>practice</i>	<i>Assignment + Experiments</i>	<i>RB-1, RB-2, RB-3</i>
<i>PIR Module Interfacing, Relay Module Interfacing</i>	<i>4</i>	<i>practice</i>	<i>Assignment + Experiments</i>	<i>RB-1, RB-2, RB-3</i>
<i>Network setup WIFI/LAN, LED blinking using Pi</i>	<i>4</i>	<i>practice</i>	<i>Assignment + Experiments</i>	<i>RB-1, RB-2, RB-3</i>
<i>Web Monitoring of Sensor outputs through API keys, Sensor based automated E-Mail Sending through Pi</i>	<i>4</i>	<i>practice</i>	<i>Assignment + Experiments</i>	<i>RB-1, RB-2, RB-3</i>
Total (hrs)	60	Practice 60		

Build Your Computer

Subject Name	Code	Type of course	T-P-P	Prerequisite
Build Your Computer	ENFC1402	Workshop	0-2-0(2)	Nil

1. Objective

- ✓ Develop ability to understand the internals of Computer and peripherals
- ✓ To have an overall idea about networking concepts and devices
- ✓ To have an overall idea about secure computing

2. Course outcome

- ✓ Build your computing device
- ✓ Troubleshoot various faults in a computer system and network
- ✓ Construct small LAN for resource sharing

3. Evaluation Systems

<i>Internal Examination</i>	<i>Component</i>	<i>% of Marks</i>	<i>Method of Assessment</i>
	Midterm Test		Written examination
	Assignment		Report and Presentation
	Experiments	50	Assessment based on Individual Lab sessions, Lab report
	Project	50	Report and presentation
	Quiz		Surprise/ preannounced ones
<i>External Examination</i>	<i>Practice</i>		Practice Test
Total		100	

Projects

1. *Developing your own computing device*
2. *Setup a camp to provide free servicing of laptops and desktops*
3. *Setup and configure a small secured LAN for file sharing*

4. Course outline

- I. **Build Computing Device:** Building computing device using Raspberry-Pi Board
- II. **Inside The PC:** Opening a Desktop/Laptop and Identification of Various Components, Study of

Different Blocks of PC

- III. **Assembling and Disassembling of PC:** Assembling and Disassembling of Different Components like Motherboard, Processor, RAM, Hard Disc and Other Components
- IV. **SMPS and Peripherals:** Identification of Various Power Supply Units and Peripherals along with Pin Configuration
- V. **BIOS:** Study of Basic Input Output System, Morden BIOS (UEFI), Security Features
- VI. **Installation of OS and Application Software:** Installation of GNU/Linux, Ubuntu LTS (Latest), Application Software
- VII. **Usage of Libreoffice:** Writer (Document), Calc (Spreadsheet), Impress (Presentation)
- VIII. **Basic Commands:** Working With Linux Commands, Vi Editor, Shell Scripting
- IX. **Basic Networking:** Wired LAN, Wireless LAN, Wireless Security and Troubleshooting
- X. **Introduction to Various Networking Devices:** Routers, Switches, Modems, Hubs, Firewall and Wireless devices
- XI. **Network Configuration:** Setting IP Addresses, Sharing Files and Folders, Network Troubleshooting, PING Test, ifconfig etc.
- XII. **Introduction To Servers and Network Security:** Files Servers, Email Servers, Proxy Servers; Essential Security Measures: Encrypt Critical Data, Secure Systems With Passwords, Back Up and Isolate Information

Session Plan

<i>Topic coverage and Internal Test</i>	<i>No. of Sessions (in hrs.)</i>	<i>Activity (lecture, tutorial, lab practice, field studies/field -trip, Workshop etc.)</i>	<i>Assignment (project, assignment, field study, seminar, etc.)</i>	<i>Suggested Reading (Book, Video, Online source, etc.)</i>
Build Your Own Device: Building Your First PC Using Raspberry Pi Board.	8	Workshop	project	https://howtoraspberrypi.com/build-pc-for-less-than-200-raspberry-pi/
Inside The PC: Opening a Desktop/Laptop and Identification of Various Components,	4	Demonstration and practice	Practice and Report writing.	https://web.stanford.edu/class/cs101/hardware-1.html

Study of Different Blocks of PC.				
Assembling and Disassembling of PC: Assembling and Disassembling of Different Components like Motherboard, Processor, Ram, Hard Disc and Other Components.	4	<i>Demonstration and practice</i>	Practice and Report writing.	https://www.youtube.com/watch?v=nBZovA_kMWA
SMPS and Peripherals: Identification of Various Power Supply Units and Peripherals along with Pin Structure.	4	<i>Demonstration and practice</i>	Practice and Report writing.	
BIOS: Study of Basic Input Output System, Modern BIOS (UEFI), Security Features.	4	<i>Demonstration and practice</i>	Practice and Report writing.	https://whatis.techtarget.com/definition/BIOS-basic-input-output-system

Installation of OS and Application Software: Installation of Ubuntu LTS (Latest), Application Software.	4	<i>Demonstration and practice</i>	Practice and Report writing.	https://tutorials.ubuntu.com/tutorial/tutorial-install-ubuntu-desktop#0
Usage of Libreoffice: Writer (Document), Calc (Spreadsheet), Impress (Presentation).	6	<i>Demonstration and practice</i>	Practice and Report writing.	
Basic Commands: Working With Linux Commands, Vi Editor, Shell Scripting.	6	<i>Demonstration and practice</i>	Practice and Report writing.	https://maker.pro/linux/tutorial/basic-linux-commands-for-beginners
Basic Networking: Wired LAN, Wireless LAN, Wireless	4	<i>Demonstration and practice</i>	Practice and Report writing.	

Security and Troubleshooting.				
Introduction to Various Networking Devices: Routers, Switches, Modems, Hubs, Firewall, wireless devices.	4	<i>Demonstration and practice</i>	Practice and Report writing.	https://www.geeksforgeeks.org/network-devices-hub-repeater-bridge-switch-router-gateways/
Network Configuration: Setting IP Addresses, Sharing Files and Folders, Network Troubleshooting, PING Test, ifconfig Etc.	4	<i>Demonstration and practice</i>	Practice and Report writing.	
Introduction To Servers and Network Security: Files Servers, Email Servers, Proxy	8	<i>Demonstration and practice</i>	Practice and Report writing.	https://w4university.wordpress.com/2013/07/01/http-dhcp-dns-ftp-smtp-proxy-and-client-server-architecture/

Servers; Essential Security Measures: Encrypt Critical Data, Secure Systems With Passwords, Back Up and Isolate Information.				
<i>Total (hrs)</i>	60hrs			

Cloud Computing Application

Subject Name	Code	Type of course	T-P-Pr (Credit)	Prerequisite
Cloud Computing Application	ENFC1403	Workshop	0-2-0(2)	

1. Objective

Key points: Briefly explain what the course covers. Indicate why the course is to be studied. Specify who should study the course and requirement of prior knowledge and skill, if any.

- | |
|---|
| <ul style="list-style-type: none"> · Learn fundamentals of cloud computing · Learn to build distributed applications and microservices with AWS Step Functions · Learn step-by-step to setup up AWS platform |
|---|

2. Course outcome

Key points: State clearly what knowledge and skill a student is expected to learn at the end of the course.

- | |
|---|
| <ul style="list-style-type: none"> · Setup AWS Account and AWS infrastructure · Deploying serverless microservices · Implementing scalability and implementing high availability |
|---|

3. Evaluation Systems

Key points: State clearly the components, weights and methods of evaluation system.

<i>Internal Examination</i>	<i>Component</i>	<i>% of Marks</i>	<i>Method of Assessment</i>
	Midterm Test		Written examination
	Assignment		Report and Presentation
	Experiments	50	Lab work, report
	Project	50	Report and presentation
	Quiz		Surprise/preannounced ones
<i>External Examination</i>	<i>Practice Examination</i>		Written examination
Total		100	

Course outline

Module I (8 Hrs)

UNDERSTANDING CLOUD BASICS

Defining cloud computing, Introducing public, private, and hybrid clouds, Introducing cloud service models – IaaS, PaaS, and SaaS, Introducing multi-tenancy models, Compare cloud value proposition with conventional models. Understand Global Infrastructure – Region, Availability Zones, Edge Locations; Setting up AWS account, Getting Familiarity with AWS Management Console; Understanding cloud-based workloads

Module II (10 Hrs)

DESIGNING CLOUD APPLICATIONS

Introducing cloud-based multitier architecture, Designing for multi-tenancy, Understanding cloud applications design principles, Understanding emerging cloud-based application architectures, Estimating your cloud computing costs, A typical e-commerce web application

Module III (8 Hrs)

INTRODUCING AWS COMPONENTS

AWS components, Managing costs on AWS cloud, Application development environments
Setting up the AWS infrastructure

Module IV (8 Hrs)

DESIGNING FOR AND IMPLEMENTING SCALABILITY

Defining scalability objectives, Designing scalable application architectures, Leveraging AWS infrastructure services for scalability, Evolving architecture against increasing loads, Event handling at scale, Setting up Auto Scaling

Module V (8 Hrs)

DESIGNING FOR AND IMPLEMENTING HIGH AVAILABILITY

Defining availability objectives, Nature of failures, Setting up high availability

Module VI (8 Hrs)

DESIGNING FOR AND IMPLEMENTING SECURITY

Defining security objectives, Understanding the security responsibilities, Best practices in implementing AWS security, Setting up security

Module VII (10 Hrs)

DEPLOYING TO PRODUCTION AND GOING LIVE

Managing infrastructure, deployments, and support at scale, Creating and managing AWS environments using CloudFormation, Using CloudWatch for monitoring, Using AWS solutions for backup and archiving, Planning for production go-live activities, Setting up for production

E-content: www.awseducate.com

https://aws.amazon.com/getting-started/use-cases/?awsf.getting-started-content=*default

Text Books:

Aurobindo Sarkar, Amit Shah, *Learning AWS - Second Edition*, Packt Publishing Limited, February 2018, ISBN 9781787281066

Reference Books:

Vipul Tankariya, *AWS Certified SysOps Administrator - Associate Guide*, Packt Publishing Limited August 2018, ISBN 9781788990776

John Stamper, Sean Senior, Kevin E. Kelly, Biff Gaut, Tim Bixler, Hisham Baz, Joe Baron, *AWS Certified Solutions Architect Official Study Guide*, John Wiley & Sons, October 2016, ISBN: 9781119138556

Online Source: <https://aws.amazon.com/>

<https://www.awseducate.com/faqs?app=3>

4. Session Plan

Topic coverage and Internal Test	No. of Sessions (in hrs.)	Activity (lecture, tutorial, lab practice, field studies/field-trip, Workshop etc.)	Assignment (project, assignment, field study, seminar, etc.)	Suggested Reading (Book, Video, Online source, etc.)
<i>Defining cloud computing, Introducing public, private, and hybrid clouds</i>	2	<i>Lecture</i>	<i>Assignment</i>	<i>Text Book -I</i>
<i>Introducing cloud Service models – IaaS, PaaS, and SaaS, Introducing multi-tenancy models</i>	2	<i>Lecture</i>	<i>Assignment</i>	<i>T.B-I</i>
<i>Understanding cloud-based workloads, Setting up AWS account</i>	2	<i>Lab Practice</i>	<i>Experiment</i>	<i>T.B-I</i>
<i>Introducing cloud-based multitier architecture, Designing for multi-tenancy</i>	2	<i>Lab Practice</i>	<i>Experiment</i>	<i>T.B-I</i>
<i>Understanding cloud applications design principles, Understanding emerging cloud-based application architectures</i>	2	<i>Lab Practice</i>	<i>Experiment</i>	<i>T.B-I</i>
<i>Estimating your cloud computing costs, A typical e-</i>	2	<i>Lab Practice</i>	<i>Experiment</i>	<i>T.B-I</i>

<i>commerce web application</i>				
<i>AWS components, Managing costs on AWS cloud</i>	2	<i>Lab Practice</i>	<i>Experiment</i>	<i>T.B-1</i>
<i>Application development environments</i>	2	<i>Lab Practice</i>	<i>Experiment</i>	<i>T.B-1</i>
<i>Setting up the AWS infrastructure</i>	2	<i>Lab Practice</i>	<i>Experiment</i>	<i>T.B-1</i>
<i>Defining scalability objectives, Designing scalable application architectures</i>	4	<i>Lab Practice</i>	<i>Experiment</i>	<i>T.B-1</i>
<i>Leveraging AWS infrastructure services for scalability</i>	4	<i>Lab Practice</i>	<i>Experiment</i>	<i>T.B-1</i>
<i>Evolving architecture against increasing loads</i>	2	<i>Lab Practice</i>	<i>Experiment</i>	<i>T.B-1</i>
<i>Event handling at scale , Setting up Auto Scaling</i>	4	<i>Lab Practice</i>	<i>Experiment</i>	<i>T.B-1</i>
<i>Defining availability objectives, Nature of failures, Setting up high availability</i>	6	<i>Presentation, Lab Practice</i>	<i>Assignment, Experiment</i>	<i>T.B-1</i>
<i>Defining security objectives, Understanding the security responsibilities</i>	3	<i>Lab Practice</i>	<i>Experiment</i>	<i>T.B-1</i>
<i>Best practices in implementing AWS security, Setting up security</i>	4	<i>Lab Practice</i>	<i>Experiment</i>	<i>T.B-1</i>
<i>Managing infrastructure, deployments, and support at scale</i>	3	<i>Lab Practice</i>	<i>Experiment</i>	<i>T.B-1</i>
<i>Creating and managing AWS environments using CloudFormation</i>	3	<i>Lab Practice</i>	<i>Experiment</i>	<i>T.B-1</i>
<i>Using CloudWatch for monitoring</i>	2	<i>Lab Practice</i>	<i>Experiment</i>	<i>T.B-1</i>
<i>Using AWS solutions for backup and archiving</i>	2	<i>Lab Practice</i>	<i>Experiment</i>	<i>T.B-1</i>
<i>Planning for production go-live activities, Setting up for production</i>	3	<i>Lab Practice</i>	<i>Experiment</i>	<i>T.B-1</i>
<i>Total (hrs)</i>	60			

Software Development Methodologies

Subject Name	Code	Type of course	T-P-P	Prerequisite
Software Development Methodologies	ENFC1404	Workshop	0-2-0(2)	Programming for Problem solving- Java or Programming for Problem Solving - C++ or Python Programming

1. Objective

<ul style="list-style-type: none"> ✓ Learn software development processes: user requirements, specifications, design, coding, testing, maintenance, documentation, management ✓ Learn DevOps software development model

2. Course outcome

<ul style="list-style-type: none"> ✓ Identify, collect requirements and prepare design documents required for managing a software ✓ Build software using DevOps model so as to release the software faster and more frequently
--

3. Evaluation Systems

<i>Internal Examination</i>	<i>Component</i>	<i>% of Marks</i>	<i>Method of Assessment</i>
	<i>Midterm Test</i>	<i>NIL</i>	<i>Written examination</i>
	<i>Assignment</i>	<i>NIL</i>	<i>Report and Presentation</i>
	<i>Experiments</i>	<i>50</i>	<i>Practice work, report and viva voce</i>
	<i>Project</i>	<i>50</i>	<i>Report and presentation</i>
	<i>Quiz</i>	<i>NIL</i>	<i>Surprise/preannounced ones</i>
<i>External Examination</i>	<i>Semester</i>	<i>NIL</i>	<i>Written examination</i>
	<i>Practice (External)</i>	<i>NIL</i>	<i>Practice Exam with viva voce</i>
<i>Total</i>		<i>100</i>	

Course outline

- All the students shall be distributed in groups for project development. They will choose the project from the list of projects (not exhaustive) to be given at the beginning of the session, which they need to develop along with the coverage of the course. A group shall not consist more than 4 members

- Some of the sample projects are:

School Management
E-Learning Web Portal
Reservation System (Railway, Airlines, etc.)
Accounting System
Voting System
Logistics Management
Contact Management

Module-I (8 Hrs.)

Integrated Development Environment, Version Control (Git), Documentation

Module-II (16 Hrs.)

Software Development Models: Principles of Life Cycle Models, Waterfall Software Development, Agile Software Development, Lean Software Development, DevOps

Module-III (12 Hrs.)

DevOps Processes and Continuous Delivery:

Requirements (Functional and Non-functional) and Specifications, Developers, Revision Control System, Build Server,

Module-IV (12 Hrs.)

Artifact Repository, Package Managers, Test Environments, Staging/Production, Release Management

Module-V (9 Hrs.)

DevOps – Architecture & Design:

DevOps Architecture, Separation of Concerns, DevOps Design (Modularity, Coupling, Cohesion)

Module-VI (9 Hrs.)

Three-tier Systems, Presentation Tier, Logic Tier, Data Tier, Handling Database Migrations

Module-VII (9 Hrs.)

Testing (Unit Testing, Integration Testing), Implementation, Deployment (Rollback, Cutover Strategies)

Text Books:

- Joakim Verona, *Practical DevOps*, Packt Publishing, 2nd Edition, 2018.

Reference Books:

Roger S. Pressman and Bruce R. Maxim, *Software Engineering – A Practitioner’s approach*, Mc Graw Hill Education, 8th Edition, 2015
Sanjeev Sharma and Bernie Coyne, *DevOps for Dummies*, John Wiley & Sons, Inc. 2nd Edition, 2015

7. Session Plan

Topic coverage and Internal Test	No. of Sessions (in hrs.)	Activity (lecture, tutorial, lab practice, field studies/field-trip, Workshop etc.)	Assignment (project, assignment, field study, seminar, etc.)	Suggested Reading (Book, Video, Online source, etc.)
Module-I (8 Hrs.)				
<i>Integrated Development Environment</i>	2 + 2	<i>lecture + practice</i>	<i>Assignment</i>	<i>TB-1, RB-1</i>
<i>Version Control (Git), Documentation</i>	4	<i>practice</i>	<i>Assignment + Experiments</i>	<i>TB-1, RB-1</i>
Module-II (16 Hrs.)				
<i>Principles of Life Cycle Models</i>	4	<i>Lecture</i>	<i>Assignment + Experiments</i>	<i>RB-1</i>
<i>Waterfall Software Development</i>	4	<i>practice</i>	<i>Assignment + Experiments</i>	<i>RB-1</i>
<i>Agile Software Development</i>	4	<i>practice</i>	<i>Assignment + Experiments</i>	<i>TB-1</i>
<i>Lean Software Development, DevOps</i>	4	<i>practice</i>	<i>Assignment + Experiments</i>	<i>TB-1</i>
Module-III (12 Hrs.)				
<i>DevOps Processes and Continuous Delivery:</i>	2 + 4	<i>lecture + practice</i>	<i>Assignment + Experiments</i>	<i>TB-1, RB-2</i>
<i>Requirements (Functional and Non-functional) and Specifications</i>				
<i>Developers, Revision Control System, Build</i>	6	<i>practice</i>	<i>Assignment +</i>	<i>TB-1, RB-2</i>

<i>Server</i>			<i>Experiments</i>	
Module-IV (12 Hrs.)				
<i>Artifact Repository, Package Managers</i>	4	<i>practice</i>	<i>Assignment + Experiments</i>	<i>TB-1</i>
<i>Test Environments, Staging/Production</i>	6	<i>practice</i>	<i>Assignment + Experiments</i>	<i>TB-1</i>
<i>Release Management</i>	2	<i>practice</i>	<i>Assignment + Experiments</i>	<i>TB-1</i>
Module-V (9 Hrs.)				
<i>DevOps – Architecture & Design: DevOps Architecture, Separation of Concerns</i>	2 + 2	<i>lecture + practice</i>	<i>Assignment + Experiments</i>	<i>TB-1, RB-1</i>
<i>DevOps Design (Modularity, Coupling, Cohesion)</i>	1 + 4	<i>lecture + practice</i>	<i>Assignment + Experiments</i>	<i>TB-1</i>
Module-VI (9 Hrs.)				
<i>Three-tier Systems, Presentation Tier,</i>	3 + 2	<i>lecture + practice</i>	<i>Assignment + Experiments</i>	<i>TB-1</i>
<i>Logic Tier, Data Tier</i>	2	<i>practice</i>	<i>Assignment + Experiments</i>	<i>TB-1</i>
<i>Handling Database Migrations,</i>	2	<i>practice</i>	<i>Assignment + Experiments</i>	<i>TB-1</i>
Module-VII (9 Hrs.)				
<i>Testing (Unit Testing, Integration Testing)</i>	1 + 2	<i>lecture + practice</i>	<i>Assignment + Experiments</i>	<i>TB-1</i>
<i>Implementation, Deployment (Rollback, Cutover Strategies)</i>	6	<i>practice</i>	<i>Assignment + Experiments</i>	<i>TB-1</i>
Total (Hrs.)	75	Theory (15 Hrs.) + Practice (60 Hrs.)		

**Course Structure
Civil Engineering
Basket - IV
2017**

Course Code	Course Title	Course Type	Credits	Prerequisite
CECC0201	Estimation & Quantity Surveying	Practice	2	Nil
CECC0412	Concrete Technology	Theory+ Practice	2	Nil
CCCE0401	Geotechnical Engineering - I	Theory + Practice	4	Nil
CCCE0407	Advanced Surveying	Theory + Practice	4	Nil
CECC0402	Foundation Engineering	Theory + Practice	3	Soil Mechanics
CCCE0402	Highway Engineering	Theory + Practice	4	Nil
CCCE0403	Water supply & Sanitary Engineering	Theory + Practice	4	Nil
CECC0405	Hydrology & Irrigation	Theory + Practice	3	Nil
CECC0414	Quality Control and Risk Management in Construction	Theory + Practice	3	Nil
CECC0407	Computer Aided Design of Steel structure	Theory + Practice	3	Nil
CECC0408	Computer Aided Design of Concrete Structures)	Theory + Practice	3	Nil
CECC0410	GIS and Digital Cartography	Theory + Practice	3	Nil
MECC0411	Strength of Material	Theory + Practice	4	Engineering Mechanics
CCCE0102	Hydraulics & Hydraulic Machine	Theory	3	FCEN0401 Basic Fluid Mechanics

Syllabus

Estimation & Quantity Surveying

Subject Name	Code	Type of course	T-P-Pr (Credit)	Prerequisite
Estimation & Quantity Surveying	CECC0201	Practice	0-3-0(2)	Nil

1. Objective

- To make familiar with calculation of quantities for different item of works.
- To provide knowledge about estimation of buildings through Estimator-2.0 software.

2. Course outcome

Gain knowledge about how to schedule & estimate different construction works both manually and using software.

3. Evaluation Systems

Internal Examination	Component	% of Marks	Method of Assessment
	Experiments	50	Lab work, report
External Examination		50	Lab work, Report/Viva
Total		100	

Module - I: BUILDING

(16hrs)

Estimations and Quantity Surveying: Reading of Plans, Sections and detailed Drawings Related to buildings; preparation of Quantities and Units.

Practice Sessions:

1. Study of construction drawings and preparation of WBS.
2. Detailed estimates for a Shopping Complex using Estimator-2.0 software.
3. Detailed estimates for a hostel Building using Estimator-2.0 software.
4. Detailed estimates for a hospital using Estimator-2.0 software.

Module -II :CULVERT

(10hrs)

Estimations and Quantity Surveying: Reading of Plans, Sections and detailed Drawings Related to irrigation structures; preparation of Quantities and Units.

5. Detailed estimates (Manual) for a Slab culvert with right angled/ Splayed wing wall.
6. Detailed estimates (Manual) for a box culvert.
7. Detailed estimates (Manual) for a Hume pipe Culvert.

Module -III:ROAD

(6hrs)

Estimations and Quantity Surveying: Reading of Plans, Sections and detailed Drawings Related to Roads structures; preparation of Quantities and Units.

8. Detailed estimates (Manual) for a road.

Module -IV :SLOPED ROOF**(6hrs)**

Estimations and Quantity Surveying: Reading of Plans, Sections and detailed Drawings Related to Sloping roof/Roof truss structures; preparation of Quantities and Units.

9. Detailed estimate (Manual) for a timber roof truss.
10. Detailed estimate (Manual) for a roof cover of GI sheets.

Module -V:QUANTITY SURVEY**(06hrs)**

Estimations and Quantity Surveying; Preparation of Quantity of materials per unit rate of work; Estimating labour.

11. Quantity of materials required for different items of works in buildings (Manual).
12. Quantity of different types of labor required for different items of works (Manual).

Module-VI: RATE ANALYSIS OF BUILDING**(10hrs)**

Specifications; Rate Analysis as per State Govt. and CPWD Standards

13. Development of Excel Sheet for Rates, Specifications and Cost Estimates.
14. Rate Analysis and Cost Estimates for a Shopping Complex using Estimator-2.0 software.
15. Rate Analysis and Cost Estimates for a hostel Building and a hospital, using Estimator-2.0 software.

Module-VII:RATE ANALYSIS OF CULVERT & ROAD (6hrs)

Specifications; Rate Analysis as per State Govt. and CPWD Standards

16. Rate Analysis and Cost Estimates for a Slab culvert with right angled wing wall using Estimator-2.0 software.
17. Rate Analysis and Cost Estimates for an arch culvert using Estimator-2.0 software.
18. Rate Analysis and Cost Estimates for a road using Estimator-2.0 software.

Text Books:

1. Estimating and Costing in Civil Engineering- By B.N.Dutta

Reference Books:

1. Estimating, Costing, Specification & Valuation in Civil Engineering-By M.Chakraborti

Session Plan

Topic coverage and Internal Test	No. of Sessions (in hrs.)	Activity (lecture, tutorial, lab practice, field studies/field-trip, Workshop etc.)	(project, Assignment, field study, seminar, etc.)	Suggested Reading (Book, Video, Online source, etc.)
Module I				
Estimations and Quantity Surveying; Reading of Plans, Sections and detailed Drawings Related to buildings, irrigation structures and Roads; preparation of Quantities and Units. Study of construction drawings and preparation of WBS.	2	lecture	1	RB ₁ ;chapter I & II
Detailed estimates for a Shopping Complex using Estimator-2.0 software.	6	Practice	2	http://estimator.in/tutorial/index.htm https://www.youtube.com/watch?v=d-EP/0M4XZS&list=PLuX_PtBw-QK1-c-B5D8SiJjfOttjxmHf6 Seen on 11 th Jun, 2019
Detailed estimates for hostel Building using Estimator-2.0 software.	4	Practice		
Detailed estimates for a hospital using Estimator-2.0 software.	4	Practice		
Sub-total (hrs)	16			
Module II				
Detailed estimates (Manual) for a Slab culvert with right angled/ Splayed wing wall.	6	Practice	3	TB ₁ ;chapter no-8 page-373 to 414
Detailed estimates (Manual) for a box culvert.	2	Practice		
Detailed estimates (Manual) for a Hume pipe Culvert.	2	Practice		
Sub-total (hrs)	Practice 10			
Module III				
Detailed estimates (Manual) for a road.	6	Practice	4	TB ₁ ; chapter no-7, page-328 to 372
Sub-total (hrs)	Practice 06			

Module IV				
Detailed estimate (Manual) for a timber roof truss	4	Practice	5	RB1; chapter VII, Page-215-299
Detailed estimate (Manual) for a roof cover of GI sheets	2	Practice		
Sub-total (hrs)	Practice 06			
Module V				
Quantity of materials required for different items of works in buildings (Manual).	04	Practice	6	RB1;chapter XIII, Page-415-528
Quantity of different types of labour required for different items of works (Manual).	02	Practice		
Sub-total (hrs)	Practice 06			
Module VI				
Specifications; Rate Analysis as per State Govt. and CPWD Standards. Development of Excel Sheet for Rates, Specifications and Cost	2	Practice	7	RB1;chapter no-13
Rate Analysis and Cost Estimates for a Shopping Complex using Estimator-2.0 software.	4	Practice		https://www.youtube.com/watch?v=NQIHnHWTRQc&list=PLuX_PtBw-QK1-C-B5D8SiJfOttjxmHf6&index=10
Rate Analysis and Cost Estimates for a hostel Building and a hospital, using Estimator-2.0 software.	4	Practice		Seen on 12 th Jun, 2019
Sub-total (hrs)	Practice 10			

Module VII				
Rate Analysis and Cost Estimates for a Slab culvert with right angled wing wall using Estimator-2.0 software.	2	Practice	8	https://www.youtube.com/watch?v=NW8ODPKgtFw&list=PLuX_PtBw-QK1-c-B5D8SiJfOttjxmHf6&index=15 Seen on 12 th Jun, 2019
Rate Analysis and Cost Estimates for a arch culvert using Estimator-2.0 software.	2	Practice		
Rate Analysis and Cost Estimates for a road using Estimator-2.0 software.	2	Practice		
Sub-total (hrs)	PRACTICE 06			
Total (hrs)	60	PRACTICE		

Concrete Technology

Course Title	Code	Type of course	T-P-PJ	Prerequisite
Concrete Technology	CECC0412	Theory+ Practice	1-1-0	Nil

Objective

- To teach the student about different property of concrete and its use in different work.

Course outcome

- Students will able to apply core concepts of Concrete technology to solve engineering problems.

Evaluation Systems

Internal Examination	Component	% of Marks	Method of Assessment
	Internal Theory	20	Written Examination
	Internal Practice	30(20+10)	Lab work + Learning Record
External Examination	External Theory	30	Written Examination
	External Practice	20	Lab Work
Total		100	

COURSE OUTLINE

Module I :Properties of Cement (6Hrs)

Cement-Different types Chemical composition and Properties Tests on cement-IS Specifications; Portland cement chemical composition Hydration; Setting of cement Structure of hydrate cement Test on physical properties for Different grades of cement

Practice 1

- XRF analysis of cement
- Specific gravity of cement (comparison study)

Practice 2

- Compressive strength of cement(comparison study)
- Soundness test of cement (comparison study)
- Setting time(comparison study)

Module II: Aggregates (5Hrs)

Classification; Mechanical properties and tests as per BIS Grading requirements Classification of aggregate Particle shape & texture strength & other mechanical properties of aggregate Specific gravity; Bulk density; porosity; adsorption& moisture content of aggregate Bulking of sand

Practice 3

- Specific gravity of coarse aggregate
- Specific gravity of fine aggregate
- Zoning of aggregates
- Water absorption of coarse aggregate

Module III :PROPERTIES OF CONCRETE (4Hrs)

Workability- Factors affecting workability; Measurement of workability by different tests Setting times of concrete; Effect of time and temperature on workability Segregation & bleeding Mixing and vibration of concrete

Practice 4 Workability test of Fresh Concrete by

10. Slump cone method
11. Compaction factor method
12. Flow table method
13. Preparation of cube mould for durability test

Module IV : CHEMICAL AND MINERAL ADMIXTURES(6 Hrs)

Accelerators; Retarders; Plasticizers- Super plasticizers; Water proofers ;Mineral Admixtures like Fly; Ash, Silica Fume; Ground Granulated Blast Furnace Slag and Metakaoline Their effects on concrete properties

Practice 14. Preparation of Design Mix of concrete

Practice 15.: Prepare the design mix using Retarder and Accelerator

Module V :SPECIAL CONCRETE(10Hrs)

Special Concretes: Introduction to light weight concrete ;Cellular concrete no-fines concrete high density concrete fiber reinforced concrete

Practice 16: Preparation of Fiber reinforced concrete

Practice 17:Preparation of Light weight concrete mix and reactive Powder concrete

Practice 18: Preparation of concrete with plastic aggregates

Practice 19: Design of concrete using construction demolition waste

Module VI :PROPERTIES OF HARDENED CONCRETE (11Hrs)

Properties of Hardened concrete Determination of Compressive and Flexural strength by Destructive tests and non-destructive tests.

Practice 20: Splitting tensile strength of cylinder and Flexural strength of beam

Practice 21: Compressive strength of cube and cylinder specimen

Practice 22: Stress-strain curve for concrete Determination of Young's Modulus.

Practice 23:

- (a) Non-destructive tests by Rebound hammer.
- (b) Destructive tests by core cutter.

Module VII :Durability of Concrete (3 Hrs)

Factors affecting durability; Tests for durability of concrete

Practice 24:

- Carbonation test for concrete.
- Resistance to chemical attack (Sulphate attack, chloride attack)

Text Books:

- M.S Shety, S. CHAND Publication

Reference Books:

- Indian standards for tests on concrete materials and mix design.

Session Plan

Topic coverage and Internal Test	No. of Sessions (in hrs.) Theory +Practice	Activity (lecture, tutorial, lab practice, field studies/field -trip, Workshop etc.)	A (Project, A, field study, seminar, etc.)	Suggested Reading (Book, Video, Online source, etc.)
Module I [2hrs.Lecture+4hrs.Practice]				
Cement-Different types Chemical composition and Properties -Tests on cement-IS Specifications- Portland cement – chemical composition	1+0=1	Lecture	1.1	Text Book(TB) Chapter(CH)- 1&2
Hydration, Setting of cements Structure of hydrate cement. Test on physical properties for Different grades of cement	1+0=1	Lecture	1.2	TB CH-2
XRF analysis of cement Specific gravity of cement (comparison study)	0+2=2	Practice		TB CH-2

Compressive strength of cement(comparison study) Soundness test of cement (comparison study)	0+2=2	Practice		TB CH-2
Module II [3 hrs.Lecture+2 hrs. Practice]				
Aggregates-Classification-Mechanical properties and tests as per BIS Grading requirements-	1+0=1	Lecture	2.1	TB CH-3
Classification of aggregate Particle shape & texture strength & other mechanical properties of aggregate	1+0=1	Lecture	2.2	
Specific gravity, Bulk density, porosity, adsorption & moisture content of aggregate Bulking of sand	1+0=1	Lecture	2.3	
(a) Specific gravity of coarse aggregate (b) Specific gravity of fine aggregate (c) Zoning of aggregates (d) Water absorption of coarse aggregate	0+2=2	Practice		
Module III [2 hrs.Lecture+2 hrs. Practice]				
Workability Factors affecting workability Measurement of workability by different tests	1+0=1	Lecture	3.1	TB CH-5
Setting times of concrete Segregation & bleeding Mixing and vibration of concrete	1+0=1	Lecture	3.2	

(a) Slump cone method (b) Compaction factor method (c) Flow table method (d) Preparation of cube mould for durability test	0+2=2	Practice		
Module IV[2 hrs.Lecture+4hrs.Practice]				
Accelerators-Retarders Plasticisers Super plasticizers- Water proofers Mineral Admixtures like Fly, Ash, Silica Fume	1+0=1	Lecture	4.1	TB CH-7
Ground Granulated Blast Furnace Slag and Metakaoline Their effects on concrete properties	1+0=1	Lecture	4.2	
Preparation of Design Mix of concrete	0+2=2	Practice		
Prepare the design mix using Retarder and Accelerator	0+2=2	Practice		
Module V [2 hrs.Lecture+8 hrs. Practice]				
Special Concretes Introduction to light weight concrete Cellular concrete	1+0=1	Lecture	5.1	TB CH-12
No fines concrete high density concrete	1+0=1	Lecture	5.2	
Preparation of Fiber reinforced concrete	0+2=2	Practice		
Preparation of Light weight concrete mix and Powder concrete	0+2=2	Practice		
Preparation of concrete with plastic aggregates	0+2=2	Practice		
Design of concrete using construction demolition waste	0+2=2	Practice		
Module VI [3 hrs.Lecture+8 hrs.Practice]				
Properties of hardened concrete Determination of Compressive and Flexural strength as per BIS	1+0=1	Lecture	6.1	

Properties of Hardened concrete Determination of Compressive and Flexural strength	1+0=1	Lecture	6.2	TB CH-10
Destructive tests and non-destructive tests.	1+0=1	Lecture	6.3	
Splitting tensile strength of cylinder and Flexural strength of beam	2+0=2	Practice		
Compressive strength of cube and cylinder specimen	2+0=2	Practice		
Stress-strain curve for concrete Determination of Young's Modulus	2+0=2	Practice		
(a) Non-destructive tests by Rebound hammer. (b) Non-destructive tests by core cutter	2+0=2	Practice		
Module VII [1 hrs.Lecture+2 hrs.Practice]				
Factors affecting durability. Tests for durability of concrete	1+0=1	Lecture	7	TB CH-9
(a) Carbonation test for concrete. (b) Resistance to chemical attack (Suphate attack, chloride attack)	0+2=2	practice		TB CH-8
Total (hrs)	30+30=60	30hrs.Lecture+30 hrs. Practice		

CCCE0401 GEOTECHNICAL ENGINEERING –I

Pre –requisites	Course Type	Credits
Nil	Theory + Practice	4

Course Objectives:

To make students understand the basic theoretical aspects and implementation of following topics in the real world situations.

Index properties of soil, Permeability of soils
Seepage through soils

Compaction and consolidation of soil
Shear strength of soil

Stress distribution in soil
Stability of slopes

Course Outcomes:

Upon successful completion of the course, students are expected to be able:

To classify soil on the basis of their index properties

Analyze different properties of soil such permeability, seepage, compaction and consolidation
Check shear strength of different soil with the help of laboratory experiments

Analyze stress distribution pattern for different types of soil

Analyze different types of slopes using different empirical methods and software aids.

MODULE - I (16 hours)

(a) INTRODUCTION: Soil formation - soil structure and clay mineralogy - Adsorbed water - Mass-volume relationship - Relative density. **(Most of the topics to be delivered in classroom teaching mode, Relative density to be dealt as practice and project module)**

(b) INDEX PROPERTIES OF SOILS: Grain size analysis - Sieve and Hydrometer methods - Consistency Limits and Indices - I.S. Classification of soils **(I.S. classification of soil to be delivered in classroom , all other topics to be dealt as dealt as practice and project module)**

(c) PERMEABILITY: Soil water - capillary rise - flow of water through soils - Darcy's-permeability law- Factors affecting - Determination of coefficient of permeability - Permeability of layered systems **(Determination of coefficient of permeability to dealt as dealt as project module, all other topics to be dealt in classroom teaching and practice mode)**

(d) SEEPAGE THROUGH SOILS: Total, neutral and effective stresses - quick sand condition - Seepage through soils - Flow nets: Characteristics and Uses (Basic appraisal only) **(All topics to dealt as classroom teaching module)**

MODULE - II (8 hours)

(e) COMPACTION: Mechanism of compaction - factors affecting - effects of compaction on soil properties. Field compaction Equipment - compaction control. **(Mechanism of compaction to be dealt as dealt as practice and project module, rest of the topics to be dealt in classroom teaching mode)**

(f) CONSOLIDATION: Stress history of clay; e-p and e-log p curves - magnitude and rate of 1-D consolidation - Terzaghi's **(To be delivered Theory in classroom)**.

MODULE - III (29 hours)

(f) SHEAR STRENGTH OF SOILS: Mohr - Coulomb Failure theories - Types of laboratory strength tests - strength tests based on drainage conditions, shear strength of clays. **(Types of shear strength test to be delivered as practice and project mode, rest of the topics to be dealt in classroom teaching mode, Mathematical Derivations to be limited to classroom activity. They should not be a part of External Evaluation)**

(g) STRESS DISTRIBUTION IN SOILS: Normal and shear stresses on a plane, Boussinesq's solution for a point load, line load, strip load, uniformly loaded circular and rectangular areas, Isobar and pressure bulb concept, stress distribution on horizontal and vertical planes, contact pressure **(All topics to be dealt in classroom teaching and practice mode, Mathematical Derivations to be limited to classroom activity. They should not be a part of External Evaluation)**

(h) STABILITY OF SLOPES: Types of slopes, failure types, causes of slope failure, factors contributing to instability of soil slope- high and low shear strength factors, slope stability analysis- analysis of finite and infinite slopes- Bishop's solution, soil stabilization measures), **(All the (S topics to be dealt in classroom teaching and practice mode, Mathematical Derivations to be limited to classroom activity. They should not be a part of External Evaluation)**

Text Books:

- 1 Basic and Applied Soil Mechanics, GopalRanjan & A S R Rao, New age International Pvt . Ltd, 2. Soil Mechanics and Foundation Engg., K.R. Arora, Standard Publishers and Distributors, Delhi.
3. Soil Mechanics and Foundation, B.C. Punmia, Ashok Kumar Jain & Arun Kumar Jain, Laxmi publications, New Delhi

Reference Books:

1. Geotechnical Engineering, C. Venkataramiah, New age International Pvt .Ltd, (2002).
2. Geotechnical Engineering, Purushotham Raj, Tata Mcgraw Hill
3. Geotechnical Engineering, ManojDutta & S K Gulati, Tata Mc.Grawhill Publishers, New Delhi.

Some

important

web links

Local server

(MRC) link :

<ftp://10.16.1.4/B.Tech/3RD%20SEMESTER/Civil/Civil-VBC%20Rao-Geotechnical%20Engg/> <http://www.nptel.ac.in/courses/105101084/>
<http://www.nptel.ac.in/courses/105103097/>

CCCE0407 ADVANCED SURVEYING

Pre - requisites	Course Type	Credits
Nil	Theory + Practice	4

Course objectives:

1. To make students able to apply knowledge of mathematics, science, and engineering to understand the measurement techniques and equipment used in land surveying.
2. To make students able to measure horizontal distances across clear landscape or across obstacles using surveying instruments like theodolite, Total station.
3. To make students able to measure horizontal and vertical distances using total station
4. To enable students to sketch contour maps of the given topography using total station and surfer software.
5. To provide practical assist to student for their better understanding of modern GIS tools through open source software such as QGIS, Surfer

Course Outcomes:

On successful completion of course students will be able to

1. Apply math, science, and technology in surveying activities.
2. Measure horizontal distances across clear landscape and across obstacles.
3. Measure horizontal angles between geographical entities.
4. Plot given geographical area on drawing sheet.
5. Preparation of contour maps using Theodolite and Total station
6. Measure altitude of points at different elevation using GPS.
7. Function effectively as team members (or team leaders)

Module1

Theodolite Survey: Use of theodolite, temporary adjustment, measuring horizontal and vertical angles Traversing, checks and closing errors , balancing a traverse , adjustment of bearings, computation of area of closed traverse, trigonometric levelling,tachometry,methods of tachometry,.

MODULE-2

Curves, types of curves, simple circular curves, compound curves, reverse curves, transition curves and vertical curve, setting out of curves.

MODULE-3

Total station: Introduction to Total station, Functions, working principles of total station applications. Electronic data recording.

GPS Basics: Introduction –Satellite, Control and User Segments –Signal Components –Errors in GPS observations

–GPS positioning –Differential GPS.

GPS Mapping: Conventional –Static –Kinematic –Semi kinematic (Stop &Go)-Rapid static Mobile mapping GIS: GIS: introduction to GIS .components of GIS, Application of GIS in Civil engineering (All will be through Project mode)

Text Books :

Surveying, volume 1,2 &3 by B.C.PUNMIA chapters 5,6,11,14

Surveying, volume 1&2 BY S.K.Duggal , TMH publisher

Surveying by A.DE, S.Chand & co.

PEADAGOGY

Module I

S. No.	Topic	Pedagogy	Details	Instructional Hrs			
				Th	Practic e	vide	Proje
	Theodolite and tachometric surveying						
a	Theodolite Survey: Use of theodolite, temporary adjustment, measuring horizontal angle and vertical angle	CRT & PRA	Field survey	0	4	0	0
b	Theodolite Survey: Theodolite traversing			1	4	0	0
c	Theodolite balancing and closing errors			1	2	0	0
d	Computation of area of closed traversed by coordinates			1	2	0	0
e	Principles of tachometry and methods of tachometry	CRT		1		0	0
f	Determination of tachometric constant	CRT & PRA	Filed survey	1	2	0	0
g	Fixed hair method of tachometer	CRT		1	0	0	0
h	Substance bar method of tachometer	CRT		1	0	0	0
i	Tangential tachometer	CRT		1	0	0	0
	Sub total	22		8	14	0	0

Module II

S. No.	Topic	Pedagogy	Instructional Hrs			
			Detail	Theory	Practic e	video
Curves						
a	Introduction to curves and classification and elements of simple circular curve	CRT	1	0	0	0
b	Setting out of simple circular curves	CRT & PRA	0	6	0	0
c	Compound curves :Elements of curve and related problem	CRT &PRA	1	4	0	0
d	Reverse curves :Elements of curve and related problem	CRT	1	0	0	0
e	Tangential curve and related problem	CRT	1	0	0	0
f	Vertical curves and related problem	CRT	1	0	0	0
Sub total		15	5	10	0	0

Module III

S. No.	Topic	Pedagogy	Details	Instructional Hrs			
				Theory	Practice	video	Project
	Total station and GPS						
a	Study on total station	CRT&PRA		1	2	0	0
b	Horizontal and vertical distance using Total Station	CRT & PRA	Field Survey	0	2	0	0
c	Traversing and area calculation using Total Station	CRT & PRA	Field surveys	1	2	0	0
d	Preparation of Contour map using Total station	PRO	Surfer software/ Quick Mgrid	0	0	0	4
e	GPS surveying	PRA and Video	Mobile GPS	0	2	1	0
f	GIS survey	CRT & Video and PRO	Using QGIS/VGIS	1	0	1	6
	Sub total	23		3	8	2	10

Foundation Engineering

Subject Name	Code	Type of course	T-P-Pr (Credit)	Prerequisite
Foundation Engineering	CECC0402	Theory + Practice	2-1-0(3)	Soil Mechanics

1. Objective

- To make students understand the basic theoretical aspects and implementation of following topics in the real-world situations: Foundations and Retaining structures.

2. Course outcome

- Upon successful completion of the course, students are expected to be able to design different retaining structures and foundations in different conditions.

3. Evaluation Systems

Internal Examination	Component	% of Marks	Method of Assessment
	Midterm Test	20	Written examination
	Experiments	30	Lab work, Report
External Examination		50	
Total		100	

4. Course outline

Module I (04 Hrs): Shallow Foundation

SHALLOW FOUNDATION: Introduction, Different types of shallow foundations, Calculation of bearing capacity of soil (**Bearing capacity can be checked using Geomecanica Software/ Bearing Capacity Software**), Calculation of settlements of foundations.

Module II (12 Hrs): Mat Foundation Design

Practice Sessions:

- Generation of structural design documents including necessary plans and section of raft/mat foundation using STAAD.Foundation software.
- Calculation of geotechnical data of soil like ultimate soil bearing capacity, depth of footing, water table depth, unit weights, etc. using STAAD.Foundation software
- Service load design of raft/mat foundation using STAAD.Foundation software.
- Structural analysis of raft/mat foundation using STAAD.Foundation software.
- Checks and reinforcement design of raft/mat foundation using STAAD.Foundation software.
- Calculation and design of concrete slab/column connections for general/local/punching shear including effect of unbalanced joint moments using STAAD.Foundation software.

Module III (09 Hrs): Deep Foundation

DEEP FOUNDATION: Introduction, Different types of deep foundations, Design methodology for piles, Calculation of pile capacity, Analysis of pile group, Settlement of pile group, (Checking of pile settlement using **Group Pile Settlement Software**), Concept of negative skin friction, Piles subjected to lateral loads, Pile load test.

Module IV (10 Hrs): Pile Foundation Design

Practice Sessions:

- Calculation of geotechnical data of soil like soil bearing capacity, depth of footing, water table depth, unit weights, etc. of pile foundation in STAAD.Foundation software.
- Service load design of pile foundation using STAAD.Foundation software.
- Structural analysis of pile group using STAAD.Foundation software.
- Checks and reinforcement design of pile foundation using STAAD.Foundation software.
- Design of pile cap using STAAD.Foundation software.

Module V (05 Hrs): Design of Well Foundation

DESIGN OF WELL FOUNDATION: Introduction and construction of well foundation. (Introduction to be given in classroom, design calculation to be done using STADD.Prosoftware).

Practice Session:

12. Design of well foundation using STAAD.Foundation software.

Module VI (08 Hrs): Design of Earth Retaining Structures

DESIGN OF RETAINING STRUCTURES: Introduction, Different types of retaining structures, Stability analysis of rigid walls. (Entire topic to be delivered in classroom teaching mode).

Practice Sessions:

- 13. Design of cantilever sheet piles using STAAD.Foundation software.
- 14. Design of anchor sheet piles using STAAD.Foundation software.

Module VII (12 Hrs): Earth Pressure and Foundation in Difficult Grounds

EARTH PRESSURE: Introduction , Types of Earth pressure, Rankine’s active and passive earth pressure, Smooth vertical wall with horizontal backfill, Extension to Soil, Coulombs wedge theory.

(Entire topic & related numerical problems to be delivered in classroom teaching mode, Mathematical derivations to be limited to classroom activity, it should not be a part of external evaluation).

Practice Session:

- 15. Calculation of Rankine’s active and passive earth pressure (**Using Earth Pressure Coefficient Software**).

FOUNDATIONS IN DIFFICULT GROUNDS: Introduction, Techniques of ground improvement, Foundations in swelling soil, Foundations in collapsible soil, Use of soil reinforcement. (Entire topic to be delivered in classroom teaching mode).

E-content:

Text Books:

- 1. Soil Mechanics and Foundation, B.C.Punmia, Ashok Kumar Jain and Arun Kumar Jain, Laxmi, publications Pvt. Ltd., New Delhi.

Reference Books:

- 1. Geotechnical Engineering, C. Venkataramiah, New age International Pvt .Ltd, (2002).
- 2. Geotechnical Engineering, Purushotham Raj, Tata Mcgraw Hill
- 3. Geotechnical Engineering, ManojDutta& S K Gulati, Tata McGraw-Hill Publishers, New Delhi.
- 4. Soil Mechanics and Foundation Engg.K.R. Arora, Standard Publishers and Distributors, Delhi.

5. Session Plan

Topic coverage and Internal Test	No. of Sessions (in hrs.)	Activity	Assignment	Suggested Reading (Book, Video, Online)
Module I				
SHALLOW FOUNDATION: Introduction, Different types of shallow foundations.	1	Lecture		
Calculation of bearing capacity of soil. (Bearing capacity can be checked using Geomechanica Software/ Bearing Capacity Software).	2	Lecture		
Calculation of settlements of foundation.	1	Lecture		
Sub-total (hrs)	04			
Module II				

Generation of structural design documents including necessary plans and section of raft/mat foundation using STAAD.Foundation software.	2	Practice		
Calculation of geotechnical data of soil like ultimate soil bearing capacity, depth of footing, water table depth, unit weights, etc. using STAAD.Foundation software.	2	Practice		
Service load design of mat foundation using STAAD.Foundation software.	2	Practice		
Structural analysis of mat foundation using STAAD.Foundation software	2	Practice		
Checks and reinforcement design of mat foundation using STAAD.Foundation software.	2	Practice		
Calculation and design of concrete slab/column connections for general/local/punching shear including effect of unbalanced joint moments using STAAD.Foundation software.	2	Practice		
Sub-total (hrs)	12			
Module III				
DEEP FOUNDATION: Introduction, Different types of deep foundations.	1	Lecture		
Design methodology for piles, Calculation of pile capacity.	2	Lecture		
Analysis of pile group, Settlement of pile group, (Checking of pile settlement using Group Pile Settlement Software)	3	Lecture		
Concept of negative skin friction, Piles subjected to lateral loads.	2	Lecture		
Pile load test.	1	Lecture		
Sub-total (hrs)	09			
Module IV				
Calculation of geotechnical data of soil like soil bearing capacity, depth of footing, water table depth, unit weights, etc. of pile foundation in STAAD.Foundation software.	2	Practice		
Service load design of pile foundation using STAAD.Foundation software.	2	Practice		

Structural analysis of pile group using STAAD.Foundation software.	2	Practice		
Checks and reinforcement design of pile foundation using STAAD.Foundation software.	2	Practice		
Design of pile cap using STAAD.Foundation software	2	Practice		
Sub-total (hrs)	10			
Module V				
DESIGN OF WELL FOUNDATION: Introduction and construction of well foundation.	3	Lecture		
Design of well foundation using STAAD.Foundation software.	2	Practice		
Sub-total (hrs)	05			
Module VI				
DESIGN OF RETAINING STRUCTURES: Introduction, Different types of retaining structures.	1	Lecture		
Stability analysis of rigid walls.	3	Lecture		
Design of cantilever sheet piles using STAAD.Foundation software.	2	Practice		
Design of anchor sheet piles using STAAD.Foundation software.	2	Practice		
Sub-total (hrs)	08			
Module VII				
EARTH PRESSURE: Introduction, Types of Earth pressure.	1	Lecture		
Rankine's active and passive earth pressure.	2	Lecture		
Smooth vertical wall with horizontal backfill, Extension to Soil, Coulombs wedge theory.	3	Lecture		
Calculation of Rankine's active and passive earth pressure (Using Earth Pressure Coefficient Software).	2	Practice		
FOUNDATIONS IN DIFFICULT GROUNDS: Introduction, Techniques of ground improvement.	1	Lecture		

Foundations in swelling soil.	1	Lecture		
Foundations in collapsible soil.	1	Lecture		
Use of soil reinforcement.	1	Lecture		
Sub-total (hrs)	12			
Total (hrs.)	60			

CCCE0402 HIGHWAY ENGINEERING

Pre - requisites	Course Type	Credits
Nil	Theory +Practice	4

Course objectives:

To provide knowledge about the highway planning and the design of highways.

To enable students to gain knowledge on the materials used in the design of highway. To gain knowledge on traffic management.

Course Outcomes:

On successful completion of course students will be able to Carry out the geometric design of the highways.

Identify the properties of the materials used in highway construction and determine the properties in a laboratory.

Perform pavement design for highways. Understand the traffic management.

MODULE - I Planning & Geometric Design of Highways: (15 Hrs)

Modes of transportation, importance of highway transportation and limitations, history of road construction. Principle of highway planning, road development plans, highway alignment requirements, engineering surveys for highway location. Geometric design - Design controls, highway cross section elements, cross slope or camber, road width, road margins, typical cross sections of roads, design speed, sight distance, design of horizontal and vertical alignments, horizontal and vertical curves.

Highway Drainage - surface and sub soil drainage. Failure of pavement, maintenance and strengthening of Highways. **(Most of the topics will be through classroom teaching as well as use of Matlab for programming)**

MODULE - II Highway Materials & Testing: (14 Hrs)

Highway Materials: Properties of sub grade, sub-base, base course and surface course materials, test on sub grade soil, aggregates and bituminous materials. . **(Most of the topics will be through classroom teaching as well as practical)**

Bituminous mix design, low and high volume Road. IRC design method for rigid and flexible pavements by IRC and CBR Methods. . **(Most of the topics will be through classroom teaching as well as practical)**

MODULE - III Traffic Engineering: (13 Hrs)

Introduction to Traffic Engineering - Traffic Survey, Traffic Characteristics, Various Traffic Studies and their application - Traffic Regulations and Controls. Traffic Signals, Design of Signals, Traffic Signs and Road Marking. Traffic Operations - Accident Prevention - Safety Methods - Intersection Design. **(Most of the topics will be through classroom teaching as well as field work)**

Text Books:

1. Highway Engineering, by S.K.Khanna and CEG Justo
2. A course in bridge engineering by Dr. S.P. Bindra

PEDAGOGY

Module I

S. No.	Topic	Pedagogy	Details	Instructional Hrs			
				Theory	Practice	video	Project
	Planning & Geometric Design of Highways						
	Modes of transportation, importance of highway transportation and limitations, history of road construction.	CRT		1	0	0	0
	Principle of highway planning, road development plans, highway alignment requirements, engineering surveys for highway location	CRT		1	0	0	0
	Geometric design - Design controls, highway cross section elements, cross slope or camber	CRT & PRA	Using MATLA B	1	1	0	0
	road width, road margins, typical cross sections of roads, design speed	CRT & PRA	Using MATLA B	1	1	0	0
	design speed, sight distance, design of horizontal and vertical alignments	CRT & PRA	Using MATLA B	1	2	0	0
	Horizontal and vertical curves.	CRT & PRA	Using MATLA B	1	2	0	0
	Highway Drainage - surface and sub soil drainage. Failure of pavement	CRT & PRA		1	1	0	0
	Maintenance and strengthening of Highways.	CRT & Video		0	0	1	0
	Sub total			7	7	1	0

Module II

S. N o.	Topic	Pedagogy	Details	Instructional Hrs			
				Theory	Practice	video	Project
	Highway Materials & Testing						
	Highway Materials: Properties of sub grade, sub-base, base course and surface course materials	CRT & PRA	Lab testing	2	0	0	0
	tests on sub grade soil	CRT & PRA	Lab testing	0	2	0	0
	Tests on aggregates and bituminous materials	CRT & PRA	Lab testing	0	3	0	0
	Bituminous mix design	CRT & PRA	Lab testing	0	2	0	0
	low and high volume Road	CRT		1	0	0	0
	IRC design method for rigid and flexible pavements by IRC	CRT & PRA	MATLAB	0	2	0	0
	CBR Methods	CRT & PRA	MATLAB	0	2	0	0
	Sub total			3	11	0	0

Module III

S. No.	Topic	Pedagogy	Details	Instructional Hrs			
				Theory	Practice	video	Project
	Traffic Engineering						
	Introduction Traffic Engineering to Traffic Survey, Traffic Characteristics	CRT		1	0	0	0
	Various Traffic Studies and their application	CRT & PRA	Field studies	1	1	0	0
	Traffic Signals, Design of Signals	CRT & PRA	Field surveys	1	1	0	0
	Traffic Signs and Road Marking.	CRT & video presentation		1		0	0
	Traffic Operations - Accident Prevention - Safety Methods	CRT		1	2	0	0
	Intersection Design	CRT & PRA	Using MATLAB	2	2	0	0
	Sub total			7	6	0	0

CCCE0403 WATER SUPPLY & SANITARY ENGINEERING

Pre –requisites	Course Type	Credits
Nil	Theory + Practice	4

Course Objectives:

- To enable the students understand about the drinking water quality through experiments.
- To make student understand the sources of drinking water.
- To train students to know the principles of water treatment and to design the treatment units.
- To train students to know the principles of waste water treatment and to design the treatment units.
- To make them understand the quality of sewage generated from different plants.

Course outcomes:

- To understand the principles of water treatment units and the design of the treatment units.
- To understand the principles of waste water treatment and the design of treatment units.
- To understand the distribution network of the drinking water and the treated waste water.
- To understand to treat the waste water and reuse to make an eco-friendly environment.

MODULE 1 (12Hrs) Water Supply Schemes & Demand

- (A) Planning and Execution of modern water supply schemes in Urban and Rural India, Sources- Surface Water and Underground water, Per capita demand, Domestic & Non-Domestic demand, Variation in demands, Design period for different components of a Water Supply System, Population Forecast, Collection, Pumping and Conveyance of water, Calculation of loss of head due to friction and minor losses, Pump and Motors, Quality of potable water. IS Standard. **(Topics related to design period, population forecast and head loss & power calculations will be through project using excel and software)**

MODULE II (12Hrs) Purification and Quality tests

- (B) Purification of water, Screening, aeration, coagulation, treatment and flocculation, Sedimentation, Filtration, Disinfection, Softening, Miscellaneous Treatments, Removal of colour, Odour, taste, Iron, Manganese, Fluoride, Dissolved Salts, Arsenic, Radioactivity, Domestic Water treatment, Distribution System, Design of Size of Pipes in simple distribution system, Valves and Fittings. **(All the topics will be through practice mode)**

MODULE III (18Hrs)

- (C) Systems of sanitation, Planning and Execution of Urban & Rural Sewage system, Collection, conveyance and system of Reuse, Quantity of sewage, Hydraulic design and construction of sewers, Appurtenances. **(Sewer design will be through HEC software)**
- (D) Quality and Characteristics of sewage, Preliminary, Primary, Secondary (Biological), Advanced (Tertiary) Treatment, Disposal and utilization, Principle of Treatment of Industrial Waste Water. **(All the topics will be through video presentation)**

Note: Detailed designs will be taken up in the sessional course related to the above theoretical paper.

Text Book:

1. Rangwala: Water Supply and Sanitary Engineering, Charotar Publishing House
2. S.K. Garg: Environmental Engineering Vol.I& II, Khanna Publishers

PEADAGOGY

S. No.	Topic	Pedagogy	Video links / Software	Instructional Hrs			
				Th	Video	Proj	Pract
(A)	Planning and Execution of modern water supply schemes in Urban and Rural India	CRT		1	0	0	0
	Sources- Surface Water and Underground water, Per capita demand, Domestic & Non-Domestic demand, Variation in demands	CRT		2	0	0	0
	Design period for different components of a Water Supply System, Population Forecast	CRT + Project		2	0	3	0
	Collection, Pumping and Conveyance of water	CRT		3	0	0	0
	Calculation of loss of head due to friction and minor losses	CRT + Project		2	0	3	0
	Pump and Motors	CRT		2	0	0	0
	Quality of potable water. IS Standard	CRT + Practice		2	0	0	6
(B)	Purification of water, Screening, aeration, coagulation, treatment and flocculation	CRT + Practice		1	0	0	6
	Sedimentation, Filtration, Miscellaneous Treatments, Disinfection, Softening,	CRT + Practice		3	0	0	6
	Removal of colour, Odour taste, Iron, Manganese, Fluoride, Dissolved Salts, Arsenic, Domestic Water treatment, Radioactivity,	CRT + Practice		1	0	0	6

S. No.	Topic	Pedagogy	Video links / Software	Instructional Hrs			
				Th	Video	Proj	Pract
	Distribution System, Design of Size of Pipes in simple distribution system, Valves and Fittings.	CRT + Project		1	0	4	0
(C)	Systems of sanitation, Planning and Execution of Urban & Rural Sewage system	CRT		2	0	0	0
	Collection, conveyance and system of Reuse	CRT		3	0	0	0
	Quantity of sewage	CRT + Practice		1	0	0	3
	Hydraulic design and construction of sewers	CRT + Practice		1	0	0	6
(D)	Quality and Characteristics of sewage	CRT		3	0	0	0
	Preliminary, Primary, Secondary (Biological)	CRT+ video+ Practice		1	2		6
	Advanced (Tertiary) Treatment	CRT+ video+ Practice		1	1		3
	Disposal and utilization, Principle of Treatment of Industrial Waste Water	CRT+ video		3	1		
			Sub total	35	4	10	42

Hydrology & Irrigation

Subject Name	Code	Type of course	T-P-PJ	Prerequisite
Hydrology & irrigation	CECC0405	Theory+ practice	2-1-0(3)	Nil

1. Objective

- To develop technical skills in students to make them familiar with hydrology, hydro-meteorology, surface and subsurface water, design water resources structures, surface and subsurface water management, integrated water resources planning, Irrigation processes, flood control, and basic of hydropower generation.

2. Course outcome

- To have knowledge of irrigation implementation on hydrology, water power and water quality along with acquaintance of planning, design, construction and application of irrigation/hydraulic structures in management of surface and subsurface water.
- Project oriented skills shall be gained by students to work efficiently in survey, planning, design and construction in irrigation sector.

3. Evaluation Systems

Internal Examination	Component	% of Marks	Method of Assessment
	Midterm Test	20	Written examination
	Experiments	30	Lab work, report
External Examination		50	Written examination, Report/Viva
Total		100	

4. Course outline

Module- I (06 Hrs)

Hydrology: Hydrological cycle, Types of Rainfall, Precipitation - measurement - average precipitation over a basin- check for consistency of records - double mass curve empirical and rational formulae, evaporation, transpiration, infiltration - Infiltration indices. Runoff - Overland flow.

Practice Sessions:

- Determination of infiltration capacity using double ring infiltrometer.

Module-II (10 Hrs)

Hydrograph: Direct runoff, Base flow, separation of base flow- Hydrograph, Unit hydrograph - Assumptions of Unit hydrograph, derivation of unit hydrograph from Direct runoff hydrograph, Computation of direct runoff hydrograph for different storms using unit hydrograph theory. (Most of the topics will be through video presentation. Topics related to Hydrograph Analysis will be through Practice mode)

Practice Sessions:

- Construction of double mass curve using EXCEL

3. Hydrograph analysis using EXCEL.

Module-III (6 Hrs)

Floods: Definition of (i) Design flood, (ii) Probable Maximum Flood and (iii) Probable maximum precipitation- Recurrence interval and flood frequency distributions.

Module-IV (08 Hrs)

Ground water flow: Specific yield, storage coefficient, coefficient of permeability, confined and unconfined aquifers, Types of aquifers, radial flow into a well under confined and unconfined conditions (only steady state conditions), Yield of a well.

Module-V (6Hrs)

Hydropower Engineering: Dams and their causes of failure, Planning of water resources projects, Single and multipurpose projects, Reservoir Planning: Storage capacity of reservoirs, Yield from reservoir, Mass curve, Reservoir losses, reservoir sedimentation (Basic concept only), Introduction to water power - Definition of terms: (i) Head, Power and efficiency, (ii) Average load, (iii) Peak load, (iv) Plant factor, (v) Pondage - Load curve. Description of components and their functions in a hydro power plant

Module-VI (12 Hrs)

Irrigation Engineering: Water requirements of crops, consumptive use, quality of water for irrigation, duty and delta, irrigation methods and their efficiencies.

Canals: Distribution systems for canal irrigation, canal capacity, canal losses, alignment of main and distributary canals, most efficient section, lined canals, their design, regime theory - Kennedys and Lacey's theories. lined canals, Water logging - causes and control. **(Canal design will be through practice mode using Excell sheet and open line sources)**

4. Design of irrigation canal using Kennedy's and Lacey's theory.
5. Design of lined canal.
5. Fixing of L-section of the canal.

Module-VII (12 Hrs)

Irrigation Structures: **(All the topics will be through field visit, practice mode only)**

- a. Regulators - Functions of cross regulators, head regulators, canal falls, aqueducts, metering flumes and canal outlets.
- b. Diversion head works- Principles and design of weirs on permeable and impermeable foundation, Khosla's theory- expressions for uplift pressure at key points - Various corrections and their calculations for simple cases.
- c. Storage works: Types of dams, design, principles of rigid gravity, stability analysis.
- d. Spillways: Spillway types, energy dissipation.
- e. River training: Objectives of river training, methods of river training.

Practice Sessions:

6. Apron design for weir on permeable foundations using Khosla's theory.
7. Design of tank surplus weir.
8. Design of vertical drop weir.
9. Design of Notch fall.
10. Design of head regulators.
11. Design of cross regulators.
15. Stability analysis of gravity dam.

Text Books:

1. Engineering Hydrology – By K. Subramanya
2. Irrigation Engineering and Hydraulic Structure- By S.K.Garg

Reference Books:

1. Engineering Hydrology – By K. C.Patra

Powerpoint presentations :

1. Module I and II: gis.ess.washington.edu/grg/courses/ess326/5-Hydrology.ppt
2. Module I, II, III, and IV: abe-research.illinois.edu/courses/tsm352/lectures/Hydrology_Lecture01.pptx
3. Module I to VI: https://www.zapmeta.ws/ws?q=water%20ppt%20presentation&asid=ws_gc_b5_2&mt=b&nw=g&de=c&ap=1o1
4. https://www.zapmeta.ws/ws?q=water%20ppt%20presentation&asid=ws_gc_b5_2&mt=b&nw=g&de=c&ap=1o1
5. Module V and VI: <https://www.slideshare.net/SuryennMon/civil-vhydrology-and-irrigation-engineering-10-cv55notes>
6. Module II: <https://www.youtube.com/watch?v=28uGiIwwfro>
7. Module II: <https://www.youtube.com/watch?v=LNUoYhZ44EE>
8. Module I to VII: hydrology.usu.edu/dtarb/cee3430/2014/SHydrographs26PlusPhiExample.pptx

7. Session Plan

Topic coverage and Internal Test	No. of Sessions (in hrs.)	Activity (lecture, tutorial, lab practice, field studies/field-trip, Workshop etc.)	Assignment (project, assignment, field study, seminar, etc.)	Suggested Reading (Book, Video, Online source, etc.)
Module I				
Hydrology: Hydrological cycle – Types of Rainfall(video)	1	lecture	assignment	Book, Video
Precipitation-measurement – average precipitation over a basin.(video)	1	lecture	assignment	Book, Video
Evaporation, transpiration, infiltration – Infiltration indices.	2	lecture	assignment	Book, Video
Determination of infiltration capacity using double ring infiltrometer.	2	practice	assignment	Book
Sub-total (hrs)	06			
Module II				
Runoff -Overland flow, Direct runoff, Base flow, separation of base flow-				

Hydrograph.	1	lecture	assignment	Book, Video
Unit hydrograph - Assumptions of Unit hydrograph, derivation of unit hydrograph from Direct runoff hydrograph.	2	lecture	assignment	Book, Video
Construction of double mass curve using EXCEL	2	practice	assignment	Book
Computation of direct runoff hydrograph for different storms using unit hydrograph theory	1	lecture	assignment	Book, Video
Hydrograph analysis using excels.	4	practice	assignment	Book
Sub-total (hrs)	10			
Module III				
Definition of (i) Design flood, (ii) Probable Maximum Flood	2	lecture	assignment	Book
Probable maximum Precipitation-Recurrence interval and flood frequency distributions.	4	lecture	assignment	Book
Sub-total (hrs)	06			
Module IV				
Ground water flow: Specific yield, storage coefficient, Types of aquifers. coefficient of permeability, confined and unconfined aquifers.	2	lecture	assignment	Book
Radial flow into a well under confined and unconfined conditions	4	lecture	assignment	Book
Yield of a well.	2	lecture	assignment	Book

Sub-total (hrs)	08			
Module V				
Water Resources Engineering: Planning of water resources projects, Single and multipurpose projects. Various Dams and failure of concrete dam	2	lecture	assignment	Book
Reservoir Planning: Storage capacity of reservoirs, yield from reservoir, Mass curve.	2	lecture	assignment	Book
Reservoir losses, reservoir sedimentation (concept only)	1	lecture	assignment	Book
Water power: Introduction to water power – Definition of terms: (i) Head, Power and efficiency, (ii) Average load, (iii) Peak load, (iv) Plant factor, (v) Pondage - Load curve. Description of components and their functions in a hydro power plant.	1	lecture	assignment	Book
Sub-total (hrs)	06			
Module VI				
Water requirements of crops, consumptive use, quality of water for irrigation.	1	lecture	assignment	Book
Duty and delta, irrigation methods and their	2			

efficiencies.(Including Micro-Irrigation)		lecture	assignment	Book
Distribution systems for canal irrigation, canal capacity, canal losses, alignment of main and distributary canals.	2	lecture	assignment	Book
Most efficient section, lined canals, their design, regime theory Kennedys and Lacey's theories.	1	lecture	assignment	Book
Design of irrigation canal using Kennedy's and Lacey's theory.	2	practice	assignment	Book
Lined canals-Water logging - causes and control. Soil Conservation Practices in brief.		lecture	assignment	Book
Design of lined canal.	2	field visit	field study	
Regulators - Functions of cross regulators, head regulators, canal falls,	2	field visit	field visit	Book

aqueducts, metering flumes and canal outlets.				
Sub-total (hrs)	12			
Module VII				
Diversion head works- Principles and design of weirs on permeable and impermeable foundation, Khosla's theory- expressions for uplift pressure at key points - Various corrections and their calculations for simple cases.	2	field visit	field study	Book
Storage works: Types of dams, design, principles of rigid gravity, stability analysis.	4	field visit	field study	Book
Spillways: Spillway types, energy dissipation.	2	field visit	Field visit	Book
River training: Objectives of river training, methods of river training	4	field visit	field study	Book
Sub-total (hrs)	12			
Total (hrs)	60			

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Quality Control and Risk Management in Construction

Course Title	Code	Type of course	Credits	Prerequisite
Quality Control and Risk Management in Construction	CECC0414	theory+ Practice	2-1-0	Nil

Objective

- To make the student realize the necessity of quality control and quality assurance in construction industry.
- To impart the procedures involved in maintaining quality in construction industry and various standards and practices prescribed therefor.
- To enlighten the student with the tools of total quality management process.
- To give hands on practice to the students in preparing quality assessment schedules and inspection check lists.
- To make the student to take up laboratory and field tests for quality assurance for civil engineering structures.

Course Outcome

- Generate quality control schedule for different projects in construction industry.
- Prepare quality control inspection check lists for selected civil engineering structures.

Evaluation Systems

Internal Examination	Component	% of Marks	Method of Assessment
	Internal Theory	20	Written examination
	Internal Practice	30(20+10)	Lab work + Learning Record
External Examination	External Theory	30	Written examination
	External Practice	20	Lab work
Total		100	

Course outline

Module: I Principles of Quality Assessment & Quality Control (QA & QC) (Theory) (8 Hrs)

[Both Internal & External Assessment University Written Test and Sessional Tests.]

Introduction: Quality Control and Quality Assessment - Construction Quality - Purpose & Scope Definition & Evolution of Quality. Factors influencing Construction Quality QualityCircle.Establishing QC Requirements - Setting up a Quality Management System - Total Quality Management - Deming's PDSA Quality Cycle, Juran's Quality Triangle & Triple Role models.Concept of Quality ISO Standards.QualityAudit.Construction Quality Assurance System (CONQUAS).Principles of Quality Control and Quality Assessment. Quality Management System, Quality Control Inspection Process. Quality Assurance & Control: Objective, Regularity Agent - Owner, Contract and Construction Oriented Objectives & Methods. Techniques and Needs of QA / QC.

Module: II Method Statement and Quality Inspection Schedule (Theory & Class Room Practice) [Internal & External Assessment.] (8 Hrs)

Method Statement - Importance and Purpose - Contents of Method Statement.

Practice Session on preparation of Method Statement for given Structure (Buildings, Irrigation Structures and Highway Projects).

Quality Inspection Schedule and importance - General Phases of Inspection Schedule for different Construction Projects - Conventional Residential Building, Multi- storied Buildings, Highway Projects - Concrete Roads, Bituminous Pavements, Elevated and, Ground and Underground Water Tanks, Practice Session on developing Quality Inspection Schedule for given Structure (Buildings, Irrigation Structures and Highway Projects).

Module:III Quality Assessment (QA) Inspection Check Lists (Theory & Class Room Practice) [Internal & External Assessment.] (8 Hrs)

Study of Quality Inspection Check Lists for various construction activities and their importance - Contents to be included - Some Standard Check Lists. Check list for Design Standards and design processes.

Module:IV(12Hrs)

Practice Session on selection of Quality Inspection check lists for given Structure (Buildings, Irrigation Structures and Highway Projects) as per identified Schedule.

Practice Session on selection of Quality Inspection check lists for given Structure (Buildings, Irrigation Structures and Highway Projects) as per identified Schedule.

Module: V Post Construction QA (Field Practice) [Internal & External Practice Assessment. No written university examination.](8 Hrs)

Study of field tests for Quality Assurance.Study of QC standards for various construction equipment including Concrete batch mixing / Bitumen batch mixing equipment.

Practice Session on Rebound Hammer Test, Ultrasonic Pulse Velocity Test and Core Sampling.

Module: VI Risk Involved in Construction Industry (Class Room & Field Practice) [Internal & External Practice Assessment. No written university examination.] (8 Hrs)

Introduction - Definition and Importance of Risk Management studies - Uncertainty Matrix - Importance of Risk Management - Risk Classification and Risk Management Process - Risk causation theories - Risk Identification Process - Preliminary Check List, Risk Events Consequences Scenario - Risk Mapping and Risk Classification - Risk Analysis.

Module: VII Safety Procedures in Construction Industry (Class Room & Field Practice) [Internal & External Practice Assessment. No written university examination.](8 Hrs)

Evaluation of Safety Project - Accident causation Theories, Foundations of a Major Injury - Unsafe Conditions and Unsafe Acts. Health and Safety Act and Regulations - Building & Other Construction Workers - Regulation of Employment and Condition of Services Act, 1996, Central Rules 1998.

Safety & Health Management System: Appraisal of construction safety management guidelines in Construction Sector - Safety Policy & Organization. Fire Prevention for different types of buildings Safety precautions in Construction activities, Construction equipment usage.

.Reference

1. Quality Control in Construction Industry
2. SDGC Contractor QC Plan Template
3. Common Mistakes in Construction Phase
4. Quality Control Process
5. Concrete Distress
6. Construction QC Inspection Report
7. Durability & Deterioration of Concrete
8. Health Assessment of RC Structures
9. Quality Inspection & Control
- 10.IS Code- irc.gov.in.sp.011.198411. QA & QC Manual Dept of WS & Sanitation – Punjab

Session Plan

Topic coverage and Internal Test	No. of Sessions (in hrs.)	Activity (lecture, tutorial, lab practice, field studies/field-trip, Workshop etc.)	Assignment (project, Assignment, field study, seminar, etc.)	Suggested Reading (Book, Video, Online source, etc.)
Module I				
Introduction: Quality Control and Quality Assessment - Construction Quality - Purpose & Scope Definition & Evolution of Quality. Factors influencing Construction Quality Circle.	2	lecture	1.1	Handouts

Establishing QC Requirements - Setting up a Quality Management System - Total Quality Management - Deming's PDSA Quality Cycle, Juran's Quality Triangle & Triple Role models. Concept of Quality ISO Standards. Quality Audit.	2	lecture	1.2	Handouts
Quality Audit. Construction Quality Assurance System (CONQUAS). Principles of Quality Control and Quality Assessment. Quality Management System, Quality Control Inspection Process.	2	lecture	1.3	Handouts
Quality Assurance & Control: Objective, Regularity Agent - Owner, Contract and Construction Oriented Objectives & Methods. Techniques and Needs of QA / QC.	2	lecture	1.4	Handouts
Sub-total (hrs)	08			
Module II				
Practice Session 1 on Quality Control Testing Procedure & Quality Control Schedule preparation	2	practice	2.1	Handouts

Practice Session 2 on Generation of sample Quality Control inspection Check list for Design Standards and design processes	2	practice	2.2	Handouts
Practice Session 3 on Generation of sample Quality Control Inspection schedule Check list for formwork for a Building / Irrigation Structure.	2	practice	2.3	Handouts
Practice Session 4 on Generation of sample Quality Control Inspection schedule Check list for concreting in a Residential building / Irrigation Structure/ Highway Projects.	2	practice	2.4	Handouts
Sub-total (hrs)	08			

Module III				
Study of Quality Inspection Check Lists for various construction activities and their importance - Contents to be included - Some Standard Check Lists. Check list for Design Standards and design processes.	2	practice	3.1	Handouts
Practice Session on selection of Quality Inspection check lists for given Structure (Buildings, irrigation Structures and Highway Projects) as per identified Schedule.	3	practice, field studies	field study	Handouts
Practice Session on selection of Quality Inspection check lists for given Structure (Buildings, Irrigation Structures and Highway Projects) as per identified Schedule.	3	practice, field studies	field study	Handouts
Sub-total (hrs)	08			
Module IV				
Importance of Quality Assessment for Materials used in construction Industry and their procurement.	1	lecture	4.1	Handouts
Study of laboratory tests for Quality Assurance. Quality Assessment Testing Procedure (Laboratory Tests) - IS Codes for Testing of Materials and Concrete.	4	practice	4.2	Handouts& IS Codes
Quality Assessment Schedule preparation for Laboratory Tests. Check Lists for Quality Control Testing Procedure & Practice.	2	practice	4.3	Handouts& IS Codes
Practice Session on Material Testing and Testing of Concrete for Quality Assessment.	5	practice	4.4	Handouts& IS Codes
Sub-total (hrs)	12			

Module V				
Study of field tests for Quality Assurance. Study of QC standards for various construction equipment including Concrete batch mixing / Bitumen batch mixing equipment Practice Sessions on laboratory tests, field tests and Field Visits	4	practice, field studies	field study	Handouts& IS Codes
Practice Session on Rebound Hammer Test, Ultrasonic Pulse Velocity Test and Core Sampling.	4	practice, field studies	field study	Handouts& IS Codes
Sub-total (hrs)	08			
Module VI				
Introduction - Definition and Importance of Risk Management studies - Uncertainty Matrix - Importance of Risk Management -	4	lecture	6.1	Handouts& IS Codes
Risk Classification and Risk Management Process - Risk causation theories - Risk Identification Process - Preliminary Check List, Risk Events Consequences Scenario - Risk Mapping and Risk Classification - Risk Analysis.	4	lecture	6.2	Handouts& IS Codes
Sub-total (hrs)	08			

Module VII

Evaluation of Safety Project - Accident causation Theories, Foundations of a Major Injury - Unsafe Conditions and Unsafe Acts. Health and Safety Act and Regulations - Building & Other Construction Workers - Regulation of Employment and Condition of Services Act, 1996, Central Rules 1998.	2	lecture	7.1	Handouts& IS Codes
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<p>Safety & Health Management System: Appraisal of construction safety management guidelines in Construction Sector - Safety Policy & Organization. Fire Prevention for different types of buildings</p> <p>Safety precautions in Construction activities, Construction equipment usage.</p> <p>Safety Practices for material handling, Safety Practices for Equipment Operation - Material safety Data Sheets</p>	2	practice, field studies	field study	Handouts & IS Codes
<p>Study of Safety Provisions for selected organizations - National Power Corporation of India Limited, Atomic Energy Regulation Board, NTPC, Godrej & Boyce.</p> <p>Visit to a project site visit for observing and noting the safety provisions adopted.</p>	2	practice, field studies	field study	Handouts & IS Codes
Sub-total (hrs)	08			
Total (hrs)	60			

Computer Aided Design of Steel Structure

Computer aided design of Steel structures	CECC0407	Theory + Practice	2-1-0(3)	Nil
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1. Objective

<ul style="list-style-type: none"> To become familiar with professional and contemporary issues in the design and fabrication of Steel structures
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2. Course outcome

<ul style="list-style-type: none"> To gain the knowledge of Steel design calculation with relevant Indian Standards To acquire skill of converting clients requirement to structural drawing and BOM by using STADD.PRO.
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3. Evaluation Systems

Internal Examination	Component	% of Marks	Method of Assessment
	Midterm Test	20	Written examination
External Examination	Assignment		Report and Presentation
	Internal Practice	30	Report and Viva
	Total	50	
External Examination	End Sem. test	30	Written examination
	External Practice	20	Viva-Voice
Total		100	

4. Course Outline

Module-I (5Hrs): Plastic Analysis

Plastic Analysis: Plastic section modulus, Load factor, shape factor, plastic moment of resistance, upper bound and lower bound theorem

Module-II (10Hrs) Failure Mechanism of beams and Portal Frames

Plastic analysis of fixed beam, continuous beam and simple rectangular portals

Practice Sessions:

1. Failure mechanism of simply supported beams with concentrated loads or udl
2. Failure mechanism of cantilever and fixed beams with concentrated loads or udl
3. Failure mechanism of portal frames with concentrated loads or udl
4. Failure mechanism of simple truss with concentrated loads at the joints

Module-III (10Hrs): Analysis & Design of Braced and Unbraced Industrial Building Using STADD.PRO

Practice Sessions:

5. Design of beam- column by welded and bolted joints
6. Design of column-slab by welded and bolted joints
7. Design of tension members, design of roof truss purlins, rafter, main tie, longitudinal tie, side purlin

Module-IV (9Hrs) Analysis & Design of Column Design of Columns, design of laced and battened column, column bases, slab base and gusseted base

Practice Sessions:

8. Design of gable end column
9. Eve girder

10. Column and gable end braces

Module-V (10Hrs) Column and base Plates and Gantry girders

Practice Sessions:

11. Column base plates and anchor bolts
12. Design of foundation
13. Design of gantry girder

Module-VI (8Hrs) Analysis & Design of Communication Tower using STADD.PRO

Practice Sessions:

15. Design of bracings
16. Design of cross arm

Module-VII (8Hrs) Analysis & Design of Transmission Tower using STADD.PRO

Practice Sessions:

17. Design of body part
18. Design of foundation

5. Reference

E-content: NPTEL

Text Books:

1. Limit State Design of Steel Structures By S K Duggal
2. Structural Analysis By R.C Hibbeler

Reference Books:

1. Design of Steel Structure -II By Ram Chandra., Standard Book House.
2. Structural analysis vol-1:S.S.Bhavikatti; Vikas Publication house

Online Source: NPTEL

<https://www.youtube.com/watch?v=C4Mm3mvN1P0>

<https://www.youtube.com/watch?v=InXzW0KI5zc>

<https://www.youtube.com/watch?v=ADhbGfbd43k>

<https://www.youtube.com/watch?v=SvmI8qAEJu4>

<https://www.youtube.com/watch?v=cDmOuT5DBF4>

<https://www.youtube.com/watch?v=tPrREp56tOM>

7. Session Plan

Topic coverage and Internal Test	No. of Sessions (in hrs.)	Activity (lecture, tutorial, lab practice, field studies/field -trip, Workshop etc.)	Assignment (Project, assignment, field study, seminar, etc.)	Suggested Reading (Book, Video, Online source, etc.)
Module I				
Plastic section modulus,	1	Lecture	assignment	Text Book
Load factor, shape factor Plastic moment of resistance,	2	Lecture	assignment	Text Book, Online source
upper bound and lower bound theorem	2	Lecture	assignment	Text Book, Online source
Sub-Total (hrs)	05			
Module II				
Plastic analysis of fixed beam and continuous beam	1+1=2	Lecture	assignment	Text Book, Online source
Plastic analysis of simple rectangular portals	1+1=2	Lecture	assignment	Text Book, Online source
Failure mechanism of simply supported beams with concentrated loads or udl	1	Practice		Online source
Failure mechanism of cantilever and fixed beams with concentrated loads or udl	1	Practice		Online source
Failure mechanism of portal frames with concentrated loads or udl	1+1=2	Lecture+ Practice		Online source
Failure mechanism of simple truss with concentrated loads at the joints	1+1=2	Lecture+ Practice		Online source
Sub-Total (hrs)	4+6=10			
Module III				
Design of beam- column by welded and bolted joints	1+2=3	Lecture+ Practice	assignment	Text Book

Design of column–slab by welded and bolted joints	1+2=3	Lecture+ Practice	assignment	Text Book
Design of tension members, design of roof truss purlins, rafter, main tie, longitudinal tie, side purlin	2+2=4	Lecture+ Practice	assignment	Text Book
Sub-Total (hrs)	10			
Module IV				
Design of Columns, design of laced and battened column, column bases, slab base and gusseted base	1+2=3	Lecture+ Practice	assignment	Text Book
Design of gable end column	1+1=2	Lecture+ Practice	assignment	Text Book
Eve girder	1+1=2	Lecture+ Practice	assignment	Text Book
Column and gable end braces	1+1=2	Lecture+ Practice	assignment	Text Book
Sub-Total (hrs)	09			
Module V				
Column base plates and anchor bolts	1+1=2	Lecture+ Practice	assignment	Text Book
Design of foundation	2+2=4	Lecture+ Practice	assignment	Text Book
Design of gantry girder	2+2=4	Lecture+ Practice	assignment	Text Book
Sub-Total (hrs)	10			
Module VI				
Design of bracings	2+2=4	Lecture+ practice	assignment	Text Book
Design of cross arm	2+2=4	Lecture+ practice	assignment	Text Book
Sub-Total (hrs)	08			
Module VII				
Design of body part	2+2=4	Lecture+ practice	assignment	Text Book

Design of foundation	2+2=4	Lecture+ practice	assignment	Text Book
Sub-Total (hrs)	08			
Total (hrs)	60			

Computer Aided Design of Concrete Structure

Subject Name	Code	Type of course	T-P-Pr (Credit)	Prerequisite
Computer Aided Design of Concrete Structures	CECC0408	Theory+ Practice	2-1-0(3)	Nil

1. Objective

- To become familiar with professional and contemporary issues in the design and fabrication of reinforced concrete members.

2. Course outcome

- To gain the knowledge of RCC design calculation with relevant Indian Standards
- To acquire skill of converting clients requirement to structural drawing and BOM by using STADD.Pro.

3. Evaluation Systems

Internal Examination	Component	% of Marks	Method of Assessment
	Midterm Test	20	Written examination
	Assignment		Report and Presentation
	Experiments	30	Lab work, report
	Project		Report and presentation
	Quiz		Surprise/preannounced ones
External Examination	End Sem. test	30	Written examination
	External Practice	20	
Total		100	

4. Course Outline

Module-I (15Hrs): Analysis Design Detailing of Multi-Storied Building Using STAAD.Pro

Practice Sessions:

- Design detailing of rectangular beam, 'T' and 'L' beam, Design of lintel and sunshades
- Design detailing of Slabs: Design and detailing of one way and two way slabs, circular slab
- Design detailing of Doglegged and cantilever staircase

Module-II (10Hrs) Analysis and Design of column

Practice Sessions:

- Design detailing of Columns: Short and long columns, axial and eccentrically loaded columns
- Design detailing of short columns uniaxial-bending
- Design for torsion, bond and Shear.

Module-III (5Hrs) : Matrix Methods for structural analysis of Trusses and Beams

Basic concepts of Matrix methods of structural analysis: Flexibility and Stiffness method application to simple trusses and beams

Module-IV (6Hrs) Influence Line Diagram of determinate and indeterminate beams

ILD for simply supported, cantilever and overhanging beams; max BM and SF due to moving loads, Graphical representation of

Practice Sessions:

- ILD for simply supported beams
- ILD For cantilever beam
- ILD for continuous beam
- ILD for three hinged arch

Module-V (4Hrs) Three hinged arch and Stiffening girder

Three- hinged arch; analysis for static loads; BM diagrams: influence line diagrams. Suspension bridges with three hinged and two hinged stiffening girders.

Module-VI (10Hrs): Analysis Design Detailing of Water Tank Using STAAD. Pro

Practice Sessions:

11. Design of underground water tank
12. Design of elevated circular and Intze tank

Module-VII (10hrs): Analysis Design Detailing of and Retaining Walls Using STAAD. Pro

Practice Sessions:

13. Design of Retaining Cantilever wall
14. Counter fort Retaining wall

Text Books:

- 1) Reinforced Design by DevdasMenon
- 2) Structural Analysis By R.C Hibbeler
1. Reinforced Concrete design-S. N. Sihna. Tata McGraw-Hill, New Delhi
2. Structural analysis vol-1:S.S.Bhavikatti; Vikas Publication house

Online Source:

<https://www.youtube.com/watch?v=8ATp13mOhvg&list=PL51300B0778FB5784&index=24>
<https://www.youtube.com/watch?v=SVC2BeqRKG>
<https://www.youtube.com/watch?v=No71m0oJ6DM>

7. Session Plan

Topic coverage and Internal Test	No. of Sessions (in hrs.)	Activity (lecture, tutorial, lab practice, field studies/field-trip, Workshop etc.)	Assignment (project, assignment, field study, seminar, etc.)	Suggested Reading (Book, Video, Online source, etc.)
Module I: Analysis Design Detailing of Multi-Storied Building Using STAAD.pro				
Design detailing of rectangular beam	1	lecture	assignment	Text Book
Design detailing of T' and 'L' beam	2	lecture	assignment	Text Book
Design of lintel and sunshades	2	lecture	assignment	Text Book , Video
Design detailing of rectangular beam, 'T' and 'L' beam	2	practice	assignment	Video
Design and detailing of one way and two way slabs	2	Lecture+ practice	assignment	Text Book
Design and detailing of circular slab	1+1=2	Lecture+ practice	assignment	Text Book

Design detailing of Doglegged	1+1=2	Lecture+practice	assignment	Text Book , Video
Design detailing cantilever staircase	1+1=2	Lecture+practice	assignment	Text Book , Video
Sub-Total (hrs)	9+6=15			
Module II: Analysis and Design of column				
Design detailing of Short and long columns axial and eccentrically loaded columns	1+2=3	Lecture+practice	assignment	Text Book
Design detailing axial and eccentrically loaded columns	2+1=3	Lecture+practice	assignment	Text Book
Design detailing of short columns uniaxial-bending	1+1=2	Lecture+practice	assignment	Text Book
Design for torsion, bond and Shear	1+1=2	Lecture+practice	assignment	Text Book
Sub-Total (hrs)	5+5=10			
Module III: Matrix Methods for structural analysis of Trusses and Beams				
Basic concepts of Matrix methods of structural analysis	1	Lecture	assignment	Text Book
Flexibility and Stiffness method	1	Lecture	assignment	Text Book
Flexibility and Stiffness method application to simple beams	2	Lecture	assignment	Text Book
Flexibility and Stiffness method application to simple trusses	1	Lecture	assignment	Text Book
Sub-Total (hrs)	5			
Module IV: Influence Line Diagram of determinate and indeterminate beams				

ILD for simply supported, cantilever and overhanging beams	1	Lecture	assignment	Text Book
ILD for simply supported beams	1	Practice	assignment	Text Book
ILD For cantilever beam	1	Practice	assignment	Text Book
ILD for continuous beam	1	Practice	assignment	Text Book
ILD for three hinged arch	1	Practice	assignment	Text Book
ILD for simply supported beams	1	Practice	assignment	Text Book
Sub-Total (hrs)	1+5=6		assignment	Text Book
Module V: Three hinged arch and Stiffening girder				
Max BM and SF due to moving loads	1+1=2	Lecture+ Practice	assignment	Text Book
Suspension Bridges with Three- hinged arch; analysis for static loads; BM diagrams: influence line diagrams	1+1=2	Lecture+ Practice	assignment	Text Book
Sub-Total (hrs)	2+2=4			
Module VI: Analysis Design Detailing of Water Tank Using STADD.PRO				
Design of underground water tank	1+2=3	Lecture+ practice	assignment	Text Book, Online source
Design of elevated circular tank	1+2=3	Lecture+ practice	assignment	Text Book, Online source
Design of elevated Intze tank	2+2=4	Lecture+ practice	assignment	Text Book, Online source
Sub-Total (hrs)	4+6=10hrs			
Module VII: Analysis Design Detailing of and Retaining Walls Using STADD.PRO				
Design of Cantilever Retaining wall	2+3=5	Lecture+ practice	assignment	Text Book, Online source
Design of Counter fort Retaining wall	2+3=5	Lecture+ practice	assignment	Text Book, Online source
Sub-Total (hrs)	4+6=10			
Total (hrs)	60hrs			

GIS and Digital Cartography

Subject Name	Code	Type of course	T-P-Pr (Credit)	Prerequisite
GIS and Digital Cartography	CECC0410	Theory + Practice	2-1-0(3)	Nil

1. Objective

- To become proficient in the construction of geodatabases (GDB) as the fundamental data storage format within all GIS Science.

2 Course outcome

At the end of this course the students will be able to:

- To understand the structure of spatial data including file associations, attribute tables, Metadata, coordinate systems, and projections.
- To develop software skills in programs used for map production in the modern cartographic workflow.

3. Evaluation Systems

Internal Examination	Component	% of Marks	Method of Assessment
	Midterm Test	20	Written examination
	Assignment		Report and Presentation
	Internal Practice	30	Report and Viva
	Total	50	
External Examination	End Sem. Test	30	Written examination
	External Practice	20	Viva-Voice
Total		100	

4. Course outline

Module-I (9Hrs) Introduction to GIS, Components of GIS, Functions and Advantages of GIS, limitations of GIS.

Practice Sessions:

- Introduction to ArcGIS (Overview, Features, About the software, Main user interface, Main menu- Project menu; Layer menu; View menu; Bookmarks menu; Plug-ins menu; Help menu, Toolbar, Legend window, Preview map, add data to the map area, Opening and saving projects, Removing data from the map, Projections).
- Building a catalog of geographic data (ArcCatalog, folder connection, inside the catalog, folder location, create a working copy of the data, connect directly to your copy of the data, remove folders that you don't need)

Module-II (11Hrs)

Data Type and Data Structure in GIS. Map Projections: Types of Map Projections.

Practice Sessions:

- Exploring data and adding it to a map (The Contents tab, Explore the contents of the Yellowstone folder, The Preview tab, Yellowstone data in Geography view, Explore the contents of a table, The Metadata tab, add a layer to a map, import metadata, Search for items, map compose)
- Managing a dataset (Define a shapefile's coordinate system, modify attributes in database tables, calculate attribute values in ArcMap, Update the table's metadata, create a layer using the related attributes, Add the vegetation type layer to the map)

5. ArcGIS Graphics language (generalization, symbology, and colour effect, change symbology and use transparency in creative ways)

Module-III (11Hrs)

Data Input: Nature and Source of data, Method of spatial data capture - Primary and Secondary, digitization and scanning method, Techniques and procedure for digitizing

Practice Sessions:

6. Projection (Understanding of projection and coordinate system, projecting a dataset, adding projected dataset into the map, define a projection to the layer)
7. Georeferencing (Basic of georeferencing, Georeferencing a Scanned Image, Assign Projection to the Referenced Image)
8. Topology (Concept of topology, topology in different GIS format, Coverage, shapefile, DXF-Drawing Exchange File, Geodatabase, Topology principle, Topological Error and Correction process, creating personal Geodatabase, creating a features dataset)

Module-IV (9Hrs)

Errors of Digitization, Error in Elimination. Spatial and Attribute Data Model and Management: Spatial, Thematic, and Temporal dimensions of Geographic Data, Conceptual, object-oriented and logical data model.

Practice Sessions:

9. Feature Dataset and Domain (Creating Feature Classes within the Feature Dataset, Creating Domain for the Feature Datasets, Digitizing the Feature Classes, Creating Topology in Arc Catalog, Viewing and Editing the Topology)
10. Google Earth (Introduction to Google Earth, Convert Shape file to KML Format, Extract data From Google Earth, Extract Point Data, Extract Polygon data, Extract line data, Convert KML File to shape file, overlaying an image into google earth)

Module-V (7Hrs)

Raster and Vector Data Model, Raster versus Vector, advantages and limitation.

Practice Sessions:

11. Buffering and Editing tools (Buffering in ArcGIS, add the data layer, create the buffer, conflation, extend the line, Erase point, Flip line, Snap, trim line, Densify, create a polygon, Create point, Create polygon)
12. Data Conversion Tools (from Excel to Table and table to Excel, GPS-from GPX to

Features, from KML to layer, from PDF to TIFF, from Raster to ASCII/Float/Point/Polygon/Polyline/Video, metadata importer/exporter/translator, Export to CAD features class to coverage, table to the database, CAD to a geodatabase, DEM to raster, LAS dataset to raster, Point/line/polygon to raster, feature class to shape file)

Module-VI (8Hrs)

Attribute data management and Meta Data concept. The concept of Digital Cartography,

Practice Sessions:

13. Open Source Software-QGIS (Overview, Features, About the software, Main user interface, Main menu-Project menu; Layer menu; View menu; Bookmarks menu; Plug-ins menu; Help menu, Toolbar, Legend window, Preview map, add data to the map area, Opening and saving projects, Removing data from the map, Projections)

14. Open Source Data-Earth Explorer USGS(Introduction to Earth Explorer web portal, Types of Data available on Earth Explorer, create an account on USGS, Download the Data, Introduction to GloVis, types of data available with GloVis, Download data from GloVis)

Module-VII (5Hrs)

Advantages and Limitations of Digital Cartography, Concept of Map Scales.

Practice Sessions:

15. Open Source Data-Bhuvan(Introduction to Bhuvan web portal, types of data available with Bhuvan, create an account on Bhuvan, Download data.)

6. Reference

E-content: Lectures note

Text Books:

1. Remote sensing and GIS 2nd Edition, Basudeb Bhatt, Oxford Publication
Anji Reddy, M. Remote sensing and Geographical information system, B.S. Publications, 2001.

Online Source:

<http://nptel.ac.in/>

<https://www.youtube.com/>

<https://www.youtube.com/watch?v=QUS3oYzTRRA>

https://www.youtube.com/results?search_query=Geometric+and+radio+metric+correction

<https://www.youtube.com/watch?v=MunYdjVxqPs>

<https://www.youtube.com/watch?v=LKA1-s3CVFA>

<https://www.youtube.com/watch?v=2lnT9HJzt1c>

<https://www.youtube.com/watch?v=YJ0UUG0z8lQ>

7.Session Plan

Topic coverage and Internal Test	No. of Sessions (in hrs.)	Activity (lecture, tutorial, lab practice, field studies/field-trip, Workshop	Assignment (Project, assignment, field study, seminar, etc.)	Suggested Reading (Book, Video, Online source, etc.)
Module-1				
Introduction to Geomatic's terminology,	1	lecture	Assignment	Book
Components of GIS	1	Lecture	Assignment	Book
Functions and Advantages of GIS, limitations of GIS	1	lecture	Assignment	Book, Video
Introduction to ArcGIS	3	lab practice	Assignment	Online Source, Video
Building a catalog of geographic data	3	lab practice	Assignment	Online Source, Video
Sub-total(hrs)	09			
Module-II				

Data Type and Data Structure in GIS	1	Lecture	Assignment	Online Source, Video
Map Projections: Types of Map Projections	1	Lecture	Assignment	Online Source, Video
Exploring data and Adding it to a map	3	lab practice	Assignment	Online Source, Video
Managing a dataset	3	lab practice	Assignment	Online Source, Video
ArcGIS Graphics language	3	Lab Practice	Assignment	Online Source, Video
Sub-total(hrs)	11			
Module-III				
Data Input: Nature and Source of data, Method of spatial data capture - Primary and Secondary	1	Lecture	assignment	Book, Video, Online source
Techniques and procedure for digitizing	1	Lecture	assignment	Book, Video, Online source
Projection(Understanding of projection and coordinate system, projecting a dataset, adding projected dataset into the map, define a projection to the layer)	3	Lab Practice	Assignment	Video, Online Source
Georeferencing (Basic of georeferencing, Georeferencing a Scanned Image, Assign Projection to the Referenced Image)	3	Lab Practice	Assignment	Online Source
Topology (Concept of topology, topology in different GIS format, Coverage, shapefile, DXF-Drawing Exchange File, Geodatabase, Topology principle, Topological Error and Correction process, creating personal Geodatabase, creating a features dataset)	3	Lab Practice	Assignment	Online Source
Sub-total (hrs)	11			
Module-IV				
Errors of Digitization, Error in Elimination	1	Lecture	Assignment	Book, Online Source

Spatial, Thematic, and Temporal dimensions of Geographic Data	1	Lecture	assignment	Book, Video
Conceptual, object oriented and logical data model	1	Lecture	Assignment	Book, Video
Feature Dataset and Domain	3	Lab Practice	Assignment	Online Source
Google Earth	3	Lab Practice	Assignment	Video, Online Source
Sub-total (hrs)	09			
Module-V				
Raster and Vector Data Model, Raster versus Vector, Advantages and limitation	1	lecture	Assignment	Book, Video
Buffering and Editing tools	3	Lab Practice	Assignment	Video, Online Source
Data Conversion Tools	3	Lab Practice	Assignment	Video, Online Source
Sub-total (hrs)	07			
Module-VI				
Attribute data management and Meta Data concept.	1	lecture	Assignment	Book, Video
The concept of Digital Cartography	1	Lecture	Assignment	Book, Video,
Open Source Software-QGIS	3	Lab Practice	Assignment	Video, Online Source
Open Source Data-Earth Explorer USGS	3	Lab Practice	Assignment	Video, Online Source
Sub-total (hrs)	08			
Module-VII				
Advantages and Limitations of Digital Cartography	1	Lecture	Assignment	Book, Video
Concept of Map Scales	1	Lecture	Assignment	Book
Open Source Data- Bhuvan	3	Lab Practice	Assignment	Video, Online Source
Sub-total (hrs)	05			
Total (hrs)	60			

Strength of Materials

Subject Name	Code	Type of course	T-P-Pr (Credit)	Prerequisite
Strength of Materials	MECC0411	Theory + Practice	2-1-0(3)	Engineering Mechanics

1. Objective

- To educate the students on basic theories behind mechanics of solids.
- To educate the students on using ANSYS for analysis of various mechanical structures and load transmitting elements.

2. Course Outcome

- Students will have knowledge and practical engineering skills in analysis of mechanical strength of structures and load transmission elements and will be able to design them based on input data.
- Students will be able to deploy ANSYS to develop mechanical design solutions.

3. Evaluation Systems

Internal Examination	Component	% of Marks	Method of Assessment
	Midterm Test	20 (ITH)	Written examination
	Assignment		Report and Presentation
	Experiments	30 (IPR) + 20 (EPR)	Lab work, report
	Project		Report and presentation
	Quiz		Surprise/preannounced ones
External Examination		30	Written examination
Total		100	

4. Course Outline

Module-I (07 Hrs): Analysis of beams

Shear and Bending Moment in Beams: Types of Beams and Loads, Concept of Shear force, Bending moment and Sign Conventions, Relation Between Load, Shear force and Bending moment, Procedure for Drawing Shear force and Bending moment Diagrams, Point of Contra Flexure.

- Simulation (Using ANSYS): Evaluate Shear Force and Bending Moment
- Simulation (Using ANSYS): Beam Analysis with Point Load, UDL, UVL and Moment

Module-II (04 Hrs)

Stresses in Beams: Simple or Pure Bending, Flexure Formula, Section Modulus, Neutral Axis, Determination Bending Stresses, Shear Stress Distribution for Different Sections.

- Simulation (Using ANSYS): To Analyze The Bending Stress of a Cantilevered and Simply Supported Beam

<https://www.youtube.com/watch?v=ekKQvGna0ig>

Module-III (05 Hrs)

Deflection of Beams: Equation of Elastic Curve, Direct Integration Method, Strain Energy Method, Castigliano's Theorem

- Stress & Deflection Analysis of Mechanical Component (Using ANSYS)
- Double Shear Test and Deflection Test Using UTM

Module-IV (06 Hrs): Analysis of Column and Shaft

Column Analysis: Failure of a Column, End Conditions, Euler's Critical Load for Long Columns, Rankine's Empirical Formula, Effective Length and Slenderness Ratio, Eccentric Loading and Secant Formula.

6. Simulation(Using ANSYS): Buckling Analysis of a Square Column, I-Beam and RCC Beam

Module-V (08 Hrs)

Torsion: Torsion Formula, Design of Shafts, Power Transmitted by Shafts, Composite Shafts, Combined Bending and Torsion, Closed-Coiled Helical Springs, Spring Connected in Series and Parallel.

7. Simulation(Using ANSYS): Static and Dynamic Analysis of Shaft

8. Simulation(Using ANSYS): Spring Structural Analysis

<https://www.youtube.com/watch?v=rJ2e4DximL0>

9. Simulation(Using ANSYS): Stress Analysis of Suspension System

https://www.youtube.com/watch?v=xI-NqAKZ_60

10. Stiffness Test of a Helical Spring

Module-VI (06 Hrs)

Theories of Failure: Failure Under Biaxial Loading, Rankine's Theory, Guest's or Tresca's Theory, Von Mises Theory, Graphical Representation of Failure, Safety Factors, Prevention of Failure in Design Stage, Diagnosis of Failure In Post-Manufacturing Stage.

11. Simulation: Spur Gear Fatigue Analysis in Ansys

<https://www.youtube.com/watch?v=2SGqcLZISQ0>

12. Simulation: Chair Structural Analysis in ANSYS

<https://www.youtube.com/watch?v=DIII8bI-ea8>

13. Simulation(Using ANSYS): Bicycle Frame Structural Analysis

https://www.youtube.com/watch?v=p-CUK_pEfr4

Module-VII (14 Hrs)

Fatigue: Failure under Cyclic Loading, Endurance Limit. S-N Curve, Stress Concentration, Goodman and Soderberg Criteria.

14. Fatigue Failure Analysis(Using ANSYS)

<https://www.youtube.com/watch?v=ywDsB3umK2Y>

15. Fatigue Analysis of a Plate With Hole(Using ANSYS)

<https://www.youtube.com/watch?v=c3yM5fT5Ztc>

16. Fatigue Analysis(Using ANSYS) of Crankshaft of Two Wheeler

17. <https://www.youtube.com/watch?v=D0g3dpd-uYM>

Fracture: Types of Failure, Brittle and Ductile Fracture, Basic Modes of Fracture. Griffith's Analysis, Energy Release Rate, Elastic Stress at the Tip of a Sharp Crack, Crack Growth and Stress Intensity Factor, Critical SIF, Fracture Toughness Testing.

18. Basic Fracture Mechanics

<https://www.youtube.com/watch?v=jJMSvgcZaGA>

19. Fracture Testing

<https://www.youtube.com/watch?v=ESj-162I74E>

20. Fracture Mechanisms - Failure

<https://www.youtube.com/watch?v=hETp6TDi7-k>

21. Tensile Test, Compression Test

Software requirement: ANSYS

Text Books:

1. Strength of materials, S.S. Rattan, Tata Mc-Graw Hill Publication.
2. Advanced mechanics of materials, A.P. Boresi and R.J. Schmidt, Willey India

Reference Books:

1. Elements of fracture mechanics, Prashant Kumar, McGraw Hill Education (India)
2. Engineering Mechanics of Solids, Egor P. Popov, Pearson publication

Online Source: YouTube, NPTEL

2. Session Plan

Topic coverage and Internal Test	No. of Sessions (in hrs.)	Activity (lecture, tutorial, lab practice, field studies/field-trip, Workshop etc.)	Assignment (project, assignment, field study, seminar, etc.)	Suggested Reading (Book, Video, Online source, etc.)
Module-I				
Shear And Bending Moment In Beams: Types of Beams and Loads, Concept of Shear force, Bending moment and Sign Conventions	1			1.Strength of materials by S.S. Rattan, Tata Mc-Graw Hill Publication
Relation Between Load, Shear force and Bending moment, Procedure for Drawing Shear force and Bending moment Diagrams, Point of Contra Flexure.	2			1.Strength of materials by S.S. Rattan, Tata Mc-Graw Hill Publication
Simulation (Using ANSYS):Evaluate Shear Force and Bending Moment Simulation (Using ANSYS): Beam Analysis with Point Load, UDL, UVL and Moment	4	Lab practice		
Sub-total (hrs)	07			
Module-I				
Stresses in beams: Simple or Pure Bending, Flexure Formula, Section Modulus, Neutral Axis, Determination Bending Stresses, Shear Stress Distribution for	2			1.Strength of materials by S.S. Rattan, Tata Mc-Graw Hill Publication 2. https://www.youtube.com/watch?v=ekKQvGna0ig

Different Sections.				
Simulation(Using ANSYS): To Analyze The Bending Stress of a Cantilevered and Simply Supported Beam	2	Lab practice		
Sub-total (hrs)	04			
Module-III				
Deflection of beams: Equation of Elastic Curve, Direct Integration Method, Strain Energy Method, Castigliano's Theorem	1			1.Strength of materials by S.S. Rattan, Tata Mc-Graw Hill Publication
Stress & Deflection Analysis of Mechanical Component(Using ANSYS) Double Shear Test and Deflection Test Using UTM	4	Lab practice		
Sub-total (hrs)	05			
Module-IV				
Column analysis: Failure of a Column, End Conditions, Euler's Critical Load for Long Columns, Rankine's Empirical Formula, Effective Length and Slenderness Ratio, Eccentric Loading and Secant Formula.	4			1.Strength of materials by S.S. Rattan, Tata Mc-Graw Hill Publication

Simulation(Using ANSYS): Buckling Analysis of a Square Column, I-Beam and RCC Beam	2	Lab practice		
Sub-total (hrs)	06			
Module-V				
Torsion: Torsion Formula, Design of Shafts, Power Transmitted by Shafts, Composite Shafts, Combined Bending and Torsion, Closed-Coiled Helical Springs, Spring Connected in Series and Parallel.	4			1.Strength of materials by S.S. Rattan, Tata Mc-Graw Hill Publication 2. https://www.youtube.com/watch?v=rJ2e4DximL0 3. https://www.youtube.com/watch?v=xI-NqAKZ_60
Simulation(Using ANSYS): Spring Structural Analysis. Stiffness Test of a Helical Spring.	4	Lab practice		
Sub-total (hrs)	08			
Module-VI				
Theories of failure: Failure Under Biaxial Loading, Rankine's Theory, Guest's or Tresca's Theory, Von Mises Theory, Graphical Representation of Failure, Safety Factors, Prevention of Failure in Design Stage, Diagnosis of Failure In Post-Manufacturing	2			1.Strength of materials by S.S. Rattan, Tata Mc-Graw Hill Publication 2. https://www.youtube.com/watch?v=2SGqcLZISQ0 3. https://www.youtube.com/watch?v=p-CUK_pEfR4 4. https://www.youtube.com/watch?v=hETp6TDi7-k

Stage.				
Simulation: Spur Gear Fatigue Analysis in Ansys. Simulation(Using ANSYS): Bicycle Frame Structural Analysis	4	Lab practice		
Sub-total (hrs)	06			
Module-VII				
Fatigue: Failure Under Cyclic Loading, Endurance Limit. S-N Curve, Stress Concentration, Goodman and Soderberg Criteria.	3			1.Strength of materials by S.S. Rattan, Tata Mc-Graw Hill Publication 2. Advanced mechanics of materials by A.P. Boresi and R.J. Schmidt, Willey India
Fatigue Analysis of a Plate With Hole(Using ANSYS). Fatigue Analysis(Using ANSYS) of Crankshaft of Two Wheeler	4	Lab practice		
Fracture: Types of Failure, Brittle and Ductile Fracture, Basic Modes of Fracture. Griffith's Analysis, Energy Release Rate, Elastic Stress at the Tip of a Sharp Crack, Crack Growth and Stress Intensity Factor, Critical SIF, Fracture Toughness Testing.	3			1.Advanced mechanics of materials by A.P. Boresi and R.J. Schmidt, Willey India 2. https://www.youtube.com/watch?v=jJMSvgcZaGA 3. https://www.youtube.com/watch?v=ESj-162174E
Tensile Test, Compression Test	4	Lab practice		
Sub-total (hrs)	14			
Total (hrs)	50			

CCCE 0102 HYDRAULICS AND HYDRAULIC MACHINE

Pre - requisites	Course Type	Credits
FCCE0404 Basic Fluid Mechanics	Theory	3

Course Objectives:

- To introduce concepts of Boundary layers and their significance in day to day applications.
- To apprise the significance of separation and wake formation, its impact in fluid flow systems and the methods of control of separation.
- To impart the phenomenon of lift and Drag of bodies immersed in fluid flow
- Introduction of Air foil theory.
- Introduce the principles of flow in open channels under uniform and critical conditions
- Make the student understand the concept of best economic section and determination of the section of such channels.
- To introduce the principles of conservation of energy and momentum as applied to open channel flows.
- To enable the students towards applying the concepts of Specific energy and Specific force for solving canal transition problems and hydraulic jump analysis.
- To introduce the basis of Gradually Varied Flow profiles and their computation.
- To introduce the principles of turbo machinery and the working of different types of pumps and turbines.
- To enable the student to understand the process of pump selection and installation.

Outcomes: At the end of the course the student will be able to

- Analyse the boundary layer flows and methods of controlling the separation of Boundary layer.
- Determine the lift and drag forces on bodies
- Design channels of best economic section and channels flowing at uniform depth.
- Solve the canal transition problems and the hydraulic jump computations.
- Understand the working principles of centrifugal pumps, reciprocating pumps and turbines (impulse and reaction).
- Determine the dimensions of the Pelton wheel bucket and those of Francis turbine.
- Apply the concept of model studies for determine the size or the power of turbines and different working conditions.

MODULE- I: Boundary Layers, Drag and Lift (13 Hrs)

A. Basic Concepts of Boundary Layer

Development of Boundary Layers on a flat plate - Laminar & Turbulent Boundary Layers, Velocity Distribution with in Boundary Layer - Thickness of Boundary Layer - Viscous Drag - Displacement Thickness, Momentum Thickness and Energy Thickness. Integral Momentum Equation - Drag Coefficients for different velocity distributions in Laminar and Turbulent Boundary Layers. Boundary Layer Separation - Effect of Adverse Pressure Gradient - Control of Boundary Layer Separation

B. Flow Past Immersed Bodies - Drag

Flow past immersed bodies - Pressure distribution around bodies - Circular Disc, Plate held normal

to flow, Cylinder and Sphere. Drag and Lift on bodies - Various types of Drag - Drag Coefficient - Variation of drag with Reynolds number for flow around cylinder, sphere, disc and plate held normal to flow.

C. **Flow Past Bodies - Lift & Air foil Theory**

Circulation - Circulation around an inclined Plate and Aerofoil - Flow around a Cylinder without Circulation - Lift and Drag on Cylinder without Circulation - Flow about a Rotating Cylinder - Magnus Effect- Stagnation Points - Lift and Drag on Rotating Cylinder. Karman Vortex Trail, Introduction to Aerofoil theory.

MODULE- II: OPEN CHANNEL FLOW (11 Hrs)

D. **Introduction & Classification of Open Channel Flows**

Classification of Open Channel Flows - Definition of terms - Wetted Perimeter -Hydraulic Mean Depth - Hydraulic Radius - Prismatic Channel - Velocity and Pressure Distribution in Open Channels- Basic Equations - Chezy's - Manning'sEquation-Manning'sEquationent forCoefficientdifferentBedRoughness. Uniform Flow -Normal Depth - Concept of Most Efficient Sections - Most Efficient Triangular, Rectangular and Trapezoidal Sections.

E. **Energy and Momentum Principles (All discussions w.r.t. to Rectangular channels only)**

Continuity and Energy equations in Open Channel Flows - Specific Energy - Specific Energy Diagram - Alternate Depths - Critical Flow - Froude Number - Critical Depth - Subcritical and Supercritical Flows - Canal Transitions - change in Bed width and Bed level - Minimum Specific Energy - Relationship between Critical Depth and Minimum Specific Energy.

Momentum Principle in Open Channels - Specific Force - Conjugate Depths - Hydraulic Jump - Ratio of Post

- to Pre- jump Depths for Rectangular Channels - Energy Lost in Jump.

F. **Gradually Varied Flow in Open Channels (All discussions w.r.t. to Rectangular channels only)**

Introduction to Varied Flow - Gradually Varied Flow and rapidly Varied Flow - Governing Equation for GVF

- Classification of GVF Profiles - Critical, Mild and Steep Slopes - M1, M2, M3, S1, S2 and S3

Profiles (C1, C3, A2, A3, H2 and H3 Profiles need not be discussed). Computation of GVF Profile - Direct Step Method

MODULE- III: Hydraulic Machines (18 Hrs)

G. **Introduction to Turbomachinery**

Force acting on stationery and moving vanes - series of vanes mounted on a wheel - work done on a rotating wheel. Functions and general working principles of Pumps & Turbines.

Types of pumps - Centrifugal and Reciprocating pumps - Relative Advantages. Selection of type of pump. Classification of Turbines - Impulse and Reaction Turbines - Selection of type of turbine.

H. **Centrifugal Pumps**

Component Parts of a Centrifugal Pump Working Principles - Priming. Work done by impeller - Classification of centrifugal pumps - Minimum starting speed of centrifugal Pumps - Multi stage

pumps. Specific Speed of Centrifugal Pumps - Pump Characteristic Curves. Net Positive Suction Head and Pump installation - Dos and Don'ts of Pump Installation and operation.

I. Reciprocating Pumps

Component parts and working of reciprocating pumps - Different types. Theoretical Discharge - Coefficient of Discharge and Slip. Work done and power required. Indicator diagram - effect of acceleration and friction on work done. Air vessels - Power saved by fitting air vessel. Cavitation and maximum speed at which pump can run without separation.

J. Turbines (Numerical problems on velocity triangles, computations of work done and efficiencies of turbines not to be included in the university examination)

Working principle of Impulse turbines - Pelton wheel - component parts, Work done by Pelton wheel - Definitions of heads and efficiencies - Gross head & Net head - Mechanical, Volumetric & Overall efficiencies. Design aspects of Pelton wheel. Governing mechanism for Pelton wheel.

Reaction turbines - Working principles of reaction turbines - Francis turbine - Component parts - Inward and outward flow turbines - Work done by Francis runner. Efficiency of Francis runner - Mechanical, hydraulic and overall efficiency. Working proportions of Francis runner. Types of Draft tubes - Cavitation in draft tubes. Governing Mechanism for Francis turbines. Working principles of Kaplan, Propeller turbines. (Numerical problems on Kaplan & Propeller turbines not to be part of external examination).

Turbine characteristic curve - Specific Speed, Unit quantities and Model relationships for turbines.

PEADAGOGY

Module –I

S. No.	Topic	Pedagogy	Video links / Software	Instructional Hrs			
				Th	Video	Proj.	Pract
Module - I: (Theory - 13 Hrs Practice - 0 Hrs)							
(A)	Basic Concepts of Boundary Layer: Development of Boundary Layers on a flat plate - Laminar & Turbulent Boundary Layers, Velocity Distribution with in Boundary Layer - Thickness of Boundary Layer.	CRT + Video	See List Below for Video Links	1	1	0	0
	Displacement Thickness, Momentum Thickness and Energy Thickness.	CRT		1	0	0	0
	Viscous Drag - Integral Momentum Equation - Drag Coefficients for different velocity distributions in Laminar and Turbulent Boundary Layers.	CRT		1	0	0	0
	Boundary Layer Separation - Effect of Adverse Pressure Gradient - Control of Boundary Layer Separation	CRT + Video		1	1	0	0
(B)	Flow Past Immersed Bodies - Drag Flow past immersed bodies - Pressure distribution around bodies - Circular Disc, Plate held normal to flow, Cylinder and Sphere.	CRT		1	0	0	0
	Drag and Lift on bodies - Various types of Drag - Drag Coefficient - Variation of drag with Reynolds number for flow around cylinder, sphere, disc and plate held normal to flow.	CRT + Video		1	1	0	0
(C)	Flow Past Bodies - Lift & Air foil Theory Circulation - Circulation around an inclined Plate and Aerofoil - Flow around a Cylinder without Circulation - Lift and Drag on Cylinder without Circulation.	CRT + Video		1	1	0	0

	Flow about a Rotating Cylinder - Effect Magnus - Stagnation Points - Lift and Drag on Rotating Cylinder. Karman Vortex Trail, Introduction to Aerofoil theory.	CRT + Video		1	1	0	0
			Sub total	8	5	0	0

Module - II

S. No.	Topic	Pedagogy	Video links / Software	Instructional Hrs			
				Th	Video	Proj.	Pract
	Open Channel Flows: (Theory - 11 Hrs Practice - 0 Hrs)						
(D)	Introduction & Classification of Open Channel Flows Classification of Open Channel Flows - Definition of terms - Wetted Perimeter -Hydraulic Mean Depth - Hydraulic Radius - Prismatic Channel - Velocity and Pressure Distribution in Open Channels.	CRT + Video		1	1	0	0
	Basic Equations - Chezy's - Manning's Equation- Manning's Coefficient . for	CRT		1	0	0	0
	Uniform Flow -Normal Depth - Concept of Most Efficient Sections - Most Efficient Triangular, Rectangular and Trapezoidal Sections	CRT		1	0	0	0
(E)	Energy Principle: Continuity and Energy equations in Open Channel Flows - Specific Energy - Specific Energy Diagram - Alternate Depths - Critical Flow - Froude Number - Critical Depth - Subcritical and Supercritical Flows.	CRT	See List	1	1	0	0
	Canal Transitions - change in Bed width and Bed level - Minimum Specific Energy - Relationship between Critical Depth and Minimum Specific Energy.	CRT + Video	Below for Video Links	1	0	0	0
	Momentum Principle: Momentum Principle in Open Channels - Specific Force - Conjugate Depths - Hydraulic Jump - Ratio of Post - to Pre- jump Depths for Rectangular Channels - Energy Lost in Jump.	CRT + Video		1	0	0	0

(F)	Gradually Varied Flow in Open Channels Introduction to Varied Flow - Gradually Varied Flow and rapidly Varied Flow - Governing Equation for GVF.	CRT		1	0	0	0
	Classification of GVF Profiles – Critical, Mild and Steep Slopes - M1, M2, M3, S1, S2 and S3 Profiles (C1, C3, A2, A3, H2 and H3 Profiles need not be discussed).	CRT + Video		1	1	0	0
	Computation of GVF Profile - Direct Step Method	CRT + Project		1	0	2	0
			Sub total	8	3	2	0

Module –III

S. No.	Topic	Pedagogy	Video links / Software	Instructional Hrs			
				Th	Video	Proj.	Pract
	Turbo- Machinery: (Theory - 18 Hrs Practice - 0 Hrs)						
(G)	Introduction to Turbomachinery Force acting on stationery and moving vanes - series of vanes mounted on a wheel - work done on a rotating wheel. Functions and general working principles of Pumps & Turbines.	CRT			0	0	0
	Types pumps and Reciprocating of - Centrifugal pumps	CRT		1	0	0	0
	Relative Advantages. Selection of type of pump. Classification of Turbines - Impulse and Reaction Turbines - Selection of type of turbine.	CRT		1	0	0	0
(H)	Centrifugal Pumps Component Parts of a Centrifugal Pump Working Principles - Priming. Work done by impeller - Classification of centrifugal pumps	CRT + Video		1	1	0	0
	Minimum starting speed of centrifugal Pumps - Multi stage pumps.	CRT		1	0	0	0
	Selection of Pumps - Specific Speed of Centrifugal Pumps - Pump Characteristic Curves. Net Positive Suction Head and Pump installation - Dos and Don'ts of Pump Installatio	CRT CRT + Project	See List Below for Video Links	1 1	0 0	0 2	0 0
(I)	Reciprocating Pumps Component and of reciprocating parts working pumps - Theoretica Discharge -	CRT +		1	1	0	0

nt types. 1
Discharge and
S

Work done and power required. Indicator diagram -
effect of

CRT 1 0 0 0

acceleration and friction on work done.

Air vessels - Power saved by fitting air vessel.
Cavitation and maximum speed at which pump can run
without

CRT 1 0 0 0

CRT 1 0 0 0

separation.

**Turbine
s**

Working principle of Impulse turbines - Pelton
wheel -

component parts, Work done by Pelton wheel -
Definitions of

CRT +

(J) heads and efficiencies - Gross head & Net head -
Mechanical,
Volumetric & Overall efficiencies. Design aspects of
Pelton
wheel. Governing mechanism for Pelton wheel.

1 1 0 0

Video

Reaction turbines - Working principles of reaction
turbines -

Francis turbine - Component parts - Inward and
outward flow

CRT +

turbines - Work done by Francis runner. Efficiency of
Francis
runner - Mechanical, hydraulic and overall
efficiency.

1 0 0 0

Video

Working proportions of Francis runner. Types of Draft
tubes -

Cavitation in draft tubes. Governing Mechanism for
Francis
turbines. Working principles of Kaplan, Propeller
turbines.

CRT 1 0 0 0

Turbine characteristic curve - Specific Speed, Unit
quantities

CRT 1 0 0 0

and Model relationships for turbines.

Sub total 1 3 0 0
5

	Video Links						
	Open Channel Flow: https://www.google.co.in/url?sa=t&rct=j&q=&esrc=s&source=web&cd=3&cad=rja&uact=8&ved=0ahU KEwjR9s						
	68moLNAhUYSO8KHQnQBd8QuAIIKDAC&url=https%3A%2F%2Fwww.youtube.com%2Fwatch%3Fv%3D3rC_kmFU7wbg&usg=AFQjCNGWaCZXXKj5z3SXRHqJMbw2-xuQ1Sg						
	Total Video Lectures: https://www.google.co.in/url?sa=t&rct=j&q=&esrc=s&source=web&cd=7&cad=rja&uact=8&ved=0ahU KEwjR9s						
	68moLNAhUYSO8KHQnQBd8QFghAMAY&url=http%3A%2F%2Fponce.sdsu.edu%2Fopen_channel_hydraulics_videos.html&usg=AFQjCNFv9vnCNlZSV1PkwasmlnEwOB8wKQ						
	Boundary Layers and the no slip condition youtube=http://www.youtube.com/watch?v=cUTkqZeIMow https://www.youtube.com/watch?v=wMxK2GtFFq0						
	https://www.youtube.com/watch?v=7SkWxEUXIoM Laminar Flow in a Pipe youtube=http://www.youtube.com/watch?v=KqqtOb30jWs&NR=1						
	Turbulent Flow in a Pipe youtube=http://www.youtube.com/watch?v=NplrDarMDF8&NR=1						
	Subcritical and supercritical flow over a weir (video courtesy of Little River Research and Design)						

<https://sites.google.com/a/vt.edu/moglen/home/animations-open-channel-flow>

<https://www.google.co.in/url?sa=t&rct=j&q=&esrc=s&source=web&cd=35&cad=rja&uact=8&ved=0ah UKewjz9>

[rkn4LNAhVBj5QKHdJ5CEU4HhAWCDswBA&url=http%3A%2F%2Fwww.learnerstv.com%2Ffree-engineering-video-lectures-ltv458-](http://www.learnerstv.com/free-engineering-video-lectures-ltv458/)

[Page1.htm&usg=AFQjCNG_5voW6LE8UPQfrfjqDOA6PqcqsA](http://www.learnerstv.com/free-engineering-video-lectures-ltv458-Page1.htm&usg=AFQjCNG_5voW6LE8UPQfrfjqDOA6PqcqsA)

<https://hydrogeo.wordpress.com/2010/02/09/videos-of-open-channel-flow-phenomena/>

**CENTURION UNIVERSITY OF TECHNOLOGY & MANAGEMENT:: PARALAKHEMUNDI
ODISHA**

CHOICE BASED CREDIT SYSTEM

COURSE STRUCTURE

**BASKET V - Engineering & Technology
Domain Courses**



**School of Engineering & Technology
JUNE 2017**

Domain D5 - Construction Planning & Project Management

Sl. No.	Course Code	Course Title	Course Nature	Credits	Pre-requisite
1	DECP0411	Quality Control in Construction Industry	Theory + Practice	4	FCEN0406 Building Materials & Construction
2	DECP0412	Geotechnical Investigations	Theory + Practice	5	CCCE0101 Geotechnical Engineering - II
3	DECP0413	Safety & Risk Management in Construction Industry	Theory + Practice	4	FCEN0406 Building Materials & Construction
4	DECP0414	Construction Equipment Management	Theory + Practice	4	FCEN0406 Building Materials & Construction
5	DECP0211	Pre-Fabricated Structures	Practice	4	Nil
6	DECP0611	Repairs, Renovation, Rehabilitation of Buildings	Practice + Project	5	FCEN0406 Building Materials & Construction
7	DECP0311	MS Project 7 Based Design Project	Project	4	Not before Semester 4
8	DEET0300	Project	Project	6	Not before Semester 4
9.	DEET0800	Internship	Practice	4	Not before Semester 4
			Total	40	

Domain D17 - Planning, Design & Drawing

S. No.	Course Code	Course Title	Course Nature	Credits	Prerequisite
1	DEPD0231	Computer Graphics	Practice	6	FCEN0406 Building Materials & Construction
2	DEPD0232	Architectural Design	Practice	6	FCEN0406 Building Materials & Construction
3	DEPD0431	Computer Aided Design of Advanced Concrete Structures	Theory + Practice	5	CCCE0405 Analysis & Design of RCC Structures
4	DEPD0433	Computer Aided Design of Advanced Steel Structures	Theory + Practice	5	CCCE0406 Analysis & Design of Steel Structures
5	DEPD0132	Design of Earthquake Resistant Structures	Theory	4	CCCE0405 Analysis & Design of RCC Structures & CCCE0406 Analysis & Design of Steel Structures
6	DEPD0331	Design Project	Project	4	Not before Semester 4
6	DEET0300	Project	Project	6	Not before Semester 4
7	DEET0800	Internship	Practice	4	Not before Semester 4
			Total	40	

Domain D20 - Smart City Planning

S. No.	Course Code	Course Title	Course Nature	Credits	Pre-requisite
1	DESP0921	Remote Sensing and Image Processing	Theory + Practice + Project	6	Nil
2	DESP0922	Surveying for Civil Projects		6	CCCE0407 Advanced Surveying
3	DESP0923	GIS & Digital Cartography		6	CCCE0407 Advanced Surveying
4	DESP0221	LIDAR Application	Practice	3	CCCE0407 Advanced Surveying
5	DESP0621	Smart City Planning	Practice + Project	5	DESP0923 GIS & Digital Cartography
6	DESP0321	Design Project (RS & GIS based Natural Disaster management project)	Project	4	Not before Semester 4
7.	DEET0300	Project	Project	6	Not before Semester 4
8.	DEET0800	Internship	Practice	4	Not before Semester 4
			Total	40	

Domain D5 - Construction Planning & Project Management

Sl. No.	Course Code	Course Title	Course Nature	Credits	Pre-requisite
1	DECP0411	Quality Control in Construction Industry	Theory + Practice	4	FCEN0406 Building Materials & Construction
2	DECP0412	Geotechnical Investigations	Theory + Practice	5	CCCE0101 Geotechnical Engineering - II
3	DECP0413	Safety & Risk Management in Construction Industry	Theory + Practice	4	FCEN0406 Building Materials & Construction
4	DECP0414	Construction Equipment Management	Theory + Practice	4	FCEN0406 Building Materials & Construction
5	DECP0211	Pre-Fabricated Structures	Practice	4	Nil
6	DECP0611	Repairs, Renovation, Rehabilitation of Buildings	Practice + Project	5	FCEN0406 Building Materials & Construction
7	DECP0311	MS Project 7 Based Design Project	Project	4	Not before Semester 4
8	DEET0300	Project	Project	6	Not before Semester 4
9.	DEET0800	Internship	Practice	4	Not before Semester 4
			Total	40	

DECP0411 Quality Control in Construction Industry

Code	Course Title	Course Type	Credits	Pre-requisites	T-P-Pr (hrs)
DECP0411	Quality Control in Construction Industry	Theory + Practice	4	FCEN0406 Building Materials & Construction	2-3-0

Course Objectives:

- To make the student realize the necessity of quality control and quality assurance in construction industry.
- To impart the procedures involved in maintaining quality in construction industry and various standards and practices prescribed therefor.
- To enlighten the student with the tools of total quality management process.
- To give hands on practice to the students in preparing quality assessment schedules and inspection check lists.
- To make the student to take up laboratory and field tests for quality assurance for civil engineering structures.

Course Outcomes:

After successful completion of the course the students will be able to

- Generate quality control schedule for different projects in construction industry.
- Prepare quality control inspection check lists for selected civil engineering structures.
- Carryout the field and laboratory tests for quality assessment in construction industry.

Module I (Theory) [Both Internal & External Assessment]

Introduction: Quality Control and Quality Assessment - Construction Quality - Purpose & Scope Definition & Evolution of Quality. Factors influencing Construction Quality Quality Circle. Establishing QC Requirements - Setting up a Quality Management System - Total Quality Management - Deming's PDSA Quality Cycle, Juran's Quality Triangle & Triple Role models. Concept of Quality ISO Standards. Quality Audit. Construction Quality Assurance System (CONQUAS). Principles of Quality Control and Quality Assessment. Quality Management System, Quality Control Inspection Process.

Quality Assurance & Control: Objective, Regularity Agent - Owner, Contract and Construction Oriented Objectives & Methods. Techniques and needs of QA / QC.

Module II (Class Room Practice) [Internal & External Practice Assessment. No written university examination]

Practice Session on Quality Control Testing Procedure & Quality Control Schedule preparation Practice Session on Generation of sample Quality Control inspection Check list for Design Standards and design processes. Practice Session on Generation of sample Quality Control Inspection schedule Check list for form work for a Building / Irrigation Structure.

Practice Session on Generation of sample Quality Control Inspection schedule Check list for concreting in a Residential building / Irrigation Structure

Practice Session on Generation of sample Quality Control Inspection schedule Check list for various works connected with a Highway project.

Module III (Laboratory & Field Practice) [Internal & External Practice Assessment. No written university examination]

Study of laboratory and field tests for Quality Assurance. Study of QC standards for various construction equipment including Concrete batch mixing / Bitumen batch mixing equipment. Practice Sessions on laboratory tests, field tests and Field Visits

Resources List

1. Quality Control in Construction Industry
2. SDGC Contractor QC Plan Template
3. Common Mistakes in Construction Phase
4. Quality Control Process
5. Concrete Distress
6. Construction QC Inspection Report
7. Durability & Deterioration of Concrete
8. Health Assessment of RC Structures
9. Quality Inspection & Control
10. irc.gov.in.sp.011.1984
11. QA & QC Manual Dept of WS & Sanitation - Punjab

DECP0412 Geotechnical Investigations

Code	Course Title	Course Type	Credits	Pre-requisites	T-P-Pr (hrs)
DECP0412	Geotechnical Investigations	Theory + Practice	5	CCCE0101 Geotechnical Engineering - II	2-3-0

Course Objectives:

- To make the student realize the importance of geotechnical investigations in construction industry.
- To enlighten the student with the subsurface geotechnical exploration methods and the processes.
- To appraise various impart the procedures of geotechnical investigations for varying soils.
- To give hands on practice to the students in carrying laboratory and field tests during the geotechnical investigation process.
- To involve the student in the boring, drilling, trial pitting and preparation of geotechnical investigation reports.

Course Outcomes:

After successful completion of the course the students will be able to

- Plan geotechnical investigations before constructing a structure.
- Conduct the laboratory and field tests as a part of geotechnical investigations.
- Analyze the geotechnical investigation test data and prepare a report for selected categories of structures.

Module I (Theory) [Both Internal & External Assessment]

Introduction: Importance of Geotechnical Investigations - Approaches to Site Investigation and Sequence of Geotechnical Investigations

Planning of Geotechnical Investigations: Planning Trial Pitting, boring and drilling.

Subsurface Exploration Necessity & Objectives and Types of Subsurface Explorations.

Suitability of different investigation procedures for Shallow & Deep Investigations, Soft Marine Clays & Expansive Soils and Liquefiable soils & Lateritic deposits

Module II (Class Room & Laboratory Practice) [Internal & External Practice Assessment. No written university examination]

Sampling and Sample Analysis: Study of Testing methods (laboratory tests) - Sample Sizes, equipment / apparatus for different tests and Soil Disturbance during Sampling & its effect.

Undisturbed Sampling Techniques: Study of Standards available, relevant codes and Sampling, laboratory testing, and in situ testing requirements.

Reporting Geotechnical Investigation Data: Preparation of Geotechnical Investigation Reports for Major Projects - Dams, Hydroelectric Projects and Railway Projects.

Module III (Laboratory & Field Practice) [Internal & External Practice Assessment. No written university examination]

Field Visit for observing Boring, Drilling, Probing and Trial Pitting, Field Visit for Undisturbed Sampling and Analysis of field test data.

Resources List

1. IGS-TC04-GI-Manual 2016
2. IS SP7 (NBC- 2005)
3. Site Investigation (Clayton, Matthews and Simons)
4. Writing Geotech Investigation Report

DECP0413 Safety & Risk Management in Construction Industry

Code	Course Title	Course Type	Credits	Pre-requisites	T-P-Pr (hrs)
DECP0413	Safety & Risk Management in Construction Industry	Theory + Practice	4	FCEN0406 Building Materials & Construction	1-3-0

Course Objectives:

To appraise the student with the causes of risks involved in construction industry and the safety provisions as per IS codes.

To enlighten the student with Safety measures to be undertaken in construction industry.

To appraise the need of various insurance schemes that are being operated in an industry.

Course Outcomes:

After successful completion of the course the students will be able to

Plan a set of constructional activities eliminating risk in execution of a constructional activity.

Carry out the constructional activities in civil engineering works following prescribed safety measures.

Realize the necessity and significance of insurance in construction industry.

Module I (Theory) [Both Internal & External Assessment]

Introduction – Definition and Importance of Risk Management studies - Uncertainty Matrix - Importance of Risk Management - Risk Classification and Risk Management Process - Risk causation theories - Risk Identification Process - Preliminary Check List, Risk Events Consequences Scenario - Risk Mapping and Risk Classification - Risk Analysis.

Evaluation of Safety Project - Accident causation Theories, Foundations of a Major Injury - Unsafe Conditions and Unsafe Acts. Health and Safety Act and Regulations - Building & Other Construction Workers - Regulation of Employment and Condition of Services Act, 1996, Central Rules 1998.

Module II (Class Room & Field Practice) [Internal & External Practice Assessment. No written university examination]

Safety & Health Management System: Appraisal of construction safety management guidelines in Construction Sector - Safety Policy & Organization - Safety Budget - Education & Training - Safety Plan, Safety Manual - Safety Committee - Incentive Programmes - Accident Reporting, Investigation & Record Keeping. Safety Inspection and Safety Audit - Workers' Health & First Aid & Facilities.

Preparation of reports for safety code provisions for some construction activities as per IS Codes.

Fire Prevention for different types of buildings

Safety precautions in Construction activities, Construction equipment usage. Managing electrical systems on site housing for staff, site office etc

Safety Practices for material handling, Safety Practices for Equipment Operation - Material safety Data Sheets

Study on Occupational Safety and Health Administration

Study of Safety Provisions for selected organizations - National Power Corporation of India Limited, Atomic Energy Regulation Board, NTPC, Godrej & Boyce.

Visit to a project site visit for observing and noting the safety provisions adopted.

Module III (Class Room & Field Practice) [Internal & External Practice Assessment. No written university examination]

Insurance in Construction Industry - Fundamental Principles of Insurance - Insurance Policies for Typical Construction Organization - Project Insurance - Fire Policy, Plant & Machinery Insurance, Liquidity Damages Insurance.

Code of Practice for Contractors on General Safety Requirements, IS Code Provisions for Construction Safety Practices - SP 70 (2002), IS Safety Codes for: Excavation (3696 Parts 1 & 2, 3764-1992), Demolition of Buildings (4130-1991), Construction involving Hot Bituminous (5916 -1970), Working with Construction Machinery (7293 -1974), Erection of Structural Steel Work (7205-1974), Piling & Deep Foundations (5121-1969) Erection of Concrete Structures (8989-1978), Construction, Operation and Maintenance of River Valley Projects (10386 Parts 4, 7 and 10)

Resources List

1. P.M. Book
2. Project Risk Management - An Overview
3. Risk Management - Washington State DOT
4. Risk Management
5. Risk Management in Construction Project Networks - Finland
6. Case Studies
7. ABC of Construction Safety - Oregon
8. Handbook on Building Fire Codes
9. Health & Safety in Construction - UK
10. IS Codes for Safety Requirements
11. NTPC Safety Rules
12. Safety, Health & Environmental Issues - US
13. Insurance

DECP0414 Construction Equipment Management

Code	Course Title	Course Type	Credits	Pre-requisites	T-P-Pr (hrs)
DECP0414	Construction Equipment Management	Theory + Practice	4	FCEN0406 Building Materials & Construction	1-3-0

Course Objectives:

To enlighten the student with various equipment used in construction industry including selection criterion and economics of the same.

To appraise the student with the aspects related to functioning, operation and maintenance of various construction equipment.

Course Outcomes:

After successful completion of the course the students will be able to

Identify the particular equipment to be used in the construction project they will undertake.

Prepare plans for economic management of the equipment in the projects they undertake.

Module I (Theory) [Both Internal & External Assessment]

Introduction: Planning & Selection of Equipment - Equipment classification - Selection criteria & Source of Information

Economics of Equipment: - Down Time Cost & Obsolescence Cost - Equipment Value, Depreciation, Owning & Operation Cost.

Time Factors & Equipment Life: Equipment Time - Down Time & Cycle Time. Equipment Life - Economic

Life, Useful Life, Operating Life and Working Life

Equipment Management & Procurement: Equipment Management Check List - Equipment Order and Invoice - Equipment Maintenance sheets and Log Book.

Module II (Class Room & Field Practice) [Internal & External Practice Assessment. No written university examination]

Practice based study on the functions, operational process, specifications for different constructional equipment

- ✓ Road Making Equipment, Material Handling Equipment and Grading Equipment
- ✓ Batching Plant, Concreting Equipment & Slip form Equipment
- ✓ Hauling, Tunneling and other Equipment
- ✓ Excavation & Embankment Making Equipment and Grading Equipment
- ✓ Batching & Mixing Equipment, Concreting Equipment & Slip form Equipment and Asphaltic Equipment
- ✓ Material Handling Equipment and Hauling & Hoisting Equipment
- ✓ Pile Driving Equipment and De-watering Equipment

Module III (Class Room & Field Practice) [Internal & External Practice Assessment. No written university examination]

Practice based study & discussion on Materials Management

- ✓ Basics of Materials Management
- ✓ Inventory Management
- ✓ MRP

Resources List

1. Construction Equipment-James E.Russel, Prentice Hall
2. Construction Planning and project management-Neeraj K.Jha

DECP0211 Pre-Fabricated Structures

Code	Course Title	Course Type	Credits	Pre-requisites	T-P-Pr (hrs)
DECP0211	Pre-Fabricated Structures	Practice	4	Nil	0-4-0

Course Objectives:

To enlighten the student with emerging technology of prefabrication in construction industry including various processes involved there upon.

To give hands on experience in planning some prefab elements in a simple units like that of a compound wall construction.

Course Outcomes:

After successful completion of the course the students will

Become knowledgeable regarding the processes of planning, production, storage, transportation and site installation of various prefabricated units pertaining to a civil engineering construction project.

Topics / Practice Sessions

Introduction: Need & Materials used in prefabrication. Advantages of Prefabrication Classification of Precast methods based on Construction type, Character of elements and Structural Scheme.

- Prefab Components, Standardization of components.

Practice Session 1: Study and report generation on Formwork for prefabrication Requirements of good formwork and Types of formwork.

Practice Session 2: Study and report generation on Prefabrication of RCC structures

- ∨ Stages of manufacturing / Components / Curing,
- ∨ Demolding & lifting / Storage & Transportation.

Practice Session 3: Study and report generation on Methods of RC Building erection

- ∨ Box - Type Blocks / Large Block Building, Multi - story Frame Buildings,
- ∨ Different Erection methods of Roofs, Columns and Foundation slab.

Practice Session 4: Study and report generation on Steel fabrication

- ∨ Workshop layout / Template & Marking and
- ∨ Pressing & Forming.

Practice Session 5: Study and report generation on Erection of Steel Structures

- ∨ Elements of erection / Types of erection and
- ∨ Longitudinal & Unit methods of assembly.

Practice Session 6: Field Practice on Production of Prefab Units for Compound Wall Construction.

Practice Session 7: Field Visit to any prefab unit and prepare a report on various aspects of prefabrication process followed.

Practice Session 8: Case study on low cost housing units.

Practice Session 9: Study and report generation on Modular Construction

Practice Session 10: Field Visit to Prefab unit of Hume Pipe Production

DECP0611 Repairs, Renovation, Rehabilitation of Buildings

Code	Course Title	Course Type	Credits	Pre-requisites	T-P-Pr (hrs)
DECP0611	Repairs, Renovation, Rehabilitation of Buildings	Practice + Project	5	Nil	0-2-3

Course Objectives:

To enlighten the student with emerging technology of prefabrication in construction industry including various processes involved there upon.

To give hands on experience in planning some prefab elements in a simple units like that of a compound wall construction.

Course Outcomes:

After successful completion of the course the students will

Become knowledgeable regarding the processes of planning, production, storage, transportation and site installation of various prefabricated units pertaining to a civil engineering construction project.

Topics / Practice / Project Sessions

Introduction: Understanding the concepts of durability and degradation of concrete structures - Defect identification / Action of chemical attack. Different types of damages to the concrete structures in normal and marine environment.

Corrosion control methods: Material Selection, Improvements in material - Design procedure, Alteration of environment, Cathodic & Anodic protection and Coatings

Strengthening concrete: Surface impregnation by vacuum methods / Slurry injection, Plate bonding, RCC Jacketing / Propping and supporting, Fiber wrap technique and Chemical and electro- chemical methods of repair.

Conservation of Heritage Buildings: Brief History of Conservation - Criteria for listing of Heritage Building - Grading of Heritage Buildings. Case Studies

Practice Session 1: Study session on Crack Diagnosis and its appraisal - Reasons for crack development / Crack prevention, Monitoring & Measuring Crack propagation and preparing a report on crack repairing techniques.

Practice Session 2 (Practice cum Project): Study session on Natural hazards & Renovation - Natural Hazards, Housing Vulnerability and Risk of Damage to House Types, Seismic Upgradation of Buildings, Damage Control & Building Performance Levels and Structural & Non- structural Performance Levels

Practice Session 3 (Practice cum Project): Study session on Rehabilitation & Retrofitting and their necessity - Leakage arrest & Water proofing and Termite treatment

Practice Session 4: Study and report preparation on strengthening of different structural elements - Columns, Beams, Slabs and Foundation treatment.

Practice Session 5 (Practice cum Project): Visits to different buildings in JITM campus (or outside) and identify the repairs needed and to prepare a report repair schedule.

Practice Session 6: Study and Report preparation Repair methods using Cement Mortars / Polymer Modified Cement Mortars, Chemical & Electro-chemical Methods.

Practice Session 7 (Project): Special consideration in toilets, plumbing fittings, electrical drawings, choosing interiors, aesthetics, false ceiling, partitions etc.

Practice Session 8: Discussion on Manual on Condition Assessment of Buildings for Repair & Upgrading.

Practice Session 9: Statutes and acts - Model Building Bye-laws, Ancient Monuments & Archeological Sites & Remains Act 2010, Permissions in Prohibited and Regulated Areas

Practice Session 10: Study & Report preparation on Renovation Methodology for different elements of a Building

DECP0311 Design Project

Code	Course Title	Course Type	Credits	Pre-requisites	T-P-Pr (hrs)
DECP0311	Design Project	Project	4	Not before Semester 4	1-3-3

Course objective:

- To enable the student understand the basic principles of Project Management
- Make the student familiarize with the activities involved in a civil engineering construction project
- To mold the student for taking up a major project through applying the M.S. Project 7 (or higher version) software.

Course Outcomes:

- After successful completion of the course the students will be able to
- Identify various activities of a construction project and the critical path for executing the same.
- Carry out a major project and prepare a document that contains all aspects of a construction project.

Students shall take any one of the following projects for practice

- Simple Residential Building with GF + FF
- Auditorium with Gallery and Indoor Sports Building
- Box Culvert / Pipe Culvert
- Water Tank
- Two lane highway.

Each of the projects are to be carried out using M. S. Project 7 software (or higher version) covering the below listed tasks. One report on each of the listed activities to be submitted. However, in case of Highway Project the appropriate Work Breakdown Structure is to be carried out.

Activities to be covered during the project

- i. Work Breakdown Structure
 - a. Site Clearance, Foundations
 - b. Form work, Concreting
 - c. Superstructure construction
 - d. Plumbing and others
- ii. Activities and Events Identification
 - a. Predecessor and Successor
 - b. Various Time Durations of Activities and Gant Chart
- iii. Network Development & Critical Path Search
 - a. Network Diagram
 - b. Slack Times, Critical Events and Critical Path
- iv. Resource Identification
 - a. Equipment and Human Resources

Note: The students take up other activities also related to Construction Project during their Major Project.

DEET0300 Project

Code	Course Title	Course Type	Credits	Pre-requisites	T-P-Pr (hrs)
DEET0300	Project	Project	6	Not before Semester 4	0-0-6

Students take up group projects and deal the following activities during the course of their project. The project Report should contain the reports of the activities and the explanation of the activity, how the same is taken up and the outcome of the activity.

- i. Functional Planning of the project,
- ii. Preparation of documents and notices required for obtaining Environmental clearance,
- iii. Preparing working drawings using Auto CAD, Revit & STAADPRO (for Reinforcement Drawing),
- iv. Listing of Specifications, Rate Analysis and Estimating using Estimator Software,
- v. Resource Scheduling & Levelling,
- vi. Preparing Quality Control checks and Quality Inspection sample reports specific to the project,
- vii. Identifying the possible Risks involved (specific to the project) and listing the Safety Measures,
- viii. Preparing sample M - book and Muster Role (Form 21),
- ix. Tendering Process, and Development of Contract Agreement during their Major Project and
- x. Project Closure.

DEET0800 Internship

Code	Course Title	Course Type	Credits	Pre-requisites	T-P-Pr (hrs)
DEET0800	Internship	Practice	4	Not before Semester 4	- -

Students to select a construction firm and obtain training (for about 8 to 10 months) on the works that are being carried out there. They are required to prepare set of different reports on the activities in which they received training. The activities should invariably involve the aspects related to planning and design apart from the topics covered in various subjects of the domain. One report on each of the activities is to be submitted individually even if a group of students work in the same site. The reports should be certified by the authorized technical personnel of the organization.

Domain D17 - Planning, Design & Drawing

S. No.	Course Code	Course Title	Course Nature	Credits	Prerequisite
1	DEPD0231	Computer Graphics	Practice	6	FCEN0406 Building Materials & Construction
2	DEPD0232	Architectural Design	Practice	6	FCEN0406 Building Materials & Construction
3	DEPD0431	Computer Aided Design of Advanced Concrete Structures	Theory + Practice	5	CCCE0405 Analysis & Design of RCC Structures
4	DEPD0433	Computer Aided Design of Advanced Steel Structures	Theory + Practice	5	CCCE0406 Analysis & Design of Steel Structures
5	DEPD0132	Design of Earthquake Resistant Structures	Theory	4	CCCE0405 Analysis & Design of RCC Structures & CCCE0406 Analysis & Design of Steel Structures
6	DEPD0331	Design Project	Project	4	Not before Semester 4
6	DEET0300	Project	Project	6	Not before Semester 4
7	DEET0800	Internship	Practice	4	Not before Semester 4
			Total	40	

DEPD0231 Computer Graphics

Code	Course Title	Course Type	Credits	Pre-requisites	T-P-Pr (hrs)
DEPD0231	Computer Graphics	Practice	6	FCEN0406 Building Materials & Construction	0-6-0

Course Outcome:

The students benefit by learning software which helps them to draw complicated drawings and also helps in producing detail drawings in proper scale.

The students benefit by learning software which helps them to better visualize complicated forms and also helps in producing photo realistic images of those 3D forms.

Module I: Introduction to computer aided 2D drafting Understanding the use of drawing tools, object editing, drawing objects, filling and setting drawing units, scales, limits that size and dimensioning, texting. Setting up of drawings of various simple architectural objects with complete text and dimensioning.

Module II: Advance computer aided 2D Drafting Advance command programming – transparent overlays hatching utilities, assigned colour and line type, use of multiline, style, block, symbol Library manipulation for accurate drawings, incorporating the above said utilities. Exercise to identify and visualize a building using softwares like AutoCAD

Module -III (Introduction to 3d modeling)

Create 3D sculpture using 3D primitives (cubes, spheres etc.) Tools: Slide facilities script attributes, V-port, editing session. Introduction to 3D-modelling technique and construction planes, drawing objects, 3D surfaces setting up elevation thickness and use of dynamic projections. Solid modeling with primitive command and Boolean operation.

Module –IV (3d rendering and setting)

Visualize a building. Explore the potential of lights and camera and use the same in the model created for the final submission. Tools: Rendering and scene setting to create a photo realistic picture, understanding material mapping, environment setting and image filling. Exercise to identify and visualize a building using the above said utilities. 3D modeling software’s like sketch up, Autocad, revit, etc

Sessional work: Assignments and drawing on the above topics.

DEPD0232 Architectural Design

Code	Course Title	Course Type	Credits	Pre-requisites	T-P-Pr (hrs)
DEPD0232	Architectural Design	Practice	6	FCEN0406 Building Materials & Construction	0-6-0

Course Objective:

Civil Engineering students are being introduced Architectural planning part for developing better understanding and execution of a Project. In the initial phase, planning concept, need based design and overall exposure to anthropometric data will be given.

Course Outcome:

Students will be able to do the design of any building by not only considering the plan but also the climate of the area.

The ideas / concepts learned in Basic Design and other related subjects have to be carried forward into the architectural design now envisaged. The exercises may be taken up as mentioned herein.

1. Small projects such as small house, canteen, clinic, study centre, Guest house, etc. may be given to the students as a design project. The requirements and their areas are to be stipulated by the design teacher. The students accompanied by the design teacher should visit at least two existing buildings as case studies. Notes should be made on these in reference to its flow of operation. Climatic angles should be observed, particularly in case of a house design. Materials used must also be observed.
2. A one week workshop on the design of a Bus stand, pavilion in a park or similar size small project should be done under the supervision of an outside teacher.
3. A two day design examination should be conducted at the end of the semester.

DEPD0431 Computer Aided Design of Advanced Concrete Structures

Code	Course Title	Course Type	Credits	Pre-requisites	T-P-Pr (hrs)
DEPD0431	Computer Aided Design of Advanced Concrete Structures	Theory+ Practice	5	CCCE0405 Analysis & Design of RCC Structures	2-3-0

Module-1 (22hrs)

Retaining Walls: Design of cantilever and counterfort retaining walls.

Water Tanks: Underground rectangular tanks – Overhead circular and rectangular tanks,

Intze tanks – Design of staging and foundations

Module-II (16hrs)

Piles and Pile caps: Design of bored cast in situ piles (bearing and friction types), under reamed piles.

Pile Cap design.

Building frames: Introduction, member stiffness, loads, analysis for vertical and lateral loads,

Torsion in buildings

Ductility of beams, design and detailing for ductility, design examples.

Module-III (12hrs)

Flexural strength of pre-stressed concrete section: Types of flexural failure, Strain compatibility method, Flexural strength using IS code Design of pre-tensioned and post tensioned flexural members

Resources List

1. S. R. Karve and V. L. Shah, Illustrated Design of Reinforced Concrete Buildings, Structures Publishers
2. .N. Krishnaraju, Prestressed concrete, Tata McGraw-Hill, New Delhi-2004.
3. S. Unnikrishna Pillai and Devdas Menon, Reinforced Concrete Design, Tata McGraw Hill

DEPD0432 Computer Aided Design of Advanced Steel Structures

Code	Course Title	Course Type	Credits	Pre-requisites	T-P-Pr (hrs)
DEPD0432	Computer Aided Design of Advanced Concrete Structures	Theory+ Practice	5	CCCE0406 Analysis & Design of Steel Structures	2-3-0

Module I

Design of gantry girder considering lateral buckling as per IS: 800. Design of Plate girders: Design of webs & flanges, Concepts of curtailment of flanges – Riveted & welded web stiffeners, web flange splices - Riveted, welded& bolted. Design of crane girder

Module II

Complete design of an industrial and office steel buildings including Column bracket, Mills buildings, Mill bent with constant moment of inertia, Lateral and longitudinal bracing for column bent Roof and side coverings Design of purlin and elements of truss, end bearing

Module III

Design of elevated water tanks, Design of staging and foundation. Tee covers Plates Stays, Longitudinal and transverse beams, Design of staging Base plates Foundation and anchor bolts, Design of transmission and communication towers

DEPD0132 Design of Earthquake Resistant Structures

Code	Course Title	Course Type	Credits	Pre-requisites	T-P-Pr (hrs)
DEPD0132	Design of earthquake Resistant Structures	Theory	4	CCCE0105 ANALYSIS & DESIGN OF RCC STRUCTURES, AND CCE0400 ANALYSIS & Design of Steel Structures	4-0-0

Module-I (18hrs)

Concept of inertia and damping Types of Damping: Difference between static forces and dynamic excitation Degrees of freedom SDOF idealization – Equations of motion of SDOF system for mass as well as base excitation Free vibration of SDOF system Response to harmonic excitation Impulse and response to unit impulse Duhamel integral

Two degree of freedom system Normal modes of vibration Natural frequencies Mode shapes Introduction to MDOF systems decoupling of equations of motion Concept of mode superposition (No derivations).

Module-II (20hrs)

Elements of Seismology: Causes of Earthquake Geological faults Tectonic plate theory Elastic rebound Epicenter Hypocentre Primary, shear and Raleigh waves Seismogram Magnitude and intensity of earthquakes Magnitude and Intensity scales Spectral Acceleration Information on some disastrous earthquakes.

Design earthquake concept: Response and design spectra, peak acceleration Site specific response spectrum Effect of soil

Properties and damping Liquefaction of soils Importance of ductility Methods of introducing ductility into RC structures.

Module-III (12hrs)

Design Methodology: IS 1893, IS 13920 and IS 4326 Codal provisions Design as per the codes Base isolation techniques Vibration control measures Important points in mitigating effects of earthquake on structures.

DEPD0331 Design Project

Code	Course Title	Course Type	Credits	Pre-requisites	T-P-Pr (hrs)
DEPD0331	Design Project	Practice + Project	4	Not before Semester 4	1-3-3

(Any one of the following) (4 Credits) - Project Course - Class Room, Field Data Collection & Computer Lab.

- a. Bridge / Culvert Project (Topics to be covered in Project)
- b. Hydroelectric Project
- c. Commercial / Hospital / Educational Complex Project
- d. Industrial steel structure building/ steel structure office buildings

- a. Bridge / Culvert Project (Topics to be covered in Project)
 - i. Functional Planning
 - ∗ Traffic Studies
 - ∗ Hydro- technical Studies
 - ∗ Geotechnical Studies
 - ∗ Environmental Considerations
 - ii. Alternatives for Bridge Type
 - iii. Bridge Selection and Detailed Design
 - ∗ Bridge Slab Design - RCC Slab
 - ∗ Steel Beam Design
 - ∗ Column and Foundation Design
- b. Hydroelectric Project (Topics to be covered in Project)
 - i. Functional Planning
 - ∗ Hydrological Studies
 - ∗ Site Selection
 - ∗ Geotechnical Investigations to be carried out
 - ∗ Environmental Considerations
 - ii. Cost - Benefit Studies
 - iii. Selection of type of Dam and Detailed Design
 - ∗ Hydraulic Design of Dam & Stability Analysis
 - ∗ Spillway Design
 - ∗ Powerhouse Layout
 - ∗ Ancillary Structures (Surge Tank, Anchor Blocks etc)
- c. Commercial / Hospital / Educational Complex Project (Topics to be covered in Project)
 - i. Functional Planning
 - ∗ Facilities Planning
 - ∗ Site and Layout Planning
 - ∗ Geotechnical Studies
 - ∗ Services Planning
 - ii. Structural Design
 - iii. Marketing Strategies
- d. Industrial steel structure building/ steel structure office buildings
 - i. Functional Planning
 - ∗ Planning of building as per bye laws
 - ∗ Materials for construction
 - ∗ Structural Design for foundation
 - ∗ Structural Design for superstructures

DEET0300 Project

Code	Course Title	Course Type	Credits	Pre-requisites	T-P-Pr (hrs)
DEET0300	Project	Project	6	Not before Semester 4	0-0-6

DEET0800 Internship

Code	Course Title	Course Type	Credits	Pre-requisites	T-P-Pr (hrs)
DEET0800	Internship	Practice	4	Not before Semester 4	- -

Students to select an architecture firm and obtain training (for about 8 to 10 months) on the works that are being carried out there. They are required to prepare set of different reports on the activities in which they received training. The activities should invariably involve the aspects related to planning and design apart from the topics covered in various subjects of the domain. One report on each of the activities is to be submitted individually even if a group of students work in the same site. The reports should be certified by the authorized technical personnel of the organization.

Domain D20 - Smart City Planning

S. No.	Course Code	Course Title	Course Nature	Credits	Pre-requisite
1	DESP0921	Remote Sensing and Image Processing	Theory + Practice + Project	6	Nil
2	DESP0922	Surveying for Civil Projects		6	CCCE0407 Advanced Surveying
3	DESP0923	GIS & Digital Cartography		6	CCCE0407 Advanced Surveying
4	DESP0221	LIDAR Application	Practice	3	CCCE0407 Advanced Surveying
5	DESP0621	Smart City Planning	Practice + Project	5	DESP0923 GIS & Digital Cartography
6	DESP0321	Design Project (RS & GIS based Natural Disaster management project)	Project	4	Not before Semester 4
7.	DEET0300	Project	Project	6	Not before Semester 4
8.	DEET0800	Internship	Practice	4	Not before Semester 4
			Total	40	

DESP0921 Remote Sensing and Image Processing

Code	Course Title	Course Type	Credits	Pre-requisites	T-P-Pr (hrs)
DESP0921	Remote Sensing And Image Processing	Theory + Practice + Project	6	Nil	1-3-3

Theory:

Introduction, Basic concepts of remote sensing, Airborne and space born sensors, Passive and active remote sensing, EMR Spectrum, Energy sources and radiation principles, Energy interactions in the atmosphere and earth surface, Spectral reflectance curves, Polar orbiting satellites, Spectral, radiometric and spatial resolutions, Multispectral, thermal and hyperspectral sensing.

Practice

Digital Image Processing - Image restoration, Image enhancement and Information extraction, Image processing software, Digital Elevation Modelling.

DESP0922 Surveying for Civil Projects

Code	Course Title	Course Type	Credits	Pre-requisites	T-P-Pr (hrs)
DESP0922	Surveying For Civil Projects	Theory + Practice + Project	6	CCCE0407 Advanced Surveying	1-3-3

Course Objective: Students are enabling to get exposure to do live projected Related to Dams, Railways, Highways, Water resources using GIS.

Course Outcome: Graduates will demonstrate an ability to identify, formulate and solve civil engineering problems.

Theory:

Reconnaissance (To determine the feasibility and rough cost of the scheme), Preliminary Survey (For collecting more precise data), Location Survey (For setting out the work on the ground). Site survey and orientation for different civil projects (Railway, Highway, Airport Planning, dam, watershed planning, Railway Bridge, Highway Bridge and commercial buildings).

Practical: Site Investigation/Supervision (field visit exposure)

DESP0923 GIS & Digital Cartography

Code	Course Title	Course Type	Credits	Pre-requisites	T-P-Pr (hrs)
DESP0923	GIS & Digital Cartography	Theory + Practice + Project	6	CCCE0407 Advanced Surveying	1-3-3

Course Objectives:

This course offers an introduction to methods of managing and processing geographic information. Emphasis will be placed on the nature of geographic information, data models and structures for geographic information, geographic data input, data manipulation and data storage, spatial analytic and modeling techniques, and error analysis.

To make students in depth knowledge in GIS and its application.

To make students familiarize with advance tools and techniques for analysis in GIS.

Course Outcome:

To solve practical problems using GIS and its extension

After completion of the course student will be able to do several digitization related projects and will be able to create maps in GIS softwares.

Theory:

GIS, Components of GIS, Variables - points, lines, polygon, Functionality of GIS, Areas of GIS application, Advantage and Limitation of GIS, GIS Data: Spatial and Attribute Data, Information Organization and Data Structures - Raster and Vector data structures, Data file and database, GIS Data Input: Nature and Source of data, Method of spatial data capture - Primary and Secondary, digitization and scanning method, Techniques and procedure for digitizing, Errors of Digitization, Error in Elimination, Attribute data capture. Concept of Digital Cartography, Advantages and Disadvantages of Digital Cartography, Concept of Map Scales: Defining Map, Projection Systems, Categories of maps, Map Scales.

Practical:

Creating GIS Database: GIS Software's, file organization and formats, Geo-database, Rectification, Digitization and Map Composition, Data Editing: Detecting and correcting errors, Re-projection, Transformation and Generalization, Edge matching and Rubber sheeting, Topology, Conversion from Other Digital Sources. Define map scale and projection system, Map composition, Visualization of geospatial data- 2D and 3D visualization

DESP0221 LIDAR Application

Code	Course Title	Course Type	Credits	Pre-requisites	T-P-Pr (hrs)
DESP0221	LIDAR Application	Practice	3	CCCE0407 Advanced Surveying	0-3-0

Course Objectives:

Application of LIDAR technique for linear and elevation measurement also for multiple use geospatial management and planning plans.

Application of LIDAR technique to get 3D map and terrain information.

To enable students to know about 3D Experience Platform and Catia.

Course Outcomes:

Students will be able to know about LIDAR and its application

Students will be more skilled in CATIA Civil module

Practical:

LIDAR, LIDAR Data Formats, LIDAR Data Collection, Alternatives to Aerial, Atmospheric LIDAR, LIDAR Data Fusion, LIDAR Accuracy, GRASS LIDAR Tools, FUSION LIDAR Tools. Introduction

to Dassault Systems software application, its uses, CATIA (Modelling and Meshing). LIDAR data processing using different software, contour preparation using LIDAR, terrain preparation and modelling.

DESP0621 Smart City Planning

Code	Course Title	Course Type	Credits	Pre-requisites	T-P-Pr (hrs)
DESP0621	Smart City Planning	Practice + Project	5	DESP0923 GIS & Digital Cartography	0-3-3

Course Objectives:

- To enable students learning with Autodesk Infracore and work with Open Street Map.
- To design different types of buildings in the project area.
- To understand the concept of terrain and slope for designing of drainage, road and railway.
- Students will be designing the city features including park, garden etc.

Course Outcomes:

After completion of this course students will be able to design and plan a twin city model of an area.

Students will get more knowledge on designing of building, road, drainage etc. through Autodesk Infracore.

Practical:

Open Street Map data creating for city, Autodesk Infracore: building space planning, highway and railway planning, bridge planning, city beautification, hydrology planning, drainage design for city, Urban storm water management, city transportation network management, Rendering and presentation.

DESP0321 RS & GIS for Natural Disaster Management – Design Project

Code	Course Title	Course Type	Credits	Pre-requisites	T-P-Pr (hrs)
DESP0321	Design Project	Practice + Project	4	Not before Semester 4	1-3-3

Course objectives:

- To enable the student understand the application of Remote sensing and GIS
- Make the student familiarize with the activities involved in GIS and Remotely sensed data.
- To mold the student for taking up a major project through applying the GIS and image processing software.
- Students shall take any one of the following projects for practice
 - a) River Flood Management
 - b) Storm Surge Management
 - c) Earth Quake Mitigation
 - d) Land Slide Mitigation
 - e) Soil erosion

Each of the projects are to be carried out using software covering the below listed tasks. One report on each of the listed activities is to be submitted.

Activities to be covered during the project

Work Breakdown

Structure

1. Site selection or Identification of problem
2. Data collection (Both primary and Secondary)
3. Methodology generation
4. Image rectification
5. Map generation
6. GIS analysis
7. Filed verification

8. Results and Final map generation

DEET0300 Project

Code	Course Title	Course Type	Credits	Pre-requisites	T-P-Pr (hrs)
DEET0300	Project	Project	6	Not before Semester 4	0-0-6

Students take up group projects and deal the following activities during the course of their project. The project Report should contain the reports of the activities and the explanation of the activity, how the same is taken up and the outcome of the activity.

1. Functional Planning of the project
2. Preparation of documents
3. Literature Review
4. Preparation of layers using MAP ARC GIS/ERDAS/Infrawork
5. Layer creation and GIS analysis
6. Identifying the possible Risks involved (specific to the project)
7. Cost estimation of the project
8. Project Closure.

DEET0800 Internship - Industry based learning Activity (4 Credits)

Code	Course Title	Course Type	Credits	Pre-requisites	T-P-Pr (hrs)
DEET0800	Internship	Practice	4	Not before Semester 4	- -

Students to select a GIS company and obtain training (for about 8 to 10 months) on the works that are being carried out there. They are required to prepare set of different reports on the activities in which they received training. The activities should invariably involve the aspects related to GIS analysis apart from the topics covered in various subjects of the domain. One report on each of the activities is to be submitted individually even if a group of students work in the same site. The reports should be certified by the authorized technical personnel of the organization

The following colour represents the syllabus revision, skill, employability and entrepreneurship.

Green : Skill

Pink : Employability

Sky : Entrepreneurship

**CENTURION UNIVERSITY OF TECHNOLOGY
& MANAGEMENT:: PARALAKHEMUNDI
ODISHA**

CHOICE BEASED CREDIT SYSTEM

COURSE STRUCTURE & SYLLABUS

BASKET I

[With effect from 2016-17 Admitted Batch]



**Centurion
UNIVERSITY**

*Shaping Lives...
Empowering Communities...*

School of Engineering & Technology

2016

BASKET - I
(Basic Sciences)

<i>Course Code</i>	<i>Course Title</i>	<i>Course Type</i>	<i>Credits</i>	<i>Prerequisite</i>	<i>Department Offering</i>
<i>FCBS0401</i>	<i>Applied Analytical Chemistry</i>	<i>Theory + Practice</i>	<i>3</i>	<i>Nil</i>	<i>Chemistry</i>
<i>FCBS0402</i>	<i>Industrial Chemistry</i>	<i>Theory + Practice</i>	<i>3</i>	<i>Nil</i>	<i>Chemistry</i>
<i>FCBS0403</i>	<i>Applied Engineering Materials</i>	<i>Theory + Practice</i>	<i>3</i>	<i>Nil</i>	<i>Chemistry</i>
<i>FCBS0404</i>	<i>Electricity and Magnetism</i>	<i>Theory + Practice</i>	<i>4</i>	<i>Nil</i>	<i>Physics</i>
<i>FCBS0405</i>	<i>Basic Mechanics and Properties of Matter</i>	<i>Theory + Practice</i>	<i>4</i>	<i>Nil</i>	<i>Physics</i>
<i>FCBS0406</i>	<i>Optics and Optical Fibres</i>	<i>Theory + Practice</i>	<i>4</i>	<i>Nil</i>	<i>Physics</i>
<i>FCBS 0101</i>	<i>Environmental Science</i>	<i>Theory</i>	<i>3</i>	<i>Nil</i>	<i>Chemistry</i>
<i>FCBS 0102</i>	<i>Differential Equations</i>	<i>Theory</i>	<i>3</i>	<i>Nil</i>	<i>Mathematics</i>
<i>FCBS 0103</i>	<i>Linear Algebra & Vector Calculus</i>	<i>Theory</i>	<i>3</i>	<i>Nil</i>	<i>Mathematics</i>
<i>FCBS 0104</i>	<i>Integral Transform</i>	<i>Theory</i>	<i>3</i>	<i>Nil</i>	<i>Mathematics</i>
<i>FCBS 0105</i>	<i>Complex Analysis</i>	<i>Theory</i>	<i>3</i>	<i>Nil</i>	<i>Mathematics</i>
<i>FCBS0106</i>	<i>Discrete Mathematics</i>	<i>Theory</i>	<i>3</i>	<i>Nil</i>	<i>Mathematics</i>

SYLLABUS

FCBS0401 APPLIED ANALYTICAL CHEMISTRY

<i>Pre-requisite</i>	<i>Course Type</i>	<i>Credits</i>
<i>Nil</i>	<i>Theory + Practice</i>	<i>3</i>

Course Objective

The aim of this course is to give students that are going to carry out an experimental work the necessary comprehension in analytical chemistry.

The course will also provide the student with knowledge to be able to understand and critically evaluate experimental data produced by others.

Module-1

Water Analysis: Importance of water, different types of water, sources and uses of water, types of water pollutants and domestic and industrial significance of analysis of water. Removal of hardness by Lime-Soda, Zeolite and Ion exchange methods. Removal of DO and dissolved CO₂ from water by De-aeration method. Desalination of brackish water by Reverse osmosis and electro dialysis process. Water disinfection by bleaching powder, liquid Cl₂, and chloramine.

Practice:

1. Determination of total hardness by EDTA method, total dissolved solids, total alkalinity
2. Determination of Turbidity by nephelometer, pH, Conductivity.
3. Determinations of BOD, COD, DO.

NB: The above parameters can also be determined by using water kits and the results are to be compared with those obtained manually.

Module-2

Soil Analysis: Composition of rocks and minerals, soil profile and properties.

Practice:

1. Determination of texture of soil.
2. Determination of moisture content in a soil sample, pH, electrical conductivity,
3. Determination of water holding capacity of soil.
4. Measurement of Calcium and Magnesium Using EDTA methods.

Module-3

Chemistry of fuels: Classification of fuels, composition and properties of Petroleum, LPG, Water gas, producer gas, CNG. Knocking – Mechanism of knocking, harmful effects, Anti knocking agents – TEL, Catalytic converters – Principle & working, Unleaded petrol, Power alcohol & Biodiesel. Photovoltaic cells - construction & working of a PV cell

Practice:

1. Proximate analysis of fuel (Coal, biomass etc.) Moisture, Volatile content, Ash, fixed carbon
2. Testing of fuel properties of the plastic oil and bio diesel: Specific gravity by picnometer, flash point and fire point by pesky-Marten flash point apparatus, viscosity by Redwood viscometer, calorific value by bomb calorimeter

Course outcome

Explain fundamental principles for environmental analytical methods (titration, electro-chemistry, instrumentation and basic parameters of water, soil, fuel etc)

Point out suitable analytical techniques for analyzing a specific compounds in an environmental matrix

*Point out suitable techniques for sampling and handling of environmental samples
 Apply quality control on chemical analysis and laboratory work and explain its importance
 Plan and carry out laboratory experiments, including data analysis and conclusions
 Describe simple approaches for troubleshooting*

FCBS0402 INDUSTRIAL CHEMISTRY

<i>Pre-requisite</i>	<i>Course Type</i>	<i>Credits</i>
<i>Nil</i>	<i>Theory + Practice</i>	<i>3</i>

Course Objective

Students may also explore in depth specialized areas of chemistry of materials, including ores, metals, cement as well as dyes, oils, soaps

Introduce the students to industrial processing principles as applicable to chemical and allied industries.

Provide the students with the knowledge of how raw materials are sourced for various chemical industries and how these materials are processed.

Provide students with advanced technical skills in Chemical Engineering that will enable them to (a) translate fundamental discoveries in materials and other high technology areas to commercial exploitation, and (b) adapt readily to the challenges presented in a diverse range of industrial sectors that can benefit from process engineering approaches.

Module 1: Preparation of soap, dyes and oil analysis :

Introduction: Types of soap (soft and hard soap), methods of preparation of soap, mechanism, difference between fats and oils, physical properties of fats and oil, general introduction to chemistry of dye, various example of dyes, types of dyes.

Practice:

Preparation of soap by saponification

Determination of the properties different type of soap

1. pH test

2. Foam test

Hard water test

Determination of iodine number of oil

Preparation of dyes (azo dyes): 2- naphthol + 4 - nitro aniline: salicylic acid + 4- nitro aniline

Preparation of Phenyle.

Applications: Effect of water hardness in cleansing action of soap. Application of dyes to cloth

Module 2: Metals estimation from ores

Introduction: General introduction on ores, types of ore, important ore minerals, application of ores.

Practice:

Estimation of Cu in copper ore

Determination of Fe as ferrous iron in an ore sample

Determination of Zn in Zinc ore by EDTA complex metric method

Module 3: Analysis of cement

Introduction: what is cement? types of cement, composition of cement, preparation of cement, applications.

Practice:

Estimation of calcium in Portland cement
 Cement hydration and pH evaluation during curing
 To check the quality of cement (colour, texture, smell test, float test, shape test and strength test)

Course outcome

Appreciate better their future roles as chemists in Industrial establishments

Be able to explain the origin of raw materials used in the chemical and allied industries

Have a good understanding of how chemical raw materials are processed into finished products.

Graduates find employment in, quality control, oil and petroleum industry, textile industry, dyes and paints industry, cement industry, just to name a few.

FCBS0403 APPLIED ENGINEERING MATERIALS

<i>Pre-requisite</i>	<i>Course Type</i>	<i>Credits</i>
<i>Nil</i>	<i>Theory + Practice</i>	<i>3</i>

Course Objective

To understand the importance of the chemical approach to nanomaterials

To study the preparation, analysis and applications of metal nanoparticles

To develop an understanding of conjugated polymers and their applications

To understand how polymer composition and architecture imparts unique properties and behavior

To study organic-inorganic hybrid materials (COMPOSITES) and how the incorporation of metals in the polymer architecture leads to new properties and applications

Module 1: Nano Materials:

Introduction, nano scale, applications in various fields.

Practice:

Synthesis of Ag, Au nano particles by wet chemical methods.

Synthesis of ZnO Nanoparticles by Precipitation Method

Synthesis of Cu nano particles Sonochemical method.

Synthesis of Fe nano particles Co-precipitation method.

Thickness measurement by sol-gel process of coating.

Module 2: Polymers

Introduction, types of polymers, Polymerisation mechanisms.

Practice:

Synthesis of Thiokol Rubber

Synthesis of a Rubber Ball from Rubber Latex

Synthesis of Polystyrene (PS)

Synthesis of Polymethyl Methacrylate (PMMA)

Synthesis of Nylon-6:6.

Determination of molecular weight of polymers by visometry method.

Module 3: Composites

Introduction :Biopolymers or synthetic polymers reinforced with natural or biofibers(termed as bio composites) as a viable alternative to glass fibre composites.Biocomposites“ refers to those composites that can be employed in bioengineering.Biocomposites are composite materials, that is, materials formed by a matrix (resin) and a reinforcement of natural fibers (usually derived from plants or cellulose). Bio composites are the combination of natural fibers (biofibers) such as wood fibers (hardwood and softwood) or non - wood fibers (e.g., wheat, kenaf, hemp, jute, sisal, and flax) with polymer matrices from both renewable and non-renewable resources.

Practice:

Synthesis of bio composite materials by using jute fibres and wood fibres

Course outcome

- Know what it takes to have a career in nanotechnology
- Understand the need to increase Nanotechnology awareness
- Understand the definition of Nanotechnology
- Know the processing of Nanoparticles and Nanomaterials
- Know the application of Nanotechnology and nanomaterials

FCBS0404 ELECTRICITY AND MAGNETISM

<i>Pre-requisite</i>	<i>Course Type</i>	<i>Credits</i>
<i>Nil</i>	<i>Theory + Practice</i>	<i>4</i>

Course Objective

- To understand electric circuit components and their use.
- To learn and verify the fundamental laws of electricity, learn how to use certain electrical devices.
- Understanding magnetic properties of matter and performing experiments to realize magnetism.

Practice I

Theory:

Electric field, Potential, EMF, capacitance, resistance, series connection, parallel connection, Kirchhoff's laws, RC circuits, LC circuits.

Lab:

1. Use a Multi-meter for measuring (a) Resistance, (b) AC and DC Voltages, (c) DC Current, (d) Capacitance and (e) Checking electrical fuses.
2. To determine an unknown Low Resistance using Potentiometer.
3. To determine an unknown Low Resistance using Carey Foster's Bridge.

Practice II

Theory: Electrical Circuits: AC Circuits: Kirchhoff's laws for AC circuits. Complex Reactance and Impedance. Series LCR Circuit: (1) Resonance, (2) Power Dissipation and (3) Quality Factor, and (4) Band Width. Parallel LCR Circuit.

Lab:

1. To verify the Superposition, and Maximum power transfer theorems.
2. To determine self-inductance of a coil by Anderson's bridge.

- To study response curve of a Series LCR circuit and determine its (a) Resonant Frequency, (b) Impedance at resonance, (c) Quality factor Q, and (d) Band width.
- To study the response curve of a parallel LCR circuit and determine its (a) Anti-resonant frequency and (b) Quality factor Q.

PRACTICE III

Theory: Magnetic Properties of Matter: Magnetization vector (**M**). Magnetic Intensity (**H**). Magnetic Susceptibility and permeability. Relation between **B**, **H**, **M**. Ferromagnetism. B-H curve and hysteresis.

Electromagnetic Induction: Faraday's Law. Lenz's Law. Self Inductance and Mutual Inductance. Reciprocity Theorem. Energy stored in a Magnetic Field.

Lab:

- To study the induced e.m.f. as a function of the velocity of the magnet.
- Measurement of field strength B and its variation in a solenoid.
- Determination of ratio.

Course outcome

Realizing the importance and use of electrical components in a circuit.

Learning how to do different connections and their purpose.

Understanding magnetism of matter and its applications

Text Book:

- Electricity and Magnetism By K. K. Tiwari, S. Chand Publishing

References:

- Electricity and Magnetism, By M. C. Saxena, Satya Prakash, V. P. Arora, Publisher: Pragati Prakashan
- Introduction to Electrodynamics, by David J. Griffiths Prentice-Hall; 3 edition (2011)
- Electricity and Magnetism by - D. C. Tayal, Himalaya Publishing, 2009.

FCBS0405 BASIC MECHANICS AND PROPERTIES OF MATTER

<i>Pre-requisite</i>	<i>Course Type</i>	<i>Credits</i>
<i>Nil</i>	<i>Theory + Practice</i>	<i>4</i>

Course Objective

To give the students overall idea about material properties and also hands on experience to measure them.

To make them realize the applications of material properties.

To expose them to phenomena like hydrostatics, elasticity, viscosity, surface tension and their applications in various places.

Encouraging them to build simple models to explain the mechanical properties.

Theory:

Elasticity: Elastic constants, Relation among elastic constants, torsion of right circular cylinder, bending of beams, Vibration of loaded cantilever.

Lab:

- Young's modulus by single/double cantilever
- Young's modulus by Searle's method
- Rigidity modulus using Barton's apparatus
- Poisson's ratio

Practice II

Theory:

Hydrostatics: hydrostatic force on a body, buoyancy, metacentric height, hydrostatic pressure, pressure measurement: manometer

Viscosity: Viscosity of fluids, Stoke's law, terminal velocity, Poiseulle's equation, Searle's viscometer.

Surface tension & surface energy: Pressure difference across curved liquid surface.

Lab:

1. Viscosity by Stokes method
2. Viscosity by Poiseulle's method
3. Metacentric height of floating body
4. Measurement of Pressure by manometer
5. Surface tension by capillary rise method
6. Determination of surface tension by Quincke's method

Practice III:

Basic Mechanics

Theory: Kinematics and Kinetics, Effort amplification using levers and pulleys, Friction, Laws of friction.

Rotational Motion: Moment of Inertia, Theorem of Parallel and Perpendicular axes. Moment of inertia of circular disc.

Lab:

1. Effort-output ratio using combination of pulleys
2. Verification of laws of static and dynamic friction
3. Moment of inertia of fly wheel

Course outcome

To understand material properties and perform experiments on them.

To understand the applications of material properties in real life.

To be able to make small models for explain few mechanical properties.

Text Book:

1. *Elements of Properties of Matter, Dec 2010 by D.S. Mathur, S.Chand (G/L) & Company Ltd*

Reference Books:

1. *A Text Book of Fluid Mechanics by R.K. Bansal, Laxmi Publishers, 2005*
2. *Engineering Mechanics Statics and Dynamics by A. K. Tayal, Umesh Publications.*

FCBS0406 OPTICS AND OPTICAL FIBRE

<i>Pre-requisite</i>	<i>Course Type</i>	<i>Credits</i>
<i>Nil</i>	<i>Theory + Practice</i>	<i>4</i>

Course Objective

To understand optical phenomena.

To understand different light sources and their use

Understand designing of microscope and artificial light sources

Understanding optical fiber and its applications

Practice I

Theory: Reflection and refraction of light. Mirror formula, lens maker's formula. Refraction through a prism. Dispersion, light sources: Principle and operations of sodium lamp, mercury lamp and LASER.

Lab:

1. To determine refractive index of the Material of a prism using sodium source.
2. To determine the dispersive power and Cauchy constants of the material of a prism using mercury source.
3. To determine the refractive index of glass slab using travelling microscope.
4. Designing of a compound microscope.

Practice II

Theory: Interference. Young's experiment, conditions for interference, Intensity distribution of fringes, Interference in thin films, Newton's rings.

Diffraction: types of diffraction, Fraunhofer diffraction at a single slit, diffraction at N-parallel slits and plane diffraction grating.

Polarization: Polariser and analyser, optical rotation and Polarimeter

Lab:

1. Determination of wavelength of light by Newton's ring method.
2. Determination of wavelength of LASER source by diffraction grating method
3. Thickness of thin paper by wedge-shaped films
4. Dispersive power and resolving power of a plane diffraction grating.
5. Polarimetry

Practice-III

Theory: Optical properties—scattering, refraction, reflection, transmission & absorption. Introduction, principle of Laser, stimulated and spontaneous emission, Coherence (temporal and spatial) Ruby Laser, Application of Lasers.

Optical Fibres: Introduction, numerical aperture, step index and graded index fibres, attenuation & dispersion mechanism in optical fibers (Qualitative only), application of optical fibres, optical communication (block diagram only)

Lab:

1. Measurement of attenuation and bending losses of an optical fibre.
2. Measurement of numerical aperture of an optical fibre
3. Study of spatial and temporal coherence of LASER
4. Making of a light guide

Course outcome

Students should understand optical phenomena.

Students should learn about different light sources and their use

Students should be able to understand optical fiber principle, operations and its applications.

Text Book:

1. *A Text Book of Optics* by M.N. Avadhanulu, Brij Lal, N. Subrahmanyam, S Chand; 23rd Rev. Edn.

References:

2. *Optics* by Ajoy Ghatak, McGraw Hill Education; 5 edition
3. *Physics-I for engineering degree students* by B.B. Swain and P.K.Jena.
4. *Concepts in Engineering Physics* by I Md. N. Khan.

FCBS0101 ENVIRONMENTAL SCIENCE

<i>Pre-requisite</i>	<i>Course Type</i>	<i>Credits</i>
<i>Nil</i>	<i>Theory</i>	<i>2</i>

Course Objective:

1. *To understand the concept of multi-disciplinary nature of Environmental Science where different aspects are dealt with a holistic approach.*
2. *Students will develop a sense of community responsibility by becoming aware of environmental issues in the larger social context.*
3. *One must be environmentally educated.*

MODULE-I

Environment and its multidisciplinary nature; Need for public awareness; Renewable and non-renewable resources—forest, water, mineral, land, food and energy resources; Structure and function of ecosystems of forest, grass land, desert and aquatic types.

MODULE -II

Biodiversity and its conservation: Biodiversity at global, national and local levels; Threats to biodiversity - Habitat loss; wild life poaching and man - wildlife conflicts; Endangered and endemic species; conservation measures.

Causes, effects and control measures of pollution, air, water and noise pollution; Nuclear hazards; solid-waste management—Causes, effects and control measures; Management of disasters due to natural causes of floods, earthquakes, cyclones and landslides.

MODULE-III

Social issues and the environment; Sustainable environment, Water conservation measures; Rain water harvesting; Resettlement and rehabilitation of people; Climate change and global warming; Acid rain; Ozone layer depletion; water land reclamation; Consumerism and waste products; Features of Environment Protection Act, Air pollution and Control of Pollution Acts; Water Pollution and its Control Act. Effects of Pollution explosion on environment and public health; Need for value education to Protect environment and resources.

Course Outcome:

1. Understand the natural environment and its relationships with human activities.
2. Characterize and analyze human impacts on the environment.
3. Integrate facts, concepts, and methods from multiple disciplines and apply to environmental problems.
4. Design and evaluate strategies, technologies and methods for sustainable management of environmental systems and for the remediation or restoration of degraded environments.

Text Book: Anubhav Kaushik & C.P. Kaushik : Environmental Studies-New age International Publishers.

Reference Books:

1. Benny Joseph : Environmental Studies-Tata Mac Graw Hill
2. E. Bharucha : Text book of Environmental Studies for Under graduate courses– Universities Press. (Book prepared by UGC Committee.

FCBS0102 DIFFERENTIAL EQUATIONS

<i>Pre-requisite</i>	<i>Course Type</i>	<i>Credits</i>
<i>Nil</i>	<i>Theory</i>	<i>3</i>

Course Objectives:

- 1) To understand most of the physical phenomena from Science and Engineering which are modeled by differential equations.
- 2) To find and interpret the solutions of the ODE & PDE appearing in signal systems, dynamical systems, stability theory and a number of applications to scientific and engineering problems.
- 3) To develop the ability to apply differential equations to significant applied and/or theoretical problems.

Course Outcomes: Upon successful completion of this course, the student will be able to:

- 1) Learn fundamental concepts of ODE & PDE theories and where and how such equations arise in applications to scientific and engineering problems.
- 2) Be competent in solving linear/non-linear 1st & higher order ODEs & PDEs using analytical solution methods to obtain their exact solutions.
- 3) Recognize the major classification of ODEs & PDEs and the qualitative differences between the classes of equations.

MODULE-I (12 Hours)

First Order Differential Equations: Separable Equations, Homogeneous & Non-homogeneous Equations, Exact Differential Equations, Integrating Factor, Linear Differential Equations, Bernoulli Equation.

MODULE-II (15 Hours)

Second & Higher Order Linear Differential Equations: Linear Dependence and Independence of Solutions, Wronskian, Constant Coefficient Homogeneous Equations, Cauchy-Euler Equation, Non-homogeneous Equations, Method of Variation of Parameter, Method of Inverse Operator, Legendre Equation.

MODULE-III (15Hrs)

Partial Differential Equation of First Order, Linear and Non-linear Partial Differential Equations, Charpit's Method, Homogeneous and Non-homogeneous Linear Partial Differential Equations with Constant Coefficients, Cauchy Type Differential Equation.

Text Book:

1) *Higher Engineering Mathematics* by B.V. Raman Publisher: TMH
Chapters: 8 (8.1 to 8.10); 9 (9.1 to 9.7), 18 (18.1 to 18.8)

Reference Book:

1) *Advanced Engineering Mathematics* by P.V.O' Neil Publisher: Thomson

FCBS0103 LINEAR ALGEBRA & VECTOR CALCULUS

<i>Pre-requisite</i>	<i>Course Type</i>	<i>Credits</i>
<i>Nil</i>	<i>Theory</i>	<i>3</i>

Course Objectives:

1. To apply concepts of Linear Algebra & Vector Calculus to the problems related to models in work, circulation and flux Problems, hydrodynamics and fluid dynamics, electrical circuits, networking, linear programming, graph theory, computer graphics, cryptography, thermodynamics, construction of curves and surfaces through specified points etc.
2. To solve the system of linear equations appearing in the problems of electrical engineering, mechanical engineering, applied mechanics etc.
3. To apply vectors in higher dimensional space in experimental data, storage and warehousing, electrical circuits, graphical images, mechanical systems and in physics.

Course Outcomes: Upon successful completion of this course, the student will be able to:

1. Use matrix operations to solve systems of linear equations and be able to determine the nature of the solutions.
2. Compute with the characteristic polynomial, eigenvalues, eigenvectors and eigenspaces of a matrix as well as the geometric and the algebraic multiplicities of an eigenvalue and then to diagonalise that matrix.
3. Determine the important quantities associated with scalar and vector fields.

MODULE-I (14 Hours)

Linear Algebra, Basic Concepts, Linear System of Equations, Solution by Gauss Elimination, Conditions of Existence and Uniqueness of Solutions, Rank of a Matrix, Determinants and Cramer's Rule, Linear Dependence and Independence.

MODULE-II (14 Hours)

Eigen Values and Eigen Vectors, Basis, Symmetric, Skew-Symmetric and Orthogonal Matrices, Complex Matrices, Similarity of Matrices, Diagonalization.

MODULE-III (14 Hours)

Vector Differential Calculus: Vector Algebra, Inner Product, Vector Product, Vector & Scalar Functions and Fields, Derivatives, Gradient of a Scalar Field, Directional Derivative, Divergence of a Vector Field, Curl of a Vector Field.

Text Book:

1) *Advanced Engineering Mathematics* by E. Kreyszig Publisher: Johnwiley & Sons Inc-8th Edition
Chapters: 6 (6.1 to 6.6); 7 (7.1, 7.3 to 7.5), 8 (8.1 to 8.4, 8.9 to 8.11)

Reference Books:

- 1) *Advanced Engineering Mathematics* by P.V.O' Neil Publisher: Thomson
- 2) *Mathematical Methods* by Potter & Goldberg ; Publisher : PHI

FCBS0103 INTEGRAL TRANSFORM

<i>Pre-requisite</i>	<i>Course Type</i>	<i>Credits</i>
<i>Nil</i>	<i>Theory</i>	<i>3</i>

Course Objectives: To describe the ideas of Fourier and Laplace Transforms and indicate their applications in the fields such as Signal & System, Digital Signal Processing, Image Processing, Theory of Control Systems, Differential Equations and many others.

1. To use Fourier series for solving boundary value problems appearing in scientific & engineering problems.
2. To get acquainted with the fact that the Laplace transform is related to the Fourier transform, but the Fourier transform expresses a function or signal as a series of modes of vibration (frequencies), whereas the Laplace transform resolves a function into its moments.

Course Outcomes: Upon successful completion of this course, the student will be able to:

1. Obtain Laplace transform of simple functions, functions expressed in graphical form, integrals and derivatives.
2. Solve differential & integral equations with initial conditions using Laplace transform.
3. Compute the Fourier series representation of a periodic function, in both exponential and sine-cosine forms.
4. Evaluate the Fourier transform of a continuous function and be familiar with its basic properties.

MODULE-I (16 Hours)

Laplace Transforms, Transforms of Derivatives and Integrals, Derivatives and Integrals of Transforms, Shifting Properties, Unit Step Function, Dirac's Delta Function, Convolution, Inverse Transforms, Solution to Differential Equation, Integral Equation.

MODULE-II (12 Hours)

Periodic Functions, Trigonometric Series, Fourier Series, Fourier Expansion of Functions of any Period, Even and Odd Functions, Half Range Expansions,

MODULE-III (14Hrs)

Fourier Integrals: Fourier Sine Integral, Fourier cosine Integral. Fourier Transforms: Fourier Sine Transform, Fourier Cosine Transform.

Text Book:

Advanced Engineering Mathematics by E.Kreyszig
Publisher: Johnwiley & Sons Inc-8th Edition
Chapters: 5 (5.1 to 5.6); 10 (10.1 to 10.4, 10.8, 10.9)

Reference Books:

- 1) *Advanced Engineering Mathematics* by P.V.O'Neil .Publisher: Thomson
- 2) *Higher Engineering Mathematics* by B.V.Raman .Publisher: TMH

FCBS0105 COMPLEX ANALYSIS

<i>Pre-requisite</i>	<i>Course Type</i>	<i>Credits</i>
<i>Nil</i>	<i>Theory</i>	3

Course Objectives:

- 1) *To understand the application of Complex Analysis to Two-Dimensional problems in Physics including Hydrodynamics and Thermodynamics and also in Engineering fields such as; Nuclear, Aerospace, Mechanical and Civil engineering, signal processing & communications.*
- 2) *To acquire the skill of contour integration to evaluate complicated real integrals appearing in Engineering problems via residue calculus.*

Course Outcomes: Upon successful completion of this course, the student will be able to:

- 1) *To get equipped with the understanding of the fundamental concepts of functions of a complex variable along with the concepts of analyticity, Cauchy-Riemann relations and harmonic functions.*
- 2) *Evaluate complex contour integrals applying the Cauchy integral theorem, Cauchy integral formula and Residue theorem.*
- 3) *Illustrate the applications of the calculus of residues in the evaluation of real integrals.*

MODULE-I (14 Hours)

Complex Analysis: Analytic Function, Cauchy-Riemann Equations, Laplace Equation, Harmonic Function, Linear Fractional Transformation.

MODULE-II (14 Hours)

Parametric representation , Line Integral in the Complex plane, Cauchy's Integral Theorem, Cauchy's Integral Formula, Derivatives of Analytic Function.

MODULE-III (14Hrs)

Power Series, Taylor's Series, Maclaurin Series, Laurent's Series, Singularities and Zeroes, Residue Theorem, Residue Integration Method, Evaluation of Real Integrals.

Text Book:

1) *Advanced Engineering Mathematics* by E. Kreyszig Publisher: Johnwiley & Sons Inc-8th Edition
Chapters: 12 (12.1 to 12.4 ,12.9) ; 13, 14 (14.2,14.4) & 15.

Reference Books:

- 1) *Advanced Engineering Mathematics* by P.V. O'Neil Publisher: Thomson
- 2) *Fundamentals of Complex Analysis (with Applications to Engineering and Science)* by E.B. Saff & A.D. Snider Publisher: Pearson

FCBS0106 Discrete Mathematics

<i>Pre-requisite</i>	<i>Course Type</i>	<i>Credits</i>
<i>Nil</i>	<i>Theory</i>	<i>3</i>

Course Objectives:

1. To learn a particular set of mathematical facts and to apply their applications in many subjects of Computer Science and Engineering such as Cryptography, Theory of Computation & Data Networking.
2. To understand mathematical reasoning in order to read, comprehend and construct mathematical arguments as well as to solve problems, occurred in the development of programming languages.
3. To work with discrete structures such as graphs to study the structure of the world wide web, to model a computer network and to find the shortest path between two places in a transportation network.

Course Outcomes: Upon successful completion of this course, the student will be able to:

1. Evaluate elementary mathematical arguments and identify fallacious reasoning.
2. Apply the logical structure of proofs and work symbolically with connectives and quantifiers to produce logically valid, correct and clear arguments.
3. Reformulate statements from common language to formal logic. Apply truth tables and the rules of propositional and predicate calculus.
4. Model and solve real-world problems using graphs, both quantitatively and qualitatively.

MODULE-I (12 Hours)

Propositional Logic, Propositional Equivalence, Predicates and Quantifiers, Nested Quantifiers, Rules of Inference, Recurrence Relations, Solving Linear Recurrence Relations.

MODULE-II (16 Hours)

Relations and its properties, Representation of Relations, Closure of Relations, Equivalence Relations and Partitions, Partial Ordering, POSet, Hasse Diagram, Maximal & Minimal elements of a Poset, Supremum & Infimum of a Poset, Lattice, Basic properties of Lattices.

MODULE-III (14Hrs)

Introduction to Graph Theory, Graph terminology, Representation of graphs, Graph Isomorphism, Connectivity, Euler and Hamiltonian Paths, Planar graph, Graph Coloring,

Text Books:

- 1 *Discrete Mathematics and its Applications* by K.H.Rosen Publisher: TMH, Sixth Edition Chapters:1(1.1 to 1.5) ; 6 (6.1, 6.2) ; 7; 8(8.1 to8.5, 8.7, 8.8)
- 2 *Elements of Discrete Mathematics* by C.L.liu & D.P. Mohapatra Publisher: TMH, Third Edition Chapter: 11 (11.1 to 11.4)

Reference Books:

- Discrete and Combinatorial Mathematics* by R.P.Grimaldi Publisher: Pearson
Discrete Mathematics and Applications by Thomas Koshy Publisher: Elsevier
Discrete Mathematical Structures by B. Kolman, R.C. Busby & S. Ross Publisher: PHI

COURSES OFFERED BY DEPARTMENT OF HUMANITIES AND MANAGEMENT

BASKET - II

Course Code	Course Title	Course type	Credits	Prerequisite	Department Offering
<i>FCHU1201</i>	<i>Foundations of English Communication</i>	<i>Workshop</i>	<i>2</i>	<i>Nil</i>	<i>Humanities</i>
<i>FCHU1202</i>	<i>Communicative Practice Laboratory -1</i>	<i>Workshop</i>	<i>2</i>	<i>Nil</i>	<i>Humanities</i>
<i>FCHU1203</i>	<i>Business Communication</i>	<i>Workshop</i>	<i>2</i>	<i>Nil</i>	<i>Humanities</i>
<i>FCHU1204</i>	<i>Communicative Practice Laboratory-II</i>	<i>Workshop</i>	<i>2</i>	<i>Nil</i>	<i>Humanities</i>
<i>FCHU1205</i>	<i>Corporate Readiness Laboratory</i>	<i>Workshop</i>	<i>2</i>	<i>Nil</i>	<i>Humanities</i>
<i>FCHU1206</i>	<i>IT Enabled Communication</i>	<i>Workshop</i>	<i>2</i>	<i>Nil</i>	<i>Humanities</i>
<i>FCHU1207</i>	<i>Career Communication</i>	<i>Workshop</i>	<i>2</i>	<i>Nil</i>	<i>Humanities</i>
<i>FCHU1208</i>	<i>Personality Development</i>	<i>Workshop</i>	<i>2</i>	<i>Nil</i>	<i>Humanities</i>
<i>FCHU1209</i>	<i>Seminar and Technical Writing</i>	<i>Workshop</i>	<i>2</i>	<i>Nil</i>	<i>Humanities</i>
<i>FCHU1210</i>	<i>Professional Etiquette</i>	<i>Workshop</i>	<i>2</i>	<i>Nil</i>	<i>Humanities</i>
<i>FCHU1211</i>	<i>Creative Writing</i>	<i>Workshop</i>	<i>2</i>	<i>Nil</i>	<i>Humanities</i>
<i>FCHU1212</i>	<i>English for Competition (GRE/GMAT/TOEFL/IELTS)</i>	<i>Workshop</i>	<i>2</i>	<i>Nil</i>	<i>Humanities</i>
<i>FCHU0210</i>	<i>Life Skills Development (LSD) – I</i>	<i>Practice</i>	<i>2</i>	<i>Nil</i>	<i>Humanities</i>
<i>FCHU0211</i>	<i>Life Skills Development (LSD) – II</i>	<i>Practice</i>	<i>2</i>	<i>Nil</i>	<i>Humanities</i>
<i>FCHU0212</i>	<i>Life Skills Development (LSD) - III</i>	<i>Practice</i>	<i>2</i>	<i>Nil</i>	<i>Humanities</i>
<i>FCMG0101</i>	<i>Economics</i>	<i>Theory</i>	<i>2</i>	<i>Nil</i>	<i>Management</i>
<i>FCMG0102</i>	<i>Accounting & Finance</i>	<i>Theory</i>	<i>2</i>	<i>Nil</i>	<i>Management</i>
<i>FCMG0103</i>	<i>Management Processes and OB</i>	<i>Theory</i>	<i>2</i>	<i>Nil</i>	<i>Management</i>
<i>FCMG0104</i>	<i>Production and Operation Management</i>	<i>Theory</i>	<i>2</i>	<i>Nil</i>	<i>Management</i>
<i>FCMG0105</i>	<i>Marketing Management</i>	<i>Theory</i>	<i>2</i>	<i>Nil</i>	<i>Management</i>
<i>FCMG0108</i>	<i>Introduction to Research</i>	<i>Theory</i>	<i>2</i>	<i>Nil</i>	<i>Management</i>
<i>FCMG0113</i>	<i>Indian Society and Culture</i>	<i>Theory</i>	<i>2</i>	<i>Nil</i>	<i>Management</i>

FCMG1201	Disaster Management	Workshop	2	Nil	Management
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Note: The evaluation for Workshop type subject will be 100% internal by the concerned faculty.

SYLLABUS

FCHU1201 FOUNDATIONS OF ENGLISH COMMUNICATION

<i>Pre - requisites</i>	<i>Course Type</i>	<i>Credits</i>
<i>Nil</i>	<i>Workshop</i>	<i>2</i>

COURSE OBJECTIVES

To develop vocabulary and grammar knowledge

To develop reading comprehension skills

COURSE OUTCOMES

Development of academic and sub-technical vocabulary

Enhancement of basic language skills, i.e., listening, speaking, reading and writing

Development of grammatical competence

Confidence level improvement

This course aims to build the vocabulary, comprehension, and writing skills for effective communication in English language. It will focus on reading, listening to, and writing passages, as a means of Course communications skills.

The essential elements of this course will include:

MODULE-I: READING SKILLS (7hrs.)

Read **one** of the following books:

Animal Farm

Alice in Wonderland

Guide

Malgudi Days

Harry Potter

Amar Chitra Katha

Comprehension Skills: Students will respond to comprehension lessons from the chosen book.

MODULE-II: WRITING SKILLS (7hr.)

Students learn grammar and usage by writing passages, and getting formal feedback on these.

MODULE-III: LISTENING SKILLS (6hrs.)

Students respond to questions based on listening to videos, audio, or speaking assignments of classmates.

MODULE-IV: SPEAKING SKILLS (7hrs.)

Speaking assignments based on chosen book or contemporary topics.

TEXT BOOKS:

Esteras, Santiago Remacha and Fabre, Elena Marco. (2007). *Professional English in Use ICT Student's Book*. Cambridge: Cambridge University Press.

REFERENCES:

Grellet, F. (1981). *Developing Reading Skills*. Cambridge: Cambridge University Press

McCarthy, M. & O'Dell, F. (2008). *Academic Vocabulary in Use*. Cambridge: Cambridge University Press.

Ur Penny, (1992). *Five-Minute Activities: A Resource Book of Short Activities* (Cambridge Handbooks for Language Teachers). Cambridge: CUP

F Klippel. (1984). *Keep Talking*. Cambridge: CUP

EVALUATION SYSTEM (CONTINUOUS INTERNAL ASSESSMENT)

Methods	Conversations	Listening Comprehension	Book Review Presentation	Vocab.	Mid-I (Presentation)	Mid-II (Online) Common Errors	Mid-III (Written)	% of Marks 100(Best 5)
Total	20	20	20	20	20	20	20	100

S. No.	Topic	Pedagogy	Details	Instructional Hrs			
				Th	Pract	video	Proj
1	Getting to Know Each Other	Activity Based Learning	Catch the Ball Introductions Ice-breaker Share an interesting fact, stories, questions, memories, embarrassing moments or sometimes relevant to the context. Useful link: http://www.icebreakers.ws/small-group/catch-ball-introductions-icebreaker.html	0	1	0	0
2	Conversation Practice	Pair work using Realia	Formulaic Expressions Doing Things with Words/ Objects Description: Student practice real life situations like using maps, asking for directions, small talk on weather, holidays, parties and eating out.	0	1	1	0
3	Formal and Informal Communication	Degrees of Formality	Worksheet: Ask the students to work in small groups of 2/3. They must read through the phrases in the table, deciding whether each phrase is formal or informal in conversation a conversation situation. When they have finished, review the exercise as a class (answers provided in the worksheet)	0	1	1	0

S. No.	Topic	Pedagogy	Details	Instructional Hrs			
				Th	Pract	video	Proj
4	Shadowing	Pronunciation – intonation, stress, pause	Find an Audio to Listen & Repeat – BBC News, Seminar Talk, Ted Talk etc. https://www.youtube.com/watch?v=GVWFGIyNswI	0	1	1	0
5	Speech Acts	Plain English	Students can 'become' anyone they like for a short time! They will be encouraged to come forward and perform small speech acts and role-plays.	0	1	0	0
6	Ask Me Questions Challenge	Questions & Responses	Individual to respond- the whole class to ask questions. In this session, a student will learn communication management.	0	1	0	0
7	TED Talk Listening	Listening Comprehension	Ice-breaker: Talkathon Assignment: In groups of 4, you are going to create/write 10 questions about the TED Talk	0	1	1	0

			Afterwards, the groups of 4 will split up in new groups of 4 to discuss and compare their questions. <i>Comprehension Test</i>				
8	Ted Talks	Communication & Confidence Body Language	Listen to a Ted Talk & make a presentation on a popular/contemporary topic	0	1	1	0
9	Reading Comprehension Strategies - 1	Pre-reading	Students are encouraged to read any two books in the first semester. [Animal Farm/Old Man and The Sea/ Guide/Malgudi Days/Amar Chitra Katha]	0	1	1	0
10	Reading Comprehension Strategies - 2	Mid - reading	Students respond to comprehension lessons from the chosen books. [Comprehension Passages, Gap filling and Sentence Completion]	0	1	1	0
11	Reading Comprehension Strategies - 3	Post Reading	Students respond to comprehension lessons from the chosen books. [Summarizing/ Narrating/ Enacting/Vocabulary Quiz/]	0	1	0	0
12	Book Review	Writing Short Passages/ Paragraphs	Write a review of your favorite book in at least 250 words. Mention 3 specific learnings and 3 distinct ways in which you plan to incorporate them in your life. To choose from the recommended books.	0	1	0	0
13	News Reading	7 Cs of Communication	Group Activity: Campus/ National News Reading Students read notice boards and visit departments Prepare campus news headlines Present in the class	0	1	0	0

S. No.	Topic	Pedagog	Details	Instructional Hrs			
				Th	Pract	video	Proj
14	Writing to the Point	Word Usage and Sentence Structure Main Idea, Coherence & Cohesion	Each group is seated in a circle. In this activity, the leader of each group cannot see (either blind or blind fold using a handkerchief), but can hear the peer voice. Ask the leader to flip through the pages, and put the finger randomly on fifteen words from the chosen book in five minutes. The other participates copy the words that are closest to the finger. This time bound activity increases the curiosity of the students and engages them in exciting communication and completion of the task. Then, I ask the students to shape the randomly chosen disconnected words into a short poem/story/essay by adding a title to it. Read Out Loud in the Class	0	1	0	0

15	Word Power	Synonyms & Antonyms	App: SPEAK ENGLISH	0	1	1	0
16	Homonyms	Some confusing words Minimizing errors through discussions	Activity: Select the correct option, Use the confusables in sentences to bring out their meaning	0	1	0	0
17	Reading and Writing about visuals	Useful Expressions	Presentation about visuals Task: Selecting information from a visual	0	1	0	0
18	Word Formation	Word structure Word hunt Vocabulary explorations	Group Activity: Students make word clouds	0	1	0	0
19	Vocabulary Building	Descriptive words	Activity : Describe yourself/ your favorite person using 5 descriptive words	0	1	0	0
20	Listen to Popular Songs	Verb tense and aspect of grammar Vocabulary Idioms and expressions	Listen to the song with lyrics Ask questions about the title Gap Filling Exercises	0	1	0	0
21	Vocabulary Development	Word Power	Quiz/ Puzzle	0	1	0	0
22	Grammar	Common Errors	Surprise Quiz & debriefing	0	1	0	0
23	Grammar	Correct Usage	Easy Grammar App-Practice Sets	0	1	0	0
24	English Language Enhancement-I	Tenses	Usage, Question and explanation Fill in the blanks	0	1	0	0
25	English Language Enhancement -II	Active and Passive	I am passive..../I am active activity	0	1	0	0
26	English Language Enhancement-III	Reported Speech	Assignment & debriefing	0	1	0	0
27	English Language Enhancement -IV	Subject-verb agreement	Online Quiz & debriefing	0	1	0	0
28	Learn Grammar with Fun	Conditionals	Activity: The whole class is divided into The Zero Conditional, The First conditional, The Second conditional, and The Conditional to perform the task	0	1	0	0

FCHU1202 COMMUNICATIVE PRACTICE LABORATORY –I

<i>Pre - requisites</i>	<i>Course Type</i>	<i>Credits</i>
<i>Nil</i>	<i>Workshop</i>	<i>2</i>

The language laboratory acts as a platform for learning, practicing and producing language skills through interactive lessons and communicative mode of teaching.

COURSE OBJECTIVES

To expose the students to a variety of self- instructional, learner- friendly modes of language learning.

To enable them to learn better pronunciation through stress on word accent, intonation, and rhythm.

To maintain good linguistic - through accuracy in grammar, pronunciation and vocabulary.

COURSE OUTCOMES

Ability to communicate fluently in different business situation

Effective oral and written communication

Appropriate word usage with correct pronunciation

Clarity of word stress and intonation

A student is required to take up five lab tests of 100 marks- three tests in spoken mode and two tests in written mode.

MODULE-I: FRIENDLY COMMUNICATION (9 HOURS)

Doing Things with Words: To ask for information, help, permission; To instruct, command, request, accept, refuse, prohibit, persuade

Practice of Formulaic Expressions: Greetings, farewells, introductions, thanks, apologies, regrets, good wishes, congratulations, condolences, offers.

Conversation Practice in familiar and unfamiliar situations

(This module will be practiced through conversation activities in pairs & groups)

MODULE-II: GRAMMAR AND VOCABULARY (9 HOURS)

The focus will be on the appropriate usage of language.

Elimination of common errors

Editing passages

Word power A-Z: Easy and quick techniques

Vocabulary building exercises

(Open Source Language Laboratory will be used to take quizzes and practice grammar & vocabulary)

MODULE-III: PHONETICS AND SPOKEN ENGLISH (12 HOURS)

Students will be trained to find out the correct pronunciation of words with the help of a dictionary /software, to enable them to monitor and correct their own pronunciation.

Pronunciation Guidelines: Consonants and Vowels

Pronunciation practice (for accent neutralization), particularly of problem sounds, in isolated words as well as sentences

Speaking Techniques: Using correct stress patterns, developing voice quality

Rhythm and Intonation

(Reading aloud of dialogues, speeches etc. for practice in pronunciation)

(In this module, the learners will use video series from BBC & Sky Pronunciation Suite to improve spoken English)

TEXT BOOKS:

Dwyer, J. (2000). *The Business Communication Handbook*. New Jersey: Prentice Hall.

REFERENCES:

Brown, G & Yule, G. (1983). *Teaching the Spoken Language*. Cambridge: Cambridge University Press.

Brown, H. D. (1994). *Teaching by Principles: An Interactive Approach to Language Pedagogy*. New Jersey: Prentice Hall.

EVALUATION SYSTEM (CONTINUOUS INTERNAL ASSESSMENT)

Methods	Role play	Speech Acts	Grammar Quiz	Story Telling	JAM	Vocabulary-Exercise	Vocabulary-Quiz	% of Marks 100(Best 5)
Total	20	20	20	20	20	20	20	100

SESSION PLAN: COMMUNICATIVE PRACTICE LABORATORY -1

MODULE I: FRIENDLY COMMUNICATION (9 HOURS)

S. No.	Topic	Pedagogy	Details	Instructional Hrs.			
				Th	Prac	Vide o	Pro j
Lab-1	Ice-Breaking/ Introductory Session	Name Game and Other Ice-breaking Activities	Knowing Each Other http://www.buzzle.com/articles/classroom-icebreaker-activities-for-students.html http://cutmlanguagelab.org/course/view.php?id=3	0	2	0	0
Lab -2	Conversation Practice-I	Role Plays OSLL (Moodle)	Speech Acts/ Formulaic Expression http://cutmlanguagelab.org/course/view.php?id=3	0	2	0	0
Lab -3	Conversation Practice-Ii	Small Skits	Small Skits Using Formulaic Expressions http://www.lazybeescripts.co.uk/Scripts/Results.aspx?iSh=5&iSk=1&iMR=11&iXR=15&iPo=2&i17=1&iAS=2&iPS=2 http://cutmlanguagelab.org/course/view.php?id=3	0	2	0	0

MODULE II: GRAMMAR AND VOCABULARY (12 HOURS)

S. No.	Topic	Pedagogy	Details	Instructional Hrs.			
				Th	Prac	Vide o	Pro j
Lab-4	Elimination of Common Grammatical Errors	Quiz OSLL (Moodle)	Emphasis on Tense, Verbs, Modals, Conditionals, Active and Passive Voice, Statements, Questions and Responses, Articles, Preposition & Concord http://cutmlanguagelab.org/course/view.php?id=3 http://www.learnenglishfeelgood.com	0	2	0	0

Lab - 5	Document Makeover	Assignment OSL (Moodle)	Editing passages: Grammatical and Construction errors http://cutmlanguagelab.org/course/view.php?id=3	0	2	0	0
Lab - 6	Vocabulary Building- Word Power	Assignment and Online practice	http://a4esl.org/ http://cutmlanguagelab.org/course/view.php?id3	0	2	0	0
Lab - 7 & 8	Vocabulary Building	Assignment and Online practice	Synonyms, Antonyms, Homophones, One-Word Substitution, Phrasal Verbs http://www.majortests.com/word-focus/vocabulary-tests.php http://www.grammarbank.com/synonyms-antonyms-worksheet.html http://cutmlanguagelab.org/course/view.php?id3	0	2	0	0

MODULE-III: PHONETICS AND SPOKEN ENGLISH (12 HOURS)

S. No.	Topic	Pedagogy	Details	Instructional Hrs.			
				Th	Prac	Video	Proj
Lab -9	Phonetics-I	Online Practice OSL (Moodle)	Phonemic Transcription Using IPA Symbols, Stress Pattern in Words and Phrases http://usefulelenglish.ru/phonetics/practice-consonants http://www.agendaweb.org/phonetic.html http://cutmlanguagelab.org/course/view.php?id=3 https://www.youtube.com/watch?v=htmkblboG9Q	0	1	1	0
Lab -10	Phonetics-Ii	Online Practice OSL (Moodle) Sky Pronunciation Suite	Rhythm and Intonation http://www.learning-english-online.net/areas/pronunciation/stress-and-intonation/ http://www.tolearnenglish.com/english_lessons/intonation-exercises http://cutmlanguagelab.org/course/view.php?id=3	0	2	0	0
Lab -11	Event Narration, Story Telling	Assignment	http://gdpi.hitbullseye.com/other-selection-tools-extempore.php http://cutmlanguagelab.org/course/view.php?id=3 http://grammar.about.com/od/developingessays/a/topnarrative07.htm	0	2	0	0

Lab -12	Speaking - Jam, Extempore	Activity Based OSLL (Moodle)	http://orelt.col.org/module/unit/3-practice-public-speaking http://cutmlanguagelab.org/course/view.php?id=3 https://www.youtube.com/watch?v=wV166cH5uQ https://www.youtube.com/watch?v=Mm-4T7qOS4	0	2	0	0
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FCHUI203 BUSINESS COMMUNICATION

Pre - requisites	Course Type	Credits
Nil	Workshop	2

COURSE OBJECTIVES

The course on Business Communication focuses on the basic skills required to be an effective communicator. It aims at imparting the communication skills that are needed in the academic and professional pursuits.

This is directed towards helping the students gain skills in comprehension, group discussions, presentations, interviews, active listening, technical writing and the ability to manage cross-cultural interactions. The focus is on the difficulty experienced by individual students, and the effort to explore a useful strategy for self-improvement. This is achieved through an amalgamation of lecture oriented approach of teaching with the task based skill oriented methodology of learning.

COURSE OUTCOMES

- Understand the differences between general communication and business communication
- Development of basic language skills, i.e., listening, speaking, reading and writing
- Effective participation in group discussion and job interviews

MODULE-I: UNDERSTANDING COMMUNICATION IN BUSINESS (8 hrs.)

The module is a guide to organization communication. It is directed towards enabling students to develop the skills necessary to manage the human resources of their organization.

General Communication and Business Communication

Communication in Organizational Settings: Patterns of Communication in the Business World

– Upward, Downward, Horizontal Grapevine etc, Channels of Communication- Internal and External, Formal and Informal

Introduction to Cross Cultural Communication

Strategies to Overcome Communication Barriers

MODULE-II: READING AND WRITING (10 hrs.)

This unit works on the competency in reading and writing skills through such tasks/activities as reading books, articles, magazines, novels, developing outlines, key expressions, situations, slogan writing and theme building exercises, dialogue writing, interpreting pictures, technical writing.

Importance of Developing Reading Skills

Sub-Skills of Reading: Predicting Content, Skimming & Scanning, Topic sentence and supporting details, Inferential Reading, Guessing the Meaning of Unfamiliar Words, Note Making

Importance of Writing Skills and Principles of Effective Writing

Writing Process: Pre-writing, Drafting and Re-Writing

Paragraph Writing

Summaries and Abstracts

Business Correspondence: Writing Business Letters, E-mail Messages, Memo, Notice, Circulars, Reports, Proposals
 Career Communication: Writing Resume/ CV and Job Application Letter

MODULE-III: LISTENING AND SPEAKING (9 HOURS)

Listening is the mother of all speaking. This unit aims to achieve competence in speaking i.e., the ability to communicate orally in clear, coherent, and persuasive language appropriate to purpose, occasion, and audience. The module focuses on developing this competency which includes acquiring poise and developing control of the language through experience in making presentations to small groups, to large groups, and through the media.

Listening Skills: Listening Process, Hearing and Listening, Types and Barriers, Effective Listening Strategies

Common forms of Oral Communication in the Business World:

Meetings: Organize Meetings, Preparing an Agenda, Chairing a Meeting, Drafting Resolutions, Writing Minutes

Persuasive Speaking: Improving Fluency and Self-Expressions, Articulation, Good Pronunciation, Voice Quality

Making an Oral Presentation: Planning, Preparing and Delivery

Facing an Interview: Preparation, Types of Interview, Do's and Don'ts

Group Discussions: Debate and GD, Types of GD, GD Etiquette

(Treatment: Developing listening and speaking skills through various activities, such as role play activities, practicing short dialogues, JAM, group discussions, debates, speeches, listening to news bulletins, viewing and reviewing documentaries and short films etc.)

TEXT BOOKS:

An Introduction to Professional English and soft skills by B.K Das et al., Cambridge University Press

REFERENCES:

Effective Technical Communication, M. Ashraf Rizvi, TMH Publications.

Business Communication, Krizan. Merrier. Logan. Williams, Thomson

Business Communication Today, Courtland L Bovee, John V Thill & Mukesh Chaturvedi, Pearson Education.

Business communication by Meenakshi Raman and Prakash Singh (Oxford)

Business Communication, Urmila Rai & S.M Rai, Himalaya Publishing House

EVALUATION SYSTEM (CONTINUOUS INTERNAL ASSESSMENT)

Methods	Role Plays (Org. Comm.)	Reading Comprehension & Note-Making	Listening & Individual Presentation	GD	Mid-I (Online Test on Vocabulary)	Mid-II (Written exam on module 2)	Mid-III (Oral Presentation)	% of Marks 100 (Best 5)
Total	20	20	20	20	20	20	20	100

SESSION PLAN: BUSINESS COMMUNICATION

S. No.	Topic	Pedagogy	Details	Instructional Hrs			
				Th	Pract	video	Proj
1	Introduction To Business Communication	Business games Written Assignment	What is Business Communication? General Communication vs. Professional Comm. Das, AIPE & SS,	0	1	0	0
2	General Communication & Business Communication	Audio-visual clips Communication game- Change your style	Difference in Style Degrees of Formality pp. 6-7 http://christopherhouse.blogspot.in/2012/08/difference-between-business.html	0	1	0	0
3	Communication In Organisational Settings	Small group work Role Plays Quiz	Internal Communication: Formal Communication Network Informal Communication Network External Communication Raman, BC, pp- 13-21 http://keydifferences.com/difference-between-formal-and-informal-communication.html	0	1	0	0
4	Understanding The Importance Of Cross-Cultural Communications	Flip class- Match your points Role Plays	The Global Marketplace The Multicultural Workforce Krizen, BC, Chapter 2 & Bovee, BCT, pp. 63- 65 http://study.com/academy/lesson/cross-cultural-communication-definition-strategies-examples.html	0	1	0	0

S. No.	Topic	Pedagogy	Details	Instructional Hrs			
				Th	Pract	video	Proj
5	Improving Intercultural Sensitivity	Communication Games and activities	Recognise Cultural Differences Overcome Ethnocentrism Study other Cultures Overcome Language Barriers Develop Effective intercultural Skills Bovee, BCT, pp. 66-82	0	1	0	0
6	Over Coming Miscommunication	Workshop (Emphasis on listening skill)	The Information Gap principle Organizational Structure Difference in Status Incorrect Choice of Medium Message Complexity Cultural Differences Psychological Barriers Noise, and barriers http://www.businesscoachphil.com/overcoming-miscommunication-at-work Raman, BC, pp.22-27	0	1	0	0
7	Strategies For Improving	Good Listener Case Studies	Open Feedback, Simple Language, Avoid Overload, Walk the Talk	0	1	0	0

	Organisational Communication	Role plays & presentations	http://debo10199businesscommunication.blogspot.in/2012/02/strategies-for-improving-organizational.html Raman, BC, pp.34-40				
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MODULE II: READING AND WRITING

S. No.	Topic	Pedagogy	Details	Instructional Hrs			
				Th	Pract	video	Proj
8	Importance Of Developing Reading Skills & Reading Strategies	Reading News clips	The Importance of Developing Reading Skills Vocabulary Skills Word Meaning Recognition Guessing the Meaning from Word Structure and Context Guidelines for Improving Reading Skill Types of Reading Tips for Improving Reading Speed Rizvi, ETC, pp. 219- 224 http://www.nclrc.org/essentials/reading/stratread.htm	0	1	0	0
9	The Sub-Skills of Reading	Guessing Game	Understanding the Main Idea and Supporting Details Reading between the Lines: Inferential Reading Understanding the Writer's Point Of View Making Predictions · Guessing the Meanings of Unfamiliar Words · Skimming and Scanning Rizvi, ETC, pp. 228-250 http://literallycommunication.blogspot.in/2013/06/reading-skills-and-its-sub-skills.html	0	1	0	0
10	Note-Making	Topicalizing Schematising Use of Reduction Devices Methods of Sequencing Practice in Note	Mechanics of Note Making Note Writing Techniques Rizvi, ETC, pp.273-289 · http://www2.le.ac.uk/offices/ld/resources/study/notes	0	1	0	0

S. No.	Topic	Pedagogy	Details	Instructional Hrs			
				Th	Pract	video	Proj
11	Importance of Writing Skills	Tasks on small paragraphs Creative writing	Writing Process: Pre-writing, Drafting and Re-writing Idea Mapping Writing and Editing Rai, BC, pp. 182-192 http://smallbusiness.chron.com/importance-writing-skills-business-845.html	0	1	0	0

12	Paragraph Writing	Written Assignment Developing story outline	Unity in writing Topic sentence Chronological order of development Using Connectives Organizing a Paragraph Adequate Development of supporting details Cohesion & Coherence in a Paragraph Rizvi, ETC, pp.337-350 http://www.wikihow.com/Write-a-Paragraph	0	1	0	0
13	Summaries & Abstracts	Written Assignment based on guidelines	Differences between Abstract and Summary Procedure for Writing Abstracts Procedure for writing summary Rizvi, ETC, pp.290-307 http://www.uts.edu.au/current-students/support/helps/self-help-resources/academic-writing/abstract-and-executive-summary	0	1	0	0
14	Writing Business Letter & Proposal	Written Assignment based on guidelines	Purpose & goal Principles of effective letter writing: Courtesy and consideration, Directness and conciseness, Avoid verbosity, Participial endings, Positive and direct statements, Clarity and precision Structure and layout Rizvi, ETC, pp.351-365 & Raman, BC, PP.256-260 http://www.writing-business-letters.com/business-proposal-letter.html	0	1	0	0
15	Memo, Notice, Circulars & Email	Written Assignment based on guidelines	What is a Memo? Email writing format Characteristics of Effective Memo Difference between notice and circular Essentials of notice and notice format Rizvi, ETC, pp.423-436 http://www.umuc.edu/writingcenter/writingresources/effective_memos.cfm http://www.englishtransform.com/2014/04/difference-between-circular-memo-notice.html	0	1	0	0
16	Reports	Written Assignment based on guidelines	Definition and Types Deciding on Format and Length Structure / Parts of Formal Report Topics Covered in a Report Introduction, Body and Closing Krizen, BC, pp 259-303 & Rizvi, ETC, pp. 452-467 http://cgu.edu/pages/852.asp	0	1	0	0

TREATMENT: Tasks/activities as reading books, articles, magazines, novels, developing outlines, key expressions, situations, slogan writing and theme building exercises, dialogue writing, interpreting pictures, technical writing.

MODULE III: LISTENING AND SPEAKING

S. No.	Topic	Pedagogy	Details	Instructional Hrs			
				Th	Pract	video	Proj
17	Listening Skills	Effective Listening Strategies TED Talks: Listening and individual presentation	Listening Process Hearing and Listening Types and Barriers Rizvi, ETC, pp. 59-75 Video : https://www.youtube.com/watch?v=C8zNx_IarUw	0	1	0	0
18	Listening Attentively	News video clips and quizzing	Overall comprehension Extracting Detail information Listening between the lines Note taking Video https://www.youtube.com/watch?v=t2z9mdXlj4A	0	1	0	0
19	Persuasive Speaking	Inspirational audio-video clips for language improvement	Communication module for persuasive meeting Feed back Taking care of non-verbal elements Decoding message Handling noise Raman, BC, pp. 123- 169 & Rizvi, ETC, pp.195 -218 Video: https://www.youtube.com/watch?v=NBObNfR2n_4 Reference: http://www.speaking.pitt.edu/student/public-speaking/persuasive.html	0	1	0	0
20	Oral Presentation	Individual presentation on Events	Improving Fluency and Self-Expressions Articulation Good Pronunciation, Voice Quality Planning & Preparing your Oral Presentation Types of Delivery Guidelines for Delivery: Verbal elements, non-verbal elements, visual elements Practice delivery elements Controlling Nervousness and Stage freight Handling questions responsively narration/JAM Raman, BC, pp. 123- 169 & Rizvi, ETC, pp.195 -218 http://www4.caes.hku.hk/epc/presentation/VIDEO https://www.youtube.com/watch?v=WJIOzflQ5w4	0	2	0	0
21	Group Discussions	GD Sessions on current/ social issues	Nature of Group Discussion Characteristics of Group Discussion Skills Selection Group Discussions Subject knowledge Oral communication skills Team management	0	2	0	0

			<i>Group Discussion Strategies</i> <i>Role Functions in Group Discussions</i> <i>Rizvi, ETC, pp 165-187</i> https://www.youtube.com/watch?v=ymcMo7JWSu8 http://placement.freshersworld.com/what-is-group-discussion/33122049				
22	<i>Group Discussions</i>	<i>GD Sessions on current/ social issues</i>	<i>Debate and GD</i> <i>Types of GD</i> <i>GD Etiquette</i>		1		
23	<i>Revision</i>	<i>TUTORIAL</i>	<i>Module - I</i>		1		
24	<i>Revision</i>	<i>TUTORIAL</i>	<i>Module - I</i>		1		
25	<i>Revision</i>	<i>TUTORIAL</i>	<i>Module - I</i>		1		

FCHU1204 COMMUNICATIVE PRACTICE LABORATORY –II

<i>Pre - requisites</i>	<i>Course Type</i>	<i>Credits</i>
<i>Nil</i>	<i>Workshop</i>	<i>2</i>

The suggestive assignments in the laboratory are intended as learning activities to facilitate the students in accomplishing the language skills which are needed to succeed in the business world.

COURSE OBJECTIVES

To master Study Skills

To acquire strategic competence to use both spoken & written language to use in a wide range of communication strategies

To acquire Business Performance Skills

COURSE OUTCOMES

The students will be able to

Write effectively for a variety of professional and social settings. They will practice writing as a process of motivated inquiry engaging others writers' ideas as they explore and develop their own. They will demonstrate an ability to revise for content and edit for grammatical and stylistic clarity. And they will develop an awareness and confidence in their own voice as a writer.

Become accomplished, active readers who appreciate ambiguity and complexity, and who can articulate their own interpretations with an awareness and curiosity for other perspectives.

Demonstrate the skills needed to participate in a conversation that builds knowledge collaboratively; listening carefully and respectfully to others' view points; articulating their own ideas in relation to other voices and ideas. Students will be able to prepare, organize and deliver and engaging oral presentation.

A student is required to take up five lab tests of 100 marks- at least two tests in written mode and three tests in spoken mode.

MODULE-I: LISTENING (6 HOURS)

Exercises on Active Listening: The whole group listens to any speech/news broadcast in English and notes down the important points. They listen again to check their points and evaluate themselves. The group then compares points to see how well they have understood the broadcast.

MODULE- II: SPEAKING (8 HOURS)

Situational Dialogues / Role Play: Organization Communication

Oral Presentations- Prepared and Extempore

'Just a minute' Sessions (JAM)

Debates

Mock Meetings

Cracking Job Interviews: Mock Sessions

Group Discussions on current topics

(This module will be practiced through speaking activities like role plays, presentations, and discussions)

MODULE-III: READING (8 HOURS)

Students will be given practice in reading and comprehension 6-8 passages of 100-300 words each, on topics of General as well as professional interest. The texts will be supported by suitable exercises designed to foster comprehension skills and vocabulary enrichment. Students are encouraged to read newspapers, articles, books and novels.

Reading Comprehension Exercises Through Tests, Writing Summary and Presenting, Note Making

Review Presentation (Movie/ Article/ Book)

Vocabulary Building Exercises

(This module encourages extensive use of reading materials)

MODULE-IV: WRITING (8 HOURS)

The Writing Lab content is designed to acquaint the students not only with the techniques of effective writing but also give them an insight into planning and writing documents that produce results.

Short Paragraphs on current general and technical topics

Creative Writing: Idea Generation

Business Letters, Email Messages, Project Writing

Writing Resumes and Cover Letters

(* Students will be required to produce and submit by the end of second semester a 350-500 word project report on a topic of their choice. The project should involve data collection, analysis and reporting. Ten marks (out of 100 marks allocated for Lab Test) will be set apart for the project.)

TEXT BOOK:

An Introduction to Professional English and soft skills by B.K Das et al., Cambridge University Press

REFERENCES:

Effective Business Communication, AshaKaul, Prentice Hall

Professional Communication, ArunaKoneru, TMH

EVALUATION SYSTEM (CONTINUOUS INTERNAL ASSESSMENT)

<i>Methods</i>	<i>Listening Skills</i>	<i>Movie Review</i>	<i>Role Plays</i>	<i>Group Discussion</i>	<i>Mock Interview</i>	<i>JAM</i>	<i>Vocabulary/ Comprehension</i>	<i>% of Marks</i>
Total	20	20	20	20	20	20	20	100(Best 5)

SESSION PLAN: COMMUNICATIVE PRACTICE LABORATORY –II

MODULE I: LISTENING (6 HOURS)

S No.	Topic	Pedagogy	Details	Instructional Hrs			
				Th	Pract	Video	Proj
Lab-1	Introduction and Ice Breakers	Activity - Based	Knowing Each Other, People's Bingo http://cutmlanguagelab.org/course/view.php?id=4	0	2	0	0
Lab - 2	Exercises On Active Listening	Activity Based	Feedback, Note Taking, Summarizing, Paraphrasing and Non-verbal Cues http://cutmlanguagelab.org/course/view.php?id=4 https://www.youtube.com/watch?v=cSohjLYOI2A	0	1	1	0
Lab - 3	Movie Review Presentation	Activity Based	The October Sky/ In Pursuit of Happiness/A Beautiful Mind/ Any Other http://cutmlanguagelab.org/course/view.php?id=4	0	1	1	0

MODULE II: SPEAKING (8 HOURS)

S. No.	Topic	Pedagogy	Details	Instructional Hrs			
				Th	Pract	Video	Pro
Lab-4	Organization Communication	Role play	Business Situations and Mock Meeting http://cutmlanguagelab.org/course/view.php?id=4 http://eduscapes.com/distance/course_activities/simulations.htm https://www.youtube.com/watch?v=3X51J-ZDMmE	0	2	0	0
Lab - 5	Oral Presentations	Activity OSLL (Moodle)	Prepared and Extempore/ Debate / 'Just a Minute' Talk (JAM) http://cutmlanguagelab.org/course/view.php?id=4	0	2	0	0
Lab - 6	Interview /Group Discussion	Mock Interview /Group Discussion OSLL (Moodle)	Frequently Asked Questions (FAQs) Discussion on Current Topics - General, Social, Political, Management, Creative, Education and Sports http://cutmlanguagelab.org/course/view.php?id=4 https://www.youtube.com/watch?v=ymcMo7JWSu8 https://www.youtube.com/watch?v=7gcsZ9H2I6s	0	2	0	0

MODULE-III: READING (8 HOURS)

S. No.	Topic	Pedagogy	Details	Instructional Hrs			
				Th	Pract	Video	Pro
Lab -7	Reading Assignment - I	Assignment , online practice and discussion	Reading abridged texts, relevant topics, and news articles http://cutmlanguagelab.org/course/view.php?id=4	0	2	0	0
Lab -8	Reading Assignment - Ii		Reading for comprehension and vocabulary http://cutmlanguagelab.org/course/view.php?id=4 http://www.majortests.com/sat/reading-comprehension.php	0	2	0	0

MODULE-IV: WRITING (8 HOURS)

S. No.	Topic	Pedagogy	Details	Instructional Hrs			
				Th	Pract	Video	Pro
Lab -9	Writing Short Paragraphs - General, Current and Technical Topics	Assignment, online practice and discussion	Write, Rewrite, Expand, Correct, Complete, and Improve Paragraphs http://cutmlanguagelab.org/course/view.php?id=4	0	2	0	0
Lab -10	Idea Generation and Creative Writing	Assignment and discussion	Problem solving/decision making, Strategy development, Outline a proposal, Create a timeline Collaboration technique, Expression of creativity, Condensing various thoughts, Put visuals and text together http://cutmlanguagelab.org/course/view.php?id=4	0	2	0	0
Lab -11	Memo Writing & Emails	Assignment and discussion	Adopt the steps of writing process for preparing of memo and emails http://cutmlanguagelab.org/course/view.php?id=4 https://www.youtube.com/watch?v=6zHLHc9CcvQ	0	2	0	0
Lab -12	Preparation Of Business Reports/ Proposals And Presentation	Project Work and discussion	Adopt the steps of writing process for preparing business reports and proposals http://cutmlanguagelab.org/course/view.php?id=4 mails https://www.youtube.com/watch?v=eLKVRDBAMvQ	0	2	0	0

FCHU1205 CORPORATE READINESS LABORATORY

<i>Pre - requisites</i>	<i>Course Type</i>	<i>Credits</i>
<i>Nil</i>	<i>Workshop</i>	<i>2</i>

A real-time project approach in the laboratory is intended to provide a developmentally appropriate ambience, make the students proactive, encourage and motivate as well as develop skills to become a good listener, good communicator and responsible. A student will experience the challenging application process and at the same time prepare for the challenging world. The experience gained from working on projects can help one understand the appropriate and effective use of language skills. It also creates context in which learners engage in purposeful communication.

All communication activities are supported with the help of live projects on general techno-management or local themes which provide exposure to the students and help them to find a suitable job in the industry.

A student is required to take up five laboratory tests of 100 marks.

COURSE OBJECTIVES

- Understand the process of communication*
- View communication from the perspective of each stakeholder*
- Plan and manage communication difficulties*
- Learn exactly how, when and what of communication*

COURSE OUTCOMES

- Understanding the convention of project report*
- Understanding the process of data collection and documentation*
- Preparation and presentation of project report*
- Preparation for various academic and professional needs*

INSTRUCTION AND DELIVERY

Instruction- led facilitation highlights interactions between students and their facilitators, and emphasizes guidance from the facilitator who will track, assess and mentor them.

Students will make a team of four members who will take up real problems and run through the semester trying to solve the problems. The lab program will augment this learning with the right theory.

Participants will use PPTS, flash presentations or high impact presentations, flip charts, blogs, boards with graphical or pictorial representations, with captions and outlines, video display or any other best mode of presentation, post-it notes and group activities to document all processes and methodology.

OUTLINE

LAB1: Introduction to the Lab Program (Session will be driven by the Facilitators)

(Structure, Objective, Methodology, Objective of Choosing Project as a Vehicle to Learn the Course, Process of Carrying out the Project, Announcing the List of Projects)

LAB2: Discussion on Project Approach and Communication (Session will be driven by the Facilitators)

LAB3: Win Your Project: A Presentation by Groups (Session will be driven by the Students)

LAB4: Project Plan Presentation by Groups (Session will be driven by the Students)

LAB5: Review of Weekly Status Reports by the Guide, and Discussions (Session will be driven by the Students)

LAB6: Progress Presentation by Groups, and Feedback by Guide and Co-Guide (Session will be driven by the Students)

LAB7: Review of Documentation File/Dossier, and Feedback by Guide

LAB8: Progress Presentation and Submission of Dossier Containing Documentary Notes

(E.g., compilation of weekly status reports, minutes, photocopies of emails, feedbacks, testimonials, photographs)

LAB 9: Presentation on the Project, Feedback by the Guide and Co-guide

LAB 10: Final Presentation by Groups in front of a Panel and Submission of Project Work

TEXT BOOK:

The Essential Guide to Doing your Research Project by O'LEARY (2011)

REFERENCES:

Logical Framework Analysis, Capacity Building Workshop for Dryland Management, May 3-5, 2000

Professional Presentations by Goodale (2007)

EVALUATION SYSTEM (CONTINUOUS INTERNAL ASSESSMENT)

Methods	Win Your Project	Project Plan Presentation	Weekly Reports	Progress Presentation	Project Presentation	Documentation	Project Report	% of Marks 100 (Best 5)
Total	20	20	20	20	20	20	20	100

S. No.	Topic	Pedagogy	Details	Instructional Hrs				
				Th	Pract	video	Proj	
1	Introduction to the Lab Program	Project-based Learning Discussion Beyond the class Learning	Structure, Objective, Methodology, Objective of Choosing Project as a Vehicle to Learn the Course, Process of Carrying out the Project (Session will be driven by the Facilitators)	0	2	0	0	
2	Announcing the List of Projects		Topics available in OSL (Moodle) http://cutmlanguagelab.org/	0	1	0	1	
3	Project Approach & Communication		(Session will be driven by the Facilitators) https://www.youtube.com/watch?v=IybtFwYb7Oc	0	1	0	1	
4	Win Your Project		Rationale for choosing the project topic What makes you say that you deserve the project?/ Why should we give you the project (Session will be driven by the Students)	0	1	0	1	
5	Project Plan		Stakeholder Analysis, Objective Analysis, Situation Analysis, Problem Analysis, Strategy Analysis (Session will be driven by the Students)	0	1	0	1	
6	6Review of Weekly Status		Dossier Verification/Reports by the Guide	0	1	0	1	
7	Review of Progress		Progress Presentation by Groups, and Feedback by Guide and Co-Guide (Session will be driven by the Students)	0	1	0	1	
8	Documentation Review		Presentation with Facilitator Beyond the class Learning	Review of Documentation File/Dossier, and Feedback by Guide	0	1	0	1
9	Progression Presentation and Report Submission		Project-based Learning Presentation and Report Writing	Progress Presentation and Submission of Dossier Containing Documentary Notes (E.g., compilation of weekly status reports, minutes, photocopies of emails, feedbacks, testimonials, photographs)	0	1	0	1

		<i>Beyond the class Learning</i>					
10	<i>Presentation on the Project</i>	<i>Project-based Learning Beyond the class Learning</i>	<i>Presentation on the Project, Feedback by the Guide and Co-guide</i>	0	1	0	1
11	<i>Project Work</i>	<i>Discussion</i>	<i>Performance Analysis</i>	0	0	0	2
12	<i>Communication</i>	<i>Discussion</i>	<i>Performance Analysis</i>	0	2	0	0

FCHU1206 IT ENABLED COMMUNICATION

<i>Pre - requisites</i>	<i>Course Type</i>	<i>Credits</i>
<i>Nil</i>	<i>Workshop</i>	<i>2</i>

COURSE OBJECTIVE AND OUTCOME

Upon completing the syllabus, students should be able to:

- *Speak confidently and fluently, in both formal and informal contexts.*
- *Write clearly, correctly and cogently*
- *Design and have a Home Page/Blog Space, Facebook Page and post comments/reports for collaboration & online presence*
- *Evolve from the role of an 'information provider', through 'motivator' and 'catalyst of change', to 'Change Agent'.*

COURSE OUTLINE

MODULE I: CONCEPTUAL FOUNDATIONS

Pre-Course Assessment

Tell me a bit about yourself: Your background, your major, your professional aspirations ... your likes ... and maybe your favorite movie, and what you like to do in your spare time...

Do you know?

Introduction to IT Enabled Communication

Communication in the New Age Context and Demand for Communication Interventions
(*This module includes pre-course assessments and presentations*)

MODULE II: BLOG DESIGNING & POSTING

Step-by- Step to Writing a Blog: Researching, Brainstorming and Structuring, Writing, Posting, Editing and Accessorizing

Photoshop for Image, Editing and graphic design

(*This module will be driven through methods like self-learning, learning by doing, and workshop*)

MODULE III: TECHNOLOGY AND COMMUNICATION

Tools for Business Correspondence and web-based exercises

Creating and delivering high impact presentations with Slides and other Visuals

Video Documentaries

Video Conferencing Sites, Skype, Team Viewer

(*This module will be facilitated through presentations, use of tools and technology*)

TEXT BOOKS

Shirley Taylor, Model Business Letters (MBL) and Other Business Documents, 5th Edition. Krizen. Merrier.Logan. Williams, Business Communication, and Thomson (BC: Krizen).

M.M. Monippally, *Business Communication Strategies (BCS: MMM)*, TMH, New Delhi, 2001.
 Arthur H. Bell & Dayle M. Smith, *Management Communication (MC: AHB & DMS)*, Wiley Student Edition, 2005

LINKS

http://ctb.ku.edu/en/tablecontents/section_1017.htm

Useful websites for some topics will be linked to the course for improving language proficiency skills of the students.

www.a4esl.org

www.learnenglishfeelgood.com

EVALUATION SYSTEM (CONTINUOUS INTERNAL ASSESSMENT)

Methods	Presenta- tion	Blog Design & Post	Video Documentary	E-mail Writing	Business Letters	Poster/ Template Design	Mid-Sem written Exam	% of Marks 100(Best 5)
Total	20	20	20	20	20	20	20	100

MODULE I: CONCEPTUAL FOUNDATIONS (3HRS)

S. No.	Topic	Pedagogy	Details	Instructional Hrs			
				Th	Pract	video	Proj
1	Pre-Course Assessment [IT Enabled Communication]	Record pre-course assessments on communication management & technology by 'Probing & Doing'	Do you Know?	0	1	0	0
2	Tell me a bit about yourself	Know each other, and create a classroom philosophy through a game	Your background, your major, your professional aspirations ... your likes ... and maybe your favorite movie, and what you like to do in your spare time...	0	1	0	0
3	Communication in the New Age	Presentation	Context and Demand for Communication Interventions Explore top five social networking sites relevant to technology sector and present in the class, create and maintain online presence on Facebook, Google + or any other	0	1	0	0

MODULE II: BLOG DESIGNING & POSTING

S. No.	Topic	Pedagogy	Details	Instructional Hrs			
				Th	Pract	video	Proj
4	Step-by- Step to Writing a Blog - 1	Learning to Learn (Self-learning)	Researching	0	1	0	0
5	Step-by- Step to Writing a Blog - 2	Learning to Learn (Self-learning)	Brainstorming & Structuring	0	1	0	0
6	Step-by- Step to Writing a Blog - 3	Learning to Learn (Self-learning)	Writing & Posting	0	1	0	0

7	Step-by- Step to Writing a Blog - 4	Learning to Learn (Self-learning)	Editing & Accessorizing	0	1	0	0
8	Blog	Workshop (Self-learning)	One Day Workshop On Blog Design (CUTM e-content)	0	1	1	0
9	Blog Design	Posting assignments/ weekly reports/share what he/she has learnt (Doing)	Assignment: "Me in a Minute" blog post, email your blog's web address to the facilitators and peer group	0	1	0	0
10	Photoshop - 2	Self- Learning & Peer Learning	Editing and Graphic Design	0	1	1	0
11	Photoshop -3	Photoshop (FOSS) Training	Video tool www.spoken-tutorial.org	0	1	0	0
12	Photoshop	Workshop	One Day Workshop On Blog Design (CUTM e-content)	0	1	1	0

MODULE III: TECHNOLOGY AND COMMUNICATION

S. No.	Topic	Pedagogy	Details	Instructional Hrs			
				Th	Pract	video	Proj
13	Business Correspondence	Document Makeover, Web-based Exercises	Letters & Emails [Write to the point with correctness, conciseness, coherence and completeness]	0	1	0	0
14	Impress Presentation	Training and Practice	Language Laboratory Impress (FOSS)- Presentations (www.spoken-tutorial.org)	0	1	0	0
15	Enhancing presentation through slides and other visuals	Use of media for presenting the visual contents to reinforce the message, and create online presence	Equip the learners with techniques where they feel more confident in front of an audience Assignment [Improve the slides] Slide Share/ Upload on YouTube or Google +	0	1	0	0
16	Delivering High Impact Presentations	Video Recording & Peer Evaluation	Mastering the Art of Delivery, Preparing to Speak, Overcoming Anxiety, Handling Questions Watch-YouTube: Steve Jobs and iPod	0	1	0	0
17	Video Documentaries	Video documentary (Self- Learning)	Each student/group will make a short documentary movie (CSR, Facilities Labs, Student Projects etc.)	0	1	0	0
18	Making of Video Documentary	Workshop	One Day Workshop on Making Video Documentaries	0	1	1	0

19	Documentary Movie	10 min. video presentation by individuals/ groups	Feedback and Analysis	0	1	0	0
20	Video Conferencing	Free conference calls, webcam chat, video conferencing, group calls	Create Account & Practice [Skype, TeamViewer, Mobile]	0	1	0	0
21	Organize and Manage a Video Conference	Use video conference for business meetings Video conference etiquette & tips	Organise, Share & Collaborate	0	1	0	0

FCHU1207 CAREER COMMUNICATION

<i>Pre - requisites</i>	<i>Course Type</i>	<i>Credits</i>
<i>Nil</i>	<i>Workshop</i>	<i>2</i>

OBJECTIVES

- Prepare the graduates to acquire their dream jobs.*
- Build their mindset with right attitude, self-awareness, pro-activeness.*
- Build confidence, and enhance their communication skills to handle all situations.*

OUTCOMES

- Build the confidence of students*
- Trigger the thinking and analyzing ability of the learners to solve problems.*
- Readiness to work on their dream jobs.*

List of Experiments

LAB 1: Introduction to Career Communication

LAB 2: Presentation on Corporate House

Create an awareness and exposure on corporate life and culture.

Learners get exposure to corporate life and culture.

LAB 3: Corporate Quiz

LAB 4: Telephonic Conversation

Learners are equipped with basic knowledge and skill practice for improved telephonic communication.

LAB 5: Email Writing

Learn the characteristics of successful e- mail messages.

Create an effective e-mail message.

LAB 6: Mini Test on Email Writing

LAB 7: Learning Etiquette

Understand what etiquette is & why it's important.

Provide practical techniques and generally-accepted professional and ethical conduct or behaviour that will help create a favourable impression in social and professional life.

Practice proper manners like greeting, saying 'please', 'thank you'.

Appear professional and well groomed.

LAB 8 :Identifying Traits for Professional and Interpersonal Success

Understand the importance of effective interpersonal communication and traits for professional success.

Explore the significance of Active Listening, Problem Solving, Respect, Decision Making, Empathy, Co-operation and Non-verbal communication for professional success.

LAB 9: Job-Application -Cover Letter

Develop the career writing skills of the learners with special emphasis on their interest in specific job positions, their strengths and what values they will bring to the organisation.

LAB 10: Job-Applications – CV

Produce a polished and impressive CV that can be tailored to each specific job application.

Develop the career writing skills of the learners with special emphasis on Statement of Purpose.

Provide with tools to showcase Unique Selling Points for the specified job description.

LAB 11: Participating in Group Discussion (GD)

Mock Interview on basic questions

LAB 12: Facing an Interview

EVALUATION SYSTEM (CONTINUOUS INTERNAL ASSESSMENT)

Methods	Presentation	Corporate Quiz	Telephonic Conversation	Email Writing	CV	GD	Interview	% of Marks 100(Best 5)
Total	20	20	20	20	20	20	20	100

SESSION PLAN: CAREER COMMUNICATION

S. No.	Topic	Pedagogy	Details	Instructional Hrs.			
				Th	Pract	video	Proj
LAB-1	Introduction to Career Communication	Discussion	The Course introduces students to the resources and skills necessary for a successful job or internship search http://cutmlanguagelab.org/course/view.php?id=2	0	2	0	0
LAB-2	Presentation on Corporate House	Team Presentation on OSLL (Moodle)	Create an awareness and exposure on corporate life and culture. Learners get exposure to corporate life and culture. http://cutmlanguagelab.org/course/view.php?id=2 https://www.youtube.com/watch?v=g-_xABU21Yc	0	1	1	0
LAB-3	Corporate Quiz	Quiz OSLL (Moodle)	This Corporate Quiz is an initiative to bring forth all the updates and insights from various industries. Through this quiz , students will be updated with the current happening in the present Corporate world http://cutmlanguagelab.org/course/view.php?id=2	0	2	0	0
LAB-4	Telephonic Conversation	Role play (Pair Work)	Learners are equipped with basic knowledge and skill practice for improved telephonic communication https://www.youtube.com/watch?v=mmXAqMQe0AI https://www.youtube.com/watch?v=6tfFRD0enV0	0	1	1	0
LAB-5	Email Writing	Doing	Learn the characteristics of successful e- mail messages.Create an effective e-mail message. http://cutmlanguagelab.org/course/view.p	0	1	1	0

			hp?id=2https://www.youtube.com/watch?v=mmXAqMQe0AI				
AB -6	Email Writing	Mini Test OSLL (Moodle)	(Questions from TCS) http://cutmlanguagelab.org/course/view.php?id=2 https://www.youtube.com/watch?v=LTKb5Fexcuk	0	2	0	0

S. No.	Topic	Pedagog	Details	Instructional Hrs.			
				Th	Pract	video	Pro j
LAB-7	Learning Etiquette	Demonstration Video Analysis	Understand what etiquette is & why it's important. Provide practical techniques and generally-accepted professional and ethical conduct or behaviour that will help create a favourable impression in social and professional life. http://cutmlanguagelab.org/course/view.php?id=2 https://www.youtube.com/watch?v=ieYuoQ9sMvA	0	1	1	0
LAB -8	Identifying Traits for Professional and Interpersonal Success	Group Activity Video Analysis	Understand the importance of effective interpersonal communication and traits for professional success. Explore the significance of Active Listening, Problem Solving, Respect, Decision Making, Empathy, Co-operation and Non-verbal communication for professional success. http://cutmlanguagelab.org/course/view.php?id=2	0	1	1	0
LAB -9	Job-Application - Cover Letter	Document Makeover	Develop the career writing skills of the learners with special emphasis on their interest in specific job positions, their strengths and what values they will bring to the organisation. http://cutmlanguagelab.org/course/view.php?id=2 https://www.youtube.com/watch?v=37TbhadX0C8	0	2	0	0

FCHU1208 PERSONALITY DEVELOPMENT

<i>Pre - requisites</i>	<i>Course Type</i>	<i>Credits</i>
<i>Nil</i>	<i>Workshop</i>	<i>2</i>

The laboratory aims at the promotion of the strategies for the personality development of the participants. The rationale behind this endeavor is the recognition of the multifaceted influence of the personality of the participants.

A student is required to take up five laboratory tests of 100 marks.

COURSE OBJECTIVE

Project the force of inner self, assert individuality, influence others and power to success.

COURSE OUTCOME

Learners develop a positive attitude and graceful personality.

LIST OF EXPERIMENTS

Lab 1: Self-Discovery/Self-Analysis

Identifying strengths and weaknesses through games and activities

Lab 2: Impression Management

Formation of impression, first and lasting impression, change: warm-up discussion

Lab 3: Body Language and Communication Style Profile Test

Lab 4 : Working on Attitude: Assertive, Aggressive, Passive

Measure your attitude, case study and role plays

Lab 5: Build Your Skills

Interpersonal Communication and Self

Lab 6: Team Building and Teamwork

Ice-breaker, test your team skills, exercise on stages of formation and effective teams

Lab 6: Explore Your Personality

Lab 7 : Motivation and Success

Ted talks, invited talks and success stories

Lab 8: Time Management

Identifying important time wasters, time management exercises

Lab 10 : Stress Management

Case-based discussions to identify causes of stress, and manage stress

Lab 11: Etiquette and Manners

Test your etiquette and manners, practice good manners

Lab 12 : Personality and Career Choice

Matching your career & personality

TEXT BOOKS:

Basic Managerial Skills for All, 9th Edition, E.H. McGrath, S.J.

Personality Development by Harold R. Wallace & L. Ann Masters, 2006.

REFERENCES:

Personality Development by [John Aurther](#) .Reprint, 2009.

[Personality Development - Transform Yourself](#) by [Rajiv K. Mishra](#), 2004.

[Power of One - Personality and Self-Development](#) by [Dr. Abhishek Mishra](#), 2007.

EVALUATION SYSTEM (CONTINUOUS INTERNAL ASSESSMENT)

Methods	Self-introduction in sales pitch	Debate/ Extempore	Presentation (USP)	Group Activity (Communication)	Public Speaking on Current Topic	Case-based Discussions	Motivation Speech	% of Marks 100 (Best 5)
Total	20	20	20	20	20	20	20	100

SESSION PLAN: PERSONALITY DEVELOPMENT

S. No.	Topic	Pedagogy	Details	Instructional Hrs			
				Th	Pract	video	Proj
1	Self-Discovery/Self-Analysis	Activity Based Learning	Game	0	2	0	0
2	Impression Management	Videos and interactions	19 tips to impress others https://www.buzzfeed.com/carolynkylstra/impress-literally-everyone-you-meet?utm_term=.nbz2MKVOJO#.qywdZLkQXQ	0	1	1	0
3	Body Language and Communication Style Profile Test	Understanding of different postures and gestures through online test	http://www.queendom.com/queendom_tests/transfer	0	1	1	0
4	Working on Assertive, Aggressive, Passive	Role Plays and are Encouraged to watch videos	https://www.youtube.com/watch?v=O6eyUUKpoU8 Role plays	0	1	1	0
5	Build Your Skills	Videos	https://www.youtube.com/watch?v=w97dR3OJB1k http://www.investopedia.com/video/play/interpersonal-skills/	0	1	1	0
6	Team Building and Teamwork	Activity Based Learning	Coin Logo Time Required: 5-10 minutes Begin by asking all participants to empty their pockets, purses, and wallets of any coins they may have and place them on the table in front of them. If someone doesn't have any coins or only has very few, others in the room can share their coins with them. Instruct each person to create their own personal logo using the coins in front of them in just one minute. Other materials they may have on them, such as pens, notebooks, wallets, etc. can also be used in creation of the logo. If there is a particularly large group, people can be broken up into teams of 3-6 people and instructed to create a logo that represents them as a team or the whole room can gather to use the coins to create a logo for the organization/group/department/etc. Each	0	1	1	0

			solitary participant can explain their logo to the group or if the room was split into groups, the leader can have each group discuss what led to the team logo and what it says about them. Not only does this activity promote self and mutual awareness, but it also enables participants to get to know each other on a more personal level. http://www.livestrong.com/article/219775-team-building-exercises-for-small-groups/				
7	Explore Your Personality	videos	https://www.16personalities.com/free-personality-test	0	1	1	0
8	Motivation and Success	videos	https://www.youtube.com/watch?v=ILEg5EZw3iQ https://www.youtube.com/watch?v=g-PNJHhf-ag	0	1	1	0
9	Stress Management	Classroom Exercise	Time Wasters Exercise.pdf	0	1	0	0
10	Etiquette and Manners	videos	https://www.youtube.com/watch?v=55cXVve0Ipw for table manners https://www.youtube.com/watch?v=VLqKVfSG-bk for interview etiquette. https://www.youtube.com/watch?v=4-8AlriF908 for manners.	0	1	1	0

S. No.	Topic	Pedagogy	Details	Instructional Hrs			
				Th	Pract	video	Proj
11	Personality and Career Choice	Classroom exercise	rs_self-assessment.pdf	0	1	0	0
12	Time Management	Group Activity	<p>How long is a minute?</p> <p>At the beginning of session ask people to close their eyes for 30 seconds and after that to open it. Nobody can watch the clock and don't measure the time. Ask of participants to open their eyes after what they believe has been 30 seconds. Of course, they all open them at different times. Afterwards, we talk about our understanding of time. Even though everyone has an equal (24 hours a day or 30 seconds for exercise), in fact, we experience it and use it in different ways. Some of us experienced it as a short period, other as a long. This always works as a good opener.</p> <p>2) Cover all the clocks in the room, then ask participants to remove their wrist watches and stand up. Instruct them to sit down when they think 1 minute has elapsed after you shout "Start" to begin the countdown. You will be surprised with the results. Just enjoy the fun that follows this activity</p>	0	1	0	0

FCHU1209 SEMINAR AND TECHNICAL WRITING

<i>Pre - requisites</i>	<i>Course Type</i>	<i>Credits</i>
<i>Nil</i>	<i>Workshop</i>	<i>2</i>

Seminar allows students the opportunity to put all of information together. The students are required to prepare technical reports including oral presentations supported by written technical papers. Seminar is designed to assist students in preparing for their career.

COURSE OBJECTIVES

Understand the requirements and ethics of technical writing in the 21st Century workplace.

Work professionally, individually and in a team to produce effective technical documents incorporating verbal, visual, and multimedia materials as necessary.

Communicate effectively by analyzing audience, organizing documents, writing clearly and precisely with no grammar errors and presenting the document with skillful design.

Locate, evaluate, and incorporate pertinent information.

Write clear, intelligent technical reports

Make seminar presentations

COURSE OUTCOMES

Understand how technical communication is used in the workplace.

Understand and use the principles of design in business and technical communication.

Apply useful descriptive language to your technical documents.

Students will gain experience in preparing a technical report including an oral presentation supported by a written technical paper.

MODULE-I: TECHNICAL COMMUNICATION ESSENTIALS

COURSE OUTCOMES

Describe the writing process most useful in today's technical writing environment.

Analyze an audience and consider appropriate writing situations to meet the audience's needs.

Understand the ethics of the workplace and apply those ethics to their technical and business writing.

OUTLINE: Communicating in the Workplace, Technical Writing Process Today, Readers and Contexts of Use, Ethics in the Technical Workplace

MODULE- II: DOCUMENT DESIGN

COURSE OUTCOMES

Create and use graphics that complement your business and technical communication.

OUTLINE: Designing Documents and Interfaces, Creating and Using Graphics

MODULE-III: TECHNICAL COMMUNICATION STRATEGIES AND RESEARCHED REPORT WRITING

COURSE OUTCOMES

Define terms clearly in technical documents.

Explain instructions and processes clearly.

Write clear proposals for business and technical situations.

Research and manage information.

Write an analytical report.

OUTLINE: Researching and Managing Information, Organizing and Drafting, Technical Definitions, Technical Descriptions, Instructions and Documentation, Proposals, Analytical Reports

MODULE-IV: SEMINAR PRESENTATION

COURSE OUTCOME

Students will not only learn from the experience gained in preparing and presenting their seminar, but will have the opportunity to observe and participate in the seminar given by their classmates.

OUTLINE: Technical Report, Seminar Presentation

(Planning, Preparing, Organizing and Seminar Presentation are the 4 stages of this module)

TEXT BOOK:

Gerson, Sharon J. and Gerson, Steven M. (2007). *Technical Writing Process and Product*. Delhi: Pearson Education.

REFERENCES:

Effective Technical Communication, M. Ashraf Rizvi, TMH Publications.

Business Communication Today, Courtland L Bovee, John V Thill & Mukesh Chaturvedi, Pearson Education.

EVALUATION SYSTEM (CONTINUOUS INTERNAL ASSESSMENT)

Methods	Proposal Writing	Report Writing	Organizing Seminar	Document Formatting	Preparing a Technical Paper	Seminar Presentation-I	Seminar Presentation-II	% of Marks 100 (Best 5)
Total	20	20	20	20	20	20	20	100

SESSION PLAN: SEMINAR AND TECHNICAL WRITING

S. No.	Topic	Pedagogy	Details	Instructional Hrs			
				Th	Pract	video	Proj
1	Introduction to Technical Writing	Activity Based Learning	Writing Genres: Technical versus non-technical writings https://www.youtube.com/watch?v=LTDsgd0ytbE	0	1	0	0
2	Preparing to Write	Doing	Audience Analysis Brainstorming Organizing information Link: https://www.youtube.com/watch?v=wxKJTI3EhuM	0	1	0	0
3	Gathering information	Google Search	How do we gather information? Ways, techniques and tools	0	2	0	0
4	Focusing on Writing Skills	Workshop	Brainstorming, Drafting, Editing	0	2	0	0
5	Technical Writing Conventions	Analysis and Discussion	Analysis of different case studies	0	1	0	0
6	Reporting	Learning to Learn Analysis and Discussion	FORMAT: Preliminary pages, Summary, Main section, Conclusion, Recommendations References	0	2	0	0

S. No.	Topic	Pedagogy	Details	Instructional Hrs			
				Th	Pract	video	Proj
7	Using and interpreting Graphics	Group work and Discussion	Matching Games : Texts and graphic types	0	2	0	0
8	Document Formatting	Workshop	Layouts Use of MS Word for Documenting Document templates	0	2	0	0

			APA Format (6th) - Microsoft Word 2010 https://www.youtube.com/watch?v=aWT9zgMPviY				
9	Documentation	Workshop	Documenting Sources: https://www.youtube.com/watch?v=-H2fRG-Rms	0	2	0	0
10	Introduction to Seminar	Discussion	Seminar : Needs and ways of preparation Video : https://www.youtube.com/watch?v=Rz2II40tQuI	0	1	0	0
11	Questioning Skills	Workshop	Asking and Responding to questions in Seminars TED TALK: https://www.youtube.com/watch?v=PkcHstP6Ht0	0	2	0	0
12	Analysis of various Seminars	Videos and Discussion	Analysis of Seminars: Pros and Cons How to make a seminar effective? https://www.youtube.com/watch?v=x7qPAY9JqE4	0	1	1	0
13	Preparing for a Seminar	Group Work	Grouping Selection of topics	0	1	0	0
14	Collection of Information	Workshop	Primary and secondary sources Preparing sample PPTs	0	2	0	0
15	Seminar Presentation-I	Group Work	Demonstration and Discussion	0	2	0	0
16	Seminar Presentation-II		Demonstration and Discussion	0	2	0	0

FCHU1210 PROFESSIONAL ETIQUETTE

<i>Pre - requisites</i>	<i>Course Type</i>	<i>Credits</i>
<i>Nil</i>	<i>Workshop</i>	<i>2</i>

Etiquette begins with meeting and greeting. Good professional etiquettes indicate that you are a mature responsible, adult who can aptly represent any organization. Etiquettes center upon respect. **COURSE**

OBJECTIVES

- To recognize the importance of proper etiquette at workplace*
- To understand the elements and characteristics of proper etiquette*
- To behave professionally and gain respect*
- To develop an action plan to improve professionalism*

COURSE OUTCOMES

At the end of this course students would be able to learn:

- Professional behavior, standards for appearance, action and attitude in a business environment*
- Handle a variety of social and business situation*
- Different styles of communication based on different situations.*

MODULE- I: MEETING AND GREETING ETIQUETTE, OFFICE ETIQUETTE (7hrs)

- Personal Branding and First Impressions
- Introducing yourself and introducing a guest
- Professionalism at office
- Language styles, tone and attitude

MODULE-II: COMMUNICATION EXCELLENCE (7hrs)

- Techno Etiquette
- Phone Etiquette
- Email Etiquette

Social Media Etiquette
MODULE-III: NETWORKING ETIQUETTE (6hrs)

Business Card Etiquette
 Names
 Titles
 Net Etiquette
 Proper Introductions

MODULE-IV: BUSINESS ETIQUETTE (7)

Presentation Etiquette
 Meeting Etiquette
 Dining Etiquette
 Global Etiquette

TEXT BOOK:

The New Etiquette, Real Manners for Real People in Real situations- An A-to-Z Guide by Marjabella Young Stewart, St. Martin Griffin.
Soft Skills, Know Yourself and the World, K.Alex.

REFERENCES:

Do's and Taboos of Hosting International Visitors, Roger E. Axtell, John Wiley & Sons, Inc.
Breaking through Culture Shock: What You Need to Succeed in International Business by Elisabeth Marx.
Dos and Taboos of International Trade by Roger E. Axtell, John Wiley & Sons, Inc.
The Art of Writing Effective E-mails, Jayprakash, Sajitha, Himalayan Publications.
International Communication Management-Individual & Organizational Outcomes by Antonio Ragus, Bookboon, 2010.
Business Communication for Success by Scott Mac Lean, Flat World Knowledge, 2010.
Effective Technical Communication, M. Ashraf Rizvi, TMH Publications.

EVALUATION SYSTEM (CONTINUOUS INTERNAL ASSESSMENT)

Methods	Introducing others, Small Talk	Role Play in formal & informal situations	Presentation	Telephonic interview	Email	Mock Meeting	Quiz on Professional Etiquette	% of Marks 100(Best 5)
Total	20	20	20	20	20	20	20	100

LESSON PLAN: PROFESSIONAL ETIQUETTE

S. No.	Topic	Pedagogy	Details	Instructional Hrs			
				Th	Pract	video	Proj
MODULE 1: MEETING & GREETING ETIQUETTE, OFFICE ETIQUETTE							
1	Personal Introduction	Role play on formal situation with proper introduction	http://smallbusiness.chron.com/first-impressions-business-etiquette-2908.html	0	1	0	0
2	Introducing Others	Knowing each other Fish bowl game	http://www.fasset.org.za/downloads/Office_Etiquette_Material/Handbook_Essential_Office_Etiquette.pdf				
3	Basics of Etiquette	Video clips Small skits	http://www.fasset.org.za/downloads/Office_Etiquette_Material/Handbook_Essential_Office_Etiquette.pdf	0	1	0	0

4	Interpersonal Etiquette	Video clips Activity on using speech acts with appropriate body language Guessing game	http://www.fasset.org.za/downloads/Office_Etiquette_Material/Handbook_Essential_Office_Etiquette.pdf	0	1	0	0
5	Professionalism And Front Office Etiquette	Video Clips Role play on front office management on their dream company Quiz	http://careerplanning.about.com/od/workplacesurvival/a/professionalism.htm http://www.octech.edu/sites/www/Uploads/files/TRIO/Professionalism%20in%20the%20Workplace.pdf	0	1	0	0
6	Professional Conduct	Conversational practice and SWOT Analysis in pair/group task	http://www.fasset.org.za/downloads/Office_Etiquette_Material/Handbook_Essential_Office_Etiquette.pdf	0	1	0	0
7	Professionalism And Front Office Etiquette	Video Clips Role play on front office management on their dream company Quiz	http://careerplanning.about.com/od/workplacesurvival/a/professionalism.htm http://www.octech.edu/sites/www/Uploads/files/TRIO/Professionalism%20in%20the%20Workplace.pdf	0	1	0	0
8	Formal & Informal Attire	Communication Game Quiz	http://www.fasset.org.za/downloads/Office_Etiquette_Material/Handbook_Essential_Office_Etiquette.pdf	0	1	0	0
9	Language Etiquette And Attitude	Enactment in different formal situations with appropriate communication styles	http://www.english.wisc.edu/rfyoung/336/attitudes.pdf https://blog.udemy.com/communication-styles/ http://www.english.wisc.edu/rfyoung/336/attitudes.pdf	0	1	0	0
10	Techno Etiquette	Conversational practice and Small skits	http://theedgeexecutivecoaching.com/articles/etiquette/techno-etiquette/# Question & Answers : http://www.workforce.com/articles/q-a-about-techno-etiquette	0	1	0	0
11	Smart Phone Etiquette	Dialogue Exchange Telephonic Quiz	http://www.talkenglish.com/LessonPracti ce.aspx?ALID=483	0	1	0	0
12	Email Etiquette Social Media Etiquette	Video Clips Written task practice Group work Debate	http://www.businessemail etiquette.com/business-e-mail-etiquette-basics/ http://www.realsimple.com/work-life/work-life-etiquette/manners/social-media-etiquette http://www.moneycrashers.com/social-media-etiquette-tips-personal-business/ Video : https://www.youtube.com/watch?v=RFZwtkoNGrk https://www.youtube.com/watch?v=ootxiibcOWc	0	0	1	0

MODULE II: COMMUNICATION EXCELLENCE (7 HOURS)

S. No.	Topic	Pedagogy	Details	Instructional Hrs			
				Th	Pract	video	Proj
10	Techno Etiquette	Conversational practice and Small skits	http://theedgeexecutivecoaching.com/articles/etiquette/techno-etiquette/# Question & Answers : http://www.workforce.com/articles/q-a-about-techno-etiquette	0	1	0	0
11	Smart Phone Etiquette	Dialogue Exchange Telephonic Quiz	http://www.talkenglish.com/LessonPractice.aspx?ALID=483	0	1	0	0
12	Email Etiquette Social Media Etiquette	Video Clips Written task practice Group work Debate	http://www.businessmailetiquette.com/business-e-mail-etiquette-basics/ http://www.realsimple.com/work-life/work-life-etiquette/manners/social-media-etiquette http://www.moneycrashers.com/social-media-etiquette-tips-personal-business/ Video : https://www.youtube.com/watch?v=RFZwtkoNGrk https://www.youtube.com/watch?v=ootxiibcOWc	0	0	1	0

MODULE-III NETWORKING ETIQUETTE (6HRS)

S. No.	Topic	Pedagogy	Details	Instructional Hrs			
				Th	Pract	video	Proj
13	Netiquette	Written Assignment Drafting Email	http://jillbremer.com/articles/etiquette/techno-etiquette/ http://www.slideshare.net/MarcellineChitolie/techno-etiquette-final-copy	0	1	1	0
14	Business Card Etiquette	Presentations and small group work	http://www.careerealism.com/3-rules-to-smart-business-card-etiquette/	0	1	1	0
15	Forms of Addressing	Written assignment Scrabble and puzzles	http://www.talkenglish.com/LessonPractice.aspx?ALID=483	0	1	1	0

MODULE IV: BUSINESS ETIQUETTE (7 hours)

S. No.	Topic	Pedagogy	Details	Instructional Hrs			
				Th	Pract	video	Proj
16	Presentation Etiquette	Demonstration	http://dianegottzman.com/2013/11/business-etiquette-9-powerful-presentation-tips/ http://dianegottzman.com/2012/07/stand-and-deliver-ten-tips-to-delivering-a-powerful-presentation/	0	1	1	0
17	Meeting Etiquette	Mock Meeting	http://businessculture.org/northern-europe/uk-business-culture/meeting-etiquette/	0	1	1	0

			http://www.fasset.org.za/downloads/Office_Etiquette_Material/Handbook_Essential_Of_fice_Etiquette.pdf				
18	Dinning Etiquette	Activity on-Playing the role of the Host/Hostess, Playing the role of the Guest	Rizvi, ETC, pp.139-164 Soft Skill, Dr.K.Alex-pp-203-219	0	1	1	0

S. No.	Topic	Pedagogy	Details	Instructional Hrs			
				Th	Pract	video	Proj
19	Golden Rules of Global Etiquette	Discussion and Activity	Developing intercultural skill http://www.kwintessential.co.uk/cultural-services/articles/international-business-etiquette.html http://www.kwintessential.co.uk/resources/country-profiles.html http://www.forbes.com/sites/susanadams/2012/06/15/business-etiquette-tips-for-international-travel/ http://www.marcaria.com/international-business-etiquette-customs-and-culture.asp	0	1	1	0
20	Doubt Clearing	One-to-One Interaction	Practice	0	1	0	0
21	Recap	Discussion	Performance Analysis	0	1	0	0

FCHU1211 CREATIVE WRITING

Pre - requisites	Course Type	Credits
Nil	Workshop	2

The aim of the course is to prepare students for careers in a workplace that is information-rich and that increasingly values communication skills and the ability to think creatively and critically. The class time will be devoted to writing workshop, innovation exercises, and the critical appreciation of write-ups. The Creative Writing course will focus on

Reading
Writing Creatively
Presentations

Thus the main objective is to breed a culture of learning where students learn a variety of approaches to creative writing in a cooperative learning environment.

COURSE OBJECTIVES

Develop thinking skills
Acquire basic skills and techniques to develop a suitable practice of creative writing in context
Use a constructive approach to critique his/her own work, as well as work by his/her peers
Organize, prepare and present spoken presentations clearly and expressively

COURSE OUTCOMES

Upon the Completion of the course, a student will
Create Blog/ Online Presence
Submit works for publication
Compose a variety of written responses for different purposes and audiences
Collaborate by sharing ideas, examples and insights, productively and respectfully in informal conversations and discussions.
Students will put into practice the learning into the personal, professional and technical sphere.

MODULE -I: WRITING CREATIVELY (12hrs)

Foundational activities

Introduction to Class Standards
(Workshops, peer conferencing, blogging, reading outside the classroom)
Collaborative Creation of Classroom Philosophy
Basics of Creative Writing

Different forms of expression

Memoirs/Writing the Personal Narratives
Situational Writing/ Writing for the Target Audience
Dialogues, Essay, Poetry Slam
Script Writing
Writing for Blogs
Cooking Up Interview Stories

Writing from visuals

Pictures, Graphs, Images, Diagrams and Designs, Cartoons
Brochures and Newsletters

(This module will be facilitated through creative writing and speaking activities)

MODULE-II: READING AND CRITICAL APPRECIATION (8hrs)

Book

(Independent Study: Two Master Piece)

Article

Movie

(Student Work: Free Choice, Discussion and Oral/ Written Critiquing, Editing/ Revision
Publication/ Sharing, Short Report on Two Authors)

(This module will be facilitated through reading activities and critical appreciation)

MODULE-III: POWER OF LATERAL THINKING TO CREATE NEW IDEAS (7hrs)

General Concepts: Creativity and Lateral Thinking
Using the Technique of Lateral Thinking in Writing
Idea Generation Games and Activities
Six Thinking Hats

(This module will be facilitated through idea generation activities and presentation)

TEXT BOOKS

Creative Writing: A Workbook with Readings- Linda Anderson

Creative Writing- By DevAnjanaNeira

REFERENCES

The Cambridge Companion to Creative Writing by David Morley, Philip Neilsen

Creative Writing- By Adele Ramet

The Creative Writing Mfa Handbook: A Guide for Prospective Graduate Students By Tom Kealey

EVALUATION SYSTEM (CONTINUOUS INTERNAL ASSESSMENT)

<i>Methods</i>	<i>Memoirs</i>	<i>Essay/ Dialogue Writing</i>	<i>Slam Poetry</i>	<i>Script Writing</i>	<i>Writing for Blog</i>	<i>Presentation from Visuals</i>	<i>Cooking up Interview Stories</i>	<i>% of Marks 100(Best 5)</i>
Total	20	20	20	20	20	20	20	100

**SESSION PLAN: CREATIVE WRITING
MODULE-1 : WRITING CREATIVELY (12 hours)**

S. No.	Topics	Pedagogy	Details	Instructional Hrs			
				Th	Prac	Vide	Proj
1	<i>Foundational activities Introduction to Class Standards (Workshops, peer conferencing, blogging, reading outside the classroom)</i>	<i>Conversational practice, Role Plays</i>	https://www.teachingchannel.org/videos/peer-conferencing https://blogging.org/	0	2	0	0
2	<i>Collaborative Creation of Classroom Philosophy</i>	<i>Group tasks</i>	http://writing-speech.dartmouth.edu/teaching/first-year-writing-pedagogies-methods-design/collaborative-learninglearning-peers https://www.eartham.edu/media/894432/creative_writing_rules.pdf	0	2	0	0
		<i>/Practice</i>	https://www.youtube.com/watch?v=syUwXYpV4zA http://classroom.synonym.com/difference-between-memoir-personal-narrative-1729.html				
4	<i>Different forms of expression Memoirs/Writing the Personal Narratives Situational Writing/ Writing for the Target Audience</i>	<i>Group work, writing, video links ,</i>	https://www.quia.com/files/quia/users/learningcircle/Situational-Writing-Tips https://www.youtube.com/watch?v=PLHkuSpJxPs https://www.youtube.com/watch?v=ZA3xt0KkWas https://www.youtube.com/watch?v=zJGX2raiafU	0	2	0	0
5	<i>Dialogues, Essay, Poetry Slam</i>	<i>Role Plays, Written tasks</i>	https://en.wikipedia.org/wiki/Poetry_slam Examples of poetry slams : http://www.poetrysoup.com/poems/best/slam	0	2	0	0
6	<i>Script Writing Writing for Blogs</i>	<i>Writing tasks individual/pairs</i>	https://www.writersstore.com/how-to-write-a-screenplay-a-guide-to-scriptwriting/	0	2	0	0

		Video links Blog writing practice	https://www.youtube.com/watch?v=XZszextv6yE BLOGS https://www.youtube.com/watch?v=t21sKonfylk				
	Cooking Up Interviews		https://www.themuse.com/advice/6-types-of-stories-you-should-have-on-hand-for-job-interviews 1610270959 https://www.themuse.com/advice/the-interview-technique-you-should-be-using				
8	Writing from visuals Pictures, Graphs, Images, Diagrams and Designs, Cartoons Brochures and Newsletters		https://twp.duke.edu/uploads/assets/Using%20Visual%20Rhetoric%20in%20Academic%20Writing.pdf https://www.youtube.com/watch?v=r6ZVGBQYNXE	0	1	0	0

MODULE-II: READING AND CRITICAL APPRECIATION (8 HOURS)

S. No.	Topics	Pedagogy	Details	Instructional Hrs			
				Th	Prac	Vide	Proj
9	Book (Independent Study: Two Master Piece)		http://www.howtolearn.com/2012/08/different-reading-techniques-and-when-to-use-them/	0	2	0	0
10	Article writing			0	2	0	0
11	Movie Review (Student Work: Free Choice, Discussion and Oral/ Written Critiquing, Editing/ Revision)			0	1	1	0
12	Publication/ Sharing, Short Report on Two Authors		https://www.elsevier.com/authors/book-authors/science-and-technology-book-publishing/overview-of-the-publishing-process	0	2	0	0

MODULE-III: POWER OF LATERAL THINKING TO CREATE NEW IDEAS (7hrs)

S. No.	Topics	Pedagogy	Details	Instructional Hrs			
				Th	Prac	Vide	Proj
13	General Concepts: Creativity and Lateral Thinking	Role Plays/ Oral Presentations Practice	www.brainstorming.co.uk/tutorials/definitions.html http://www.trainingcoursematerial.com/free-training-articles/creativity-problem-solving-	0	1	1	0

			decision-making-and-lateral-thinking/defining-lateral-thinking-parallel-thinking-creativity-and-innovation Video :https://www.youtube.com/watch?v=H7PyFNzPSVY				
14	Idea Generation Games and Activities	Pair/group activities	http://study.com/academy/lesson/what-is-idea-generation-definition-process-techniques.html	0	1	1	0
15	Six Thinking Hats	Group task	http://www.debonogroup.com/six_thinking_hats.php	0	1	1	0
16	DOUBT CLEARING			0	1	0	0

FCHU1212 ENGLISH FOR COMPETITION (GRE/GMAT/TOEFL/IELTS)

<i>Pre - requisites</i>	<i>Course Type</i>	<i>Credits</i>
<i>Nil</i>	<i>Workshop</i>	<i>2</i>

COURSE OBJECTIVE

Familiarize the learners with the pattern of the TOEFL/GMAT/IELTS/GRE examination and improve overall English skills to face the competitive exams confidently.

COURSE OUTCOME

Learners understand the pattern of the TOEFL, IELTS and GRE examination and apply test-taking strategies in exams.

A student is required to take up five laboratory tests of 100 marks.

LIST OF EXPERIMENTS

1: TOEFL Listening

Developing Listening Comprehension by taking notes after the short recorded conversations.

2: TOEFL Speaking

Developing test taking strategies to face speaking test of TOEFL exam through role play and Mock Interview.

3: TOEFL Reading

Practicing and improving student's confidence in completing the various sections of reading test in TOEFL examination.

4: TOEFL Writing

Learning and enhancing writing skills required for TOEFL writing test.

5: IELTS Listening

Practicing the listening comprehension of the students and handling questions while listening the recorded conversations.

6: IELTS Speaking

Developing test taking strategies to face speaking test of IELTS examination through role plays and mock interviews.

7: IELTS Writing

Summarizing or explaining information presented in a graph, chart, table or diagram.

8: IELTS Reading

Understanding and interpreting the text in its particular use of language, ideas and style.

9: GRE Reading Comprehension

Taking GRE Reading Comprehension examination with confidence utilizing the methods and strategies.

10: GRE SENTENCE COMPLETION

Developing sentence completion strategies through logical thinking.

11: GRE SENTENCE EQUIVALENCE

Learning and developing strategies to deal with sentence equivalence questions.

12: GRE VOCABULARY

Understanding and using appropriate choice of vocabulary in GRE vocabulary section.

13. GRE Vocabulary & Verbal-Sentence Corrections

14. GMAT Verbal-Critical Reasoning

15. GMAT Verbal- Reading Comprehension

(The entire lab will be facilitated through online quizzes, and practice sets available in language lab)

TEXT BOOKS:

NorthStar Building Skills for the TOEFL iBT, High Intermediate Level (Pearson Education).

NorthStar Building Skills for the TOEFL iBT, Intermediate Level (Pearson Education).

McGraw-Hill's New GRE: 2011-2012 Edition

Princeton Review: Cracking the New GRE 2012

REFERENCES:

Longman Preparation Course for the TOEFL Test – iBT Speaking (Pearson Education).

Longman Preparation Course for the TOEFL Test – iBT Listening (Pearson Education).

Longman Preparation Course for the TOEFL Test – iBT Writing (Pearson Education).

Longman Preparation Course for the TOEFL Test – iBT Reading (Pearson Education).

NorthStar Building Skills for the TOEFL iBT, Advanced Level (Pearson Education).

Achieve IELTS Workbook: Intermediate to Upper Intermediate: English for International Education (Achieve IELTS Intermediate/Upper) (Paperback).

Kaplan New GRE Premier 2011-2012

Barron's New GRE 19th Edition Grade

Manhattan GRE

Gruber's Complete GRE Guide 2012

Nova's GRE Prep Course Grade

ETS's Official Guide to the GRE Revised General Test

Barron's GRE Verbal Workbook

Barron's IELTS with Audio CD: International English Language Testing System (Paperback)

Achieve IELTS Teacher's Book: Intermediate to Upper Intermediate: English for International Education (Achieve IELTS Intermediate/Upper) (Paperback)

Step Up to IELTS Self-study Student's Book [STUDENT EDITION] (Paperback)

IELTS Collected Papers: Research in speaking and writing assessment (Studies in Language Testing) (Paperback)

EVALUATION SYSTEM (CONTINUOUS INTERNAL ASSESSMENT)

Methods	Listening & fill-up blanks, short answers, Multiple-choice	JAM/ Questions & Responses	Vocabulary Quiz, Sentence Completion & Re-order paragraphs	Reading Comprehension	Summarize /Data Comment	Essay Writing	Analytical Writing	% of Marks 100 (Best 5)
Total	20	20	20	20	20	20	20	100

SESSION PLAN: ENGLISH FOR COMPETITION

S. No	Topic	Pedagogy	Details	Instructional Hrs			
				Th	Pract	video	Pro t
.							

1	TOEFL Listening	Listening Activity Based Learning	http://www.examenglish.com/TOEFL/toefl_listening.htm	0	1	1	0
2	TOEFL Speaking	Listening and speaking activity	http://www.examenglish.com/TOEFL/TOEFL_Speaking_part5.htm	0	1	1	0
3	TOEFL Reading & Writing	Reading and Writing Practice	http://www.examenglish.com/TOEFL/TOEFL_reading1.htm (Reading) https://www.englishclub.com/esl-exams/ets-toefl-practice-writing.htm . http://www.time4writing.com/toefl/ (Writing)	0	2	0	0
4	IELTS Listening	Listening Practice	http://takeielts.britishcouncil.org/prepare-your-test/free-ielts-practice-tests/listening-practice-test-1	0	1	1	0
5	IELTS Speaking	Speaking Practice	http://takeielts.britishcouncil.org/prepare-your-test/free-practice-tests/speaking-practice-test-1	0	2	0	0
6	IELTS Writing & Reading	Writing & Reading Practice	http://takeielts.britishcouncil.org/prepare-your-test/free-practice-tests/writing-practice-test-1-ielts-academic http://takeielts.britishcouncil.org/sites/default/files/Writing_practice_test_1_IELTS_Academic_questions.pdf (writing) http://takeielts.britishcouncil.org/prepare-test/practice-tests/reading-practice-test-1-academic (Reading)	0	2	0	0
7	GRE Reading Comprehension	Reading Practice	http://gre.graduateshotline.com/reading_comprehension_practice.html#.V2kJDRITXCM https://www.ets.org/gre/revised_general/prepare/verbal_reasoning/reading_comprehension/sample_questions	0	2	0	0
8	GRE Sentence Completion & Sentence Equivalence	Online practice	http://gre.graduateshotline.com/gre_sentence_completion.pl https://www.ets.org/gre/revised_general/prepare/verbal_reasoning/text_completion/sample_questions http://www.examfocus.com/gre/pt/verbal/sentence-equivalence-1.html	0	2	0	0
9	GRE Vocabulary	Online practice	http://gre.graduateshotline.com/	0	2	0	0
10	GMA Verbal-Sentence Corrections	Online practice	http://freemattest.net/Questions http://www.majortests.com/gmat/sentence_correction.php	0	2	0	0
11	GMAT Verbal-Critical Reasoning	Online practice	http://www.majortests.com/gmat/critical_reasoning_test01	0	2	0	0
12	GMAT Verbal-Reading Comprehension	Online practice	http://www.majortests.com/gmat/reading_comprehension_test01	0	2	0	0

FCHU0210 LIFE SKILLS DEVELOPMENT-I [English]

<i>Pre - requisites</i>	<i>Course Type</i>	<i>Credits</i>
<i>Nil</i>	<i>Practice</i>	<i>2</i>

OBJECTIVES

To provide ample opportunities for practice

To approach reading comprehension questions and improve your vocabulary

OUTCOME

To qualify competitive exams

MODULE I: (24 HOURS)

S. No.	Topic	Pedagogy	Details	Instructional Hrs			
				Th	Pract	video	Proj
1	Reading Comprehension-1 & 2	Workbook Practice	Passage Reading	0	2	0	0
2	Reading Comprehension-3 & 4	Workbook Practice	Passage Reading	0	2	0	0
3	Reading Comprehension-1, 2 & 3	Workbook Practice	Passage Reading	0	2	0	0
4	Reading Comprehension-4,5 & 6	Workbook Practice	Passage Reading	0	2	0	0
5	Vocabulary(10 New Words)	Workbook Practice	Learning 10 new words	0	2	0	0
6	Vocabulary(15 New Words)	Workbook Practice	Learning 15 new words	0	2	0	0
7	Vocabulary(15 New Words)	Workbook Practice	Learning 15 new words	0	2	0	0
8	Vocabulary(20 New Words)	Workbook Practice & Quiz	Learning 20 new words	0	2	0	0
9	Reading Comprehension-1 & 2	Workbook Practice	Passage Reading	0	2	0	0
10	Reading Comprehension-3 & 4	Workbook Practice	Passage Reading	0	2	0	0
11	Reading Comprehension-5 & 6	Workbook Practice	Passage Reading	0	2	0	0
12	Speaking Skills	ACTIVITY	JAM	0	2	0	0
MODULE II: (24 HOURS)							
1	Vocabulary	Workbook Practice	Learning new words	0	2	0	0
2	Vocabulary	Workbook Practice	Learning new words	0	2	0	0
3	Reading Practice	News Reading	Reading Comprehension	0	2	0	0
4	Reading Comprehension-1 & 2	Workbook Practice	Passage Reading	0	2	0	0
5	Reading Comprehension-3 & 4	Workbook Practice	Passage Reading	0	2	0	0
6	Vocabulary	Workbook Practice	Learning new words	0	2	0	0

7	Vocabulary	Workbook Practice	Learning new words	0	2	0	0
8	Vocabulary	Quiz	Learning new words	0	2	0	0
9	Vocabulary	Workbook Practice	Learning new words	0	2	0	0
10	Speaking Skills	GD & Analysis	General Topics	0	2	0	0
11	Reading Comprehension-1 & 2	Workbook Practice	Passage Reading	0	2	0	0
12	Vocabulary-1	Quiz	Learning new words	0	2	0	0
MODULE-3 (24 HOURS)							
1	Reading Comprehension-1 & 2	Workbook Practice	Passage Reading	0	2	0	0
2	Vocabulary-1	Workbook Practice	Learning new words	0	2	0	0
3	Vocabulary-2	Surprise Quiz	Learning new words	0	2	0	0
4	Vocabulary-2	Workbook Practice	Learning new words	0	2	0	0
5	Vocabulary-3	Workbook Practice	Learning new words	0	2	0	0
6	Vocabulary-3	Asking Each Other	Learning new words	0	2	0	0
7	Vocabulary-4	Quiz	Learning new words	0	2	0	0
8	Reading Comprehension-1 & 2	Workbook Practice	Passage Reading	0	2	0	0
9	Reading Comprehension-3 & 4	Workbook Practice	Passage Reading	0	2	0	0
10	Speaking Practice	Activity Based Learning	Extempore/ Communication Game	0	2	0	0
11	Vocabulary-5	Workbook Practice	Learning new words	0	2	0	0
12	Vocabulary-5	Recap & Analysis	Vocabulary Exercises	0	2	0	0

EVALUATION SYSTEM: INTERNAL ASSESSMENT (50) + EXTERNAL ASSESSMENT (50)

Methods	Online Test-I	Online Test-I	Online Test-I	Attendance	Assignment	% of Marks 50
Total	10	10	10	10	10	100

FCHU0211 LIFE SKILLS DEVELOPMENT-II [APTITUDE]

<i>Pre - requisites</i>	<i>Course Type</i>	<i>Credits</i>
<i>Nil</i>	<i>Practice</i>	<i>2</i>

OBJECTIVE

Aptitude and Reasoning Tests are designed to give an objective assessment of a Candidate's ability in numerical as well as analytical

OUTCOMES

Ability skills will be increased

Improved skills to qualify all competitive exams like Banking Exams, Company-based Exams, Railway Exams, GATE Exams

SESSION PLAN: APTITUDE MODULE I: (24 HOURS)

S. No.	Topic	Pedagogy	Details	Instructional Hrs			
				Th	Pract	video	Proj
1	Number System-01	Workbook Practice	Operation on Numbers, Classification of Numbers, Tests of Divisibility	0	2	0	0
2	Number System-01	Workbook Practice		0	2	0	0
3	Number System-02	Workbook Practice	Unit Digit Calculation, Remainder Calculation,	0	2	0	0
4	Number System-02	Workbook Practice		0	2	0	0
5	Practice Test - 01	Practice Test	Practice Test on Number System http://gradestack.com/blogs/short-quiz-on-number-system-for-ctet-2015/	0	2	0	0
6	Lcm & HCF	Workbook Practice	Basics of LCM & HCF	0	2	0	0
7	Lcm & HCF	Workbook Practice	Basics of LCM & HCF	0	2	0	0
8	Practice Test - 02	Practice Test	Practice Test on LCM & HCF	0	2	0	0
9	Average	Workbook Practice	Basics of Average	0	2	0	0
10	Average	Workbook Practice	Basics of Average	0	2	0	0
11	Practice Test - 03	Practice Test	Practice Test on Average	0	2	0	0
12	Practice Test - 04	Practice Test	Practice Test on Number System, LCM & HCF & Average	0	2	0	0

MODULE II: (24 HOURS)

<i>S. No.</i>	<i>Topic</i>	<i>Pedagogy</i>	<i>Details</i>	<i>Instructional Hrs</i>			
				<i>Th</i>	<i>Pract</i>	<i>video</i>	<i>Proj</i>
1	<i>Percentage</i>	<i>Workbook Practice</i>	<i>Basics of Percentage</i>	0	2	0	0
2	<i>Percentage</i>	<i>Workbook Practice</i>	<i>Basics of Percentage</i>	0	2	0	0
3	<i>Practice Test – 05</i>	<i>Practice Test</i>	<i>Practice Test on Percentage</i>	0	2	0	0
4	<i>Ratio & Proportion</i>	<i>Workbook Practice</i>	<i>Basics of Ratio & Proportion</i>	0	2	0	0
5	<i>Practice Test-06</i>	<i>Practice Test</i>	<i>Practice Test on Ratio & Proportion</i>	0	2	0	0
6	<i>Time & Work</i>	<i>Workbook Practice</i>	<i>Basics of Time & Work, Chain Rule</i>	0	2	0	0
7	<i>Time & Work</i>	<i>Workbook Practice</i>	<i>Basics of Time & Work, Chain Rule</i>	0	2	0	0
8	<i>Practice Test – 07</i>	<i>Practice Test</i>	<i>Practice Test on Time & Work</i>	0	2	0	0
9	<i>Pipes & Cistern</i>	<i>Workbook Practice</i>	<i>Basics of Pipes & Cistern</i>	0	2	0	0
10	<i>Time & Distance, Trains</i>	<i>Workbook Practice</i>	<i>Basics of Time & Distance, Trains</i>	0	2	0	0
11		<i>Workbook Practice</i>	<i>Basics of Time & Distance, Trains</i>	0	2	0	0
12	<i>Practice Test – 08</i>	<i>Practice Test</i>	<i>Practice Test on Time & Distance, Trains</i>	0	2	0	0

MODULE-3 (24 HOURS)

S. No.	Topic	Pedagogy	Details	Instructional Hrs			
				Th	Pract	video	Proj
1	Boats & Streams	Class Task	Basics of Boats & Streams	0	2	0	0
2	Profit & Loss	Class Task	Basics of Profit & Loss	0	2	0	0
3	Profit & Loss	Home Task	Basics of Profit & Loss	0	2	0	0
4	Practice Test - 09	Practice Test	Practice Test on Profit & Loss http://gradestack.com/ssc/quants-quiz-on-profit-and-loss-for-ssc-cgl-2015-exam/	0	2	0	0
5	Practice Test - 10	Practice Test	Practice Test on Boats & Streams	0	2	0	0
6	Practice Test -11	Practice Test	Practice Test on Average,Percentage,NumberSystem,LCM& HCF, Boats &Streams, Average,Profit&Loss,Trains,Time & Distance www.livetest.in	0	2	0	0
7	Practice Test - 12	Practice Test	Practice Test on Average,Percentage,NumberSystem,LCM& HCF, Boats & Streams, Average,Profit&Loss,Trains,Time & Distance https://www.wiziq.com/tests/aptitude-test	0	2	0	0
8	Practice Test - 13	Practice Test	Practice Test on Average,Percentage,NumberSystem,LCM& HCF, Boats & Streams, Average,Profit&Loss,Trains,Time & Distance	0	2	0	0
9	Practice Test -14	Practice Test	Practice Test on Average,Percentage,NumberSystem,LCM& HCF, Boats & Streams, Average,Profit&Loss,Trains,Time & Distance	0	2	0	0
10	Practice Test - 15	Practice Test	Practice Test on Average,Percentage,NumberSystem,LCM& HCF, Boats & Streams, Average,Profit&Loss,Trains,Time & Distance	0	2	0	0
11	Practice Test - 16	Practice Test	Practice Test on Average,Percentage,NumberSystem,LCM& HCF, Boats & Streams, Average,Profit&Loss,Trains,Time & Distance http://www.freeonlinetest.in	0	2	0	0
12	Practice Test -17	Practice Test	Practice Test on Average,Percentage,NumberSystem,LCM& HCF, Boats & Streams,	0	2	0	0

			<p>Average, Profit & Loss, Trains, Time & Distance</p> <p>References for online tests:</p> <p>http://www.careerride.com/Online-practice-test.aspx</p> <p>http://www.freeonlinetest.in</p> <p>http://gradestack.com</p> <p>www.livetest.in</p> <p>https://www.wiziq.com/tests/aptitude-test</p>				
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EVALUATION SYSTEM: INTERNAL ASSESSMENT (50) + EXTERNAL ASSESSMENT (50)

Methods	Online Test-I	Online Test-I	Online Test-I	Attendance	Assignment	% of Marks
Total	10	10	10	10	10	100

FCHU0212 LIFE SKILLS DEVELOPMENT – III [REASONING]

Pre - requisites	Course Type	Credits
Nil	Workshop	2

SESSION PLAN: REASONING MODULE I: (24 HOURS)

S. No.	Topic	Pedagogy	Details	Instructional Hrs			
				Th	Pract	video	Proj
1	Number Series	Workbook Practice	BASICS	0	2	0	0
2	Number Series	Workbook Practice	BASICS	0	2	0	0
3	Practice Test - 01	Practice Test	Practice Test on Number Series http://gradestack.com/ssc/reasoning-quiz-on-number-series-for-ssc-exams-3/	0	2	0	0
4	Letter Series	Class Task	BASICS	0	2	0	0
5	Letter Series	Workbook Practice	BASICS	0	2	0	0
6	Practice Test - 02	Practice Test	Practice Test on Letter Series	0	2	0	0
7	Alpha Numeric Series	Workbook Practice	Basics	0	2	0	0
8	Alpha Numeric Series	Workbook Practice	Basics	0	2	0	0
9	Practice Test - 03	Practice Test	Practice Test on Alpha Numeric Series	0	2	0	0
10	Continuous Pattern Series	Workbook Practice	Basics	0	2	0	0

11	Continuous Pattern Series	Workbook Practice	Basics	0	2	0	0
12	Practice Test - 04	Practice Test	Practice Test on Number Series, Letter Series, Alpha Numeric Series & Continuous Pattern Series	0	2	0	0

MODULE II: (24 HOURS)

S. No.	Topic	Pedagogy	Details	Instructional Hrs			
				Th	Pract	video	Proj
1	Percentage	Workbook Practice	Basics of Percentage	0	2	0	0
2	Percentage	Workbook Practice	Basics of Percentage	0	2	0	0
3	Practice Test - 05	Practice Test	Practice Test on Percentage	0	2	0	0
4	Ratio & Proportion	Workbook Practice	Basics of Ratio & Proportion	0	2	0	0
5	Practice Test-06	Practice Test	Practice Test on Ratio & Proportion	0	2	0	0
6	Time & Work	Workbook Practice	Basics of Time & Work, Chain Rule	0	2	0	0
7	Time & Work	Workbook Practice	Basics of Time & Work, Chain Rule	0	2	0	0
8	Practice Test - 07	Practice Test	Practice Test on Time & Work	0	2	0	0
9	Pipes & Cistern	Workbook Practice	Basics of Pipes & Cistern	0	2	0	0
10	Time & Distance, Trains	Workbook Practice	Basics of Time & Distance, Trains	0	2	0	0
11	Time & Distance, Trains	Workbook Practice	Basics of Time & Distance, Trains	0	2	0	0
12	Practice Test - 08	Practice Test	Practice Test on Time & Distance, Trains	0	2	0	0

MODULE-3 (24 HOURS)

S. No.	Topic	Pedagogy	Details	Instructional Hrs			
				Th	Pract	video	Proj
1	Miscellaneous	Workbook Practice	Basics	0	2	0	0
2	Miscellaneous	Workbook Practice	Basics	0	2	0	0
3	Practice Test - 11	Practice Test	Practice Test on Syllogism, Puzzle, Letter & Number Series, Miscellaneous	0	2	0	0
4	Practice Test - 12	Practice Test	Practice Test on Syllogism, Puzzle, Letter & Number Series, Miscellaneous	0	2	0	0

5	Practice Test - 13	Practice Test	Practice Test on Syllogism,Puzzle,Letter & Number Series,Miscellaneous	0	2	0	0
6	Practice Test - 14	Practice Test	Practice Test on Syllogism,Puzzle,Letter & Number Series, Miscellaneous	0	2	0	0
7	Practice Test - 15	Practice Test	Practice Test on Syllogism, Puzzle,Letter & Number Series ,Miscellaneous	0	2	0	0
8	Practice Test - 16	Practice Test	Practice Test on Syllogism,Puzzle,Letter & Number Series,Miscellaneous	0	2	0	0
9	Practice Test - 17	Practice Test	Practice Test on Syllogism,Puzzle,Letter & Number Series,Miscellaneous	0	2	0	0
10	Practice Test - 18	Practice Test	Practice Test on Syllogism,Puzzle,Letter & Number Series,Miscellaneous	0	2	0	0
11	Practice Test - 19	Practice Test	Practice Test on Syllogism,Puzzle,Letter & Number Series,Miscellaneous	0	2	0	0
12	Practice Test - 20	Practice Test	Practice Test on Syllogism,Puzzle,Letter & Number Series,Miscellaneous http://gradestack.com http://www.freeonlinetest.in www.livetest.in	0	2	0	0

EVALUATION SYSTEM: INTERNAL ASSESSMENT (50) + EXTERNAL ASSESSMENT (50)

Methods	Online Test-I	Online Test-I	Online Test-I	Attendance	Assignment	% of Marks 50
Total	10	10	10	10	10	100

FCMG0101 ECONOMICS

Pre - requisites	Course Type	Credits
Nil	Theory	2

Course Objective:

In today's dynamic economic environment, effective managerial decision making requires timely and efficient use of information. The basic purpose of this course is to provide students with a basic understanding of the economic principles, methodologies and analytical tools that can be used in business decision making problems. It provides an understanding of the economic environment and its impact on strategy formulation. The course also focuses on the impact of economic policies on managerial decision-making by providing an understanding of fiscal policy, and national and global economic issues affecting business.

The language of science (and all analytical thinking) is mathematics. Since economics is a social science, use of some mathematical tools, basically the constrained and un-constrained optimization

techniques will help in measuring and solving the basic economic problems and thus improves decision-making. It becomes difficult and totally un-practicable to solve business (economic) problems logically and systematically without use of mathematics. The basic objective is to solve problems mathematically and interpret the results economically.

Module-1: Micro Economics

Introduction to economics: Scarcity, Choice and Efficiency, Fundamental issues of what, how and for whom to produce to make the best use of economics. Demand for a commodity: Law of demand, Demand schedule and demand curve, Individual and market demand, Change in demand, Consumer behavior: Analysing law of demand through Marshallian utility analysis, Indifference curve technique and Consumer Surplus.

Elasticity of demand: Price Elasticity of demand: Estimation, Types, Elasticity and revenue, Factors affecting price elasticity of demand. Income elasticity, Cross elasticity, Uses of different concepts of elasticity in business decisions.

Analysis of Supply: Law of Supply, Supply schedule and supply curve, Change in supply, Price elasticity of supply, Equilibrium of demand and supply: Equilibrium with demand and supply curves, Effect of a shift of demand and supply curves.

Production Function: Production function with one variable input, Production function with two variable inputs, optimal combination of inputs, Returns to scale

Cost Theory: Types of costs, Production and cost, Short-run cost functions, Long-run cost functions, Economies of scale and scope, Cost-Volume-profit Analysis

Market: Meaning, types and characteristics of different market structure (Perfect competition, Monopoly, Monopolistic competition and Oligopoly)

Module: 2: Macro Economics

National Income Accounting: Circular flow of Income, National Income Concept, Eight variants of national product aggregates, Measurement (Income, Value Added and Expenditure), Real and Nominal GNP, Difficulties in measuring the national income, Uses of National income statistics, Money and Inflation: Demand for and supply of money. Causes and consequences of Inflation. Commercial and central banking: Role and functions of commercial banks and R.B.I., Monetary Policy and Fiscal policy: Objectives and Instruments, Balance of Payment (BoP): Meaning, BoP Account, Disequilibrium in BoP, Measures to correct disequilibrium in BoP, Foreign Exchange: Floating Exchange Rate and Fixed Exchange Rates

Books & Reference:

1. *Managerial Economics in a Global Economy*, by D. Salvatore, Sixth Edition, OUP, 2008
2. *Managerial Economics*, Truett&Truett, Wiley Publication.
3. *Managerial Economics*, by Petersen Craig H. Cris Lewis and S.K. Jain, Pearson, 2007
4. *Modern Micro Economics*, Koutsoyiannis, (1975), A, Macmillan Press
5. *Managerial Economics*, Mehta, P. L (1999), Sultan Chand & Sons
6. *Principles of Microeconomics*, Mankiw, N. G (2006), Cengage Learning
7. *Macroeconomics*, Mankiw, N. G, (2009), Worth Publishers
8. *Macroeconomics, Theory and Policy*, Dwivedy, D.N (2007), Tata McGraw Hill
9. *Macroeconomics*, D'Souza, E (2008), Pearson Education
10. *Macroeconomic Analysis*, Shapiro, E (2003), Galgotia Publications
11. *Environmental Economics in Theory and Practice – Hankey N, Shogren J F, and White B – 1999 – Macmillan Indian Limited*
12. *Indian Economy*, Mishra &Puri (2011), Himalaya Publishing House

FCMG0102 ACCOUNTING AND FINANCE

<i>Pre - requisites</i>	<i>Course Type</i>	<i>Credits</i>
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<i>Nil</i>	<i>Theory</i>	<i>2</i>
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Course Objective:

- a) To familiarise the students with basic terms of accounting, accounting principles, concepts and convention.
- b) To equip the students with various concepts, tools and techniques of Cost accounting as well as Management accounting essential for managerial decision making process.
- c) To aware students overview of Time Value of Money, Working Capital and Stock Market

Course outcomes:

On the successful completion of this paper the students should be able composed the information about:

- Develop a basic understanding of accounting and financial ratio analysis.
- Students will be able to create, balance and deliver a budget and use budget information for planning and decision purposes.
- Undertake various costing techniques and information for planning and decision-making
- Demonstrate time management by understand various financial funding options for project planning and working capital management of an organizations.
- Know how financial markets as well as the global economy are impacting their organization today and how they will impact their organization into the future.

Module 1:

Basic Accounting Concepts and Conventions, Basic Accounting Equation, Accounting Mechanism: Journals, Ledgers, Trial Balance, Basic Financial Statements: Analysis of Items found in Balance Sheet and Income Statement, Ratio Analysis

Module 2:

Cost Concepts and Cost Terms: Financial Accounting vrs. Cost Accounting, Direct and Indirect Costs, Fixed, Variable and Semi-variable Costs, Standard, Budgeted and Actual Costs, Controllable and Non-controllable costs, Preparation of Cost Sheet, Cost-Volume-Profit Analysis: Concept of Marginal Cost and Contribution, Concept of Break Even Analysis, Applications of Marginal Costing

Module 3:

Time Value of Money: Concept, Simple and Compound Interest, Present Value of a Single Amount, Present Value of an Uneven Series, Future Value of an Annuity, Present Value of an Annuity
Working Capital Management: Meaning and Components of Working Capital, Determinants of Working Capital, Profitability-Risk Trade-off, Types of Working Capital, Importance of Working Capital, Operating Cycle: Concept and Estimation
Stock Market: Types of Capital Issues: Initial Public Offer, Follow-on Public Offer, Rights Issues, Preferential Issues, Red-herring Prospectus, Free Pricing of Issues, Greenshoe Option, Lock-in Period, Safety Net, Listing of Securities on Stock Exchanges

Books Recommended:

1. *Accounting for Management—Ashok Sehgal, Taxxman*
2. *Financial Accounting -- A managerial Perspective, R. Narayanswamy, PHI*
3. *Khan & Jain – Management Accounting, TMH.*
4. *Horngren ,Datar, Foster- Cost Accounting, Pearson.*
5. *Financial Accounting, Jain/Narang/Agrawal, Kalyani.*
6. *Basic Financial Accounting for Management, Shah, Oxford.*
7. *Financial Management by I. M. Pandey*
8. *Financial Management – Theory and Practice by Chandra*
9. *Financial Management – Text and Problems by Khan & Jain*

FCMG0103 MANAGEMENT PROCESSES AND ORGANIZATIONAL BEHAVIOR

<i>Pre - requisites</i>	<i>Course Type</i>	<i>Credits</i>
<i>Nil</i>	<i>Theory</i>	<i>2</i>

Course Objectives:

Management as a subject of study has brought a new paradigm in managing organizations. The young professionals has to learn and reflect the basic principles of management. Along with it the knowledge of Individual and group behaviour and its impact at the workplace is vital. Organizational Behavior (OB) is a field of study that investigates the impact that individuals, groups, and structure have on behavior within an organization. Then it applies that knowledge to make organizations work more effectively. This course will expose students to gain knowledge on the basic principles of management and organization behavior.

Course Introduction

Management as a subject of study has brought a new paradigm in managing organizations. The young professionals has to learn and reflect the basic principles of management. Along with it the knowledge of Individual and group behaviour and its impact at the workplace is vital. Organizational Behavior (OB) is a field of study that investigates the impact that individuals, groups, and structure have on behavior within an organization. Then it applies that knowledge to make organizations work more effectively. This course will expose students to gain knowledge on the basic principles of management and organization behavior.

Course Content

Unit: I

Emergence of Management as a discipline, Principles of management, (Planning, organizing, staffing and controlling) Contributions to management by Luther Gullick , Henri Fayol and Peter F. Drucker and Introduction: Concept and models of OB, Approaches to OB (Systems, Human resource and Contingency)

Unit: II

Individual System: Learning, Perception, Personality and Motivation,

Unit: III

Social System: Group Dynamics and Leadership.

Books Recommended:

1. Robins & Sanghii; Organizational Behavior, Pearson
2. Luthans ,F; Organizational Behavior-TMH
3. Udai Pareek ; Understanding Organizational Behavior, Oxford
4. Prasad,L.M; Organization behavior, S.Chand.
5. K. Aswathappa; Organization behaviour
6. Prasad.L.M ; Principles of Management,

FCMG0104 PRODUCTION AND OPERATION MANAGEMENT

<i>Pre - requisites</i>	<i>Course Type</i>	<i>Credits</i>
<i>Nil</i>	<i>Theory</i>	<i>2</i>

Course Objective:

The course is designed to acquaint the students with decision making in production and operation function of an organization.

Course Outcomes :

- ✓ Acquire a working understanding of the roles/functions of production management in the context of business enterprise.
- ✓ The learner will have a deep knowledge of the fundamental theory and mathematical principles involved in Production and Operation Management.
- ✓ They can use specialized knowledge in Operations Management to solve business processes.
- ✓ They will be capable of applying these principles to solve relevant production or service system problems.

Module 1:

Operations Management- An Introduction : Primary topics in Operations Management, Operations Function and Transformation process . Manufacturing Strategy and Mass customization, Product Development and Service Design , New Product design, Product life cycle, Process design, Process life cycle

Module 2:

Project scheduling Models: Project Network, Critical path Method (CPM), Programme Evaluation Review Technique (PERT).

Scheduling: Objective of Scheduling, Sequencing, Sequencing model: "n" jobs 1 machine, "n" jobs 2 machines.

Module 3:

Inventory Management: Concept of inventory with independent demand: Inventory cost structure, Deterministic inventory model - EOQ models, instantaneous receipt, Inventory model with discounts.

Module 4:

Quality Management: Concept of quality; Quality of design, Conformance & performance; Cost of poor process performance and quality. Statistical Quality Control - Process Control (X-bar, R & P chart, np chart).

Concept of TQM, Just in Time and Lean Production Basic element in JIT, Pull system, Push system

Books Recommended:

- 1) Chase, Jacobs, Aquilano, Agarwal, - "Operations Management", TMH
- 2) Krajewski, Ritzman, Kansal, - "Operations Management", Pearson
- 3) Everette. Adam Jr., Ronald J. Ebert, - "Production and Operations Management", PHI
- 4) Roberta S. Russell & Bernard W. Taylor III, - "Operations Management", Pearson/ PHI
- 5) Aswathappa & Sridhar Bhat, - "Production and Operations Management", HPH
- 6) Gaither, Frazier- Operations Management

FCMG0105 MARKETING MANAGEMENT

<i>Pre - requisites</i>	<i>Course Type</i>	<i>Credits</i>
<i>Nil</i>	<i>Theory</i>	<i>2</i>

Course Objective:

- a) To familiarize the students with the concepts and theories and strategies of marketing.
- b) To focus on the application of these concepts to various marketing contexts
- c) To focus on the emerging areas of marketing

Course outcomes :

- ✓ The students will understand the various marketing approach in today's competitive scenario.
- ✓ The students will learn the application of various marketing tools for solving business problems

The students will acquire and develop the marketing skills to be a successful marketing person

Module 1:

Introduction to marketing; What is marketing?, Importance of marketing function, Process of marketing, Concepts like need, want, value, satisfaction etc, Elementary idea of marketing mix. Understanding Marketing Environment; Factors affecting marketing environment (PESTEL),Porter’s five forces model, Introduction to market research

Module 2:

Segmentation, Targeting & positioning (STP);What is market segmentation?, Criteria for effective segmentation, Targeting selected markets, Targeting strategies, Positioning , Effective positioning strategies, Positioning of brands and repositioning ,introduction to consumer behavior.

Module 3:

Product Management; Classification of products, Product life cycle (PLC), Brand and branding. Pricing; Meaning & objective, steps in setting the price, pricing policies. Promotion; What is promotion, types of promotion, advertising, sales promotion, integrated marketing communication Place; Marketing channels, Channel conflict management, Distribution system. Introduction to services marketing, Emerging concepts like green marketing, e-marketing & social marketing.

Books Recommended:

1. *Marketing Management: A South Asian Perspective- Phillip Kotler, Kevin Lane Keller, Abraham Koshy and MithileshwarJha, 13th Edition Pearson, Education Publication*
2. *Marketing Mangement: Fourth edition- RajanSaxena*
3. *Positioning: The Battle for Your Mind- Al Ries& Jack Trout, Warner Books USA*

FCMG0108 INTRODUCTION TO RESEARCH

<i>Pre - requisites</i>	<i>Course Type</i>	<i>Credits</i>
<i>Nil</i>	<i>Theory</i>	<i>2</i>

Course Objectives:

1. *To introduce the students about research, methods and techniques.*
2. *To understand the process and apply in other areas.*

Course outcome:

1. *Students will be able to understand the process of doing a research.*
2. *Students will be able to write a research report.*

Course Contents:

Module: I Science and Social Science as Knowledge

Common sense view of Science, Seeing is believing?, Visual Experiences, Relevant Facts, Facts precede theory, Observation, Experiment as an adequate basis of Science, Deductive and inductive logic, falsification-A logical view,

Module: II Process of doing Research

Overview: Problem Definition, hypothesis and its function, Types of Research, Literature Review, Research Design, *Sampling:* Census and sample survey, different types of sample design, *Measurement:* Measurement and scaling techniques, *Methods of Data Collections:* Experimentation,

observation, interview, Survey, case study; *Data Analysis and Interpretation*: Qualitative and quantitative data, data presentation, central tendency and dispersion, association, test of significance.

Module: III Report Writing and Presentation

Significance of report writing, different steps in report writing, layout of research report & Types of Report, Presentation, Ethics in Report Writing.

Books Recommended

1. Ranjit Kumar, 2011, *Research Methodology: A Step by Step Guide*, Sage South Asia Publication.

FCMG0113 INDIAN SOCIETY AND CULTURE

<i>Pre - requisites</i>	<i>Course Type</i>	<i>Credits</i>
<i>Nil</i>	<i>Theory</i>	<i>2</i>

Course Objectives:

- a) Develop an understanding social environment
- b) Develop an understanding of cultural environment
- c) Understanding the linkages among social, cultural and business environment

Course outcomes :

- Students would develop an idea about the socio-cultural environment in which they would be working as scientists, researchers and entrepreneurs.
- More specifically, they would get an appreciation of how societal and cultural issues interface with technology and science in the context of overall development of the country.
- Attempt is also made to familiarise students with the science and technology policies that would benefit modern India.

Course Contents:

Module 1: Introduction to Indian Society

Indian Society - Roots of Indian Society , Social Structure – Rural and Urban Contexts, Social Institutions in Indian Society, Caste, Tribe, Dalits and Other Excluded Groups, Power and Conflicts

Module 2: Introduction to Culture in Indian Society

Culture in Ancient, Medieval and Modern India, Languages and Literature in India, Culture Change and its Impact on Indian Society

Module 3: Social Movements

Reformers and Radicals – Rammohan Roy, Syed Ahmed Khan, JotiroPhule, Gopal Krishna Gokhale, BalGangadharTilak, TarabaiShinde, DayanandaSaraswati and Vivekananda Nurturing a Nation – M. K. Gandhi, RabindraNath Tagore, B R Ambedkar, Mohammad Ali Jinnah, EV Ramaswami, Jawaharlal Nehru, RammanoharLohia, Jayaprakash Narayan, Verrier Elwin Peasant, Tribal, Women and Environment movement

Module 4: Social Issues in Modern India

Poverty, Gender Inequality, Disparity and Social Exclusion: SC, ST, Women, Child, Challenged

Module 5: Science, Technology and Society

Science, Technology and Development Linkage, Appropriate Technology, Science and Technology Policy

Books Recommended:

1. *Indian Society and Culture: Continuity and Change* – by N. Hasnain
2. *Social and Cultural History of India* – O.M. Prakash
3. *Makers of Modern India* – RamachandraGuha

FCMG1201 DISASTER MANAGEMENT

<i>Pre - requisites</i>	<i>Course Type</i>	<i>Credits</i>
<i>Nil</i>	<i>Theory</i>	<i>2</i>

**B. Tech BASKET- III
(2017)
Course Structure**

Course Code	Course Title	Course Type	Credits	Prerequisite	Department offering
ENFC0105	Introduction to Aerospace Engineering(NEW)	Theory	3	Nil	
ENFC0102	Material Sciences(NEW)	Theory	3	Nil	ME
FCEN0101	Chemical Process Calculations	Theory	3	FCEN0402 Industrial Chemistry	Chemical
FCEN0102	Basic Electronics	Theory	3	Nil	ECE
FCEN0103	Signals & Systems	Theory	3	Nil	ECE
FCEN0104	Digital Electronic Circuits	Theory	3	Nil	ECE
FCEN0105	Basic Electrical Engineering	Theory	3	Nil	EEE
FCEN0106	Electrical Machines – I	Theory	3	Nil	EEE
FCEN 0107	Analog and Digital Electronics	Theory	3	Nil	EEE
FCEN0108	Workshop Technology	Theory	3	Nil	Mechanical
FCEN0109	Engineering Mechanics	Theory	3	Nil	Mechanical
FCEN0110	Thermal Engineering	Theory	3	Nil	Mechanical
FCEN0111	Earth System Science	Theory	3	Nil	Mining
FCEN0112	Introduction to Mining	Theory	3	Nil	Mining
FCEN0113	Mine Development	Theory	3	Nil	Mining
FCEN0114	Mine Surveying I	Theory	3	Nil	Mining
FCEN0115	Introduction to Biotechnology	Theory	3	Nil	Biotech
FCEN0116	Introduction to Biophysics	Theory	3	Nil	Biotech
FCEN0117	Biosafety, bioethics, IPR and Patents	Theory	2	Nil	Biotech
FCEN0118	Computer Fundamental and Organization	Theory	3	Nil	CSE (MACT & CTIS)
FCEN0119	Operating System Building Blocks	Theory	3	Nil	CSE (MACT & CTIS)

Practice Courses

Course Code	Course Title	Course Type	Credits	Prerequisite	Department offering
ENFC0208	Aerodynamics Laboratory(New)	Practice	2	Nil	Aerospace
ENFC0203	Introduction to Robotics(New)	Practice	2	Nil	ME
FCEN0201	Introduction to Internet Technology	Practice	3	Nil	CSE
FCEN0202	Basic Electronics Laboratory	Practice	2	Nil	ECE
FCEN0203	Signals and Systems Laboratory	Practice	2	Nil	ECE
FCEN0204	Digital Electronic Circuits Laboratory	Practice	2	Nil	ECE
FCEN0205	Electronics Workshop – I	Practice	2	Nil	ECE
FCEN0206	Basic Electrical Engineering Lab	Practice	2	FCEN0105 Basic Electrical Engineering (C-orequisite)	EEE
FCEN0207	Electrical Workshop Practice	Practice	2	Nil	EEE
FCEN0208	Basic Electrical Simulation Lab	Practice	2	Nil	EEE
FCEN0209	Electrical Machines-I Lab	Practice	2	FCEN0106 Electrical Machines - I (Corequisite)	EEE
FCEN0210	Analog and Digital Electronics Lab	Practice	2	Nil	EEE
FCEN0211	Automation Lab (PLC)	Practice	2	FCEN0102 Basic Electronics	EEE
FCEN0212	Geometric Drawing	Practice	2	Nil	Mechanical
FCEN 0213	Workshop Technology Practice	Practice	2	Nil	Mechanical
FCEN0214	Mining Surveying	Practice	2	Nil	Mining
ENFC0207	Mobile App. Development for Android(New)	Practice	2	Nil	CSE

Project Courses

Course Code	Course Title	Course Type	Credits	Prerequisite	Department offering
FCEN0304	Electrical Load Survey	Project	2	Nil	EEE

Theory cum Practice Courses

Course Code	Course Title	Course Type	Credits	Prerequisite	Department offering
ENFC0401	Engineering Metrology and Measurements(New)	Theory+ Practice	3	Nil	ME
FCEN0401	Basic Fluid Mechanics	Theory + Pract	5	Nil	Civil
FCEN0402	Introduction to Programming in C	Theory + Pract	5	Nil	CSE
FCEN0403	Object Oriented Programming Using C++	Theory + Pract	5	Nil	CSE
FCEN0404	Database Management System	Theory + Pract	5	Nil	CSE
FCEN0405	Mechanical Unit Operations	Theory + Pract	5	Nil	Chemical
FCEN0406	Building Materials & Construction	Theory + Pract	4	Nil	Civil
FCEN0407	Basic Surveying	Theory + Pract	4	Nil	Civil
FCEN0408	Principles of Biochemistry	Theory + Pract	5	Nil	Biotech
FCEN0409	Cell Biology	Theory + Pract	5	Nil	Biotech
FCEN0410	Introduction to Web Technology	Theory + Pract	4	Nil	CSE-CTIS
FCEN0411	Data Structures and algorithms	Theory+ pract	4	Nil	CSE (MACT & CTIS)
FCEN0412	Designing enterprise network	Theory+ pract	5	Nil	CSE (MACT & CTIS)
FCEN0413	Installation and configuration of Linux desktop	Theory+ pract	4	Nil	CSE-MACT
FCEN0414	Information Security – I	Theory+ pract	4	Nil	CSE-CTIS
ENFC0411	Python Programming(New)	Theory+	3	Nil	CSE

		<i>Pract</i>			
<i>ENFC0417</i>	<i>Sensors & IOT(New)</i>	<i>Theory + Pract</i>	<i>3</i>	<i>Nil</i>	<i>ECE</i>
<i>ENFC0412</i>	<i>Programming for Problem solving – Java(New)</i>	<i>Theory + Pract</i>	<i>3</i>	<i>Nil</i>	<i>CSE</i>

Project cum Practice Courses

Course Code	Course Title	Course Type	Credits	Prerequisite	Department offering
<i>ENFC0601</i>	<i>Product Development(New)</i>	<i>Practice + Project</i>	<i>3</i>	<i>Nil</i>	<i>ME</i>
<i>FCEN0603</i>	<i>Electrical Circuit Drawing (AutoCAD)</i>	<i>Pract.+ Proj.</i>	<i>2</i>	<i>Nil</i>	<i>EEE</i>
<i>ENFC1401</i>	<i>Programming Internet of Things(New)</i>	<i>Workshop</i>	<i>2</i>	<i>Nil</i>	<i>CSE</i>
<i>ENFC1402</i>	<i>Build Your Own Computer(New)</i>	<i>Workshop</i>	<i>2</i>	<i>Nil</i>	<i>CSE</i>
<i>ENFC1403</i>	<i>Cloud Computing Applications(New)</i>	<i>Workshop</i>	<i>2</i>	<i>Nil</i>	<i>CSE</i>
<i>ENFC1404</i>	<i>Software Development Methodologies(New)</i>	<i>Workshop</i>	<i>2</i>	<i>Programming Basics</i>	<i>CSE</i>

SYLLABUS

Introduction to Aerospace Engineering

Subject Name	Code	Type of course	T-P-P (Credit)	Prerequisite
Introduction to Aerospace Engineering	ENFC0105	Theory	3-0-0(3)	Nil

1. Objective

- ✓ To familiarize with the Basic Concepts of Flying, Aircraft Structures, Systems, Instruments and Power Plants used in Airplanes.

2. Course Outcome

- ✓ To Identify the Component of Flight and Suitable Materials for Aircraft Structure.
- ✓ To Perform Basic Calculation on Mechanics using Newton Law for Lift, Drag and Moment.

3. Evaluation Systems

Internal Examination	Component	% of Marks	Method of Assessment
	Midterm Test	30	Written examination
	Assignment	5	Submission of assignment
	Learning record	5	Report and presentation
External Examination		60	Written examination
Total		100	

4. Course Outline

Module I (08 Hrs)

History of Flight: Early flying vehicles by Wright brothers, hot air balloons, Classification of flight vehicles, biplanes and monoplanes, developments in aerodynamics airplanes and Helicopters, Components of an airplane and their functions.

Module II (06 Hrs)

Basics of Aeronautics: Physical properties and structure of the atmosphere, temperature, pressure and altitude relationships.

Module III(08 Hrs)

Newton's law of motions applied to aeronautics - evolution of lift, drag and moment. aerofoils, mach number, subsonic, transonic, supersonic, hypersonic flows.

Module IV(06 Hrs)

Airplane Structures and Materials: General types of construction, monocoque and semi-monocoque constructions, typical wing and fuselage structure.

Module V (06 Hrs)

Airplane Structures and Materials: Materials used in aircraft metallic and non-metallic materials, use of aluminium alloy, titanium, stainless steel and composite materials.

Module VI (06 Hrs)

Systems and Instruments: Conventional control, Powered controls, Basic instruments for flying, typical systems for control actuation.

Module VII(08 Hrs)

Power Plants: Basic ideas about piston, turboprop and jet engines - use of propeller and jets for thrust production - comparative merits, principles of operation of rocket, types of rockets and typical applications, exploration into space.

References

Text Books:

1. J.D. Anderson, Introduction to Flight, McGraw Hill
2. A.C. Kermode, Mechanics of Flight, Himalayan Book

Reference Books:

1. E.H.J. Pallet, Aircraft Instruments & Principles, Pitman & Co

Online Source: NPTEL, You tube

Material Sciences

Subject Name	Code	Type of course	T-P-P (Credit)	Prerequisite
Material Sciences	ENFC0102	Theory	3-0-0(3)	Nil

1. Objective

- To study classification and properties of materials used in day to day life
- To understand the material application and it's need.

2. Course Outcome

- Students will able to identify materials for engineering use.
- Students will able to select best materials for a specific design and production.

3. Evaluation Systems

Internal Examination	Component	% of Marks	Method of Assessment
	Midterm/Class Test	30	Written Examination
	Assignment-2	05	Report and Presentation
	Learning Record	05	Report
External Examination		60	Written Examination
Total		100	

4. Course Outline

Module I (8 Hrs)

Steel, Stainless Steel & Types, HSLA Steels, Dual Phase Steels, Tool and Die Steels. Nonferrous Alloys- Aluminium & Alloys, Copper & Alloys, Zinc & alloys, Nickel & Alloys , Magnesium Alloys, Titanium Alloys, Super Alloys.

Module II (7 Hrs)

Polymer- Thermosetting, Thermoplastics; Elastomers- Natural & Synthetic Rubber; Composites Material- Classification Based on Matrix and Topology, Particle Reinforced Composites, Fiber Reinforced Composites. Structural Composites, Constituents of Composites, MMC, PMC and FRP. Ceramic Composites, Geosynthetics, Pre-stressed Hollow Concrete Panel, Carbon Composites Fullerenes, C64, Bucky Ball Structures, Graphene.

Module III (5 Hrs)

Prefabricated Materials:Types and Applications, Autoclaved Aerated Concrete (AAC), Cellular Lightweight Concrete (CLC).

Module IV (8 Hrs)

Electrical & Magnetic Materials: Classifications, Properties, Advantages & Applications, Photo Voltaic Material, Dielectric Materials.

Module V (6 Hrs)

Solar Cell and Super Conductivity, Ferro Electricity, Electro-active Polymers, Piezoelectric Material , Magneto Electric Materials, Electrorheological Fluids.

Module VI (6 Hrs)

Fiber Optic Sensors, Photoconductivity; Introduction to Nano-materials, CNTs Production Process and Uses, Fibers Production and Uses.

Module VII (8Hrs)

Smart Material, Shape Memory Alloys, Piezoelectric Ceramics, Biomaterials, Bioactive Glass & Ceramic, Polymer & Composite, UHTC, Soft Materials, Energy Materials.

Text Books:

1. Materials Science and Engineering, W D Callister, 2014, 2nd Edition, Wiley India Private Limited, India.

Reference Books:

1. Material Science and Engineering, V Raghavan, 2013, 5th Edition, PHI publication, India.
2. Material Science and Engineering, S Chawla, 2011, 1st Edition, Dhanpat Rai & co Private Ltd., India.

1. Session Plan

Topic coverage and Internal Test	No. of Sessions (in hrs.)	Activity (lecture, tutorial, lab practice, field studies/field -trip, Workshop etc.)	Assignment (Project, assignment, field study, seminar, etc.)	Suggested Reading (Book, Video, Online source, etc.)

Module I

Steel	01	Lecture	field study	<ol style="list-style-type: none"> 1. nptel.ac.in/courses/113104059/lecture_pdf/Lecture%201.pdf 2. Materials Science and Engineering, W D Callister, 2014, 2nd Edition, Wiley India Private Limited, India. 3. https://www.youtube.com/watch?v=917JqonyoKA https://www.youtube.com/watch?v=sc24cSZJQcg 4. https://www.youtube.com/watch?v=hTw9LVMBLns
Stainless Steel & Types	01	Lecture	field study	<ol style="list-style-type: none"> 1. https://en.wikipedia.org/wiki/Stainless_steel 2. Materials Science and Engineering, W D Callister, 2014, 2nd Edition, Wiley India Private Limited, India. 3. http://nptel.ac.in/courses/113104059/
HSLA Steels, Dual Phase steels	01	Lecture		<ol style="list-style-type: none"> 1. https://www.metalsupermarkets.com/what-is-hsla-steel/ 2. https://en.wikipedia.org/wiki/High-strength_low-alloy_steel 3. https://mme.iitm.ac.in/vsarma/mm5025/TRIP-DP-TWP-Notes.pdf 4. https://www.worldautosteel.org/steel-basics/steel-types/dual-phase-dp-steels/
Tool and Die Steels	01			<ol style="list-style-type: none"> 1. https://www.hitachi-metals.co.jp/e/products/auto/ml/pdf/yss_tool_steels_d.pdf 2. http://www.substech.com/dokuwiki/doku.php?id=tool_and_die_steels
Aluminium & Alloys	01	Lecture		<ol style="list-style-type: none"> 1. https://materialsdata.nist.gov/.../Aluminum%20and%20Aluminum%20Alloys%20Davis 2. nptel.ac.in/.../16%20-%20Properties%20and%20Applications%20of%20Materials.pdf 3. nptel.ac.in/courses/112104203/12 4. Raghavan, V, Material science and Engineering, 2013, 5th Edition, PHI publication, India.
Copper & Alloys	02	Lecture		<ol style="list-style-type: none"> 1. Material science and Engineering, V Raghavan, 2013, 5th Edition, PHI publication, India.

				2. nptel.ac.in/courses/103106109/.../Lecture%202%20Material%20of%20construction.pdf .
Magnesium Alloys, Titanium Alloys, Super Alloys	01	Lecture		<ol style="list-style-type: none"> 1. W D Callister, Materials Science and Engineering, 2014, 2nd Edition, Wiley India Private Limited, India. 2. https://www.sciencedirect.com/topics/materials-science/aluminum-magnesium-alloys 3. https://uknowledge.uky.edu/cgi/viewcontent.cgi?article=1036&context=cme_etds 4. nptel.ac.in/courses/113105057/25 5. http://megamex.com/superalloys.html
Module II				
Polymer-Thermosetting, Thermoplastics	02	Lecture	field study	<ol style="list-style-type: none"> 1. nptel.ac.in/courses/112107086/13 2. nptel.ac.in/courses/112104229/15 3. W D Callister, Materials Science and Engineering, 2014, 2nd Edition, Wiley India Private Limited, India.
Elastomers-Natural & Synthetic Rubber	01	Lecture		1. W D Callister, Materials Science and Engineering, 2014, 2nd Edition, Wiley India Private Limited, India.
Classification based on matrix and topology, Particle Reinforced Composites, Fiber Reinforced Composites	01	Lecture		<ol style="list-style-type: none"> 1. W D Callister, Materials Science and Engineering, 2014, 2nd Edition, Wiley India Private Limited, India. 2. https://onlinecourses.nptel.ac.in/noc18_me03 3. nptel.ac.in/downloads/112104168 4. http://nptel.ac.in/courses/101104010
Structural Composites, Constituents of Composites	01	Lecture		1. nptel.ac.in/courses/112108150/pdf/PPTs/MTS_12_m.pdf
MMC, PMC and FRP	01	Lecture	field study	<ol style="list-style-type: none"> 1. http://nptel.ac.in/courses/112107086/22 2. http://nptel.ac.in/courses/113105028/32
Ceramic Composites, Geosynthetics,	01	Lecture	field study	<ol style="list-style-type: none"> 1. nptel.ac.in/courses/112107085/module6/lecture6/lecture6.pdf 2. nptel.ac.in/courses/112104122/22

Pre-stressed Hollow Concrete Panel, Carbon Composites Fullerenes, C60, Bucky ball Structures, Grapheme				
Module -III				
Prefabricated Materials: Types and Applications	02	Lecture	field study	<ol style="list-style-type: none"> 1. https://www.youtube.com/watch?v=ixNre1dGyp0 2. http://www.hollowcore.com.au/ 3. https://en.wikipedia.org/wiki/Fullerene
Autoclaved Aerated Concrete (AAC), Cellular Lightweight Concrete (CLC).	03	Lecture	field study	<ol style="list-style-type: none"> 1. https://www.cogentoa.com/article/10.1080/23312009.2015.1026638.pdf 2. www.understandingnano.com/what-is-buckyball-c60.html 3. https://en.wikipedia.org/wiki/Autoclaved_aerated_concrete 4. textofvideo.nptel.ac.in/105102012/lec41.pdf 5. nptel.ac.in/courses/105102088/27 6. https://www.youtube.com/watch?v=uwbFxUXG2cM
Module IV				
Electrical & Magnetic Materials: Classifications, Properties, Advantages & Applications, Dielectric Materials	08	Lecture		<ol style="list-style-type: none"> 1. nptel.ac.in/courses/115104088/42 2. V Raghavan, Material science and Engineering, 2013, 5th Edition, PHI publication, India.
Module V				
Photo Voltaic Material, Semi conductivity, Solar Cell and Super Conductivity	03	Lecture	field study	<ol style="list-style-type: none"> 1. nptel.ac.in/courses/113106062/Lec19.pdf 2. nptel.ac.in/courses/113105025/40 3. nptel.ac.in/courses/113104012/34
Ferro electricity, Electro-active polymers	01	Lecture		<ol style="list-style-type: none"> 1. https://en.wikipedia.org/wiki/Electroactive_polymers 2. https://www.azom.com/article.aspx?ArticleID=13516

Piezoelectric Material , Magneto Electric Materials, Electrorheological Fluids	02	Lecture		1.nptel.ac.in/courses/113104005/69 2.nptel.ac.in/courses/112107088/module1/lecture28/lecture28.pdf
Module -VI				
Fiber optic Sensors, Photoconductivity	02	Lecture	field study	1. nptel.ac.in/courses/112104158/lecture39.pdf 2. https://onlinecourses.nptel.ac.in/noc18_ph06
Introduction to Nano-Materials, CNTs Production Process and Uses	02	Lecture	field study	1. http://www.nptel.ac.in/courses/103103033/38 2.nptel.ac.in/courses/118104008/ 3.nptel.ac.in/courses/103103026/42 4. https://www.cheaptubes.com/carbon-nanotubes-history-and-production-methods-2/ https://www.youtube.com/watch?v=CuqS8GSpC-4
Fiber Production and Uses.	02	Lecture	field study	1. https://www.youtube.com/watch?v=IIvveb58PCo
Module -VII				
Smart Material, Shape Memory Alloys	02	Lecture		1. nptel.ac.in/courses/112104173/Mod_1_smart_mat Lec_5.pdf 2.W D Callister, Materials Science and Engineering, 2014, 2nd Edition, Wiley India Private Limited, India.
Piezoelectric Ceramics	02	Lecture		1. https://www.youtube.com/watch?v=qXLStQQxHzU
Biomaterials, Bioactive glass & Ceramic, Polymer & Composite	02	Lecture		1. https://www.youtube.com/watch?v=XqFSIG6WKO0 2. https://www.youtube.com/watch?v=yZKdFVAJcrE 3. https://www.youtube.com/watch?v=s5mDUrF8YuQ
UHTC	01	Lecture		1. https://www.youtube.com/watch?v=A-pd3ia8Y4g 2. https://www.youtube.com/watch?v=XIIkWh1nYQ 3.ceramics.org/wp-content/uploads/2011/08/applications-uhtc-johnson.pdf 4. https://en.wikipedia.org/wiki/Ultra-high-temperature_ceramics

Soft Materials, Energy Materials	01	Lecture		1. https://www.youtube.com/watch?v=HdwFkEV8dek 2. https://www.youtube.com/watch?v=Od4g5kcWsu0 3. https://www.youtube.com/watch?v=IipCijBHeQ https://www.youtube.com/watch?v=f5RwX_plgw
Total	48 Hrs			

FCEN0101CHEMICAL PROCESS CALCULATIONS

<i>Pre – requisites</i>	<i>L+T+P</i>	<i>Credits</i>
<i>FCBS0402 Industrial Chemistry</i>	3+1 + 0	3

OBJECTIVE:

To teach concept of degree of freedom and its application to solution of mass and energy balance equations for single and network of units and introduce to process simulators.

OUTCOME:

This course gives an idea to the students, an introduction to chemical engineering calculations, establish mathematical methodologies for the computation of material balances, energy balances and to present an overview of industrial chemical processes.

Module I

BASIC CHEMICAL CALCULATIONS

Units and Dimensions - Basic and derived units –Use of model units in calculations – Methods of expression –Compositions of mixture and solutions. Gas Calculations Ideal and real gas laws –Gas constant –Calculations of pressure, volume and temperature using ideal gas law –Use of partial pressure and pure component volume in gas calculations –Applications of real gas relationship in gas calculation.

MATERIAL BALANCE

Stoichiometric principles –Application of material balance to unit operations like distillation – Evaporation, crystallisation, drying etc., –Material balance with chemical reaction –Limiting and excess reactants –Recycle –Bypass and purging –Unsteady state material balances.

Module II

HUMIDITY AND SATURATION

Properties of atmospheric air –Humidity of air –Calculation of absolute humidity, molal humidity, relative

humidity and percentage humidity –Use of humidity in condensation and drying –Psychrometric

chart, dew point –Wet and dry bulb thermometry. FUELS AND

COMBUSTION

Determination of composition by Orsat analysis of products of combustion of solid, liquid and gas fuels –Calculation of excess air from Orsat technique, problems on sulphur and sulphur burning compounds –Theoretical flame temperature.

Module III

ENERGY BALANCE

Thermo Physics Heat capacity of solids, liquids, gases and solutions –Use of mean heat capacity in heat calculations –Problems involving sensible heat and latent heats –Evaluation of enthalpy. Thermo Chemistry Standard heat of reaction, heats of formation, combustion, solution, mixing etc.,

–Calculation of standard heat of reaction –Effect of pressure and temperature on heat of reaction –Energy balance for systems with and without chemical reaction –Unsteady state energy balances.

TEXT BOOKS:

2. Bhatt, B.I. and Vora, S. M., "Stoichiometry", 4th Editio
3. Hougen, O.A., Watson, K.M. and Ragatz, R.A., "Chemical Process Principles", Vol. I, CBS Publishers & Distributors, 1995.

REFERENCES:

1. Venkataramani, V. and Anantharaman, N., "Process calculations",
2. Himmelblau, D., "Basic Principles and Calculations in Ch
3. Chohey, N.P. and Hicks, Engineering T.G., "Handbook Calculations", Edition, McGraw of Hill Chemical Inc. 1984.2
4. K.V.Narayanan, B.Lakshmi pathy, "Stoichiometry and Process C

FCEN0102 BASIC ELECTRONICS

<i>Pre - requisites</i>	<i>L+T+P</i>	<i>Credits</i>
<i>Nil</i>	<i>3+1 + 0</i>	<i>3</i>

Course Objectives: The objectives of this subject are to
Learn Fundamentals of electronic devices.
Design and Applications of electronic circuits.

Course Outcomes:

Upon successful completion of this subject, students should be able to:
Identify the applications and functions of electronics in Engineering.
Recognize basic electronic components and devices used for different electronic functions.
Use basic techniques for analyzing analogue and digital electronic circuits.
Design analogue and digital electronic circuits at block level.
Manage the tools in a basic electronics laboratory and use electronic simulation.

Module-1 (15 Hours) Semiconductor Physics and Junction Diode

Characteristics:

Various properties of Conductor, Semiconductor & Insulator, n and p –type semiconductors, Mass Action Law, Continuity Equation, Hall Effect, Comparison of Si & Ge Semiconductor, Fermi level in intrinsic and extrinsic semiconductors, Open-circuited, forward bias & reverse bias of p-n junction diode, Energy band diagram of PN diode, Drift & Diffusion Current, Mobility & Conductivity, Diode equation, Volt-ampere characteristics of p-n diode, Temperature dependence of VI characteristic, Transition and Diffusion capacitances, Breakdown Mechanisms in Semiconductor (Avalanche and Zener breakdown), Zener diode characteristics, Characteristics of Tunnel Diode with the help of energy band diagrams, Varactor Diode, LED And photo diode, **(topics will be delivered through Class room teaching + Hands on Practice based experiments)**

Module- II (12 Hours) Rectifiers, Filters and Regulators:

Half wave rectifier, ripple factor, full wave rectifier, Application of p-n diode as clipper, clamper. Types of filter, Inductor filter, Capacitor filter, L- section filter, PI- section filter, Multiple L- section and Multiple PI-section filter. Simple circuit of a regulator using Zener diode, Series and Shunt voltage regulators. **topics will be delivered through Class room teaching + Hands on Practice based experiments)**

Module- III (15 Hours) BJT and FET Characteristics:

Bipolar Junction Transistor, Types, Construction & study of currents in a Transistor, Input and Output characteristics of transistor in Common Base(CB), Common Emitter(CE), and Common collector(CC) configurations, comparison of CE, CB, CC transistor configuration, Relation between Alpha, Beta & Gamma, JFET characteristics (Qualitative and Quantitative discussion), , MOSFET characteristics (Enhancement and depletion mode), Symbols of MOSFET, Introduction to SCR and UJT, Thermal run away, Thermal stability, (**topics will be delivered through Class room teaching + Hands on Practice based experiments)**)

Text Books:

1. *Electronic Devices and Circuits*–J.Millman, C.C.Halkias, and Satyabratha Jit Tata McGraw Hill, 2nd Ed., 2007.
2. *Electronic Devices and Circuits* –R.L. Boylestad and Louis Nashelsky, Pearson/Prentice Hall, 9th Edition, 2006.

Reference Books:

1. *Electronic Devices and Circuits* –T.F. Bogart Jr., J.S.Beasley and G.Rico, Pearson Education, 6th edition, 2004.
2. *Principles of Electronic Circuits* –S.G.Burns and P.R.Bond, Galgotia Publications, 2nd Edn., 1998.
3. *Microelectronics*–Millman and Grabel, Tata McGraw Hill, 1988.
4. *Electronic Devices and Circuits* –Dr. K. Lal Kishore, B.S. Publications, 2nd Edition, 2005.
5. *Electronic Devices and Circuits*- Prof GS N Raju I K International Publishing House Pvt .Ltd 2006

Module I

S. NO.	Topic	Pedagogy	Details	Instructional Hrs			
				Theory	Practice	video	Project
1	Review of semi conductor Physics –n and p –type semi conductors (Text Book 1: 1.1, 1.2, 1.3)	CRT	Chalk & talk	1	0	0	0
2	Mass Action Law, Continuity Equation	CRT	PPT mode	2	0	0	0
3	Hall Effect, Fermi level in intrinsic and extrinsic semiconductors Physical operation of p-n junction Diodes	CRT	Chalk & talk	2	0	0	0
4	Terminal Characteristics of Junction Diodes (The Forward Bias Region, The Reverse Bias Region, The Breakdown Region) (Text Book 1: 3.2)	CRT	PPT mode	1	0	0	0
5	The current components in p-n diode, Law of junction, Diode equation (Text Book 1: 3.5)	CRT	PPT mode	2	0	0	0
6	Volt-ampere characteristics of p-n diode, Temperature dependence of VI characteristic, Transition and Diffusion capacitances, Step graded junction (Text Book 1: 3.6)	CRT+PR A	Component Level Design for	2	0	0	0
	Operation in the Reverse Breakdown Region Zener						

7	Diodes (Specifying and Modeling the Zener Diode, Use of the Zener as a Shunt Regulator, Temperature Effects, A Final Remark) (Text Book 1: 3.4)	CRT+PR A	Practice	1	0	0	0
8	Tunnel Diode, (Text Book 1: 3.8.3), Light-Emitting Diodes (LEDs) (Text Book 1: 3.8.4)	CRT	Chalk & talk	2	0	0	0
9	Varactor Diode, LED (Text Book 1: 3.8.5, 3.8.6)	CRT		1	0	0	0
10	LCD And photo diode (Text Book 1: 3.8.7,3.8.8)	CRT+PR A	Component Level Design for Practice	1	0	0	0
Module II		Sub total		15	0	0	0
11	Half wave rectifier, ripple factor (Text Book 1: 4.1,4.2)	CRT+PR A	Component Level Design for	3	0	0	0
12	Full wave rectifier, ripple factor (Text Book 1: 4.3,4.3)			3	0	0	0

13	Rectifier with Filters (Inductor filter ,Capacitor filter, L-section filter ,PI section filter), Multiple L-section and Multiple PI-section filter.		Practice	3	0	0	0
14	Simple circuit of a regulator using zener diode, Series and Shunt voltage regulators (Text Book 1: 4.11)			3	0	0	0
Module III		Sub total	12	0	0	0	0
15	Simplified Structure and Modes of Operation (Text Book 1: 5.1.1), Operation of npn transistor in the Active Mode (Text Book 1: 5.1.2), Operation of pnp transistor in the Active Mode (Text Book 1: 5.1.6)	CRT	PPT MODE	2	0	0	0
16	Current Voltage Characteristics (Circuit Symbols and Conventions, Graphical Representation of transistor characteristics (Text Book 1: 5.2)	CRT	PPT MODE	1	0	0	0
17	Dependence of i_c on the Collector Voltage- The Early Effect, The Common Emitter Characteristics, Transistor Breakdown (Text Book 1: 5.3)	CRT	Chalk & talk	2	0	0	0

Module III

S. No.	Topic	Pedagogy	Details	Instructional Hrs			
				Theory	Practice	video	Project
18	BJT as an amplifier and as a switch (Large Signal Operation –The Transfer Characteristic, Amplifier Gain, Graphical Analysis, Operation as a Switch) (Text Book 1: 5.3)	CRT+PR A	Component Level Design for Practice	2	0	0	0
19	Input and Output characteristics of transistor in Common Base(CB), Common Emitter(CE), and Common collector(CC) configurations,	CRT+PR A		2	0	0	0
20	Relation between Alpha, Beta and Gama (Text Book 1: 5.3)	CRT	PPT MODE	1			
21	MOSFET characteristics (Enhancement and depletion mode), Symbols of MOSFET	CRT+PR A	Component Level Design for Practice	2	0		
22	Comparison of Transistors (Text Book 1: 6.7)	CRT	Chalk & talk	1			
23	Introduction to SCR and UJT (Text Book 1: 7.2)	CRT		1			
24	Thermal run away, Thermal stability,	CRT		1			
				15	0	0	0

FCEN0103 SIGNALS AND SYSTEMS

<i>Pre – requisites</i>	<i>L+T+P</i>	<i>Credits</i>
<i>Nil</i>	3+ 0 + 0	3

Course Objectives:

The objectives of this subject are to

To introduce the student to the idea of signals, system analysis and its characterization.
To provide a foundation to numerous other courses that deal with signal and system concepts directly or indirectly: viz: communication, control, instrumentation etc.

Course Outcomes:

Upon successful completion of this subject, students should be able to:

Understand about various types of signals, classify them, analyze them, and perform various operations on them.

Understand about various types of systems, classify them, analyze them and understand their response behavior.

Appreciate use of transforms in analysis of signals and system. Carry simulation on signals and systems for observing effects of applying various properties and operations.

Create strong foundation of communication and signal processing to be studied in the subsequent semester.

Module –I (14+4 hours) Continuous-Time and Discrete-Time Signals and Systems:

Continuous and discrete time signals: Some Elementary Continuous-time and Discrete-Time signals. Classification of Signals –Periodic and a periodic even –odd –energy and power signals –Deterministic and random signals –Causal and non causal signals and anti causal signals -- complex exponential and sinusoidal signals ---Simple Manipulations of Continuous and discrete time signals. **(Topics will be covered through CRT & Practice)**

Continuous-Time Systems: Mathematical equation governing LTI Continuous-Time systems, Block diagram and signal flow graph representation, response of LTI Continuous-Time system in time domain, classification of Continuous-Time systems, convolution of Continuous-Time signals. **(Topics will be covered through CRT & Tutorial)**

Discrete-Time Systems: Input-Output Description, Block Diagram Representation, Classification, Interconnection; Analysis of Discrete-Time LTI Systems: Techniques, Response of LTI Systems, Properties of Convolution, Causal LTI Systems, Stability of LTI Systems; Discrete-Time Systems Described by Difference Equations; Implementation of Discrete-Time Systems; Correlation of Discrete-Time Signals: Cross correlation and Autocorrelation Sequences, Properties. **(Topics will be covered through CRT & Tutorial)**

Module –II (09 Hours) The Continuous-Time Fourier Series:

Basic Concepts and Development of the Fourier Series, Calculation of the Fourier Series, Properties of the Fourier Series. **(Topics will be covered through CRT & Tutorial)** The Continuous-Time Fourier Transform:

Basic Concepts and Development of the Fourier Transform, Properties of the Continuous-Time Fourier Transform. **(Topics will be covered through CRT & Tutorial)**

Discrete time Fourier transform(DTFT) :The discrete time Fourier transform of Aperiodic signal, Convergence of Fourier transform, the Fourier transform of signal with poles on unit circle, frequency domain and time domain signal properties,properties of DTFT **(Topics will be covered through CRT & Tutorial)**

Module- III

(15 Hours)

The Laplace transforms and its application to system analysis:

The Laplace Transform: Region of convergence, properties of Laplace transform, poles and zeros of rational

functions of s, Inverse Laplace transform by partial fraction method and convolution method, Analysis of LTI Continuous-Time system, stability in s-domain, **(Topics will be covered through CRT & Practice)**

The ZTransform and Its Application to the Analysis of LTI Systems:

The Z-Transform: The Direct Z-Transform, The Inverse Z-Transform; Properties of the Z-Transform; Rational Z-Transforms: Poles and Zeros, Pole Location and Time-Domain Behavior for Causal Signals, The System Function of a Linear Time-Invariant System; Inversion of the Z-Transforms: The Inversion of the Z-Transform by Power Series Expansion, The Inversion of the Z-Transform by Partial-Fraction Expansion; The One-sided ZTransform: Definition and Properties, Solution of Difference Equations. **(Topics will be covered through CRT& Practice)**

Text Books:

1. *Digital Signal Processing –Principles, Algorithms and Applications* by J. G. Proakis and D. GManolakis, 4th Edition, Pearson.
Chapter 1 (1.2),Chapter 2 (2.1, 2.2, 2.3, 2.4, 2.5, 2.6.1, 2.6.2) ,Chapter 3 (3.1, 3.2, 3.3, 3.4.2, 3.4.3, 3.6.1, 3.6.2) ,Chapter 4 (4.1, 4.2.3, 4.2.4, 4.2.5, 4.2.8, 4.3, 4.4)
2. *Fundamentals of Signals and Systems - M. J. Roberts,* TMH Chapter 8 (8.3, 8.4, 8.7) , Chapter 10 (10.3, 10.6)
3. *Signals and Systems –A NagoorKani,* TMH
Chapter 1 [1.1, 1.2, 1.3, 1.4, 1.5 (for Module-1)], Chapter 2 [2.1,2.2,2.3,2.4,2.5,2.6,2.7,2.8,2.9, 2.10(for module-1)], Chapter 3 [3.1, 3.2, 3.3, 3.4, 3.5,3.6,3.7(for module-3)], Chapter 4 [4.1, 4.2, 4.3, 4.4, 4.5, 4.6, 4.7, 4.9, 4.10, 4.11, 4.12

(for Module-2)],Chapter 6 [6.1 to 6.6, 6.8 to 6.9, 6.12, 6.13 (for Module-1); 6.7 (for module-3)],Chapter 7 [7.1 to 7.6 (for module-3)], Chapter 8 [8.1 to 8.4 (for module-2)] **Reference**

Book:

1. *Signals and Systems - P. R. Rao,* TMH.
2. *Signals and Systems--- Alan V. oppenheim and Alan S. Willsky,* PHI
3. *Signals and Systems by Chi-Tsong Chen,* Oxford
4. *Principles of Signal Processing and Linear Systems,* by B.P. Lathi, Oxford **5. Principles of Linear Systems and Signals, by B.P. Lathi, Oxford**

Web resources:

1. *Signals and Systems* by Prof. T.K.Basu, IIT Kharagpur, <http://nptel.ac.in/courses/108105065/>
2. *Signals and Systems,* Prof. K.S. Venkatesh, IIT Kanpur <http://nptel.ac.in/courses/117104074/>
3. *Digital Signal Processing,* Prof. S.C.Dutta Roy, IIT Delhi,<http://nptel.ac.in/courses/117102060/>
4. MIT(ocw.mit.edu).

List of Open Source Software/learning website:

Software: SCILAB

Learning Website: NPTEL Videos

MIT open course ware website

Module I

S. No	Topic	Pedagogy	Details	Instructional Hrs			
				Theor y	Practic e	video	Projec t
	Continuous-Time and Discrete-Time Signals and Systems:						
1	Some Elementary Continuous-time and Discrete-Time Signals	CRT		1	0	0	0
2	Classification of Signals –Periodic and a periodic even –odd –energy and power signals –Deterministic and random signals –Causal and non causal signals and anti causal signals -- complex exponential and sinusoidal signals ---	CRT		3	0	0	0
3	Simple Manipulations of Continuous and discrete time signals.	Practi ce	Using SCILAB / MATLA B	0	2	0	0

			Simulati on				
4	Continuous-Time Systems:Mathematical equation governing LTI Continuous-Time systems, Block diagram and signal flow graph representation,	CRT		2	0	0	0
5	response of LTI Continuous-Time system in time domain, classification of Continuous-Time systems,	CRT		2	0	0	0
6	convolution of Continuous-Time signals. Discrete-Time Systems: Input-Output Description, Block Diagram Representation, Classification, Interconnection;	CRT		2	0	0	0
7	Analysis of Discrete-Time LTI Systems: Techniques, Response of LTI Systems, Properties of Convolution, Causal LTI Systems, Stability of LTI Systems;	CRT		2	0	0	0
8	Discrete-Time Systems Described by Difference Equations;	CRT		1	0	0	0
	Implementation of Discrete-Time Systems;	CRT		1	0	0	0
10	Correlation of Discrete-Tim Signals: Cross correlation and Autocorrelation Sequences, Properties.	Practi ce	Using SCILAB / MATLA B Simulati on	0	2	0	0
				14	4	0	0

Module II

S. No.	Topic	Pedagogy	Details	Instructional Hrs			
				Theory	Practice	video	Project
The Continuous-Time Fourier Series:							
11	Basic Concepts and Development of the Fourier Series,	CRT		1	0	0	0
12	Calculation of the Fourier Series,	CRT		1	0	0	0
13	Properties of the Fourier Series.	CRT		1	0	0	0
The Continuous-Time Fourier Transform:							
14	Basic Concepts and Development of the Fourier Transform,	CRT		1	0	0	0
15	Properties of the Continuous-Time Fourier Transform	CRT		2	0	0	0
Discrete time Fourier transform(DTFT) :							
16	The discrete time Fourier transform of Aperiodic signal,	CRT		1	0	0	0
17	Convergence of Fourier transform, the Fourier transform of signal with poles on unit circle,	CRT		1	0	0	0
18	frequency domain and time domain signal properties,properties of DTFT	CRT		1	0	0	0
				9	0	0	0

Module III

S. No.	Topic	Pedagogy	Details	Instructional Hrs			
				Theory	Practice	video	Project
	The Laplace transforms and its application to system analysis:						

19	The Laplace Transform: Region of convergence,	CRT		1	0	0	0
20	properties of Laplace transform, poles and zeros of rational functions of s,	CRT		2	0	0	0
21	Inverse Laplace transform by partial fraction method and convolution method,	CRT		1	0	0	0
22	Analysis of LTI Continuous-Time system, stability in sdomain,	CRT		1	0	0	0
The Z-Transform and Its Application to the Analysis of LTI Systems:							
23	The Z-Transform: The Direct Z-Transform,	CRT		1	0	0	0
24	The Inverse Z-Transform;	CRT		1	0	0	0
25	Properties of the Z-Transform;	CRT		2	0	0	0
26	Rational Z-Transforms: Poles and Zeros, Pole Location and Time-Domain Behavior for Causal Signals,	CRT		1	0	0	0
27	The System Function of a Linear Time-Invariant System;	CRT		1	0	0	0
28	Inversion of the Z-Transforms: The Inversion of the Z-Transform by Power Series Expansion,	CRT		1	0	0	0
29	The Inversion of the Z-Transform by Partial-Fraction Expansion;	CRT		1	0	0	0
30	The One-sided Z-Transform: Definition and Properties, Solution of Difference Equations.	CRT		2	0	0	0
				15	0	0	0

FCEC0104 DIGITAL ELECTRONICS CIRCUITS

<i>Pre - requisites</i>	<i>L+T+P</i>	<i>Credits</i>
<i>Nil</i>	3+ 0 + 0	3

Course Objectives:

The objectives of this subject are to
 Learn basic concepts on various digital designs
 Implementation and simulation of various digital circuits through Hardware description languages.

Course Outcomes:

Upon successful completion of this subject, students should be able to:
 Minimize the circuit complexity.
 Design and implement different combinational and sequential circuit
 Develop new digital design. Design high speed memories.

MODULE - I: (14 hours) Number System and Codes

Binary Number base Conversations, Octal and Hexadecimal numbers, Complements, Signed Binary Numbers, Binary Codes- BCD Codes, Gray Code, ASCII Character Code, Codes for serial data transmission and storage.

(topics will be delivered through Class room teaching)

Boolean Algebra and Logic Gates

Axiomatic definition of Boolean algebra. Basic theorems and properties of Boolean algebra, Boolean functions; Canonical and Standard forms; min-terms and max-terms standard forms; min-terms and max-terms, standard forms , Digital Logic Gates, multiple inputs. **(topics will be delivered through Class room teaching+**

Handson Practice based experiments) Gate Level Minimization:-

The Map Method, K Maps, input five variables, Produ and NOR implementation. AND –OR invent, OR-AND invent implementation, Ex-OR function, Parity generation and checking. **(topics will be delivered through Class room teaching+ Hands on Practice based experiments)**

MODULE - II: (14 hours) Combinational Logic

Combinational Circuits, Analysis and Design Procedure; Binary Adder-Sub tractor, Decimal Adder, Binary Multiplier, Magnitude Comparator, Decoders, Encoders, Multipliers, HDL for Combinational Circuits. **(topicswill be delivered through Class room teaching + Hands on Practice based experiments)****SynchronousSequential Logic**

Sequential Circuit, Latches, Flip-flop, Analysis of Clocked sequential Circuits, HDL for Sequential Circuits,

State Reduction and Assignment. Design Procedure. **(topics will be delivered through Class room teaching+ Handson Practice based experiments)**

MODULE - III: (14 hours) Registers and Counters

Shift Register, Ripple Counters, Synchronous Counters Asynchronous Counter, Ring Counters, and Modulo-N Counters. **(topics will be delivered through Class room teaching+ Hands on Practice based experiments)****Hardware**

Description Language

Introduction to HDL, Structure of HDL coding, Analysing basic gates using HDL, HDL for various Boolean circuits and techniques (Boolean algebra, gate level minimization, comparators, code converters), HDL for various Synchronous, Sequential Circuits and Applications. **(topics will be delivered through Simulation usingsoftware tool)**

Memory and Programmable Logic

Random Access Memory (RAM), Memory Decoding, Error detection and Correction, Read only Memory, Programmable Array Logic, Sequential Programmable Devices. **(topics will be delivered through Class roomteaching)**

Text Book

1. *Digital Design, 3rd Edition by M. Morries Mano, Pearson Edu. India (Ch: 1, 2, 3, 4, 5, 6, 7, 8)*
2. *Fundamentals Of Digital Circuits, A. Anand Kumar, 3rd Edition, PHI learning, ISBN: 978-81-203-5052-6*
3. *Circuit Design and Simulation with VHDL, second edition By Volnei A. Pedroni, ISBN-13: 978-8120343016*

Reference Books:

1. *Digital Principles and Applications, 6th Edition, Donald P. Leach, Albert Paul Malvino and GoutamSaha, Tata McGraw Hill Publishing Company Ltd., New Delhi.*
2. *Digital Fundamentals, 5th Edition, T.L. Floyd and R.P. Jain, Pearson Education, New Delhi.*
3. *Digital Electronics, Principles and Integrated Circuit, Anil K. Jain, Wiley India Edition* **4. Digital Design – Principle & Practice, 3rd Edition by John F. Wokerly, Pub. Pearson Education.**

Module I

S. No.	Topic	Pedagogy	Details	Instructional Hrs			
				Theory	Practice	video	Project
	Introduction & Overview of Digital Electronics, Binary number, base conversations, Octal & Hexadecimal numbers						

1	Key topics: - Introduction to binary, octal & hexadecimal numbers, binary to decimal, octal & hexadecimal conversion, Decimal to binary, octal & hexadecimal conversion. Reference:-MM –1.2 to 1.4, JFW-2.1 to 2.4	CRT		2	0	0	0
2	Complements, signed binary numbers. Key topics:-1's complement, 2' complement, 10's compl binary numbers and related problems. Reference: - MM –1.5 to 1.6, JFW- 2.5 to 2.9	CRT		2	0	0	0

Module I (Contd...)

S. No.	Topic	Pedagogy	Details	Instructional Hrs			
				Theory	Practice	video	Project
3	Binary codes –BCD codes, Gray code, ASCII character code, code for serial data transmission and storage. Key topics:-Weighted & non –weighted codes, Binary to BCD & gray code conversion, and related problems. Reference: - MM –1.7 to1.8, JFW-2.10 to 2.11	CRT		1	0	0	0

No.							
15	Binary adder , subtractor, Key topics: - Introduction to combinational circuits, Logic diagram, designing procedures, Half adder & subtractor , Full adder & subtractor, BCD adders. Reference : - MM-4.1 to 4.5, JFW-4.2 , JFW- 5.10.1 to 5.10.4	CRT + Practice	Component Level Design	2	3	0	0
16	Binary multiplier Key topics :- Implementation of 2-bit & 4-bit Multiplication using Adders/ IC- 74283(Binary adders) Block diagram, Reference: - MM-4.6, 4.7 JFW-5.11	CRT		2		0	0
17	Magnitude comparator. Key topics :- Mathematical modeling of 4-bit Magnitude comparator. Reference :- MM-4.6,4.7 JFW- 5.11	CRT + Practice	Component Level Design	2	2	0	0
18	Decoders, encoder Key topics: - Introduction to 3 to 8, 2 to 4 line decoder, Parity encoder, Boolean function implementation using Decoders, encoder, Reference : - MM-4.8 to 4.10, JFW- 5.4.1 to 5.7.4	CRT		2	0	0	0
19	Multiplexer	CRT + Practice	Component Level Design	1	3	0	0
	Key topics: - n to 1 line multiplexer , Boolean function implementation using multiplexer, DeMux Reference :- MM-4.8 to 4.10, JFW- 5.4.1 to 5.7.4						
20	Sequential circuits: Latches. Key topics : -Introduction sequential circuits, S-R latch, , D latch: Truth table, Logic diagram, Excitation Table.	CRT + Practice	Component Level Design	1	2	0	0
21	Sequential circuits: Flip flop Key topics : - J-K Flip-flop, T flip-Flop, D Flipflop: Truth table, Logic diagram, Excitation Table. Reference : - MM-5.1 to 5.2, JFW- 7.2 to 7.2.5	CRT + Practice	Component Level Design	1	2	0	0
22	Analysis of clocked sequential circuits: State reduction and assignment, Key topics: - State equation, state table, state Diagram Reference: - MM-5.4-5.6, JFW- 7.4.1 to 7.4.6,7.9	CRT		3	0	0	0
				14	16		

Topic

Pedagogy

Details

Instructional Hrs

Module III

S. no.	Topic	Pedagogy	Details	Instructional Hrs			
				Theory	Practice	video	Project
23	Shift register. Key topics :-Introduction to registers, Shift register: Serial in, parallel in, serial out, parallel out, shift right, shift left, Universal shift resistors . Reference : - MM–6.1 to 6.2, JFW- 8.5 to 8.5.2	CRT		2	0	0	0
24	Ripple counters. Key topics :- Introduction to binary ripple counter , state diagram, timing diagram Reference : - MM–6.3, JFW - 8.5.5	CRT		2	0	0	0
25	Synchronous counter Key topics :-Binary counter, Up-down binary counter, BCD counter with parallel load. Reference : - MM–6.4	CRT		2	0	0	0

Module III (Contd...)

S. no.	Topic	Pedagogy	Details	Instructional Hrs			
				Theory	Practice	video	Project
26	Ring counters. Key topics :- Ring counter & Johnson counter : Timing Diagram Reference : - MM –6.5, JFW- 8.5.6 to 8.5.7	CRT		1	0	0	0
27	Module –N counters. Key topics :- designing of mod counters. Reference : - MM 6.4	CRT		1	0	0	0
28	Introduction to HDL, HDL for various Boolean circuits and techniques (gate level minimization, comparators, code converters)	Practice	VERILOG Programming (Software: Xilinx)	0	3	0	0
29	HDL for combinational circuits. Key topics :- Gate level modeling , Data flow modeling , behavioral modeling . Reference : - MM –4.11	Practice		0		0	0
30	HDL description of Design, examples. Key topics : Structural description of Multiplier and Multiplexers Reference : - MM –8.5	Practice		0	3	0	0
31	HDL for registers & counter. Key topics :- HDL for synchronous counter & ripple counter . Reference : - MM –6.6, JFW- 8.5.10	Practice		0		0	0
32	Random Access Memory Reference : - MM –7.1,, JFW- 10.1 to 10.2	CRT		1	0	0	0
33	Memory decoding. Key topics :- coincident decoding , address multiplication. Reference : - MM –7.2, 7.3, JFW- 10.3 to 10.4	CRT		1	0	0	0
34	Error detection & correction. Key topics :- Hamming code, single error correction, double error detection. Reference : - MM –7.4	CRT		1	0	0	0
35	Read only memory Key topics :-Internal logic of RAM, combinational circuit implementation, types of ROMs, Reference : - MM –7.5 to 7.6, JFW- 10.1.1 to 10.1.6	CRT		1	0	0	0
36	programmable array logic. Key topics :- conditional PLD, PAL with 4 inputs & 4 outputs. Reference : - MM –7.5 to 7.6, JFW- 10.1.1 to 10.1.6	CRT		1	0	0	0
37	Sequential programmable devices. Key topics :-Sequential programmable logic device (SPLD), complex programmable logic device (CPLD), field programmable gate array(FPGA). Reference : - MM –7.8, JFW- 10.5	CRT		1	0	0	0
				14	6	0	0

FCEN0105 Basic Electrical Engineering

<i>Pre - requisites</i>	<i>L+T+P</i>	<i>Credits</i>
Nil	3+ 0 + 0	3

Course Objectives:

- *Impart a basic knowledge of electrical quantities such as current, voltage, power, energy and frequency to understand the impact of technology in a global and societal context.*
- *Provide working knowledge for the analysis of basic D.C. and A.C. circuits used in electrical and electronic devices.*
- *Develop selection skill to identify the type of generators or motors required for particular application.*
- *Highlight the importance of transformers in transmission and distribution of electric power.*
- *Emphasize the effects of electric shock and precautionary measures.*
- *Improve the ability to function on multi-disciplinary teams.*

Course Outcomes:

After studying this course, students will be able to:

- **Understand electrical circuit concepts**
- **Understand electromagnetic and electromagnetic induction**
- **Understand DC Machines**
- **Understand single and three phase A.C circuits, and Understand AC machines and measuring instruments**

Module-1 (16 Hours)

Introduction to Electrical Engineering : Essence of electricity, Electric field; electric current, potential and potential difference, Emf, electric power, ohm's law

Sources, Source Conversion, Induced EMF, Energy Stored in Inductor & Capacitor.(PPT & Animated videos) DC Networks: Laws and Theorems applicable to DC networks (KCL & KVL, Node voltage & Mesh current

analysis, Delta-Star & Star-Delta conversion, Superposition principle in R-L and R-C circuits with DC excitation, Simple problems. (e-content& simulations using PSICE)

Magnetic Circuits: Introduction to Electromagnetism, B-H curve, Permeability, Reluctance, Solution of simple magnetic circuits, Hysteresis and Eddy current loss. (Class room teaching)

D.C. Machines: Construction, Classification and Principle of operation of DC machines, EMF equation of DC generator, Speed Equation of DC Motor. (Class room teaching & videos)

Module-2 (16 Hours)

Single-Phase AC Circuits: Single-phase EMF Generation, Waveform and Phasor Representation, Average and Effective value of sinusoids, Peak factor & Form factor, Complex Impedance and Power using j-operator, Power factor. (Class room teaching & videos)

Three-Phase AC Circuits: Comparison between single-phase and three-phase systems, Three-phase EMF Generation, Line and Phase quantities in star and delta networks, Power and its measurement in three-phase balanced circuits. (Class room teaching)

Single-Phase Transformers: Construction and principle of operation, EMF Equation, Transformation ratio, Practical and Ideal transformers. (Class room teaching)

Module-3 (13 Hours)

Induction Motors: Introduction to Three-phase and Single-phase Induction Motors, Concept of Slip, Slip-Torque characteristics (no derivations). (Class room teaching e-content)

Measuring Instruments: Introduction, PMMC Ammeters and Voltmeters with extension of range, Moving-Iron Ammeters and Voltmeters, Dynamometer type Wattmeter, Energy meter. (Class room teaching & e-content)

Text Books:

1. D. C. Kulshreshtha, "Basic Electrical Reference Engineering" ,

Books:

1. Hughes, "Electronical & Technology", Ninth Edition (Revised Edition),.
2. D.C. Kulshreshtha, "Basic Electrical Engineering", Tata
3. Rajendra Prasad, "Fundamentals-Hall of India, EModulelectrical Engineeri

Sl No.	Topic	pedagogy	Instruction hrs.			
			Theory	Practice	video	Project
01	Introduction to Electrical Engineering : Essence of electricity, Electric field; electric current, potential and potential difference	CRT	1	0	0	0
02	Emf. electric power. oh	CRT www.youtube.com/watch?v=iLzfe_HxrWI	1	0	0	0
03	basic circuit components, Ideal and Practical Sources	CRT	1	0	0	0
04	Source Conversion	CRT	1	0	0	0
05	Induced EMF	CRT	1	0	0	0
06	Energy Stored in Inductor & Capacitor	CRT	1	0	0	0
07	DC Networks: Laws and Theorems applicable to DC networks (KCL & KVL	PRACTICE	0	2	0	0
08	Node voltage	PRACTICE	0	2	0	0
09	Mesh current analysis	PRACTICE	0	2	0	0
10	Delta-Star & Star-Delta conversion	CRT www.youtube.com/watch?v=igvqOyJYAoA	1	0	0	0
11	Superposition principle	PRACTICE	0	2	0	0
12	Thevenin's Norton theorem &	PRACTICE	0	2	0	0
13	Transients in R-L and R-C circuits with DC excitation	PRACTICE	0	2	0	0
14	Simple problems	TUTORIAL	1	0	0	0
15	Magnetic Circuits: Introduction to Electromagnetism, B-H curve	CRT	1	0	0	0
16	Permeability, Reluctance, Solution of simple magnetic Circuits	CRT	1	0	0	0
17	Hysteresis and Eddy current loss	CRT	1	0	0	0
18	D.C. Machines: Construction	CRT USING VIDEOS	1	0	0	0
19	Classification and Principle of operation of DC machines, EMF equation of DC generator,	CRT USING VIDEOS www.youtube.com/watch?v=Jh167TEECBk	1	0	0	0
20	Speed Equation of DC Motor	CRT USING VIDEOS				

MODULE- II

Sl No.	Topic	pedagogy	Instruction hrs.			
			Theory	Practice	video	Project
01	Single-Phase AC Circuits: Single-phase EMF Generation, Waveform and Phasor Representation	CRT USING VIDEOS	2	0	0	0

02	Average and Effective value of sinusoids, Peak factor & Form factor	CRT USING VIDEOS	2	0	0	0
03	Complex Impedance and Power using j-operator, Power factor.	CRT USING VIDEOS	2	0	0	0

MODULE-II(Contd...)

SI NO.	Topic	pedagogy	Instruction hrs.			
			Theory	Practice	video	Project
04	Three-Phase AC Circuits: Comparison between singlephase and three-phase systems, Three-phase EMF Generation	CRT USING VIDEOS www.youtube.com/watch?v=fGPdPKMSpv8	2	0	0	0
05	Line and Phase quantities in star and delta networks, Power and its measurement in three-phase balanced circuits.	CRT	2	0	0	0
06	Single-Phase Transformers: Construction and principle of operation,	CRT	2	0	0	0
07	EMF Equation, Transformation ratio	CRT	2	0	0	0
08	Practical and Ideal transformers	CRT	2	0	0	0

MODULE--III

01	Induction Motors: Introduction to Three-phase and Single-phase Induction Motors, Concept of Slip	CRT	2	0	0	0
02	Concept of Slip, Slip-Torque characteristics	CRT	1	0	0	0
03	Measuring Instruments: Introduction, PMMC Ammeters and Voltmeters with extension of range	CRT	2	0	0	0
04	Moving-Iron Ammeters and Voltmeters	CRT	1	0	0	0
05	Dynamometer type Wattmeter, Energy meter		2	0	0	0

FCEN0106 Electrical Machines- I

Pre - requisites	L+T+P	Credits
Nil	3+ 0 + 0	3

Course Objectives:

- To introduce the students about the principles of electromagnetism applicable to dc and ac machines.
- To familiarize the students about fundamentals laws that governs the operation of generator and its application. -To introduce the students about construction and associated with starting of dc motor.
- To analyse the behaviour and performance of dc machine under different operating conditions. -To make student understand about various three phase transformer connections.

Course Outcomes:

On successful completion of this course, students will be able to:

- Distinguish the constructional similarity and dissimilarity between various dc and ac machine.
- Demonstrate appropriate behaviours and knowledge of electrical machines when working with the classroom teaching and lab experience.
- Students will be able to prepare professional quality graphical presentations of laboratory data and computational results.
- Students will demonstrate an understanding of the fundamental control practices associated with AC

and DC machines.

-In the lab, at least for 50% experiments, students will write a software programme for logic (mathematical equation).

Module-I (14 Hrs): DC Generator

Dc Generators: Armature winding- Lap and wave, Simplex and duplex(Autocad), Method of excitation, Classification, Derivation of emf,, Process of commutation, Armature reaction, Interpoles, Compensating winding and equalizer rings(**class room teaching**)

Dc Generator Characteristics: Characteristics for Separately Excited DC Generator (No-Load and Load), Conditions for Self Excitation, Critical Resistance and Critical Speed, Characteristics for Self Excited DC Shunt Generator (No-Load and Load), Process of building up of voltage, Causes of failure of voltage build-up and remedies, Voltage Regulation, Parallel Operation of DC Shunt Generators and DC Series Generators. (**class room teaching+ Practice in electrical machine lab**)

Module-II (15 Hrs) : DC Motor

Dc Motor Characteristics: Characteristic for Speed Armature Current, Torque Armature Current and Speed Torque of (i) Separately Excited DC Motor, (ii) DC Shunt Motor, (iii) DC

Series Motor, and (iv) DC Compound Motor, Comparison between Different types of DC Motors and their Application. (Lecture & practice)

Dc Motor Starting And Performance Characteristics: Starting of DC Shunt, Series and Compound Motors, Condition for maximum power, Speed Control of DC Shunt and Series

Motors, Classification of Losses, Efficiency Evaluation from Direct and Indirect Methods (i) Brake Test

(Direct method), (ii) Swinburne's Test (Indirect method).(**class room teaching+ practice in electrical machine lab.**)

MODULE-III (13 Hrs): Transformer

Single phase transformer: Phasor Diagrams at No-Load and Load Conditions, Equivalent Circuit, Determination of Parameters From Tests (Open Circuit Test and Short Circuit Test, Back to Back test), Per unit calculation, Polarity test, Voltage regulation, all day efficiency. (**class room teaching+ practice in electrical machine lab.**)

Three Phase Transformers: Three-phase transformer connections- Star-star, Two Single-Phase Transformers connected in Open Delta (V-Connection) and their rating, T-Connection (Scott Connection) of Two Single-Phase Transformers to convert Three-Phase balanced supply to Two-Phase balanced supply. Delta-delta, Star-delta, Delta-star, Zig-zag connections. Scott connection, Open delta connection. (**class room teaching+ practice in electrical machine lab**) Auto Transformers (**class room teaching**)

Text Book:

1. *Electrical Machines* –D P Kothari and I J Nagrath –Tata McGraw Hill. **Reference Book(s):**
2. *Electrical Machinery* –P S Bimbhra –Khanna Publishers.
3. *Electrical Machines* –P.K.Mukherjee & S.Chakravorti–Dhanpat Rai Publications
4. *Electrical Machines-I* - B.L.Theraja- S.Chand Publications

Module I

S. No.	Topic	Pedagogy	Details	Instructional Hrs			
	DC GENERATOR			Theory	Practice	video	Project
1	Generator construction and principle of operation ,Armature winding- (Lap and wave, Simplex and duplex)	CRT	https://www.youtube.com/watch?v=iRVKAb_hs5A	1	0	1	0
2	Method of excitation, Classification of dc Generator	CRT	e-content	1	0	0	0
3	Derivation of emf equation of dc generator	CRT	e-content	1	0	0	0
4	Process of commutation	CRT	e-Content	1	0	0	0

5	Armature reaction, Interpoles, Compensating winding and equalizer rings.	CRT	e-Content & https://www.youtube.com/watch?v=Sp4O_7xoLIE	1	0	1	0
6	Characteristics for Separately Excited DC Generator (No-Load and Load), Conditions for Self Excitation, Critical Resistance and Critical Speed.	CRT + PRACTICE	E-content & Practice In Electrical Machine Lab And Graphically Find Out Critical Speed and Critical Resistance	1	1	0	0
7	Characteristics for Self Excited DC Shunt Generator (No-Load and Load), Process of building up of voltage)	CRT + PRACTICE	E-Content & Practice In Electrical Machine Lab And Graphically Find Out INTERNAL AND EXTERNAL CHARACTERISTICS	1	1	0	0
9	Causes of failure of voltage build-up and remedies, Voltage Regulation	CRT	e-Content	1	0	0	0
10	Parallel Operation of DC Shunt Generators and DC Series Generators	CRT + practice	Practice In Electrical Machine Lab	1	1	0	0

Module II

S. No.	Topic	Pedagogy	Details	Instructional Hrs			
				Practice	Video	Project	
DC MOTOR							
11	Characteristic for Speed~Armature Current, Torque~Armature Current and Speed~Torque of (i) Separately Excited DC Motor, (ii) DC Shunt Motor, (iii) DC Series Motor, and (iv) DC Compound Motor, Comparison between Different types of DC Motors and their Application.	CRT	e-content	3	0	0	0
12	Dc Motor Starting And Performance Characteristics: Starting of DC Shunt, Series and Compound Motors	CRT + Practice	E-Content Along With Practice In Electrical Machine Lab	2	1	0	0
13	Condition for getting maximum power	CRT	e-content	1	0	0	0
14	Speed Control of DC Shunt and Series Motors	CRT + Practice	e-Content & Practice In Electrical Machine Lab	3	1	0	0
15	Classification of Losses	CRT	e-content	1	0	0	0
16	Efficiency Evaluation from Direct and Indirect Methods (i) Brake Test (Direct method), (ii) Swinburne's Test (i) Regenerative/Hopkinson	CRT + PRACTICE	e-Content & Practice in electrical machine lab.(all tests)	1	2	0	0
<u>Module III</u>							
TRANSFORMER							

17	Single Phase Transformer: Phasor Diagrams at NoLoad and Load Conditions,	CRT	e-content	1	0	0	0
18	Equivalent circuit of transformer	CRT	e-content	1	0	0	0

19	Determination of Parameters From Tests (Open Circuit Test and Short Circuit Test, Back to Back test), Per unit calculation, Polarity test, Voltage regulation, all day efficiency.	CRT + practice	e-Content & Practice in electrical machine lab. (all tests)	1	2	0	0
20	Three Phase Transformers: Three-phase transformer connections- Star-star, Two SinglePhase Transformers connected in Open Delta (VConnection) and their rating, TConnection (Scott Connection) of Two SinglePhase Transformers to convert Three-Phase balanced supply to Two-Phase balanced supply	CRT	e-content	3	0	0	0
21	Delta-delta, Star-delta, Delta-star, Zig-zag connections. Scott connection, Open delta connection,	CRT	e-content	2	0	0	0
22	Auto Transformers	CRT	e-content	1	0	0	0

FCEN 0107 Analog and Digital Electronics

Pre –requisites	L+T+P	Credits
Nil	3+ 0 + 0	3

Course Objectives:

- To make the students understand the various electronics circuit by using semiconductor devices. -To train the students to analysis different amplifier (small signal & large signal).
- To train the students such a way that, it will help them to realise the practical circuit in easy manner.

Course Outcomes:

On successful completion of this course, students will be able to: -Construct small analog and digital electronics circuit.

- Design circuit parameter, so that it will give better performance in complicated electronics circuit.

MODULE –I (10 Hours)

1. Diode Circuits: Zener Diode as Voltage Regulator, Diode Circuits with Time-Varying Sources, Switching Characteristics of a Diode, Special Purpose Diodes. **(class room teaching+ Lab practice) (Multisim)**
2. Small Signal Amplifier: BJT, FET small signal models, AC Gain, Input and Output Impedances, Some Special Circuits, Darlington Pairs and Feedback Pairs, Frequency Response of Single Stage RC Coupled Amplifiers and Multistage Transistor Amplifiers. **(class room teaching)**

MODULE –II (20 Hours)

3. Large Signal Amplifiers: Classification, Class-A and Class-B Power Amplifiers Complimentary and Symmetry Amplifiers, Class-C Amplifiers. **(class room teaching + Lab practice) (Multisim)**
4. Feed Back Amplifiers and Oscillators: Feedback Concepts, Types of Feedback Circuits, Effects of Negative Feedback Circuits, Unijunction Oscillator and PLL. **(class room teaching)**
5. Operational Amplifier: Basic Operational Amplifier, Differential Amplifier, Basic Operational Amplifier Circuits, Application of OPAMPs, Linear Application of OPAMPs, OPAMP Filters. **(classroomteaching + Lab practice) (Multisim)**
6. Combinational Circuits: Introduction to Digital Electronics Circuits, K-maps and their Simplification, Adder, Subtractors, Digital Comparator Circuits, Parity Checkers/Generators, Multiplexers and Decoders, Demultiplexers/Decoders, Programmable Logic Arrays. **(class room teaching + Practiceusing software)(LogiSim)**
7. Sequential Circuits and Systems: Introduction, Memory Cells and Flip-Flops, Registers, Counters, Asynchronous Counters, State Diagrams**(class room teaching)Text Books:**
 1. *Electronics: Analog and Digital, I.J. Nagrath, PHI Learning Pvt. Ltd., New Delhi.*
 2. *Digital Design Principle& Practice, 3rd Edition by John F. Wokerly, Pub. Pearson Education*

Reference Books:

1. *Millman's Electronic Devices and Circuits, 2ndEdition Education Pvt. Ltd., New Delhi.*
2. *Electronic Devices and Circuit Theory, 9th/10thEdition R.L. Boylestad and L. Nashelsky, Pearson Education, New Delhi.*
3. *Digital Fundamentals, 5thEdition, T.L. Floyd and R.P. Jain, Pearson Education, New Delhi.*
4. *Fundamentals of Digital Circuits, 2ndEdition, A. Anand Kumar, PHI Learning Pvt. Ltd., New Delhi.*

Module I

S. No.	Topic	Pedagogy	Details	Instructional Hrs			
				Theory	Practice	video	Project
1	Diode Circuits: Zener Diode as Voltage Regulator, Special Purpose Diodes	CRT	https://www.youtube.com/watch?v=d4zO39K_ce8 black board	1	0	1	0
2	Diode Circuits with Time-Varying Sources, Switching Characteristics of a Diode	CRT+P RA	black board hardware practice	1	1	0	
3	Small Signal Amplifier: BJT, FET small signal models, AC Gain, Input and Output Impedances, Some Special Circuits, Darlington Pairs and Feedback Pairs, Frequency Response of Single Stage RC Coupled Amplifiers and Multistage Transistor	CRT	https://www.youtube.com/watch?v=c1lafpmv13M https://www.youtube.com/watch?v=tz62tq_KEc	5	0	1	0

				om/watch?v=QO5FgM7MLGg black board						
Module II										
4	<i>Large Signal Amplifiers: Classification, Class-A and Class-B Power Amplifiers Complimentary and Symmetry Amplifiers, Class-C Amplifiers</i>	CRT + PRAC		https://www.youtube.com/watch?v=vyjJFRIT7w https://www.youtube.com/watch?v=nLMC8j8ys4 HARDWARE practice (CLASS-A Amplifier)	4	1	1			0
5	<i>Feed Back Amplifiers and Oscillators: Feedback Concepts, Types of Feedback Circuits, Effects of Negative Feedback Circuits, Unijunction Oscillator and PLL</i>	CRT		black board						
6	<i>Operational Amplifier: Basic Operational Amplifier, Differential Amplifier, Basic Operational Amplifier Circuits, Application of OPAMPs, Linear Application of OPAMPs, OPAMP Filters</i>	CRT+ PRAC		black board Hardware based	7	0	0			0
				5		2	0			0

Module III

7	<i>Conditional Circuits: Introduction To Digital Electronics Circuits, K-maps and their Simplification, Adder, Subtractors, Digital Comparator Circuits, Parity Checkers/Generators, Multiplexers And Decoders, Demultiplexers/Decoders, Programmable Logic Arrays.</i>	CRT		black board & simulation using Logisim	4	2	0			0
8	<i>Sequential Circuits and Systems: Introduction, Memory Cells And FlipFlops, Resistors, Counters, Asynchronous Counters, State Diagrams</i>	CRT		black board	4	0	0			0
Total					33	4	3			0

FCEN0108 WORKSHOP TECHNOLOGY

Pre –requisites	Course type	Credits
NIL	Theory	3

Course Objectives:

1. To learn about basic manufacturing processes such as casting, forming, joining

Course Outcomes:

On successful completion of this course, students will be able to:

1. Can suggest suitable manufacturing technique for given component.

Module-I (24 Hrs): Introduction to Work Holding Devices and Manufacturing Tools

Work holding, Tool Holding Devices, measuring and cutting tools for Carpentry, Fitting, Plumbing
 Work holding, Tool Holding Devices, measuring and cutting tools for Blacksmith & Welding.
 Carpentry: Making simple joints: a) Half-lap b) Mortise joints. Carpentry: Job using Wood Turning
 Lathe –Stepped Pulley, cot leg Fittings: Making of simple mating profiles a) VEE b) Dovetail c) Half
 round joints. Basic Pipe Fittings

, Sanitary Fittings, Water Meter Installation. (Most of the topics will be through learn by doing and laboratory mode)

Module-II (20 Hrs): Introduction to Casting and Welding

Casting Terminology- Sand Moulding Practice, Moulding Materials Patterns- Types, Allowances
 Melting Practice (Cupola, electrical furnace) Introduction to Welding, Brazing & Soldering Oxy
 Acetylene Gas Welding-Process, Techniques Arc Welding- Process, Techniques, Defects. Lap
 Joint, Butt Joint, T-Joint, V joint MIG, TIG and spot welding. (Most of the topics will be through learn
 by doing and laboratory mode)

MODULE-III (14 Hrs): Introduction To Forming

Cold & Hot Working of Metals- Black Smithy, Forging and forging tools Black-smithy:
 Converting round rod into Square Ring, Converting round rod into square S-Hook Cold & Hot
 Working of Metals- Extrusion, Drawing Cold & Hot Working of Metals- Sheet metal Operations,
 tools, Preparation of Square Tray. (Most of the topics will be through learn by doing and
 laboratory mode)

TEXT BOOKS:

1. Workshop Technology Vol. I & II, S.K. Hazra Chaudhary, A.K. Hazra Chaudhary, Asian Book Comp., New Delhi.
2. Production Engineering - P.C. Sharma, S. Chand
3. Workshop Practice : R.K. Rajput, Laxmi Publication

REFERENCE BOOKS:

1. Workshop Technology, Vol. 1, 2 & 3 –W.A.J. Chapman, WAJ, Edward Arnold.
2. Workshop Technology (Vol. 1 and 2) –B. S. Raghuvanshi, Dhanpath Rai and Sons, New Delhi.

Module

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S. N.	Topic	Pedagogy	Details	Instructional Hrs			
				Th. +Tutorial	Practice	video	Project
1	Work holding, Tool holding devices, measuring and cutting tools for carpentry, fitting, plumbing	CRT & PRA		1	2	1	0
2	Work holding, Tool holding devices, measuring and cutting tools for black smithy & welding	CRT & PRA		1	2	1	0
3	Carpentry: Making simple joints: a) Halflap b) Mortise joints	PRA & PRO		1	2	0	1
4	Carpentry: Job using wood turning lathe –Stepped Pulley, cot leg	PRA &		1	2	0	1

5	Fittings: Making of simple mating profiles a) VEE b) Dovetail c) Half round joints.	PRA & PRO		1	2	0	1
6	Basic pipe fittings, Sanitary fittings, Water meter installation	CRT & PRA		1	2	1	0
Sub total		24		06	12	3	3

Module II

S. No.	Topic	Pedagogy	Details	Instructional Hrs			
				Theory	Practice	video	Project
	Introduction To Casting And Welding						
1	Casting Terminology- Sand Moulding Practice, Moulding Materials	CRT & PRA		1	1	0	0
2	Patterns- Types, Allowances	CRT & PRA		1	1	0	0
3	Melting Practice (Cupola, electrical furnace)	CRT & PRA		2	1	0	0
4	Introduction to Welding, Brazing & Soldering	CRT & PRA		2	0	0	0
5	Oxy Acetylene Gas Welding- Process, Techniques	PRA & PRO		0	1	0	1

6	Arc Welding- Process, Techniques, Defects	PRA		0	1	0	0
7	Lap Joint, Butt Joint, T-Joint, V joint	PRA& PRO		1	1	0	2
8	MIG, TIG and spot welding	PRA& PRO		0	2	0	2
	Sub total	20		7	08	0	5

Module III

S. No.	Topic	Pedagogy	Details	Instructional Hrs			
				Theory	Practice	video	Project
1	Introduction To Forming Cold & Hot Working of Metals-	PRA& PRO					1
	Black Smithy, Forging and forging Tools			1	2	0	
2	Black-smithy: Converting round rod into Square Ring, Converting round rod into square S-Hook	PRA& PRO					1
				0	2	0	
3	Cold & Hot Working of Metals- Extrusion, Drawing	CRT					0
				3	0	0	
4	Cold & Hot Working of Metals- Sheet metal Operations, tools, Preparation of Square Tray	CRT & PRA& PRO					1
				1	2	0	
	Sub total	14		5	6	0	3

FCEN0109 ENGINEERING MECHANICS

Pre –requisites	Course type	Credits
NIL	Theory	3

Course objectives:-

1. This course teaches students about the effect of forces during static and dynamic Conditions.
2. It gives insight about friction, virtual work and forces in the trusses
3. To determine axial forces, shear forces, and bending moments.
4. To study the bending phenomenon in beams and stress developed in them.

Course Outcomes:-

1. To provide the student with a thorough understanding of concept, drawing and free body diagrams.
2. Able to draw SF and BM diagram of a loaded beam

- Identify the stress developed in beams due to bending.

Module-I (20 Hrs):

Concurrent and non-concurrent forces on a plane: Principle of statics, composition and resolution of forces, free body diagram, equilibrium of concurrent coplanar forces, Lami's theorem, moment and principle of moment, types of supports and support reactions, equilibrium of general case of forces in a plane.

(The topic will be through class room teaching)

Center of gravity- General case of parallel forces in a plane, centre of parallel forces in a plane, centroid and centre of gravity, centroid of composite plane figures and curves, distributed forces in a plane. **(The topic will be through class room teaching)**

Friction: Types of friction, laws of friction, angle of friction, coefficient of friction, angle of repose, equilibrium of bodies on rough inclined planes, equilibrium of ladder. **(The topic will be through class room teaching)**

Module-II (17 Hrs):

Moment of Inertia: Rectangular and polar moment of inertia, radius of gyration, parallel axis theorem and perpendicular axis theorem, moment of inertia of plane composite figures and material bodies.

(The topic will be through class room teaching and experiments)

Plane trusses: Classification of truss, assumptions, method of joints and method of sections. **(The topic will be through class room teaching and ANSYS software)**

Principle of virtual work: Equilibrium of ideal systems, application to practical problems. **(The topic will be through class room teaching)** **MODULE-III (15 Hrs):**

Shear Force and Bending Moment: Types of beams—Concept of shear force and bending moment—S.F and B.M diagrams for cantilever, simply supported and overhanging beams subjected to point loads, U.D.L., uniformly varying loads and combination of these loads, point of contra flexure, relation between S.F., B.M and rate of loading at a section of a beam. **(The topics will be through class room teaching and ANSYS software)** **Flexural Stresses in beams:** Theory of simple bending, assumptions, flexure formula, determination bending stresses, section modulus for various beam sections, neutral axis. **(The topics will be through class room teaching and ANSYS software)**

Shear stresses in beams: Shear stress at a section, shear stress distribution for different sections. **(The topics will be through class room teaching)**

Text books:

- Engineering Mechanics by S Timoshenko, D.H Young and J.V.Rao, Revised 4th edition (Special Indian Edition), McGraw Hill.
- Engineering Mechanics, S.S. Bhavikatti, New Age International Publisher
- Strength of Materials, R. K. Bansal, Laxmi Publications

Reference books:

- Engineering Mechanics of Solids, by Egor P. Popov, Pearson Publication
- Mechanics of Materials, R.C. Hibbeler, Pearson Publication
- Engineering Mechanics, D.S. Kumar, S.K. Kataria and Sons **Module I**

S. No.	Topic	Pedagogy	Details	Instructional Hrs
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				Theory +Tutorial	Practice	video	Project
1	Concurrent and non-concurrent forces on a plane: Principle of statics	CRT		2	0	0	0
2	Composition and resolution of forces	CRT		2	0	0	0
3	Cree body diagram, equilibrium of concurrent coplanar forces, Lam	CRT		2	0	0	0
4	Moment and couple, V Moment	CRT		1	0	0	0
5	Types of supports and support reactions	CRT		2	0	0	0
6	Equilibrium of general case of forces in a plane	CRT		2	0	0	0
7	Center of gravity- General case of parallel forces in a plane, centre of parallel forces in a Plane	CRT		1	0	0	0
8	Centroid of composite plane figures and curves	CRT		3	0	0	0
9	Distributed forces in a plane	CRT		1	0	0	0
10	Friction: Types of friction, laws of friction, angle of friction, coefficient of friction, angle of repose	CRT		2			
11	Equilibrium of bodies on rough inclined planes, equilibrium of ladder	CRT		2			
	Sub total	20		20	0	0	0
			Module II				

S. No.	Topic	Pedagogy	Details	Instructional Hrs			
				Theory	Practice	video	Project
1	Moment of Inertia: Rectangular and polar moment of inertia, radius of Gyration	CRT		2	0	0	0

2	<i>Parallel axis theorem and perpendicular axis theorem</i>	<i>CRT</i>		2			
3	<i>Moment of inertia of plane composite figures and material bodies</i>	<i>CRT</i>		4	0	0	0
4	Plane trusses: <i>Classification of truss, Assumptions</i>	<i>CRT</i>		1	0	0	0
5	<i>Method of joints and method of sections</i>	<i>CRT</i>		4	0	1	0
6	Principle of virtual work: <i>Equilibrium of ideal systems</i>	<i>CRT</i>		1			
7	<i>Application to practical problems</i>	<i>CRT</i>		2			

Sub total	17	16	0	1	0
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Module III

S. No.	Topic	Pedagogy	Details	Instructional Hrs			
				Theory	Practice	video	Project
1	Shear Force and Bending Moment: Types of beams	CRT		1	0	0	0
2	Concept of shear force and bending moment –S.F and B.M diagrams for cantilever, simply supported and overhanging beams subjected to point loads, U.D.L., uniformly varying loads and combination of these loads	CRT+ ANSYS simulation		3	0	1	0
3	Point of contra flexure, relation between S.F., B.M and rate of loading at a section of a beam	CRT		1	0	0	0
4	Flexural Stresses in beams: Theory of simple bending, assumptions, flexure formula	CRT+ ANSYS simulation		2	0	1	0
5	Flexure formula, determination bending stresses, section modulus for various beam sections, neutral axis	CRT		3	0	0	0
6	Shear stresses in beams: Shear stress at a section	CRT+ ANSYS simulation		1	0	1	0
7	Shear stress distribution for different Sections	CRT		1	0	0	0
	Sub total	15		12	0	3	0

FCEN0110 THERMAL ENGINEERING

<i>Pre –requisites</i>	<i>Course type</i>	<i>Credits</i>
NIL	Theory	3

COURSE OBJECTIVES:

To make the student understand

1. *To be able to state various laws of thermodynamics and to define heat, work, thermal efficiency and the difference between various forms of energy*
2. *To be able to identify and describe energy exchange processes (in terms of various forms of energy, heat and work)*
3. *To be able to apply the steady-flow energy equation or the First Law of Thermodynamics to a system of thermodynamic components (heaters, coolers, pumps, turbines, pistons, etc.) to estimate required balances of heat, work and energy flow.*
4. *The importance of reversibility in the maximization of the efficiency of an engine*

COURSE OUTCOMES:

1. *Students will be able to prepare energy balance sheet*
2. *Will be able to understand various processes of thermodynamic cycles*
3. *Will be familiar with the steam table which will further help them in advanced thermodynamics for understanding power cycles*
4. *Capability to determine thermodynamic efficiency of various energy related processes*

MODULE-I (18 Hours)

Basic concepts and definition: Scope of Thermodynamics, Macroscopic and Microscopic approaches; Types of Systems, Properties, State and its representation on a property diagram, Process and its representation, point and path function; Reversible and Irreversible processes; Thermodynamic equilibrium and quasi-static processes, Zeroth Law of Thermodynamics and temperature, Measurement of temperature and calibration of thermometers, the ideal gas temperature scale. **(The topic is taught through PPT presentation and practice)**

Energy Transfer: Work Transfer (definition and calculation), Different modes of work, Displacement Work for various processes, Free expansion; Heat Transfer. **(The topic is taught through class room teaching)** **First Law of Thermodynamics:** Formal statement (using cyclic processes), First law for processes of fixed masses (closed systems) and introduction of internal energy as a thermodynamics property, Introduction of enthalpy as a thermodynamic property; Definition of specific heats and their use in calculation of internal energy and enthalpy with emphasis on ideal gases. Application of First Law to control volumes; Nozzle, Diffuser, Compressor, Turbine, Throttling device, Heat Exchanger (only steady flow need be considered). **(Application of First Law to control volumes will be through video presentation)**

MODULE-II (18 Hours)

Second Law of Thermodynamics: Limitations of First law, Kelvin-Planck and Clausius statements of Second Law, corollaries, Heat engine, Refrigerator and heat Pump, Clausius inequality.

Entropy: Definition, Principles of increase of entropy, Change of entropy of perfect gas in various

processes.

Properties of pure substances: p-v, p-T, T-S, h-S diagram for steam, different types of steam, Introduction to steam tables with respect to specific volume, pressure, temperature, enthalpy and entropy. **(Properties of pure substances will be through class room teaching & video presentation)**

MODULE-III (18 Hours)

IC engines: Introduction, Working of IC engines. Classification of IC engines, 2-Stroke and 4-Stroke engines, petrol and diesel engines, engine nomenclature. **(Topics related to IC engines will be through Practice & video presentation)**

Gas Power Cycles: Carnot Cycle, Air standard cycles-Otto, Diesel, Dual Combustion.

Vapour Power Cycles: Introduction Power cycles, The Carnot vapour cycle and its limitations, The Rankine cycle, Means of increasing the Rankine cycle efficiency, The reheat cycle, The regenerative feed heating cycle.

(Topics related to Gas & Vapour power cycles will be through class room teaching & video presentation)

Introduction to Gas Turbine Cycles- Open & Closed Cycle. **(Topics related to gas turbine will be through video presentation)**

TEXT BOOKS:

1. *Engineering Thermodynamics, P.K. Nag, Tata McGraw Hill Companies*
2. *Thermodynamics: An Engineering Approach, Y.A Cengel, M. A Boles, Tata McGraw Hill Companies.*

REFERENCE BOOKS:

1. *Fundamentals of Thermodynamics*, C. Borgnakke, R. E. Sonntag, WILEY Publication.

Module I

S. No.	Topic	Pedagogy	Details	Instructional Hrs			
				Theory +Tutorial	Practice	video	Project
1							
2	Basic concepts and definition: <i>Scope of Thermodynamics, Macroscopic and Microscopic approaches</i>			1	0	0	0
3	<i>Types of Systems, Properties, State and its representation on a property diagram, Scope of Thermodynamics, Process and its representation</i>	CRT		2	0	0	0
4	<i>Reversible and Irreversible processes; Thermodynamic equilibrium and quasi-static processes</i>	CRT & Video presentation		1	0	1	0
5	<i>Zeroth Law of Thermodynamics and temperature, Measurement of temperature</i>	CRT & PRA		1	1	0	0
6	Energy Transfer: <i>Work Transfer, Heat Transfer</i>	CRT		2	0	0	0
7	First Law of Thermodynamics: <i>Formal statement (using cyclic processes, First law for processes of fixed masses(closed systems) and introduction of internal energy</i>	CRT & Video presentation		2	0	2	0
8	<i>Definition of specific heats with emphasis on ideal gases</i>	CRT		2	0	0	0
9	<i>Application of First Law to control volumes; (only steady flow need be considered).</i>	CRT & Video presentation		2	0	1	0

	Sub total	18	13	1	4	0
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Module II

S. No.	Topic	Pedagogy	Details	Instructional Hrs		
				Practice	video	Project
1	Second Law of Thermodynamics: Limitations of First law, Kelvin Planck and Clausius statements of Second Law, Corollaries	CRT		0	0	0
2	Clausius inequality	CRT		0	0	0
3	Heat engine, Refrigerator and heat Pump	CRT & PRA		1	0	0
4	Entropy: Definition, Principles of increase of entropy	CRT		0	0	0
5	Change of entropy of perfect gas in various processes	CRT		0	0	0
6	Properties of pure substances: p-v, p- T, T-S, h-S diagram for steam	CRT & Video presentation		0	4	0
7	Different types of steam	CRT		0	0	0
8	Introduction to steam tables with respect to specific volume, pressure, temperature, enthalpy and entropy	CRT		0	0	0
	Sub total	18		1	4	0

Module III

S. No.	Topic	Pedagogy	Details	Instructional Hrs			
				Theory	Practice	video	Project
1	IC engines: Introduction, Working of IC engines	PRA & Video presentation		0	1	1	0
2	Classification of IC engines, 2-Stroke and 4-Stroke engines, petrol and	PRA		0	2	0	0

	<i>diesel engines, engine nomenclature.</i>						
3	Gas Power Cycles: Carnot Cycle	<i>CRT</i>		1	0	0	0
4	<i>Air standard cycles-Otto, Diesel, Dual Combustion.</i>	<i>CRT</i>		2	0	0	0

5	Vapour Power Cycles: Introduction Power cycles, The Carnot vapour cycle and its limitations	CRT & Video presentation		2	0	1	0
6	The Rankine cycle, Means of increasing the Rankine cycle efficiency	CRT		2	0	0	0
7	The reheat cycle	CRT		1	0	0	0
8	The regenerative feed heating cycle	CRT		1	0	0	0
9	Introduction to Gas Turbine Cycles Open & Closed Cycle.	CRT & Video presentation		2	0	2	0
	Sub total	18		11	3	4	0

FCEN0111 EARTH SYSTEM SCIENCE Credits 3[3 0 0] Pre-requisites : Nil

Credit 3

Space Science: Solar System, Age of the Earth, Origin of Solar system. Meteors and Meteorites.

Earth Dynamics: Interior of the Earth, Composition of the Earth, Seismic waves, Seismograph, Plate Tectonics, Basics of Earthquake Engineering, Landslides, Volcanoes.

Geological Oceanography: Sea waves, Tides, Ocean currents, Geological work of seas and oceans, Tsunami and its causes, Warning system and mitigation.

Hydrogeology: Water table, Aquifer, Groundwater fluctuations and groundwater composition, Hydrologic cycle.

Glaciology: Glacier types, Different type of glaciers, Landforms formed by glacier.

Geological bodies and their structures: Rock, mineral, batholiths, dyke, sill, fold, fault, joint, unconformity.

Earth's Atmosphere: Structure and composition of atmosphere, Atmospheric circulation, Geological work of wind, Greenhouse effect and global warming, Carbon dioxide sequestration. Steps to maintain clean and pollution free atmosphere with governing laws, precautionary measures against disasters.

Biosphere: Origin of life, Evolution of life through ages, Geological time scale, biodiversity and its conservation.

Natural Resources: Renewable and non-renewable resources, Mineral and fossil fuel resources and their geological setting, mining of minerals and conservation, effect of mining on surface environment.

Recommended Books:

1. Earth's Dynamic – W. Kenneth Systems and Eric H. Christiansen
2. Exploring Earth: An introduction to Physical Geology – John P. Davidson
3. Holmes Principles of Physical Geology – A. Holmes (Revised Ed. Doris L. Holmes)
4. A Textbook of

Geology
–P K Mukherjee

5. Earth System Science from biogeochemical cycles to global changes –M. Jacobson, R.J. Charlson, H. Rodhe and G.H. Orians (2002)
6. Fundamentals of Geophysics –W. Lowrie.

FCEN0112 INTRODUCTION TO MINING [3 0 0]

Pre-requisites: Nil

Credit 3 Mining-

Definition and economic importance; Mine –definition, different types and classification; Mine life cycle; Mineral deposit –different types and their classification; Mineral resources of India; Modes of entry to a mine –shaft, incline, decline, adit and box-cut.

Overview of surface mining:

Types of surface mines, unit operations, basic bench geometry, applicability & limitations and advantages & disadvantage **Overview of underground mining:**

Different coal mining methods and their applicability & limitations; Different metal mining methods and their applicability & limitations; Basic concepts of transportation, ventilation, illumination and support in underground mines.

FCEN0113 MINE DEVELOPMENT [3 0 0]

Pre-requisites : Nil

Credit 3

Opening-up of Deposits: Choice of mode of entry- adit, shaft, decline and combined mode, their applicability, number and disposition.

Vertical and Inclined Shafts: Location, shape, size, and organization of shaft sinking, construction of shaft collar, shaft fittings.

Shaft Sinking Operations: Ground breaking and muck disposal- tools and equipment, lining; ventilation, lighting and dewatering; sinking in difficult and water-bearing ground.

Insets: Design, excavation and lining.

Mechanized Sinking: Simultaneous sinking and lining; slip - form method of lining; high speed sinking.

Shaft Boring: Methods and equipment.

Special Attributes: Widening and deepening of inclined and vertical shafts; staple shafts, raised shafts.

Main Haulage Drifts and Tunnels: Purpose, shape, size and location; excavation ground breaking, muck disposal, ventilation and supporting.

High Speed Drifting/Tunneling: Application of mechanized methods; road headers and tunnel boring machines.

Recent Developments in shaft sinking and drifting/tunneling.

Layouts of pit-top and pit-bottom, Coal Handling Plant, Bunkers and Railway Sidings

FCEN0114 MINE SURVEYING - I [3 0 0]

Pre-requisites : Nil

Credit 3

Surveying: Definition, objective, classification and principles of surveying.

Linear Measurement: Instruments for measuring distances; ranging and taping survey lines; Chain surveying – principle, field work, off-sets, booking and plotting, obstacles in taping.

Angular Measurement: Bearing of lines; Rectangular coordinate system; Essentials of the micro-optic theodolite; Measurement of horizontal and vertical angles; Temporary and permanent adjustments; Theodolite traversing; Computation of co-ordinates; Adjustment of traverse; Temporary and permanent adjustments.

Leveling: Definition & terminology; Leveling instruments types - tilting, auto set and digital levels; Leveling staves; Different types of leveling - differential, profile, cross-sectional and reciprocal leveling; Booking and reduction methods; Underground leveling; Temporary and permanent adjustments of levels.

Total Station: Principle of electronic measurement of distance and angles; construction and working with Total Station; Errors; Application and recent developments in Total Station.

Plane Table Surveying: Methods **Contours:** Concepts; Characteristics of contour; Contour Interval; Methods of contouring and uses of contours.

FCEN0115 INTRODUCTION TO BIOTECHNOLOGY (3 0 0 3)

Pre-requisites : Nil Credit 3

OBJECTIVES

■ To introduce students basic knowledge about biotechnology

MODULE I: Biochemistry 15

Component of the cell, structure and biochemical functions, Biomolecules-Carbohydrates, lipids, proteins,

Nucleic acids, Structure and classification of enzymes

MODULE II Cell Biology 15

Eukaryotic, Prokaryotic cells, Cell cycle –Mitosis and Meiosis, Cell fractionation and flow cytometry.

Molecular Biology

Introduction to nucleic acids: Nucleic acids as genetic material, Structure and physicochemical properties of

elements in DNA and RNA, Biological significance of differences in DNA and RNA.

MODULE III 15

Immunology :Cells of immune system, Development, maturation, activation and differentiation of T cells and B cells, Phagocytosis process

Biotechnology Applications: Industrial production, Drug discovery and development

TOTAL: 45 PERIODS

The students will be able to understand fields of Biotechnology and their specialized functions.

· They will acquire precise knowledge of various aspects of a living cell, its

structure, genetics and gene interactions and immune system.

· Also the students will get knowledge about Biotechnology application in industry and health care field.

TEXT BOOKS

1. Lehninger A.L., Nelson D.L. and Cox M.M. Principles of Biochemistry. CBS publishers and distributors.
2. Murray R.K., Granner D.K., Mayes P.A. and Rodwell V.W. Harpers Biochemistry.

Appleton and Lange ,Stanford ,Conneticut.

3. Satyanarayana,ry"U .Books"Biochemist&Allied (P) Ltd., 2005.
4. Lodish, Harvey etal., " Molecular Cell Biology," 6t
5. Alberts, Bruce, "Molecular Biology of Cell", 5th Ed
6. Satyanarayana, U. "Biotechnology"td.,2005. Books & Allied (P
7. Friefelder, David. "Molecular Biology." Narosa Publ

REFERENCE

1. Lewin's GENES XI, Published by Jones & Bartlett Lea
2. Kuby J, Immunology, WH Freeman & Co., 7th Edition 2012.

FCEN0116 INTRODUCTION TO BIOPHYSICS (3 0 0 3)

Credits 3

Prerequisite: Nil

OBJECTIVES

1. Learn the structures of biological molecules
2. To understand the concept of structural analysis
3. Learn the techniques for analysis and determination of structure of biomolecules

MODULE 1: Structures of Biological macromolecules 17

Levels of structures in proteins, nucleic acids and polysaccharides - primary, secondary, tertiary and quaternary structures

Conformational analysis of proteins

Polypeptide chain geometries, internal rotation angles, Ramachandran plot, potential energy calculations, forces that determine protein structure –hydrogen bonding, hydrophobic interactions, ionic interactions, disulphide bonds –prediction of protein structure.

MODULE 2 : Conformational analysis of Nucleic acid 12

General characteristics of nucleic acid structure –geometric –Glycosidic bond –

rotational isomers, ribose puckering–backbone rotation angles and steric hindrances
–forces stabilizing ordered forms –base pairing and base stacking

MODULE 3: Technoques for the study of Biological structures 16

Electron Microscopy, Ultracentrifuge, Viscometry, Molecular –sieve chromatography, electrophoresis, NMR and EPR. X-Ray crystallography, X-ray fiber diffraction, light scattering, Neutron scattering **Total hours: 45**

TEXT BOOK:

Biophysical Chemistry, Cantor and Schimmel, part I and II, W.H. Freeman and co

FCEN0117 BIOSAFETY, BIOETHICS, IPR & PATENTS (2 0 0 2) Credits 2 Prerequisite Nil OBJECTIVES

1. To introduce the biosafety regulations and ethical concepts in biotechnology
2. To emphasize on IPR issues and need for knowledge in patents in biotechnology

MODULE I: Bioethics and Biosafety 12

Bioethics –Necessity of Bioethics, different paradigms of Bioethics –National & International. Ethical issues against the molecular technologies.

Biosafety–Introduction to biosafety and health hazards concerning biotechnology. Introduction to the concept of containment level and Good Laboratory Practices (GLP) and Good Manufacturing Practices (GMP).

MODULE 2: Patent and Patent Laws 10

Objectives of the patent system - Basic principles and general requirements of patent law biotechnological inventions. Introduction to Indian Patent Law. World Trade Organization and its related intellectual property provisions. Intellectual/Industrial property and its legal protection in research, design and development. Patenting in Biotechnology, economic, ethical and depository considerations.

MODULE 3: Intellectual Property Rights 8

Intellectual property rights-TRIP- GATT-International conventions patents and methods of application of patents-Legal implications-Biodiversity and farmer rights.

TOTAL 30

REFERENCES:

1. Beier, F.K., Crespi, R.S. and Straus, T. Biotechnology and Patent protection-Oxford and IBH Publishing Co. New Delhi.
2. Sasson A, Biotechnologies and Development, UNESCO Publications.
3. Singh K, Intellectual Property rights on Biotechnology, BCIL, New Delhi
4. Regulatory Framework for GMOs in India (2006) Ministry of Environment and Forest,

5. Cartagena Protocol on Biosafety (2006) Ministry of Environment and Forest, Government of India, New Delhi

FCEN 0118 Computer Fundamental and Organization

Code	Course Title	Course Type	Credits	Pre-requisite	T-P-Pr
FCEN 0118	Computer Fundamental and Organization	Theory	3	Nil	3-0-0

Learning Objectives:

The basic knowledge of how a computer works is very important for any fresh networking or operating system professional. The functional knowledge of a computers working and its main building parts are paramount. The computers of today may come with variety of features but the basic working principles remain the same. Students will explore the fundamentals of organization of a computer and the principles and building units of a computer (its hardware). Also, they will be introduced to the basics of networking and MS Office.

Course Outcomes:

Student will able to know about Basic knowledge about computers. Fundamental hardware components that make up

a computer's hardware and Word the processing role and electronic of each spreadsheet of. An overview these of MSWORD, MSEXCEL and MSPOWER POINT. Attain the knowledge about basics of Networking

Syllabus

Unit I: General Features of a Computer(12hrs)

General features of a computer, Generation of computers, Personal computer, workstation, mainframe computer and super

computers. Computer applications –data processing, information processing, commercial, office automation, industry and

engineering, healthcare, education, graphics and multimedia.

Unit II: Computer Organization (6hrs)

Computer organization, central processing unit, computer memory –primary memory and secondary memory. Secondary storage devices –Magnetic and optical media. Input and output units. OMR, OCR, MICR, scanner, mouse, modem.

Unit III: Computer Hardware and Software (11hrs)

Computer hardware and software. Machine language and high level language. Application software, computer program,

operating system. Computer virus, antivirus and computer security. Elements of MS DOS and Windows OS. Computer

arithmetic, Binary, octal and hexadecimal number systems. Algorithm and flowcharts, illustrations, elements of a database

and its applications

Basic Gates (Demorgans theorems, duality theorem, NOR, NAND, XOR, XNOR gates), Boolean expressions and logic diagrams, Types of Boolean expressions

UNIT IV: MS Office (4hrs)

Word processing and electronic spread sheet. An overview of MSWORD, MSEXCEL and MSPOWER POINT

UNIT V: Introduction to Networking (6hrs)

Network of computers.Types of networks, LAN, Intranet and Internet.Internet applications. World Wide Web, E-mail, browsing and searching, search engines, multimedia applications.

Books for Reference:

1. Alexis Leon and Mathews Leon (1999): Fundamentals of information Technology, Leon Techworld Pub.
2. Jain, S K (1999) : Information Technology "O" level
3. Jain V K (2000) "O" Level Personal Computer softwa
4. Rajaraman, V (1999): Fundamentals of Computers, Prentice Hall India
5. Hamacher, Computer Organization McGrawhill
6. Alexis Leon: Computers for everyone. Vikas, UBS
7. Anil Madaan : Illustrated Computer Encyclopedia. Dreamland Pub
8. Sinha. Computer Fundamentals BPB Pub.

Pedagogy

S I · N	Topic	Teaching Method	Refere nce/To ol	Instructional Hours	
				Theor	y
Practi o · cal	Computer Fundamental and Organization				
1	General features of a computer, Generation of computers, Personal computer, workstation,	Class Room Teaching + PPT		3	0
2	mainframe computer and super computers			2	0
3	Computer applications – data processing, information processing,			2	0
4	commercial, office automation, industry and engineering, healthcare, education, graphics and multimedia.			3	0
5	Computer organization, central processing unit, computer memory –primary memory and secondary memory.			3	0
6	Secondary storage devices –Magnetic and optical media. Input and output units. OMR, OCR, MICR, scanner, mouse, modem.			3	0
7	Computer hardware and software. Machine language and high level language.			3	0
8	Application software, computer program, operating system. Computer virus, antivirus and computer security. Elements of MS DOS and Windows OS.			3	0
9	Computer arithmetic, Binary, octal and hexadecimal number systems. Algorithm and flowcharts, illustrations, elements of a database and its applications			5	0
10	Word processing and electronic spread sheet. An overview of MSWORD, MSEXCEL and MSPOWER POINT			4	0
11	Network of computers. Types of networks, LAN, Intranet and Internet.		3	0	
12	Internet applications. World WideWeb, E-mail, browsing and searching, search engines, multimedia applications.		3	0	
Total				39	0

FCEN0119 Operating System Building Blocks (Theory) Credit 3 T-P-Pr (3-0-0)

Code	Course Title	Course Type	Credits	Pre-requisite	T-P-Pr
FCEN0119	Operating System Building Blocks	Theory	3	Nil	3-0-0

Learning Objectives:

The operating system is the most important program that runs on a computer. Every general-purpose computer must have an operating system to run other programs. Operating systems perform basic tasks, such as recognizing input from the keyboard, sending output to the display screen, keeping track of files and directories on the disk, and controlling peripheral devices such as disk drives and printers. This course covers the concept of operating system and its applications.

Course Outcome:

After learning the fundamental concepts in Operating system including how OS has evolved over the years and different components of OS, students will continue to more significant functions of OS like Process management, storage and memory management etc. This will provide the necessary information for students to extract maximum benefits out of the OS while developing programs, working with applications and etc.

Syllabus

Unit I: Introduction to Operating System (6 Hrs.)

Objectives and Functions of OS, Evolution of OS, OS Structures, OS Components, OS Services, System calls, System

programs, Virtual Machines.

Unit II: Process Management –Processes and Threads (8 Hrs.)

Processes: Process concept, Process scheduling, Co-operating processes, Operations on processes, Inter process

communication, Communication in client-server systems. Threads: Introduction to Threads, Single and Multi-threaded

processes and its benefits, User and Kernel threads, Multithreading models, Threading issues. CPU Scheduling: Basic

concepts, Scheduling criteria, Scheduling Algorithms, Multiple Processor Scheduling, Real-time Scheduling, Algorithm

Evaluation, Process Scheduling Models.

Unit III: Process Management –Synchronization and Deadlocks (8 Hrs.)

Process Synchronization: Mutual Exclusion, Critical –section problem, Synchronization hardware, Semaphores, Classic

problems of synchronization, Critical Regions, Monitors, OS Synchronization, Atomic Transactions. Deadlocks: System

Model, Deadlock characterization, Methods for handling Deadlocks, Deadlock prevention, Deadlock Avoidance, Deadlock

Detection, Recovery from Deadlock.

Unit IV: Storage Management (10 Hrs.)

Memory Management: Logical and physical Address Space, Swapping, Contiguous Memory Allocation, Paging, Segmentation with Paging. Virtual Management: Demand paging, Process creation, Page Replacement Algorithms,

Allocation of Frames, Thrashing, Operating System Examples, Page size and other considerations, Demand segmentation.

File-System Interface: File concept, Access Methods, Directory structure, File- system Mounting, File sharing, Protection and consistency semantics. File-System Implementation: File-System structure, File-System Implementations, Directory Implementation, Allocation Methods, Free-space Management, Efficiency and Performance, Recovery. Disk Management: Disk Structure, Disk Scheduling, Disk Management, Swap-Space Management, Disk Attachment, stable-storage Implementation

Unit V: Protection and Security (7hrs)

Protection: Goals of Protection, Domain of Protection, Access Matrix, Implementation of Access Matrix, Revocation of Access Rights, Capability- Based Systems, Language –Based Protection. Security: Security Problem, User Authentication, One –Time Password, Program Threats, System Threats, Cryptography, Computer –Security Classifications

Reference Books:

1. Operating System Concepts and design by Milan Milonkovic, II Edition, McGraw Hill 1992.
2. Operation System Concepts by Tanenbaum, 2nd Edition, Pearson Education.
3. Operating System by Silberschatz / Galvin / Gagne, 6th Edition,WSE (WILEY Publication)
4. Operating System by William Stallings, 4th Edition, Pearson Education.
5. Operating System by H.M.Deitel , 2nd Edition,Pearson Education
6. Operating System by Abraham Silberschatz and peter Baer Galvin, 8th Edition, Pearson Education 1989 (Chapter 1,3.1,3.2,3.3,3.4,3.6,4,5,6 (Except 6.8,6.9), 7, 8,9,10,11,13, (Except 13.6) 19 (Except 19.6),20(Except 20.8, 20.9), 22,23).
7. Operating Systems by Nutt, 3/e Pearson Education 2004

Pedagogy

S I. N	Topic	Teaching Method	Refer ence/ Tool	Instructional Hours	
				Theo ry	Prac tice
0.	Operating System Building Blocks				
1.	Introduction to Operating System: Objectives and Functions of OS, Evolution of OS, OS Structures, OS Components, OS Services, System calls, System programs, Virtual Machines.			6	

2.	Process Management –Processes and Threads: Processes: Process concept, Process scheduling, Co-operating processes, Operations on processes, Inter process communication, Communication in client-server systems. Threads: Introduction to Threads, Single and Multi-threaded processes and its benefits.	Class Room Teaching +PPT	4	
3.	User and Kernel threads, Multithreading models, Threading issues. CPU Scheduling: Basic concepts, Scheduling criteria, Scheduling Algorithms, Multiple		4	
	Processor Scheduling, Real-time Scheduling, Algorithm Evaluation, Process Scheduling Models.			
4.	Process Management – Synchronization and Deadlocks: Process Synchronization: Mutual Exclusion, Critical – section problem, Synchronization hardware, Semaphores, Classic problems of synchronization, Critical Regions, Monitors, _____		3	
5.	OS Synchronization, Atomic Transactions. Deadlocks: System Model, Deadlock characterization, Methods for handling Deadlocks, Deadlock prevention, Deadlock Avoidance, Deadlock Detection, Recovery from Deadlock.		5	
6.	Storage Management: Memory Management: Logical and physical Address Space, Swapping, Contiguous Memory Allocation, Paging, Segmentation with Paging. Virtual Management: Demand paging, Process creation, Page Replacement Algorithms, Allocation of Frames, Thrashing, Operating System Examples. _____	Class Room Teaching + PPT	4	
7.	Page size and other considerations, Demand segmentation. File-System Interface: File concept, Access Methods, Directory structure, File- system Mounting, File sharing, Protection and consistency semantics. File-System Implementation: File-System structure, File-System Implementations,		3	
8.	Directory Implementation, Allocation Methods, Free-space Management, Efficiency and Performance, Recovery. Disk Management: Disk Structure, Disk Scheduling, Disk Management, Swap-Space Management, Disk Attachment, stable-storage Implementation. _____	Class Room Teaching + PPT	3	
9.	Protection and Security: Protection: Goals of Protection, Domain of Protection, Access Matrix, Implementation of Access Matrix, Revocation of Access Rights, Capability- Based Systems, _____		3	
10.	Language – Based Protection. Security: Security Problem, User Authentication, One –Time Password, Program Threats, System Threats, Cryptography, Computer –Security Classifications Objective review.		4	

11.	Total	39	0
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Aerodynamics Laboratory

Subject Name	Code	Type of course	T-P-P	Prerequisite
Aerodynamics Laboratory	ENFC0208	Practice	0-2-0(2)	Nil

1. Objective

<ul style="list-style-type: none"> ✓ To Predict Different Aerodynamic Propulsion in Aero Applications
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2. Course Outcome

<ul style="list-style-type: none"> ✓ Ability to Use the Fundamental Dynamics Principles in Aircraft Applications.
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3. Evaluation Systems

Internal Examination	Component	% of Marks	Method of Assessment
	Experiments	40	Lab work
	Learning record	10	Report and presentation
External Examination		50	Lab work
Total		100	

4. List of Experiments

1. Application of Bernoulli's Equation – venturimeter and orifice meter.
2. Frictional loss in laminar flow through pipes.
3. Frictional loss in turbulent flow through pipes.
4. Calibration of a subsonic Wind tunnel.
5. Determination of lift for the given airfoil section.
6. Pressure distribution over a smooth circular cylinder.
7. Pressure distribution over a rough circular cylinder.
8. Pressure distribution over a symmetric aerofoil.
9. Pressure distribution over a cambered aerofoil.
10. Flow visualization studies in subsonic flows.
11. Calculation of drag over smooth cylinder
12. Calculation of drag over rough cylinder

6. List of Equipment for a Batch of 30 Students

S.N.	Name of Equipment	Quantity	Experiment No.
1	Venturimeter	1	1
2	Orificemeter	1	1
3	Pipe friction apparatus	1	2, 3
4	Subsonic Wind tunnel	1	4, 5, 6, 7, 8, 9, 10, 11, 12
5	Models(aerofoil, rough and smooth cylinder, flat plate)	1	5, 6, 7, 8, 9

Introduction to Robotics

Subject Name	Code	Type of course	T-P-P (Credit)	Prerequisite
Introduction to Robotics	ENFC0203	Practice	0-2-0(2)	Geometric Drawing

1. Objectives

- To Provide An Overview To Students On Various Types of Industrial Robots and Their Configurations.
- To Educate The Students on Use Of DELMIA To Carryout Simulation Exercises of Various Types of Robotic Arms Suiting to Specific Applications.

2. Course Outcome

- Students Will Have Knowledge and Skill To Program Industrial Robots For Performing Various Tasks.
- Students Will Be Able To Undertake Simulation Exercises Of Various Types Of Robotic Arms As A Pre-Requisite Leading To A Safe, Cost Effective, Reliable And Optimum Design.

3. Evaluation Systems

Internal Examination	Component	% of Marks	Method of Assessment
	Midterm Test		
	Assignment		
	IPR	50	Lab work, report
	Project		
	Quiz		
External Examination	EPR	50	Lab work & Report
Total		100	

4. List of Experiments (45 Hours)

1. DELMIA: Simulated Models of Various Types Industrial Robots & Its Architecture.
2. DELMIA: Simulation of Activities Like: Pick and Place, Coordinated Movement, Spot Welding and Arc Welding.
3. DELMIA: Designing Own Robotic Arm with Insight to Robot Kinematics.
 - i) A Prismatic Robotic Arm.
 - ii) A Revolute Joint Robotic Arm.
 - iii) Articulated Robotic Arm
 - iv) Spherical Robotic Arm

4. Robot Programming: Use of Brabofor Pick and Place Actions.
5. An Understanding of Different Sensors, Their Operation and Application. Demonstration of Use of Sensors for At Least 3 Applications of Robot.
6. Commanding A Robot To Achieve Tasks On The Basis Of Sensor Information, A Description Of Motors, And How Their Velocity Is Set, And Other Robotic Actuators.

5. Reference

Text Books:

1. M.P. Groover, Industrial Robotics, Second Edition, TMH Publishers.
2. S.R. Deb and S. Deb, Robotics Technology and Flexible Automation, Second Edition, TMH Publishers.

Reference Books:

1. Y Koren, Robotics for Engineers, TMH Publishers.

Online Source:

6. Session Plan

Sl. No	Topic coverage and Internal Test	No. of Sessions (in hr)	Activity	Assignment	Suggested Reading (Book, Video, Online source, etc.)
1	Demonstration of various robotic arms available in DELMIA	3	Lab Demonstration	Collection of tutorials related various Robotic Arms	DELMIA help file
2	Robotic architecture. Demonstration of prismatic, revolute and SCARA	6	Lab Demonstration	Development of Robotic Arm in DELMIA & Demonstration of Application.	DELMIA help file
3	Robotic architecture. Demonstration of articulated robotic arm and Spherical robotic arm	3	Lab Demonstration	Development of Robotic Arm in DELMIA & Demonstration of Application.	DELMIA help file
4	Demonstration of application in spot welding and arc welding	3	Lab Demonstration	Development of Robotic Arm in DELMIA &	DELMIA help file

				Demonstration of application.	
5	Demonstration of application in assembly line operation.	3	Lab Demonstration	Development of robotic arm in DELMIA & Demonstration of application.	DELMIA help file
6	Robotic Programming practice to do pick and place action.	3	Lab practice	Development of programs to do other actions like writing on the white board, Erasing the same with wiper. At least 3 such Activities	Brabo Manual
7	Demonstration of assignment Exercises	3	Lab practice	Recording of all assignments	BraboManual
8	Demonstration of application of sensors, At least 3 sensor based applications	3	Lab practice	Identifying different types of sensors that can be used in robot arm application	
9	Demonstration of use of sensors	3	Lab practice		
10	Demonstration of sensors to actuate motors and its speed control	3	Lab Practice		
11	Demonstration of sensors to actuate motors and its speed control	6	Lab Practice	A Mini project of designing to making a movement to robotic arm	
12	A mini Project Demonstration	6			
	Total (hours)	45			

Developed by: Prof. Mir Sadat Ali , Prof. D. Mohanta& Prof. G. N. Arka

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Developed on: June 2018

FCEN0201 INTRODUCTION TO INTERNET TECHNOLOGY

Course Nature: Practice

Credit: 5

Course Objectives:

1. To introduce the concepts of Internet and Impact of Internet in human life.
2. To introduce the basic concepts of web designing.
3. To make the students understand the web designing languages like HTML, CSS and Java Script.
4. To train the students on the methods of designing the responsive sites.
5. To make the students understand various concepts related web design. Course Outcomes:

On successful completion of this course, students will be able to: 1. Design a complete responsive, attractive, static website.

Module-I (12 Hrs): INTERNET AND HTML BASICS

(A) **Internet Technology:** Basic Concepts of Internet, How it Works ?, Browser Types, Server Types, Site Advantages, Skills Required, Tools Required, Domain Names, Site Construction, Hosting

Concepts, Ecommerce Hosting, Site Backup, Site Statistics, Site Popularity, Free Graphics. **(Most**

of the topics will be through presentation and live demonstration)

(B) **HTTP:** Home, Overview, Parameters, Messages, Requests, Responses, Methods, Status Codes, Header Fields, Caching, URL Encoding, Security, Message Examples, HTTPs. **(Most of the topics will be through presentation and live demonstration)**

(C) **HTML:** Overview, Basic Tags, Elements, Attributes, Formatting, Phrase Tags, Meta Tags, Comments, Images, Tables, Lists, Text Links, Image Links, Email Links, Frames, Iframes,

Blocks, Backgrounds, Colors, Fonts, Forms, Embed Multimedia, Marquees, Header, Style Sheet, Javascript, Layouts. **(Most of the topics will be through presentation and live demonstration)**

Module-II (20 Hrs) : HTML5 & CSS3

(A) **HTML5:** Overview, Syntax, Attributes, Events, Web Forms 2.0, SVG, MathML, Web Storage, WebSQL, Server-Sent Events, Web Socket, Canvas, Audio & Video, Geolocation, Microdata, Drag & drop, Web Workers, IndexedDB, Web Messaging, Web CORS, Web RTC. . **(Most of the topics will be through presentation and live demonstration)**

(B) **CSS:** Introduction, Syntax, Selectors, Backgrounds, Text, Fonts, Links, Lists, Tables, Box Model, Border, Outline, Margin, Padding, Dimension, Display, Position, Float, Align, Combinators, Pseudo-class, Pseudo-element, Navigation Bar, Image Gallery, Image Opacity, Image Sprites, Media Types, Attr Selectors, Rounded Corners, Border Images, Backgrounds, Colors, Gradients, Shadows, Text, Fonts, 2D Transforms, 3D Transforms, Transitions, Animations, Multiple Columns, User Interface, Box Sizing. Viewport, Grid View, Media Queries,

(C) Images, Videos,

Frameworks. **(Most of the topics will be through presentation and live demonstration)**

MODULE-III (20 Hrs) : JAVASCRIPT & BOOTSTRAP

(A) **JavaScript:** Overview, Syntax, Enabling, Placement, Variables, Operators, If...Else, Switch Case, While Loop, For Loop, For...in, Loop Control, Functions, Events, Cookies, Page Redirect, Dialog Boxes, Void Keyword, Page Printing, Objects, Number, Boolean, Strings, Arrays, Date, Math, RegExp, HTML DOM, Error Handling, Validations, Animation, Multimedia, Debugging, Image Map, Browsers. . **(Most of the topics will be through presentation and live demonstration)**

(B) **Bootstrap:** Introduction, Environment Setup, Grid System, CSS Overview, Typography, Code, Tables, Forms, Buttons, Images, Helper Classes, Responsive utilities, Glyphicons, Drop downs, Button Groups, Button Drop downs, Input Groups, Navigation Elements, Navbar, Breadcrumb,

Pagination, Labels, Badges, Jumbotron, Page Header, Thumbnails, Alerts, Progress Bars, Media Object, List Group, Panels, Wells, Bootstrap Plugins. . **(Most of the topics will be through presentation and live demonstration)**

TEXT BOOKS:

1. *Web Warrior Guide to Web Design Technologies*, Don Gosselin, Joel Sklar & others, Cengage Learning
2. *Teach yourself web technology*, Ivan Bayross, BPB Publication
3. *Web Programming: Building Internet Applications*, Chris Bates, Wiley Dreamtech
4. *Web Technologies*, Uttam K Roy, Oxford
5. *Web Technology: A developer perspective*, Gopalan & Akilandeswari, PHI

Module I

S. No.	Topic	Pedagogy	Details	Instructional Hrs			
				Theory + Tutorial	Practice	video	Project
Internet Technology:		Most of the topics will be through presentation and Live demonstration					
1	Basic Concepts of Internet, How it Works?			0	0	0	
2	Browser Types, Server Types, Site Advantages, Skills Required, Tools Required,			1	0	0	
3	Domain naming Server and Domain Naming System,			1	0	0	
4	Site Construction Basics			0	0	0	

5	Web Server			0	0	0
6	Control Panel and Hosting methods			1	0	0
HTTP:						
7	Home, Overview, Parameters, Messages, Requests, Responses, Methods, Status Codes, Header Fields, Caching, URL Encoding, Security, Message Examples, HTTPs			1	0	0
HTML:						
8	Overview, Basic Tags, Elements, Attributes, Formatting, Phrase Tags, Meta Tags, Comments, Images, Tables, Lists, Text Links, Image Links,			2	0	0
9	Email Links, Frames, Iframes, Blocks, Backgrounds, Colors, Fonts,			2	0	0
10	Forms,			2	0	0
11	Embed Multimedia, Marquees, Header, Style Sheet, Javascript, Layouts			2	0	0
Sub Total:				12	0	0

Module II

S. No.	Topic	Pedagogy	Details	Instructional Hrs			
				Theory	Practice	video	Project
HTML5:							
	Overview, Syntax, Attributes, Events, Web						
1	Forms 2.0,	Most of the topics will be through presentation and live demonstration		0	1	0	0
2	SVG, MathML, Web Storage, Web SQL, Server-Sent Events, Web Socket,			0	1	0	0
3	Canvas, Audio & Video, Geolocation, Microdata,				1	0	
4	Drag & drop, Web Workers, IndexedDB,			0	1	0	0
5	Web Messaging, Web CORS, Web RTC			0	1	0	0
CSS3:							
6	Introduction, Syntax, Selectors, Backgrounds,			0	2	0	0
7	Text, Fonts, Links, Lists, Tables, Box Model, Border, Outline, Margin, Padding, Dimension,			0	2	0	0
8	Display, Position, Float, Align, Combinators, Pseudo-class, Pseudoelement,				2	0	0
9	Navigation Bar, Image Gallery, Image Opacity, Image Sprites, Media Types,			0	2	0	0
10	Rounded Corners, Border Images, Backgrounds, Colors, Gradients, Shadows,			0	2	0	0
11	Text, Fonts, 2D Transforms, 3D Transforms, Transitions, Animations,			0	1	0	0
12	Multiple Columns, User Interface, Box Sizing, Viewport, Grid View,				2		
13	Media Queries, Images, Videos, Frameworks			0	2	0	0
Sub Total:					20	0	0

Module III

S. No.	Topic	Pedagogy	Details	Instructional Hrs			
				Theory +Tutorial	Practice	video	Project
JavaScript							
	Overview, Syntax, Enabling, Placement, Variables, Operators,	Most of the topics will be through presentation and Live demonstration		0	1	0	0
	If...Else, Switch Case, While Loop, For Loop, For...in,			0	1	0	0
	Loop Control, Functions, Events,			0	2	0	0
	Cookies, Page Redirect, Dialog Boxes, Void Keyword, Page Printing,			0	1	0	0
	Objects, Number, Boolean, Strings, Arrays, Date, Math,			0	2	0	0
	RegExp, HTML DOM, Error Handling, Validations,			0	2	0	0
	Animation, Multimedia, Debugging, Image Map, Browsers			0	1	0	0
Bootstrap:							
	Introduction, Environment Setup, Grid System, CSS Overview,			0	1	0	0
	Typography, Code, Tables, Forms, Buttons, Images, Helper Classes,			0	1	0	0
	Responsive utilities, Glyphicons, Drop downs, Button Groups,			0	2	0	0
	Button Drop downs, Input Groups, Navigation Elements,			0	2	0	0
	Navbar, Breadcrumb, Pagination, Labels, Badges,			0	1	0	0
	Jumbotron, Page Header, Thumbnails,			0	1	0	0
	Alerts, Progress Bars,						
	Media Object, List Group, Panels, Wells, Bootstrap Plugins			0	2	0	0
Sub Total:							
				0	20	0	0

FCEN0202 BASIC ELECTRONICS LABORATORY

PRACTICE **Credits: 02** **Hours: [36]**

Course Objectives:

The objectives of this Laboratory are to

- 1. Identify schematic symbols and verifying the characteristics of electronic devices e.g. Diode, Zener Diode, LED, BJT, JFET and MOSFET etc.*
- 2. Design, analysis and verification of electronic circuits e.g. Rectifiers, Clipper, Clamper, Filters, Amplifiers and Operational Amplifiers etc.*

Course Outcomes:

Upon successful completion of this laboratory, students should be able to:

- 1. Get the exposure of electronics engineering which allows training students with good scientific and engineering breadth so as to comprehend, analyze, design, and create novel products and solutions for the real life problems.*
- 2. Apply this knowledge under supervision to solve engineering problem with core field.*
- 3. Get the knowledge of foundation course for further study.*

List of Experiments

1. Identification of basic electronic components & familiarization with bread board and measuring instruments
2. Study and use of Function generator & Oscilloscope to generate & view waveforms and also measure its amplitude and frequency.
3. Verification of the V-I characteristics of forward & reverse biased PN-junction diode.
4. Verification of the V-I characteristics of forward & reverse biased of Zener diode.
5. Implementation of Half wave and full wave rectifier without and with capacitor filter. Tracing of waveforms, Measurement of DC load voltage, AC load voltage & ripple factor values.
6. Implementation of clipper circuits using PN-junction diode. Tracing of waveforms at the clipper circuits output.
7. Plot and verify the input and output characteristics of BJT in Common Emitter Configuration.
8. Plot and verify the input and output characteristics of BJT in Common Base Configuration.
9. Implementation of DC biasing circuit of BJT and measurement of DC voltages and currents
10. Verification of the drain characteristics of JFET
11. Plot and verify the transfer characteristics of F.E.T and calculate various J.F.E.T parameters
12. RC based low pass filter and high pass filter design

FCEN0203 SIGNALS & SYSTEMS LABORATORY

PRACTICE

Credits:02

Hours [36]

Course Objectives:

The objectives of this Laboratory are to

- 1. Introduce the concepts and techniques associated with the understanding of signals and systems.*
- 2. Familiarize with techniques suitable for analyzing and synthesizing both continuous-time and discrete time systems and provide with an appreciation of applications for the techniques and mathematics used in this course.*

Course Outcomes:

Upon successful completion of this laboratory, students should be able to:

- 1. Determine the response of an LTI system using convolution and classical methods. Analyze system properties based on impulse response.*
- 2. Determine and analyze the responses of LTI system to periodic signals using Fourier series. **List***

of Experiments

1. Introduction to MATLAB/SCILAB programming
2. A) Generation of various types of waveforms (sine, cosine, square, triangular etc.)
B) Plot unit step, unit ramp, unit impulse
C) Study and analysis of different types of systems.
3. Computation of Energy and power of a given signal
4. A) Linear convolution of sequences
B) Computation of autocorrelation of a sequence, cross correlation of two sequences
5. Computation of the power spectral density of a sequence using SCILAB/MATLAB 6. Analysis of Fourier series and Transforms of different waveforms using SCILAB/MATLAB
7. Computation of Laplace Transform of different types of signal.
8. Computation of Z-transform of given signals.
9. Computation of DTFT of different types of signals.
10. Finding of stability of a LTI system

Tools to be used: MATLAB / SCILAB

Reference Books:

- 1. Digital Signal Processing: A MATLAB-Based Approach –Vinay K. Ingle and John G. Proakis, Cengage Learning.*
- 2. Fundamentals of Digital Signal Processing using MATLAB –Robert J. Schilling and Sandra L. Harris, Cengage Learning.*

FCEN0204 DIGITAL ELECTRONIC CIRCUITS LABORATORY

PRACTICE

Credits: 02

Hours: [36]

Course Objectives:

The objectives of this Laboratory are to:

1. Provide basic concepts on various digital designs through hands on practice.
2. Simulation platform for various digital circuits through Hardware description languages.

Course Outcomes:

Upon successful completion of this laboratory, students should be able to:

1. Develop new digital design
2. Design high speed memories through HDL programming.

List of Experiments

1. Verification of truth table of different digital logic gates: AND, OR, NAND, NOR, EX-OR, EX-NOR, NOT.
2. Design and implementation of Half Adder, Full Adder, Half Subtractor and Full subtractor using various logic gates.
3. Design, implement and test a given combinational circuit design example with (i) NAND Gates only (ii) NOR Gates only and (iii) using minimum number of Gates.
4. Gate-level minimization: Two level and multi level implementation of Boolean functions.
5. Combinational Circuits: design, assemble and test: code converters, a. gray code to binary and 7 segment display.
6. Implementation of combinational logic circuits with multiplexers and de-multiplexers.
7. Flip-Flop: implementation and verification of SR, D & J-K flip-flops.
8. Shift Registers: Design and investigate the operation of all types of shift registers with a. parallel load.
9. Counters: Design, assemble and test various ripple and synchronous counters - decimal a. counter, Binary counter with parallel load.
10. Clock-pulse generator: design, implement and test using 555 timer.
11. Mini Project: Binary Multiplier: design and implement.

Using VHDL:-

12. Verilog/VHDL simulation and implementation of Experiments 1, 2, 3, 6 & 7.

FCEN0205 ELECTRONICS WORKSHOP-I

PRACTICE

Credits: 02

Hours: [42]

Course Objectives:

The objectives of this Laboratory are to:

1. Understand and conceptually visualize the theoretical concepts of different components covered in the basic electronics.
2. Understand the use and application of surface mount technology in the manufacture of an electronic circuit and its hands on practice.

Course Outcomes:-

Upon successful completion of this laboratory, students should be able to:

1. Identify different tools and electronic components
2. Use and solder the electronic components on a Varo board with proper polarity to design simple circuits

List of Experiments

1. Identify the various tools & write down their uses.
Material required: various tools -Wire Cutter.Wire Stripper -Various types of Pliers-Vice.-Crimping Tools (RJ-11/RJ-45) -Screw-Drivers -Testers
2. Identify the various type of connector used in various Gadgets & Instruments/Equipments
Material Required :1. USB connector and cable, 2. Audio Cables and Connectors (3.5mm headphone jack, Digital Optical Audio), 3. Video Cables (VGA cable, DVI to VGA, S-Video cables, VGA to S-Video cables), 4. Audio and Video Cables (RCA Connector Cables, HDMI Cables, Display Port), 5.Data Cables (Fire wire IEEE 1394, eSATA Cables), 6. Networking Related Cables (Phone RJ11 Cable, Ethernet Cable)
3. Solder the joint connection of wires and check it. De-solder it and Re-solder.
Materials required: soldering iron. Solder wire, Flux, Desoldering Pump
4. Study of basic electronics components - Resistors and Capacitors (Find out the values from color bands/written values and compare it with measured values using multimeter)
Material required: Varioustypes of resistors, Capacitors and multimeter.
5. Study of basic electronics components - Identify the terminals of a Diode and its Polarity, Identify the terminals of a Transistor and its Type (n-p-n or p-n-p)
Material Required: Diode, Transistor, Multimeter, connecting wire
6. Study of Electrical wiring.
Material Required: Switch Board, Switches, Plugs, Electric Bulb, Fuse, Regulator, Two way switch, Wires
7. Design of rectifier circuit with filter, variable resistor, voltage regulator.
Material Required: Transformer (230-18), diodes, capacitor, variable resistor, voltage regulator for 5 volt and 12 volt.
8. Study of BJT as switch.
Material Required: Transistor, Resistors, Diode, Relay, LED
Study and use of Relay (design a simple relay circuit).
Material Required: Transistor, Resistors, Diode, Relay, LED
10. Check the continuity of a printed line on a PCB using Multi-meter. Study of different types of boards for electronics circuit design.
Material Required: PCB (single layer, double layer and multi layer) and Varo Board
11. Survey of optoelectronics devices (LED, Photo diode, photo transistor, LDR, Opto-isolator).
Materialrequired: different types of optoelectronics devices, data sheets.
12. Study of CRO, function generator & Measurement of voltage, frequency and Phase Angle.
13. Study of different types of transformer with different power supply (step down in particular if Step up transformer is not possible)

ECEN0206 Basic Electrical Engineering Laboratory

Credits: 02

Total Hours: 42

Course Objectives:

- Provide working knowledge for the analysis of basic D.C. and A.C. circuits used in electrical and electronic devices.

Course Outcomes:

- Understand DC Machines
- Understand single and three phase A.C circuits.
- Understand AC machines and measuring instruments.

List of Experiments

1. Connection & Measurement of power consumption of a fluorescent lamp.
2. Measurement of armature & field resistances of a D.C Compound Machine.
3. Connection & Testing of 1- \emptyset Energy Meter.
4. Calculation of No-Load losses of a 1- \emptyset Transformer.
5. Study of 1- \emptyset induction motor or fan motor.
6. Determination of OCC (Open Circuit Characteristics) of D.C Shunt Generator.
7. Starting of 3- \emptyset induction motor by star-delta- Δ) (Ystarter or DOL starte
8. Calculation of current, voltage, power & power factor of series RLC circuit excited by 1- \emptyset A.C Supply.
9. Starting & Speed Control of D.C Shunt motor by (i) Field flux control method & (ii) armature voltage control method.
10. V-I Characteristics of Incandescent lamp.
11. Verification of Thevenin's theorem.
12. Study of DC motor using three point starter.

S. No.	Topic	Pedagogy	Details	Instructional Hrs			
				Theory + Tutorial	Practice	Video	Project
1	Connection & Measurement of power consumption of a fluorescent lamp	PRAC	Hands on Practice	1	2	0	0
2	Measurement of armature & field resistances of a D.C Compound Machine	PRAC	Hands on Practice	1	2	0	0
3	Connection & Testing of 1- \emptyset Energy Meter	PRAC	Hands on Practice	1	2	0	0
4	Calculation of No-Load losses of a 1- \emptyset Transformer	PRAC	Hands on Practice	1	2	0	0

5	Study of 1-Ø induction motor or fan Motor	PRAC	<i>Hands on Practice</i>	1	2	0	0
6	Determination of OCC (Open Circuit Characteristics) of D.C Shunt Generator	PRAC	<i>Hands on Practice</i>	1	2	0	0
7	Starting of 3-Ø induction motor by star-delta-Δ) (Ystarte Starter	PRAC	<i>Hands on Practice</i>	1	2	0	0
8	Calculation of current, voltage, power & power factor of series RLC circuit excited by 1-Ø A.C Supply	PRAC	<i>Hands on Practice</i>	1	2	0	0
9	Starting & Speed Control of D.C Shunt motor by (i) Field flux control method & (ii) armature voltage control method	PRAC	<i>Hands on Practice</i>	1	2	0	0
10	V-I Characteristics of Incandescent Lamp	PRAC	<i>Hands on Practice</i>	1	2	0	0
11	Verification of	PRAC	<i>Hands on Practice</i>	0	2	0	0
12	Study of DC motor using three point starter	PRAC	<i>Field Visit</i>	0	3	0	0

FCEE0207 Electrical Workshop Practice

Credits: 02

Total Hours: 42

Course Objective:

- To develop special skills required for repairing small electrical domestic appliances, making joints and carrying out work and detecting faults etc. in electrical equipments and circuits.

Course Outcomes:

After successful completion of the course, student will be able to

- *identify and understand importance of various electrical and electronics components*
- *understand basic construction and operation of various laboratory equipments*
- *develop basic relay contactor logic and operation of electric control panel*
- *perform basic maintenance and troubleshooting of house hold equipments, energy saving etc.*

List of Experiments1. To study safety precautions for electrical

engineering, draw the electrical symbol and general electrical house wiring.

2. To study the various types of accessories and tools.

3. Working of fuse and circuit breaker.
4. To setup a series, parallel and staircase wiring using the given lamps.
5. To study Earth-wire connection and Earth-wire measurement in electrical wiring.
6. To set-up residential house wiring using switches, socket, fuse, junction box, energy meter etc.
7. Fault analysis of residential house wiring.
8. Study of multimeter, voltmeter, ammeter, wattmeter (both AC&DC)
9. Connection & fault analysis in Domestic appliances (Fan, electric iron, fluorescent tube).
10. Study of Industrial wiring in the workshop and study of bimetallic relay.
11. Study of a 11 0.4 KV transformer substation
12. PCB design

S. No.	Topic	Pedagogy	Details	Instructional Hrs			
				Theory + Tutorial	Practice	Video	Project
1	To study safety precautions for electrical engineering, draw the electrical symbol and general electrical house wiring.	PRAC	<i>Hands on Practice</i>	1	2	0	0
2	To study the various types of accessories and tools.	PRAC	<i>Hands on Practice</i>	1	2	0	0
3	Working of fuse and circuit breaker.	PRAC	<i>Hands on Practice</i>	1	2	0	0
4	To setup a series, parallel and staircase wiring using the given lamps.	PRAC	<i>Hands on Practice</i>	1	2	0	0
5	To study Earth-wire connection and Earth-wire measurement in electrical wiring.	PRAC	<i>Hands on Practice</i>	1	2	0	0
6	To set-up residential house wiring using switches, socket, fuse, junction box, energy meter etc.	PRAC	<i>Hands on Practice</i>	1	2	0	0
7	Fault analysis of residential house Wiring	PRAC	<i>Hands on Practice</i>	1	2	0	0

8	Study of multimeter, voltmeter, ammeter, wattmeter (both AC&DC)	PRAC	<i>Hands on Practice</i>	1	2	0	0
9	Connection & fault analysis in Domestic appliances (Fan, electric iron, fluorescent tube).	PRAC	<i>Hands on Practice</i>	1	2	0	0
10	Study of Industrial wiring in the workshop and study of bimetallic relay.	PRAC	<i>Hands on Practice</i>	1	2	0	0
11	Study of basic of a computer and Accessories	PRAC	<i>Hands on Practice</i>	0	2	0	0
12	Study of a 11 0.4 KV transformer Substation	PRAC	<i>Field Visit</i>	0	3	0	0

FCEN0208 Basic Electrical simulation Lab

Credits: 02
42

Total Hours:

Course Objectives:

- To make the students understand the various electrical circuit in software approach.
- To train the students such a way that, it will help them to realise the practical circuit in easy manner.

Course Outcomes:

On successful completion of this course, students will be able to:

- Construct and analyse a practical circuit without having practical knowledge.
- Design circuit parameter, so that it will give better performance in complicated electrical network.

List of experiments:

1. Simulation of DC & AC Circuits
2. DC & AC Transient response of R-L Series network
3. DC & AC Transient response of R-C Series network
4. DC & AC Transient response of R-L-C Series network
5. Mesh Analysis
6. Nodal Analysis
7. Simulation of Norton and Superposition theorem
8. Star Delta Transformation
9. Clipper designing and finding out the i/p and o/p waveforms.
10. Clamper designing and finding out the i/p and o/p waveforms

11. Half wave and full wave rectifier designing and finding out the i/p and o/p waveforms.

12. Transformer

S. No.	Topic	Pedagogy	Details	Instructional Hrs			
				Theory	Tutorial	Practical	Project
	Lists of experiments						
1	Simulation of DC & AC Circuits.	PRAC	Software Practice (Matlab)	0	2	0	0

2	DC & AC Transient response of R-L Series network.	PRAC	Software Practice (Matlab)	0	2	0	0
3	DC & AC Transient response of R-C Series network.	PRAC	Software Practice (Matlab)	0	2	0	0
4	DC & AC Transient response of R-L-C Series network.	PRAC	Software Practice (Matlab)	0	2	0	0
5	Mesh Analysis	PRAC	Software Practice (Matlab)	0	2	0	0
6	Nodal Analysis	PRAC	Software Practice (Matlab)	0	2	0	0
7	Simulation of Norton and Superposition theorem.	PRAC	Software Practice (Matlab)	0	2	0	0
8	Star Delta Transformation	PRAC	Software Practice (Matlab)	0	2	0	0
9	Clipper designing and finding out the i/p and o/p waveforms.	PRAC	Software Practice (Matlab)	0	2	0	0
10	Clamper designing and finding out the i/p and o/p waveforms.	PRAC	Software Practice (Matlab)	0	2	0	0
11	Half wave and full wave rectifier designing and finding out the i/p and o/p waveforms.	PRAC	Software Practice (Matlab)	0	2	0	0
12	Transformer	PRAC	Software Practice (Matlab)	0	2	0	0

FCEN0209 Electrical Machines-I Lab

Credits: Total Hours: 42

Course Objectives:

- To introduce about construction and associated parts of different machines.
- To analyse the behaviour and performance of dc machine under different operating conditions.
- To make student understand about various three phase transformer connections.

Course Outcomes:

On successful completion of this course, students will be able to:

- Distinguish the constructional similarity and dissimilarity between various dc and ac machine.
- Demonstrate appropriate behaviours and knowledge of electrical machines when working with the class room teaching and lab experience.
- In the lab, at least for 50% experiments, students will write a software programme. for logic(mathematical equation).

List of Experiments

1. Determination of critical resistance & critical speed from no load test of a DC Shunt generator.
2. Plotting of external and internal characteristics of a DC shunt generator.
3. Determination of efficiency of DC machine by direct loading.
4. Determination of efficiency of DC machine by
5. Determination of Efficiency and Voltage Regulation by Open Circuit and Short Circuit test on single phase transformer.
6. Speed control of DC Motor by Ward-Leonard Method.
7. Study of current, voltage & frequency of a 1-ph transformer & to calculate voltage and current of the transformer using CRO.
8. Polarity test and Parallel operation of two single phase transformers.
9. Back to back test of a single phase transformer.
10. Load characteristics of DC (i) self (ii) separately excited DC generator.
11. Calculation of earth resistivity of industrial earthing.
12. Separation of core losses of a DC machine.

S. No.	Topic	Pedagogy	Details	Instructional Hrs			
				Theory +Tutorial	Practice	video	Project
1	Determination of critical	PRAC	Software				

	resistance & critical speed from no load test of a DC Shunt generator			Practice(Matlab)	0	2	0
2	Plotting of external and internal characteristics of a DC shunt generator		PRAC	Software Practice(Matlab)	0	2	0
3	Determination of efficiency of DC machine by direct loading		PRAC	Software Practice(Matlab)	0	2	0
4	Determination of efficiency of DC machine by Swinburn	PRAC		Software Practice(Matlab)	0	2	0
5	Determination of Efficiency and Voltage Regulation by Open Circuit and Short Circuit test on single phase transformer	PRAC		Software Practice(Matlab)	2	0	0
6	Speed control of DC Motor by Ward-Leonard Method	PRAC		Software Practice(Matlab)	2	0	0
7	Study of current, voltage & frequency of a 1-ph transformer & to calculate voltage and current of the transformer using CRO	PRAC		Software Practice(Matlab)	0	2	0
8	Polarity test and Parallel operation of two single phase transformers	PRAC		Software Practice(Matlab)	2	0	0
9	Back to back test of a single phase transformer	PRAC		Software Practice(Matlab)	0	2	0
10	Load characteristics of DC (i) self (ii) separately excited DC generator	PRAC		Software Practice(Matlab)	2	0	0
11	Calculation of earth resistivity of industrial earthing	PRAC		Software Practice(Matlab)	2	0	0
12	Separation of core losses of a DC machine	PRAC		Software Practice(Matlab)	0	2	0

FCEN0210 Analog & Digital Electronics Lab

Credits: 02 Total Hours: 42

Course Objectives:

-To make the students understand the various electronics circuit by using semiconductor devices in practical mode.

-To train the students to analysis different amplifier (small signal & large signal) in practical mode. -To train the students such a way that, it will help them to realise the practical circuit in easy manner.

Course Outcomes:

On successful completion of this course, students will be able to: -Construct analog and digital electronics circuit.

-Design circuit parameter, so that it will give better performance in complicated electronics circuit.

List of experiments:

1. Switching characteristics of Diode
2. Switching characteristics of transistor
3. Switching characteristics of thyristor
4. Design & fabrication of Analog DC power supply
5. Verifications of Boolean function using logic gate
6. Use of NAND gate as universal gate
7. Use of NOR gate as universal gate
8. Verifications of multiplexer and de-multiplexer using ICs
9. Study of FLIP-FLOP
10. Design of 4 bit CPU, which can perform different operations

S. No.	Topic	Pedagogy	Details	Instructional Hrs			
				Theory +Tutorial	Practice	video	Project
	Lists of experiments						
1	Switching characteristics of Diode	PRAC	Hardware Practice	0	2	0	0
2	Switching characteristics of transistor	PRAC	Hardware Practice	0	2	0	0
3	Switching characteristics of thyristor	PRAC	Hardware Practice	0	2	0	0

4	Design & fabrication of Analog DC power supply.	PRAC	Hardware Practice	0	2	0	0
5	Verifications of Boolean function using logic gate	PRAC	Hardware Practice	0	2	0	0
6	Use of NAND gate as universal gate	PRAC	Hardware & simulation Practice	0	2	0	0
7	Use of NOR gate as universal gate	PRAC	Hardware & simulation Practice	0	2	0	0
8	Verifications of multiplexer and de-multiplexer using ICs	PRAC	Hardware & simulation Practice	0	2	0	0
9	Study of FLIP-FLOP	PRAC	Hardware & simulation Practice	0	2	0	0
10	Design of 4 bit CPU, which can perform different operations	PRAC	Simulation	0	2	0	0

FCEN0211 Automation Lab (PLC)

Credits: 02
42

Total Hours:

Course Objective

Experimenting the theory by

-Prepare the students competency in the area of Automation.

-Prepare students having good balance between analytical skills and hands-on Skills

- Prepare students with multi-disciplinary

*competency **Course Outcomes:** On successful*

completion of this course, students will be able to:

-Use a number of PLC programming languages to develop control solutions. - Describe the input output interface circuits and their role in the PLC's reliability.

LIST OF EXPERIMENTS

1. Study hardware and software used in PLC

2. Implementation of Logic gates
3. Develop a ladder program for DOL starter
4. Develop an application using On-Delay timer.
5. Develop an application using OFF Delay Timer
6. Develop an application using UP/DOWN counter
7. Implementation of PLC Arithmetic instructions
8. Study of PID controller instruction for a pilot plant
9. Study of open loop control system using PLC
10. Study of closed loop control system using PLC

Reference Book(s):

1 .E.A. Parr 2003, *Programmable Controllers-An Engineer's, Third Ed., Guide*, Newnes Oxford OX28DP, England [ISBN: ISBN:0-7506-5757-X]

2. Richard Cox 2001, *Technician's Guide To , Fifth Program Ed.*, Thomsonable Con Delmar Learning Albany, NY 12212-5015 [ISBN: ISBN:0-7668-1427-0]

S.NO	Topic	Pedagogy	Details	Instructional Hrs			
				Theory	Practice	video	Project
1	Study hardware and software used in PLC	PRACTICE		0	3	0	0
2	Implementation of Logic gates	PRACTICE	<i>Through hardware & software</i>	0	3	0	0
3	Develop a ladder program for DOL starter	PRACTICE	<i>Through hardware & software</i>	0	3	0	0
4	Develop An application using On-Delay timer.	PRACTICE	<i>Through hardware & software</i>	0	3	0	0
5	Develop An application using OFF Delay Timer	PRACTICE	<i>Through hardware & software</i>	0	3	0	0
6	Develop an application using UP/DOWN counter	PRACTICE	<i>Through hardware & software</i>	0	3	0	0
7	Implementation of PLC Arithmetic instructions	PRACTICE	<i>Through hardware & software</i>	0	3	0	0
8	Study of PID controller instruction for a pilot plant	PRACTICE	<i>Through software MATLAB</i>	0	3	0	0
9	Study of open loop control system using PLC	PRACTICE	<i>Through hardware & software</i>	0	3	0	0
10	Study of closed loop control system using PLC	PRACTICE	<i>Through hardware & software</i>	0	3	0	0

FCEN0212 GEOMETRICAL DRAWING LAB

<i>Pre –requisites</i>	<i>Course type</i>	<i>Credits</i>
<i>NIL</i>	<i>Practice</i>	<i>2</i>

Course Objectives:

At the end of Session, participants are able to learn:

1. Advanced solutions for conceptual design, 3D modelling, and documentation.
2. To do product design, industrial design and styling 3D Surface Model,
3. To perform Assembly design & template based design ,
4. To Create Kinematics with visual analysis and validation which will give you high quality performance insights for product decisions.
5. To perform Manufacturing and generating of different views from a 3D model.

Course Outcomes:

On successful completion of this course, students will be able to:

1. At the end of Session, participants are able to create :
2. 3D Solid Model,
3. 3D Surface Model,
4. Assembly of parts,
5. Creating Kinematics,
6. Manufacturing and generating of different views from a 3D model.

Module-I (12 Hrs): Part Modelling

Creation of simple solids, Parametric modelling, Booleans and Functional Modelling, Rendering **(All of the topics will be through learn by doing and laboratory mode)**

MECHANICAL/CIVIL/ ELECTRICAL BRANCH STUDENTS ARE REQUIRED TO DO PROJECTS RELATED TO THEIR OWN BRANCH

Module-II (12Hrs) : Assembly Modelling

Simple Assembly, Constraints, Digital Mockup

(All of the topics will be through learn by doing and laboratory mode) MECHANICAL/CIVIL/ ELECTRICAL BRANCH STUDENTS ARE REQUIRED TO DO PROJECTS RELATED TO THEIR OWN BRANCH

MODULE-III (14 Hrs) : Drafting

Creation of layout, Part Drawing, Detailed drawing

(All of the topics will be through learn by doing and laboratory mode) MECHANICAL/CIVIL/ ELECTRICAL BRANCH STUDENTS ARE REQUIRED TO DO PROJECTS RELATED TO THEIR OWN BRANCH

Note: Platform is Solid works / Catia /Pro-E

TEXT BOOKS:

1. CAD CAM, M.P. Groover
2. Geometrical Modelling, M.E. Morteson

Module I

S. No.	Topic	Pedagogy	Details	Instructional Hrs			
				Theory +Tutorial	Practice	video	Project
	Part Modelling						
1	Creation of simple solids	PRA		0	2	0	0
2	Parametric modeling	PRA		0	4	0	0
3	Booleans and Functional Modelling	PRA		0	4	0	0
4	Rendering	PRA		0	2	0	0
	Sub total			00	12	0	0

Module II

S. No.	Topic	Pedagogy	Details	Instructional Hrs			
				Theory	Practice	video	Project
	Assembly modeling						
1	Simple Assembly	PRA		0	4	0	0
2	Constraints	PRA		0	4	0	0
3	Digital Mockup	PRA		0	4	0	0
	Sub total			0	12	0	0

Module III

S. No.	Topic	Pedagogy	Details	Instructional Hrs			
				Theory	Practice	video	Project
	Drafting						
1	Creation of layout	PRA		0	4	0	0

2	Part Drawing	PRA		0	4	0	0
3	Detailed drawing	PRA		0	4	0	2
	Sub total			00	12	0	2

FCEN 0213 WORKSHOP TECHNOLOGY PRACTICE

Pre –requisites	Course type	Credits
NIL	Practice	2

Learning Objectives: To know various tool, work loading devices in carpentry, fitting, joining, sheet metal forming and plumbing.

Course Outcomes: Can manufacture simple components.

(Two jobs from each trade are to be done)

Module I

Carpentry:

1. Handling of carpentry tools: Practice in marking, sawing, planing and chiseling to size
2. Making simple joints: a) Half-lap b) Mortise joints.
3. Job using Wood Turning Lathe –Stepped Pulley.

Fitting:

1. Use of fitting tools: practice in marking, fitting to size
2. making of simple mating profiles
 - a) VEE b) Dovetail c) Half round joints.

Module II Welding:

1. Introduction to Tools & Welding Equipment
 - a) Edge Preparation for Various Joints: Lap Joint, Butt Joint, T-Joint
2. Brazing & Soldering (Demonstration)

House Wiring:

1. Parallel or series connection of two bulbs
2. To control two lamps by two independent switches located at two different places
3. To prepare a House wiring circuit with PVC conduit wiring system including 5Amps , 15Amps socket , fluorescent lab, MCB and Energy meter.

Module III Plumbing:

1. Introduction to Plumbing Tools

2. Basic Pipe Fittings
3. Sanitary Fittings
4. Water Meter Installation **Black-smithy:**
 1. Introduction to Forging & Forging Tools- Use (Demonstration)
 2. Converting round rod into Square Ring
 3. Converting round rod into square S-Hook

FCEN0214 Mining SURVEYING LAB [0 0 2]

Study and sketch the linear measuring instruments & carrying out Chain Surveying; Prismatic Compass and carrying out Compass Traversing; Vernier theodolite & angle measurement by Repetition Method; Angle measurement by Reiteration Method using Micro-optic theodolite; Study and sketch of a Tilting level & carrying out Fly Leveling; Study and sketch of Auto level & carrying out Profile Leveling; Study and sketch of 1" Theodolite and angle measurement; Plane Table Surveying by Radiation Method and Contouring; Study and sketch of Total Station and measurement of angles, distance and determination of coordinates and RL using Total Station; Preparation of grid and plotting the field data.

Mobile App Development for Android

Subject Name	Code	Type of course	T-P-P (Credit)	Prerequisite
Mobile App Development for Android	ENFC0207	Practice	0-2-0(2)	Programming for Problem Solving – Java

1. Objective

Learn to develop Android mobile Apps

2. Course Outcome

Develop Android mobile Apps using Kotlin

3. Evaluation Systems

Internal Examination	Component	% of Marks	Method of Assessment
	Midterm Test	NIL	Written examination
	Assignment	NIL	Report and Presentation
	Experiments (Internal)	50	Practice work, report and viva voce
	Project	NIL	Report and presentation
	Quiz	NIL	Surprise/preannounced ones
External Examination	Semester	NIL	Written examination
	Practice	50	Practice test with viva-voce

Total		100	
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✓ **Android App projects to work on along with practice (Non-exhaustive list)**

1. Quiz Android App
 - a) Without online database connectivity
 - b) With online database connectivity
2. Course Recommendation Android App
3. Smart Messaging Android App
4. Dictionary Android App
5. Online Shopping Android App
6. Voting System Android App
7. Reminder Application Android App
8. Sentence Framer Android App
9. PC Control over the Internet Android App
10. Password Based Remote Door Open System Android App
11. Wi-Fi Library Book Locator Android App
12. Pick and Place Robotic Arm Android App
13. **Course outline**

Module – I (6 hrs.)

Introduction to Android OS, Development environment (Android Studio, Kotlin)

Module – II (10 hrs.)

Android application basics (Activity, Service, Content provider, Broadcast receiver, Intents)

Module – III (8 hrs.)

User Interface – Layouts, Widgets, Event handling, Notifications

Module – IV (8 hrs.)

Data Storage – Shared preference, Internal storage, External storage

Module –V (8 hrs.)

Data Storage – SQLite, Content provider

Module – VI (12 hrs.)

Networking – Android network overview and management, Socket and HTTP, Wi-Fi and Bluetooth, GPS; Handler, AsyncTask

Module – VII (8 hrs.)

Multimedia – Voice recording, Image capturing, Drawing & animatio

Text Books:

1. Eunice Adutwumwaa Obugyei, Natarajan Raman, Learning Kotlin by building Android Applications, Packt Publishing Limited, June 2018
2. Antonio Leiva, *Kotlin for Android Developers*. Leanpub, 2018.

Reference Books:

1. Ed Burnette, *Hello, Android: Introducing Google's Mobile Development Platform*. O'Reilly, 2010.
2. Pradeep Kothari, *Android Application Development, Black Book*. Kogent Learning Solutions Inc, 2014.
3. G. Blake Meike, *Programming Android*. O'Reilly, 2011.
4. Michael Burton, *Android App Development for Dummies*. John Wiley & Sons, 2015.

Online Sources:

1. <https://developers.google.com/training/android/>
2. <https://developer.android.com/kotlin/>
3. <https://kotlinlang.org/docs/tutorials/kotlin-android.html>
4. <http://www.vogella.com/tutorials/android.html>
5. <https://www.tutorialspoint.com/android/>

4. Session Plan

Topic coverage and Internal Test	No. of Sessions (in hrs.)	Activity (, tutorial, lab practice, field studies/field-trip, Workshop etc.)	Assignment (Project, assignment, field study, seminar, etc.)	Suggested Reading (Book, Video, Online source, etc.)
Module – I (6 hrs.)				
Introduction to Android OS, Development environment (Android Studio)	2	Lab practice	Experiment	Book, Online source: www.codeproject.com/Articles/803424/Article-Introduction-to-Android-OS
Introduction to Kotlin	4	Lab practice	Experiment	Book, Online source: https://kotlinlang.org/docs/tutorials/kotlin-android.html
Module – II (12 hrs.)				
Android application basics (Activity, Service)	4	Lab practice	Experiment, Assignment	Book, Online source: in.udacity.com/interview-skill-certification/android-basics-user-interface--ud834
Android application basics (Content provider, Broadcast receiver)	4	Lab practice	Experiment, Assignment	Book, Online source: in.udacity.com/interview-skill-certification/android-basics-user-interface--ud834
Android application basics (Intents)	2	Lab practice	Experiment, Assignment	Book, Online source: in.udacity.com/interview-skill-certification/android-basics-user-interface--ud834
Module – III (8 hrs.)				
User Interface– Layouts	2	Lab practice	Experiment	Book, Online source: developer.android.com/guide/topics/ui
Widgets, Event handling, Notifications	6	Lab practice	Experiment, Assignment	Online source
Module – IV (8 hrs.)				
Data Storage – shared preference	4	Lab practice	Experiment	Online source: developer.android.com/guide/topics/data/data-storage
Internal storage, External storage, SQLite, Content	4	Lab practice	Experiment, Assignment	Book, Online source

<i>provider</i>				
Module – V (8 hrs.)				
SQLite	4	Lab practice	Experiment , Assignment	Book, Online source: developer.android.com/guide/topics/data/data-storage
Content provider	4	Lab practice	Experiment , Assignment	Book, Online source: developer.android.com/guide/topics/data/data-storage
Module – VI (12 hrs.)				
Networking – Android network overview and management	2	Lab practice	Assignment	Book, Online source: www.vogella.com/tutorials/AndroidNetworking/article.html
Socket and HTTP, Wi-Fi and Bluetooth, GPS.	4	Lab practice	Experiment	Book, Online source
Handlers, AsyncTask	6		Experiment	Book, Online source
Module – VII (8 hrs.)				
Multimedia – Voice recording, image capturing, basic drawing & animation	4	Lab practice	Experiment , Assignment	Online source: https://www.javatpoint.com/playing-audio-in-android-example
Basic drawing & animation	4	Lab practice	Experiment , Assignment	Book, Online source
Total (hrs.)	60			

FCEN0304 Electrical Load Survey

Credits: 02 Total Hours: 42

1. Conceptual development about load forecast as a tool for planning capacity addition by various utilities and stakeholders and to serve as a guideline to plan growth of industries & infrastructural development
 2. Area Load Survey : For project report choose a semi-urban area i.e, an area with mixed load. Based on the field study design an electrical installation considering the existing as well as expected load growth during the next 5 years.

Data to be collected for all consumer categories in the project area:

Domestic & Commercial (Number of Consumers, Electrical Energy Consumption per consumer), Public Lighting, Public Water Works (Estimated connected electric load (kW) and the average electricity consumption per Kilo-watt of connected load (kWh / kW) i.e. Hours of operation), Irrigation

(Numbers of Pump Set / Tube wells, Capacity of pump sets, Hours of operation, Electrical Energy Consumption), Lift Irrigation Scheme(Major), Industrial (L.T Industries, H.T. Industries with a demand less than 1 MW, H.T, Industries with a demand of 1 MW and above), Railway Traction, Bulk Non-Industrial HT Supply,

Total Electrical Energy Consumption at Consumer

Electrical Energy Requirement at Generating End, Annual Electric Load Factor, Maximum Demand Factor category wise, Draw a load curve considering(variation during different hours of the day, Daily maximum and minimum value of the load, Seasonal Variation, peak of the load during a year, Draw an average load curve), Decide additional capacity requirement of lines and substations, Choose appropriate location mark it in the map, Prepare an estimate for investment, Prepare the cost benefit analysis including loss reduction and revenue inflow, Submit this report to a competent authority as a consulting engineer.

3. Methodology for forecasting adopted in India currently for 17th EPS: partial end use methodology for forecasting electricity demand for short and medium term i.e. time series analysis and end use method, extrapolation technique based on growth rates for long term electricity demand forecasting, forecast demand of electricity using econometric model, considering demand influencing factors for which econometric indicators were available and also taking into account the projected growth rates of different sectors of the economy.

4. Annual electricity demand forecast in terms of electrical energy requirement in MU and peak electric load in MW at Power Station Bus bars of electricity utilities for each State, Union Territory, Region and All India

Engineering Metrology and Measurements

Subject Name	Code	Type of course	T-P-P (Credit)	Prerequisite
Engineering Metrology and Measurements	ENFC0401	Theory + Practice	1-2(3)	Nil

1. Course Objective

- ✓ To Make Students Familiar with the Measuring Systems, and the Standard of Measurements. Learns about Basic Measurement Devices.
- ✓ Understanding the Basic Measurement Systems in the Real Time Engineering Applications.
- ✓ Enables Students to Work in Quality Control and Quality Assurances Divisions Industries.

Course Outcomes

- ✓ Selecting Suitable Measuring Instruments for Basic and Typical Applications in the Industries.
- ✓ Analyze Measurement Requirement.
- ✓ Can Choose Transducer & Sensors for Products.

2. Evaluation Systems

Internal Examination	Component	% of Marks	Method of Assessment
	ITR/Cass Test	20	Best of 2 (Written Test)
	IPR	30	Lab Work & Report
External Examination	ETR	30	Written Examination
	EPR	20	Lab Work & Report
Total		100	

3. Course Outline

Module I: (6 Hours)

Introduction to Metrology; Importance and Need for Measurements and Metrology; Need for Inspection; Precision & Accuracy; Errors in Measurement.

Practice: (Laboratory Mode- Learn by Doing)

Calibration of Measuring Instruments Using Slip Gauge Blocks.

Module II: (9 Hours)

Limit System; Limits Fits & Tolerances; Allowances; Hole Basis & Shaft Basis Systems; Interchangeability; Gauge Design. (Class room Teaching and videos)

Practice: (Laboratory Mode- Learn by Doing)

1. Introduction to Metrology Laboratory (Steel Rule, Tape, Right Angle, Protractor, Surface Plate).
2. Gauges- Filler, Radius, Thread, Wire, Snap & GO-NOGO.

Module III: (9 Hours)

Standards of Measurement; Dial Indicators; Vernier Apparatus; Micrometers; Comparators (Mechanical, Electrical, Pneumatic).

Practice: (Laboratory Mode- learn by Doing)

3. Vernier Caliper- Inside, Outside, Depth Measurement & Height Gauge.
4. Micrometers, Outside, Inside Micrometer & Depth Micrometer.
5. Three Points Bore Micrometer

Module IV: (10 Hours)

Measurement of Angles & Tapers using Bevel Protractor; Angle Gauges; Sine Bars; Flatness Spirit Level & Surface Plate.

Practice: (Laboratory Mode- learn by Doing)

6. Sine Bar/Bevel Protractor-Measurement of Angles.
7. Flatness Test Using Sprit Level.
8. Use of Dial Indicators-in-lathe.

Module V: (9 Hours)

Gear Tooth Metrology; Inspection & Alignment Tests. Transducers; Variable Resistance Transducer; LVDT; Comparative Transducer; Piezoelectric Transducer; Photo Voltaic Cells; Devices for Pressure Measurement- Dead Weight Tester; Bourdon Tube Pressure Gauge; Diaphragm and Bellow Gauges. (Topics will be covered by explaining and followed by practice mode)

Practice: (Laboratory Mode- Learn by Doing)

9. Gear Tooth Metrology, Inspection & Alignment Tests.

Module VI: (10 Hours)

Low Pressure Measurements; Force Measuring Using Proving Rings; Torque Measuring Using Dynamometers; Strain Measurements; Profile Projector; Tool Maker's Microscope; Optical Flats; Laser Interferometers; Autocollimators.

Practice: (Laboratory Mode- Learn by Doing)

10. Optical Flat Use & Surface Plate Test Using Spirit Level & Dial Gauge.

11. Measurement of Template Using Profile Projector.

Module VII: (12 Hours)

Assessment of Surface Roughness; Machining Symbols for Surface Finish; Measuring Instruments; Tally-Surf; Screw Thread Measurement- Terminology; Precision Instruments Based on Laser Principles- Laser Interferometer Application; Coordinate Measuring Machine (CMM).

Practice: (Laboratory Mode- Learn by Doing)

12. Surface Finish by Taylor's Apparatus –LVDT.

13. Measurement of Tool angle in Tool Maker’s Microscope.

14. Repeat Laboratory-1 or Test.

(50% of the topics will be covered by “Learn by Doing” principle and few video presentations)

6. Reference:

Text books:

1. Gupta, I C, A Text Book of ENGINEERING METROLOGY.2016. 8th Edition, Reprint, Dhanpat Rai Publication, New Dehi-110002
2. Narayana, K L, Engineering Metrology.2014. Third Edition, Scitech Publication(India) Privet Limited

Reference Books:

- ✓ Mahajan, M, A Text Book of Metrology. 2010. DhanpatRai& Co (P) Ltd,ISBN 13: 978-817700051

7. Session Plan

Topic coverage and Internal Test	No. of Sessions (in hrs.)	Activity (lecture, tutorial, lab practice, field studies/field-trip, Workshop etc.)	Assignment (Project, assignment, field study, seminar, etc.)	Suggested Reading (Book, Video, Online source, etc.)
Module I				
Introduction to metrology Importance and need for measurements and metrology	1	lecture	Assignment	https://www.youtube.com/watch?v=xcvN11HHY9o https://www.youtube.com/watch?v=qXhOWXShH1w Mahajan, M, A Text Book of Metrology. 2010. DhanpatRai& Co (P) Ltd,ISBN 13: 978-817700051
Need for Inspection	1	lecture	Assignment	https://www.youtube.com/watch?v=YYr

				njEo90fs Mahajan, M, A Text Book of Metrology. 2010. DhanpatRai& Co (P) Ltd,ISBN 13: 978-817700051
Precision & Accuracy	1	lecture	Assignment	https://www.youtube.com/watch?v=b38hFWvEjwI Mahajan, M, A Text Book of Metrology. 2010. DhanpatRai& Co (P) Ltd,ISBN 13: 978-817700051
Errors in Measurement	1	lecture	Assignment	https://www.youtube.com/watch?v=cGdbQeRSYTc Mahajan, M, A Text Book of Metrology. 2010. DhanpatRai& Co (P) Ltd,ISBN 13: 978-817700051
Practice				
1. Calibration of measuring Instruments using slip gauge blocks	2	practice		
Module II				
Limit System, Limits Fits & Tolerances	2	lecture	Assignment	https://www.youtube.com/watch?v=zxyER18KnnM&list=PL0uwpDY0Y8Q2aoPhDuEZLI1PVuKKUGb90 https://www.youtube.com/watch?v=zxyER18KnnM&list=PL0uwpDY0Y8Q2aoPhDuEZLI1PVuKKUGb90&index=1 Mahajan, M, A Text Book of Metrology. 2010. DhanpatRai& Co (P) Ltd,ISBN 13: 978-817700051
Allowances, Hole Basis & Shaft Basis Systems, Interchangeability	1	lecture	Assignment	https://www.youtube.com/watch?v=APT7hf5Wv0&list=PL0uwpDY0Y8Q2aoPhDuEZLI1PVuKKUGb90&index=4 Mahajan, M, A Text Book of Metrology. 2010. DhanpatRai& Co (P) Ltd,ISBN 13: 978-817700051
Design of Gauges- GO, NOGO	2	lecture	Assignment	https://www.youtube.com/watch?v=uN0ZTmhsH1w https://www.youtube.com/watch?v=mZHHdim3hOY Mahajan, M, A Text Book of Metrology.

				2010. DhanpatRai& Co (P) Ltd,ISBN 13: 978-817700051
Practice				
2.Introduction to Metrology Laboratory(1hr) + Steel Rule, Tape, Right Angle Protractor, Surface Plate	2	Practice	field study	
3.Gauges- Filler ,Radius, Thread, Wire, Snap, GO-NOGO	2	Practice	field study	
Module III				
Standards of Measurement	1	lecture	Assignment	Mahajan, M, A Text Book of Metrology. 2010. DhanpatRai& Co (P) Ltd,ISBN 13: 978-817700051
Dial Indicators, Vernier caliper & Micrometer	1	lecture	Assignment	https://www.youtube.com/watch?v=FqSJhY_lctc https://www.youtube.com/watch?v=vkPlzmalvN4 https://www.youtube.com/watch?v=StBc56ZifMs Mahajan, M, A Text Book of Metrology. 2010. DhanpatRai& Co (P) Ltd,ISBN 13: 978-817700051
Comparators Mechanical, Electrical, Pneumatic	1	lecture	Assignment	Mahajan, M, A Text Book of Metrology. 2010. DhanpatRai& Co (P) Ltd,ISBN 13: 978-817700051
Practice				
4.Vernier Caliper- inside, outside, depth measurement, Height Gauge	2	Practice	Field Study	
5.Micrometers, Outside & Inside Micrometer, Depth Micrometer	2	Practice	Field Study	
6.Three point Bore Micrometer	2	Practice	Field Study	

Module IV				
Angular Measurements Measurement of Angles & Tapers using Bevel Protractor, Angle Gauges, Sine bars	3	lecture	Assignment	https://www.youtube.com/watch?v=oJFUI_FHlio https://www.youtube.com/watch?v=F/uCEeipdCw https://www.youtube.com/watch?v=u-PLC3uK1CM
Spirit Level, Surface Plate	1	lecture	Assignment	https://www.youtube.com/watch?v=H-F2C5F78aw
Practice				
7.Sine Bar/Bevel Protractor- Measurement of Angles	2	Practice		
8.Flatness test using Sprit Level	2	Practice		
9.Use of Dial Indicators-in –Lathe.	2	Practice		
Module V				
Gear Tooth Metrology	2	lecture	Assignment	https://www.youtube.com/watch?v=fb278VIHICU
Inspection & Alignment Tests	1	lecture	Assignment	https://www.youtube.com/watch?v=utZVv7QvRt8
Transducers, Variable Resistance Transducer, LVDT, comparative transducer, piezoelectric transducer, photo voltaic cells.	2	lecture	Assignment	https://youtu.be/vuVFbKxsxds
Devices for pressure measurement- dead weight tester, bourdon tube pressure gauge, diaphragm and	1	lecture	Assignment	

bellow gauges.				
Practice				
10.Gear Tooth Metrology, Inspection & Alignment tests	3	Practice		
Module VI				
Low Pressure Measurements	1	lecture	Assignment	
Force Measuring Using Proving Rings. Torque Measuring Using Dynamometers, Strain Measurements	2	lecture	Assignment	
Profile Projector, Tool Maker's Microscope, Optical Flats. application.	1	lecture	Assignment	https://www.youtube.com/watch?v=HG09GXaeZFc https://www.youtube.com/watch?v=hqsVXA5S2xM https://www.youtube.com/watch?v=5JE7BV-XkSk
Laser Interferometers	1	lecture	Assignment	https://www.youtube.com/watch?v=UA1qG7Fjc2A
Autocollimators	1	lecture	Assignment	https://www.youtube.com/watch?v=XHEywuzl9sA
Practice				
11.Optical Flat Use & Surface Plate test using Spirit Level & Dial Gauge	2	Pratice	Field study	
12.Measurement of template using Profile Projector	2	Practice	Field Study	
Module VII				
Assessment of Surface Roughness,	1	lecture	Assignment	https://www.youtube.com/watch?v=omh

Machining Symbols for Surface Finish, Measuring Instruments, Tally-Surf,				oWIs2d-M https://www.youtube.com/watch?v=VyePASErr5Q
Screw Thread Measurement-Terminology, Determination of Effective Diameter Using Two, three Wire Method	2	lecture	Assignment	https://www.youtube.com/watch?v=N4pjJMmk3A https://www.youtube.com/watch?v=LjQt6ISFISg
Coordinate measuring machine (CMM)	1	lecture	Assignment	https://www.youtube.com/watch?v=844UiRBVxIY
Practice				
11.Surface Finish by Taylor's Apparatus	2	Practice	field study	
13.Measurement of Tool angle in Tool Maker's Microscope	2	Practice	Field Study	
14.Repeat Laboratory-1	2	Practice	field study	
15. Repeat Laboratory-2	2	Practice	field study	
Total Hours	65			

Engineering Metrology and Measurements

Subject Name	Code	Type of course	T-P-P (Credit)	Prerequisite
Engineering Metrology and Measurements	ENFC0401	Theory + Practice	1-2(3)	Nil

4. Course Objective

- ✓ To Make Students Familiar with the Measuring Systems, and the Standard of Measurements. Learns about Basic Measurement Devices.
- ✓ Understanding the Basic Measurement Systems in the Real Time Engineering Applications.

- Enables Students to Work in Quality Control and Quality Assurances Divisions Industries.

5. Course Outcomes

- Selecting Suitable Measuring Instruments for Basic and Typical Applications in the Industries.
- Analyze Measurement Requirement.
- Can Choose Transducer & Sensors for Products.

6. Evaluation Systems

Internal Examination	Component	% of Marks	Method of Assessment
	ITR/Cass Test	20	Best of 2 (Written Test)
	IPR	30	Lab Work & Report
External Examination	ETR	30	Written Examination
	EPR	20	Lab Work & Report
Total		100	

7. Course Outline

Module I: (6 Hours)

Introduction to Metrology; Importance and Need for Measurements and Metrology; Need for Inspection; Precision & Accuracy; Errors in Measurement.

Practice: (Laboratory Mode- Learn by Doing)

Calibration of Measuring Instruments Using Slip Gauge Blocks.

Module II: (9 Hours)

Limit System; Limits Fits & Tolerances; Allowances; Hole Basis & Shaft Basis Systems; Interchangeability; Gauge Design. (Class room Teaching and videos)

Practice: (Laboratory Mode- Learn by Doing)

15. Introduction to Metrology Laboratory (Steel Rule, Tape, Right Angle, Protractor, Surface Plate).

16. Gauges- Filler, Radius, Thread, Wire, Snap & GO-NOGO.

Module III: (9 Hours)

Standards of Measurement; Dial Indicators; Vernier Apparatus; Micrometers; Comparators (Mechanical, Electrical, Pneumatic).

Practice: (Laboratory Mode- learn by Doing)

17. Vernier Caliper- Inside, Outside, Depth Measurement & Height Gauge.

18. Micrometers, Outside, Inside Micrometer & Depth Micrometer.

19. Three Points Bore Micrometer

Module IV: (10 Hours)

Measurement of Angles & Tapers using Bevel Protractor; Angle Gauges; Sine Bars; Flatness Spirit Level & Surface Plate.

Practice: (Laboratory Mode- learn by Doing)

20. Sine Bar/Bevel Protractor-Measurement of Angles.

21. Flatness Test Using Sprit Level.

22. Use of Dial Indicators-in-lathe.

Module V: (9 Hours)

Gear Tooth Metrology; Inspection & Alignment Tests. Transducers; Variable Resistance Transducer; LVDT;

Comparative Transducer; Piezoelectric Transducer; Photo Voltaic Cells; Devices for Pressure Measurement- Dead Weight Tester; Bourdon Tube Pressure Gauge; Diaphragm and Bellow Gauges. (Topics will be covered by explaining and followed by practice mode)
Practice: (Laboratory Mode- Learn by Doing)

23. Gear Tooth Metrology, Inspection & Alignment Tests.

Module VI: (10 Hours)

Low Pressure Measurements; Force Measuring Using Proving Rings; Torque Measuring Using Dynamometers; Strain Measurements; Profile Projector; Tool Maker’s Microscope; Optical Flats; Laser Interferometers; Autocollimators.
Practice: (Laboratory Mode- Learn by Doing)

24. Optical Flat Use & Surface Plate Test Using Spirit Level & Dial Gauge.

25. Measurement of Template Using Profile Projector.

Module VII: (12 Hours)

Assessment of Surface Roughness; Machining Symbols for Surface Finish; Measuring Instruments; Tally-Surf; Screw Thread Measurement- Terminology; Precision Instruments Based on Laser Principles- Laser Interferometer Application; Coordinate Measuring Machine (CMM).
Practice: (Laboratory Mode- Learn by Doing)

26. Surface Finish by Taylor's Apparatus –LVDT.

27. Measurement of Tool angle in Tool Maker’s Microscope.

28. Repeat Laboratory-1 or Test.

(50% of the topics will be covered by “Learn by Doing” principle and few video presentations)

6. Reference:

Text books:

3. Gupta, I C, A Text Book of ENGINEERING METROLOGY.2016. 8th Edition, Reprint, Dhanpat Rai Publication, New Dehi-110002
4. Narayana, K L, Engineering Metrology.2014. Third Edition, Scitech Publication(India) Privet Limited

Reference Books:

- Mahajan, M, A Text Book of Metrology. 2010. DhanpatRai& Co (P) Ltd,ISBN 13: 978-817700051

7. Session Plan

Topic coverage and Internal Test	No. of Sessions (in hrs.)	Activity (lecture, tutorial, lab practice, field studies/field-trip, Workshop etc.)	Assignment (Project, assignment, field study, seminar, etc.)	Suggested Reading (Book, Video, Online source, etc.)
Module I				

Introduction to metrology Importance and need for measurements and metrology	1	lecture	Assignment	https://www.youtube.com/watch?v=xcvN11HHY9o https://www.youtube.com/watch?v=qXhOWXShH1w Mahajan, M, A Text Book of Metrology. 2010. DhanpatRai& Co (P) Ltd,ISBN 13: 978-817700051
Need for Inspection	1	lecture	Assignment	https://www.youtube.com/watch?v=YYrnjEo90fs Mahajan, M, A Text Book of Metrology. 2010. DhanpatRai& Co (P) Ltd,ISBN 13: 978-817700051
Precision & Accuracy	1	lecture	Assignment	https://www.youtube.com/watch?v=b38hFWvEjwI Mahajan, M, A Text Book of Metrology. 2010. DhanpatRai& Co (P) Ltd,ISBN 13: 978-817700051
Errors in Measurement	1	lecture	Assignment	https://www.youtube.com/watch?v=cGdbQeRSYTc Mahajan, M, A Text Book of Metrology. 2010. DhanpatRai& Co (P) Ltd,ISBN 13: 978-817700051
Practice				
1. Calibration of measuring Instruments using slip gauge blocks	2	practice		
Module II				
Limit System, Limits Fits & Tolerances	2	lecture	Assignment	https://www.youtube.com/watch?v=zxyER18KnnM&list=PL0uwpDY0Y8Q2aoPhDuEZLI1PVuKKUGb90 https://www.youtube.com/watch?v=zxyER18KnnM&list=PL0uwpDY0Y8Q2aoPhDuEZLI1PVuKKUGb90&index=1 Mahajan, M, A Text Book of Metrology. 2010. DhanpatRai& Co (P) Ltd,ISBN 13: 978-817700051
Allowances, Hole Basis & Shaft Basis Systems,	1	lecture	Assignment	https://www.youtube.com/watch?v=APT7hf5Wv0&list=PL0uwpDY0Y8Q2aoPhDuEZLI1PVuKKUGb90&index=4 Mahajan, M, A Text Book of Metrology.

Interchangeability				2010. DhanpatRai& Co (P) Ltd,ISBN 13: 978-817700051
Design of Gauges- GO, NOGO	2	lecture	Assignment	https://www.youtube.com/watch?v=uN0ZTmhsH1w https://www.youtube.com/watch?v=mZHHdim3hOY Mahajan, M, A Text Book of Metrology. 2010. DhanpatRai& Co (P) Ltd,ISBN 13: 978-817700051
Practice				
2.Introduction to Metrology Laboratory(1hr) + Steel Rule, Tape, Right Angle Protractor, Surface Plate	2	Practice	field study	
3.Gauges- Filler ,Radius, Thread, Wire, Snap, GO-NOGO	2	Practice	field study	
Module III				
Standards of Measurement	1	lecture	Assignment	Mahajan, M, A Text Book of Metrology. 2010. DhanpatRai& Co (P) Ltd,ISBN 13: 978-817700051
Dial Indicators, Vernier caliper & Micrometer	1	lecture	Assignment	https://www.youtube.com/watch?v=FqSJhY_lctc https://www.youtube.com/watch?v=vkPlzmalvN4 https://www.youtube.com/watch?v=StBc56ZifMs Mahajan, M, A Text Book of Metrology. 2010. DhanpatRai& Co (P) Ltd,ISBN 13: 978-817700051
Comparators Mechanical, Electrical, Pneumatic	1	lecture	Assignment	Mahajan, M, A Text Book of Metrology. 2010. DhanpatRai& Co (P) Ltd,ISBN 13: 978-817700051
Practice				
4.Vernier Caliper- inside, outside, depth measurement, Height	2	Practice	Field Study	

Gauge				
5.Micrometers, Outside & Inside Micrometer, Depth Micrometer	2	Practice	Field Study	
6.Three point Bore Micrometer	2	Practice	Field Study	
Module IV				
Angular Measurements Measurement of Angles & Tapers using Bevel Protractor, Angle Gauges, Sine bars	3	lecture	Assignment	https://www.youtube.com/watch?v=oJFUI_FHlio https://www.youtube.com/watch?v=F/uCEeipdCw https://www.youtube.com/watch?v=u-PLC3uKlCM
Spirit Level, Surface Plate	1	lecture	Assignment	https://www.youtube.com/watch?v=H-F2C5F78aw
Practice				
7.Sine Bar/Bevel Protractor- Measurement of Angles	2	Practice		
8.Flatness test using Sprit Level	2	Practice		
9.Use of Dial Indicators-in –Lathe.	2	Practice		
Module V				
Gear Tooth Metrology	2	lecture	Assignment	https://www.youtube.com/watch?v=fb278VIHICU
Inspection & Alignment Tests	1	lecture	Assignment	https://www.youtube.com/watch?v=utZVv7QvRt8
Transducers, Variable Resistance Transducer, LVDT, comparative transducer, piezoelectric	2	lecture	Assignment	https://youtu.be/vuVFbKsxsds

transducer, photo voltaic cells.				
Devices for pressure measurement- dead weight tester, bourdon tube pressure gauge, diaphragm and bellow gauges.	1	lecture	Assignment	
Practice				
10.Gear Tooth Metrology, Inspection & Alignment tests	3	Practice		
Module VI				
Low Pressure Measurements	1	lecture	Assignment	
Force Measuring Using Proving Rings. Torque Measuring Using Dynamometers, Strain Measurements	2	lecture	Assignment	
Profile Projector, Tool Maker's Microscope, Optical Flats. application.	1	lecture	Assignment	https://www.youtube.com/watch?v=HG09GXaeZFc https://www.youtube.com/watch?v=hqsVXA5S2xM https://www.youtube.com/watch?v=5JE7BV-XkSk
Laser Interferometers	1	lecture	Assignment	https://www.youtube.com/watch?v=UA1qG7Fjc2A
Autocollimators	1	lecture	Assignment	https://www.youtube.com/watch?v=XHEywuzl9sA
Practice				
11.Optical Flat Use & Surface Plate test using Spirit Level & Dial Gauge	2	Pratice	Field study	

12.Measurement of template using Profile Projector	2	Practice	Field Study	
Module VII				
Assessment of Surface Roughness, Machining Symbols for Surface Finish. Measuring Instruments, Tally-Surf,	1	lecture	Assignment	https://www.youtube.com/watch?v=omh_oWIs2d-M https://www.youtube.com/watch?v=VyePASErr5Q
Screw Thread Measurement-Terminology, Determination of Effective Diameter Using Two, three Wire Method	2	lecture	Assignment	https://www.youtube.com/watch?v=N4pjJMmk3A https://www.youtube.com/watch?v=LjQt6ISFISg
Coordinate measuring machine (CMM)	1	lecture	Assignment	https://www.youtube.com/watch?v=844UiRBVxIY
Practice				
11.Surface Finish by Taylor's Apparatus	2	Practice	field study	
13.Measurement of Tool angle in Tool Maker's Microscope	2	Practice	Field Study	
14.Repeat Laboratory-1	2	Practice	field study	
15. Repeat Laboratory-2	2	Practice	field study	
Total Hours	65			

FCEN0401 BASIC FLUID MECHANICS

[5 0 0]

Module-I: FLUID KINEMATICS AND FLUID DYNAMICS (16 Hrs):

Recapitulation of Fluid Properties and Hydrostatics (Not for external examination)

- (A) Principle of conservation of mass - Continuity equation in differential form for three dimensional flow in Cartesian co-ordinates. Rotational & Irrotational flows - Irrotationality condition. Continuity equation for one dimensional flow. **(Most of the topics will be through video presentation)**
- (B) **Fluid Dynamics:** Euler's equation of motion flow-Principle along of conservation a stream l of energy through integration-Bernoulli's of E-Practical Principle equation a applications of- Kinematics Bernoulli's of free jets. **(Topics Principle on practical applications will be through practice and field demonstration)**
- (C) **Flow Measurement in pipes and channels:** Pitot tube, Prandtl tube, Flow meters and Weirs. Flow through orifices and mouthpieces **(All the topics will be through practice and field measurement)**
- (D) **Principle of Conservation of momentum:** Impulse momentum equation. Application of momentum principle for forces on pipe bends and reducers. (Simple problems on pipe bends and reducers in x-y plane) **(Most of the topics will be through class room teaching with a project on pipe bends.)**

Module-II: STEADY FLOW THROUGH PIPES (14 Hrs)

- (E) **Laminar Flow:** Laminar and turbulent flow characteristics, Reynolds experiment, Reynolds number -Laws of laminar and turbulent friction. Laminar flow through circular pipes - Hagen Poiseuille equation for loss of head. **(Topics related to laminar flow & turbulent flow and Reynolds experiment will be through Multimedia presentation)**
- (F) **Turbulent flow through pipes:** Darcy - Weisbach equation for loss of head. Hydro-dynamically Smooth and rough boundaries (Velocity distributions for smooth & rough boundaries to be appraised and not to be included in external examination), Relative roughness - Laminar sub-layer. Variation of friction factor with Reynolds number and relative roughness **(Topics related. Moody' to pipe friction and determination of friction factor will be through practice mode. Pipe design problems will be through Project mode using pipe analysis software.)**
- (G) **Practical problems in pipe flows:** Minor losses in pipes, Pipes in series and parallel - Equivalent pipe. Branched pipes - HGL and TEL. Simple Pipe. Reservoir problems and Syphon. Network Problems. Power transmission through a pipe and power transmission through a nozzle. **(Most of the topics will be through project mode)**

MODULE-III: DIMENSIONAL ANALYSIS AND MODEL TESTING (12 Hrs)

- (H) **Fundamental Concepts of Dimensional Analysis:** Importance of Dimensional Analysis & Model Study- Units and Dimensional Formulae for Various Engineering Quantities- Dimensional Homogeneity. Non-dimensional Parameters- Raleigh's-Buckingham's Method- Omitted π and Theorem Superfluous variables. Capillary Rise, Drag on Cylinder, Resistance of a Ship, Discharge over a Sharp Crested Weir, Fall Velocity of a Sphere, Head Characteristics of a Pump, Thrust on a Propeller.

- (I) **Similarity Laws:** Concepts of Similarity- Geometric, Kinematic and Dynamic Similarities- Important Dimensionless Numbers- Reynolds Number, Froude Number, Mach Number, Euler Number, Weber Number - Similarity Laws- Reynolds law and Froudes law - Modelling Criteria- Distorted Models and River models. Practical applications of modelling and similarity.

Text Books:

1. *Hydraulics and Fluid mechanics:* P.N.MODI & S.M.SELH,
2. *Fluid mechanics:* A.K.JAIN, Khanna publishers
3. *Fluid Mechanics* <http://www.eolss.net/eolsssamplechapters/c07/e2-15-01-01/E2-15-01-01-TXT-03.aspx> 4. <http://www.msubbu.in/ln/fm/>

PEDAGOGY

Note:

- 1) **Project hrs shown are not part of class room teaching. Students to carry out the assigned project and submit for evaluation.**
- 2) **Evaluation - External 50 Marks Internal 50 Marks.**
- 3) **Internal evaluation of Practical work - Will be based on the day to day work at practice sessions and project works submitted.**
- 4) **External evaluation of Practical work - Will be by an external examiner.**
- 5) **Internal evaluation of work carried through projects - Will be part of the regular evaluation. No separate external evaluation for topics under project mode.**

MODULE - I

S. No.	Topic	Pedagogy	Video links / Software	Instructional Hrs			
				Th	Video	Proj.	Pract
<i>Fluid Kinematics & Fluid Dynamics: (Theory - 18 Hrs Practice - 12 Hrs)</i>							
(A)	Fluid Kinematics: Lagrangian and Eulerian description of fluid flow- Different types of fluid flow - One, two and three dimensional flows, Uniform & non-uniform flows, Steady & unsteady flows, Compressible & incompressible flows and Laminar & turbulent flows.	CRT + Video	See List Below for Video Links	1	1	0	0
	<i>Fluid Kinematics (Continued):</i> Description of flow pattern - Stream line, Streak line, Path line. Stream surface and stream tube.	CRT + Video		1	1	0	0
	<i>Fluid Kinematics (Continued):</i> Principle of conservation of mass - Continuity equation in differential form for three dimensional flow in Cartesian co-ordinates.	CRT		2	0	0	0
	<i>Fluid Kinematics (Continued):</i> Continuity equation in differential form for three dimensional flow in Cartesian coordinates. Rotational & Irrotational flows - Irrotationality condition.	CRT		1	1	0	0
	<i>Fluid Kinematics (Continued):</i> Continuity equation for one dimensional flow.	CRT		1	0	0	0
(B)	Fluid Dynamics: Euler's equationline for ideal flow -	CRT		2	0	0	0
	<i>Fluid Dynamics (Continued):</i> Principle of conservation of energy through integration line - Bernoulli's Principle	CRT		2	0	0	0
	<i>Fluid Dynamics (Continued):</i> Practical applications of Bernoulli's Principle.	CRT		0	0	2	2

	<i>Fluid Dynamics (Continued): Kinematics of free jets</i>		1	0	2	1	
(C)	Flow Measurement in pipes and channels: Pitot tube, Prandtl tube, Flow meters and Weirs.	CRT + Proj, + Pract.	1	0	1	9	
(D)	Principle of Conservation of momentum: Impulse momentum equation. Application of momentum principle for forces on pipe bends and reducers.	CRT + Video + Proj.	1	1	1	0	
			Sub total	13	4	6	12

MODULE - II

S. No.	Topic	Pedagogy	Video links / Software	Instructional Hrs			
				Th	Video	Proj	Pract
	<i>Steady Flow through Pipes: (Theory - 18 Hrs Practice Hrs - 9)</i>						
(E)	Laminar Flow: Laminar and turbulent flow characteristics, Reynolds experiment, Reynolds number - Laws of laminar and turbulent friction.	CRT + Video	See List Below for Video Links	1	1	0	0
	<i>Laminar Flow (Contd): Laminar flow through circular pipes Hagen Poiseuille equation for loss of head</i>	CRT		1	0	0	0
(F)	Turbulent flow through pipes: Darcy - Weisbach equation for loss of head.	CRT + Pract.		1			3
	<i>Turbulent Flow through Pipes (Contd): Hydro-dynamically Smooth and rough boundaries, Relative roughness.</i>	CRT + Video + Proj.		1	1	1	0

MODULE - III

S. No.	Topic	Pedagogy	Video links / Software	Instructional Hrs			
				Th	Video	Proj	Pract
	<i>Turbulent Flow through Pipes (Contd): Laminar sub-layer. Variation of friction factor with Reynolds number and relative roughness.</i>	CRT + Proj.		2	0	1	0
	<i>Moody's chart and Pipe des</i>	CRT + Proj.		2	0	2	0
(G)	Practical problems in pipe flows: Minor losses in pipes, Pipes in series and parallel - Equivalent pipe. Branched pipes	Proj. + Pract.		1	0	1	3
	<i>Practical Problems (Contd): HGL and TEL. Reservoir problems and Syphon.</i>	CRT + Proj.		1	0	3	0
	<i>Practical Problems (Contd): Pipe Networks.</i>	CRT + Proj.		1	0	3	0
	<i>Practical Problems (Contd): Power transmission through a pipe and power transmission through a nozzle.</i>	CRT		1	0	0	0

S. No.	Topic	Pedagogy	Video links / Software	Instructional Hrs			
				Th	Video	Proj	Pract
	Steady Flow through Pipes: (Theory + Tutorials - 22 Hrs Practice Hrs - 9)						
(H)	Fundamental Concepts of Dimensional Analysis: Importance of Dimensional Analysis & Model Study- Units and Dimensional Formulae for Various Engineering Quantities.	CRT	See List Below for video Links	1	1	0	0
	<i>Fundamental Concepts of Dimensional Analysis (Contd): Dimensional Homogeneity. Non-dimensional Parameters- Raleigh's-Buckingham's Method</i>	CRT		2	0	0	0
	<i>Fundamental Concepts of Dimensional Analysis (Contd): Omitted and Superfluous Variables</i>	CRT		1	0	0	0
	<i>Application of Concepts of Dimensional Analysis for Practical Cases: Capillary Rise, Drag on Cylinder, Resistance of a Ship, Discharge over a Sharp Crested Weir, Fall Velocity of a Sphere, Head Characteristics of a Pump, Thrust on a Propeller.</i>	CRT + Project		2	0	1	0
(I)	Similarity Laws: Concepts of Similarity- Geometric, Kinematic and Dynamic Similarities.	CRT + Video		1	1	0	0
	<i>Similarity (Contd): Important Dimensionless Numbers- Reynolds Number, Froude Number, Mach Number, Euler Number, Weber Number.</i>	CRT		1	0	0	0
	<i>Similarity (Contd): Similarity Laws - Reynolds law and Froudes law.</i>	CRT		2	0	0	0
	<i>Similarity (Contd): Modelling Criteria- Distorted Models and River models.</i>	CRT + Project		1	0	2	0
	<i>Similarity (Contd): Practical applications of modelling and similarity.</i>	CRT + Project		2	0	2	0
				Sub total	13	2	5

Video Links

Bernoulli Equation: <https://www.youtube.com/watch?v=brN9citH0RA>

<https://www.youtube.com/watch?v=bC8v6hIXnSk> <https://www.youtube.com/watch?v=UJ3-Zm1wblQ>

<https://www.youtube.com/watch?v=oUd4WxjoHKY>

<http://www.efm.leeds.ac.uk/CIVE/FluidsLevel1/Unit03/T4.html> Flow Measurement:

Venturi Meter Fabrication :	https://www.youtube.com/watch?v=Zpux9MvvDmw
Venturi Efect :	https://www.youtube.com/watch?v=H3TcLoapJBo
:	http://www.wermac.org/specials/venturiflowmeter.html
Flow over Weirs :	https://www.youtube.com/watch?v=oXYHe-DGyVE
Flume demo :	https://www.youtube.com/watch?v=awsnbnljy78
Weirs :	https://www.youtube.com/watch?v=Ax38XN_XqCU
V-Notch :	https://www.youtube.com/watch?v=2dZfln7CUos
Reynolds Experiment :	

https://www.google.co.in/url?sa=t&rct=j&q=&esrc=s&source=web&cd=1&cad=rja&uact=8&ved=0ahUKEwi95tTyzevMAhXMQY8KHTYSCpYQuAIIHDAA&url=https%3A%2F%2Fwww.youtube.com%2Fwatch%3Fv%3DoApDhs4xtaY&usq=AFQjCNHBzFOQZmxeLQ-J2f3m4Jq_kNy5yA:

<https://www.youtube.com/watch?v=1wNmtle6qkE:> https://www.youtube.com/watch?v=0ThQ_nD97hY

<https://www.google.co.in/url?sa=t&rct=j&q=&esrc=s&source=web&cd=31&cad=rja&uact=8&ved=0ahUKEwj7tsKx0evMAhVFpo8KHdu4AL44HhAWCBowAA&url=https%3A%2F%2Fwww.studyblu.com%2Fnotes%2Fnote%2Fn%2Flecture-4-flowthroughpipelinespdf%2Ffile%2F3676950&usq=AFQjCNEU9-DkCQ1MOQVWRvxBTEZmvrLlew> Pipe Friction Expt :

http://uorepc-nitk.vlabs.ac.in/exp1/index.html#AVPlayerID_65ed5c82

Visiflow Applet :

<http://www.ce.utexas.edu/gishydro/ferdi/webedu/visiflow/visiflow.html> http://www.lmfa.ec-lyon.fr/perso/Valery.Botton/english/acoustic_streaming_bis.html

<https://www.physicsforums.com/threads/experimental-fluid-mechanics-videos-series.113713/>

FCEN0402 INTRODUCTION TO PROGRAMMING IN C

<i>Pre – requisites</i>	<i>Course Type</i>	<i>Credits</i>
<i>Nil</i>	<i>Theory + Pracice</i>	<i>5</i>

Course Objectives:

1. To provide basic knowledge of programming tools and techniques.
2. To familiarize the programming environment and syntax of C programming.
3. To understand the working of basic programming constructs.
4. To learn different powerful concepts that can be applied in project development.

Course Outcomes:

1. The students will be able to apply programming skills to problem solving.
2. The student will able to write 150 to 200 line programs without any error. 3. At the end of the session the students can come out with a mini project applying their programming skills.

Module I:

(23Hours)

- (A) Problem solving techniques: Algorithm, flow chart; Structure of C program, Character set, Identifiers, Keywords, Data Types, Constants and Variables, Input-output statements, relational and logical operators, increment and decrement operators, conditional operator, bit-wise operators, assignment operators, expressions, type conversions, conditional expressions, precedence and order of evaluation, statements and blocks, if and switch statements, loops:-while, do-while and for statements, break, continue, goto. *(Most of the topics will be*

Module II:

(30 Hours)

(B) Arrays-concepts, declaration, definition, accessing elements, two-dimensional and multi-dimensional arrays, applications of arrays. Designing structured programs:-Functions, parameter passing, user defined functions, recursive functions, storage classes-extern, auto, register, static, scope rules. pointers-

S. No.	Topic	Pedagogy	Details	Instructional Hrs				
				Theory	Practice	video	Project	
1	Problem solving techniques: Algorithm	CRT & Learn by example	Class Assignment on algorithm writing	1	0	0	0	
2	Problem solving techniques: flow chart		Class Assignment on flow chart writing	1	0	0	0	
3	Structure of C program	CRT	Familiarize with the programming editors	1	1	0	0	
4	Character set, Identifiers	CRT, Quiz	Quiz session	1	0	0	0	
5	Keywords, Data Types	CRT, Q & A	Q & A Session	1	0	0	0	
6	Constants and Variables, Input-output statements	CRT & PRA	Practice problems	1	1	0	0	
7	relational and logical operators, increment and decrement operators			1	1	0	0	
8	conditional operator, bit-wise operators, assignment operators,			1	1	0	0	
9	expressions, type conversions			1	1	0	0	
10	conditional expressions, precedence and order of evaluation			1	1	0	0	
11	statements and blocks, if and switch statements			CRT, PRA & learn by problem solving	2	1	0	0
12	loops:-while, do-while				1	1	0	0
13	for statements, break, continue, goto	1	1		0	0		
			Sub total	14	9	0	0	

concepts, initialization of pointer variables, pointers and function arguments, address arithmetic, Character pointers and functions, pointers to pointers, pointers and multidimensional arrays, dynamic memory management functions, command line arguments. Most of the topics will be through powerpoint presentation and practice mode)

Module III:

(27 Hours)

(B) Derived types-structures-declaration, definition and initialization of structures, accessing structures, nested structures, arrays of structures, structures and functions, pointers to structures, self referential structures, unions, typedef, bit fields, C program examples. Input and output-concept of a file, text files and binary files, streams, standard I/O, Formatted I/O, file I/O operations. Most of the topics will be through power point presentation and practice mode)

(C) **Text Books:**

1. E. Balaguruswamy "Programming in C", Tata McGraw Hill 3rd
2. Y. Kanetkar, "Let - 9th edition C",. BPB Publications

Reference:

1. H. Scheldt, "C The Complete Reference", Tata McGraw Hi

Module I

Module II

S. No.		Pedagogy	Details	Instructional Hrs			
				Theory	Practice	video	Project
1	Arrays-concepts	CRT, Quiz	Quiz session	1	0	0	0
2	Declaration, definition	CRT, Q & A	Q & A Session	1	0	0	0
3	accessing elements	CRT, PRA & learn by problem solving	Practice Programs	1	1	0	0
4	two-dimensional arrays			1	1	0	0
5	multi-dimensional arrays			1	1	0	0
6	applications of arrays	CRT, Learn by example		1	1	0	0
7	Designing structured programs:-Functions	CRT, PRA, PRO & learn by problem solving		1	0	0	2
8	parameter passing, user defined functions	CRT, PRA		1	1	0	0
9	recursive functions	CRT, PRA & learn by problem solving		1	1	0	0
10	storage classes-extern, auto, register, static, scope rules	CRT, PRA & QA	Q & A Session	1	1	0	0
11	pointers-concepts, initialization of pointer variables	CRT, PRA & learn by problem solving	Practice Programs	1	1	0	0
12	pointers and function arguments, address arithmetic, Character pointers and functions	CRT, PRA		2	1	0	0
13	pointers to pointers, pointers and multidimensional arrays	CRT, PRA		2	1	0	0
14	dynamic memory management functions, command line arguments	CRT, PRA		2	1	0	0
	<u>Module III</u>		Sub total	17	11	0	2
1	Derived types-structures-declaration	CRT, Q & A	Q & A Session	1	0	0	0
2	structures and functions,	CRT, PRA	Practice Programs	2	2	0	0
3	C program examples.	PRA		0	2	0	0
4	definition and initialization of structures, accessing structures	CRT, PRA		1	1	0	0

5	nested structures, arrays of structures	CRT, PRA	2	1	0	0
6	pointers to structures, self-referential structures,	CRT, PRA	1	1	0	0
7	unions, typedef, bit fields	CRT, PRA, Quiz	1	1	0	0
8	Input and output–concept of a file	CRT, PRA	1	1	0	0
9	text files and binary files, streams	CRT, PRA	1	1	0	0
10	standard I/O, Formatted I/O	CRT, PRA	1	1	0	0
11	file I/O operations	CRT, PRA	2	1	0	0
12	Mini Project	PRO	0	0	0	2
		Sub total	13	12	0	2

FCEN0403 OBJECT ORIENTED PROGRAMMING USING C++

Pre - requisites	Course Type	Credits
Nil	Theory + Pracice	5

Course Objective As a result of successful completion of this course, the students will:

1. Get a clear understanding of object-oriented concepts.
2. Understand object oriented programming through C++.
3. Understand the concept of classes and objects, inheritance, polymorphism.

Course Outcome Upon successful completion of this course, students should be able to:

1. Students will able to write 150 to 200 lines programs without any error.
2. The student will understand the advantage of object oriented program over structured oriented program.

Module-I (25 hours)

(A) Introduction to object oriented programming: object oriented concepts (Class, object, encapsulation, aggregation, inheritance and polymorphism). How to write a C++ program. Data types, expressions, operators, control structures. Functions: definition, parameter passing, inline function, function overloading. Classes: data members, function members, static data members, constant members function, and friend function. **Most of the topics will be through power point presentation and practice mode)**

Module-II (30 hours) (A) More about classes: Constructors, destructors, friend classes, nested classes, local classes, this pointer, namespaces. Overloading: Operator overloading (binary, unary, String Concatenation, increment, decrement), operator overloading using friend function (Stream operators). Type conversion (Using constructor, Operator function). Inheritance: Derived classes, member accessibility, forms of inheritance, virtual base classes. Polymorphism: Pointers to objects, virtual functions, Abstract class, virtual destructors. **Most of the topics will be through power point presentation and practice mode)**

Module - III (20 hours)

(A) Streams & Files: streams, hierarchy of stream classes. Unformatted I/O operators, formatted i/operations manipulators, user defined manipulators, exception handling. Templates, Standard template Library. **Most of the topics will be through power point presentation and practice mode)**

Text Books:

1. E. Balguruswamy, "Object Oriented Programming with

Module III		Sub total	12	18	0	0
		<i>PPT</i>				
13	Streams & Files: streams, hierarchy of stream classes. Unformatted I/O operators, formatted i/o Operations	Program Demonstration practice Lab	2	4	0	0
14	Manipulators: user defined manipulators,		2	2	0	0
15	exception handling		2	4	0	0
16	Templates: Standard template Library.		2	2	0	0
		Sub total	8	12	0	0

FCEN0404 DATABASE MANAGEMENT SYSTEM

Pre – requisites	Course Type	Credits
Nil	Theory + Pracice	5

Course Objectives:

1. To introduce the fundamental concepts of database systems and their importance in practical life.
2. To introduce the basic concepts necessary for designing, using, and implementing database systems and applications.
3. To make the students understand the principles behind relational database management systems including the database environment, the relational model, relational languages (SQL).
4. To make students able to develop simple SQL queries. Course Outcomes:

On successful completion of this course, students will be able to:

1. Understand, appreciate and effectively explain the underlying concepts of database technologies
2. Solve simple database problems related to manipulating data present in the database by writing SQL Queries.
3. Design and implement a relational model for a given problem-domain.

Module-I (14 Hrs): INTRODUCTION TO DATABASES

- (A) **Introduction to Database Systems and File Based Systems:** Database Systems, Common uses of Database Systems, File Based Approach, Limitations of File Based Approach, File-oriented Systems vs. Database Systems (Most of the topics will be through power point presentation: Demonstration of Fileoriented System and Database System)
- (B) **Database Approach:** Database, Database Management System (DBMS), Database Application Programs, Components of DBMS Environment, Advantages and Disadvantages of DBMS. (Most of the topics will be through power point presentation)
- (C) **Roles in Database Environment:** Data and Database Administrators (DBA), Database Designers, Application Developers, End-Users. (Most of the topics will be through power point presentation)

models, Network and Object Oriented Data models, Mapping E-R model to Relational model. **(Most of the topics will be through practice mode)**

(G) **Normalization:** Normal forms: 1NF, 2NF, 3NF **(Most of the topics will be through practice mode)**

MODULE-III (30 Hrs): RELATIONAL MODEL AND SQL

(H) **Terminologies of Relational Model:** Relational Data Structure, Mathematical Relations, Database Relations, Properties of Relations, Relational Keys, Representing Relational Database Schema.

(I) **Integrity Constraints and Views:** Nulls, Entity Integrity, Referential Integrity, General Constraints, Views, Purpose of Views.

(J) **SQL: Introduction:** Objectives of SQL, Writing SQL Command.

(K) **SQL: Data Definition:** Data Definition, Creating a Database, Table Operations (Create, Alter, and Drop), Creating an Index, Removing an Index.

(L) **SQL: Data Manipulation:** Simple Queries, Sorting Results (Order By), Aggregate Functions, Join, Grouping Results (Group By)

(M) **Query-By-Example:** Introduction to QBE, Building Select queries using QBE.

TEXT BOOKS:

1. *Database Systems By Thomas M. Connolly and Carolyn E. Begg - Pearson Education-4th, edition (Chapters: 1, 2, 3, 5, 6, 7.1, 7.2, 11, 13)*
2. *Fundamentals of Database System By Elmasari & Navathe - Pearson Education-5th, Edition.*

REFERENCE BOOKS:

1. *An introduction to Database System - Bipin Desai, Galgotia Publications*
2. *Database System: concept, Design & Application - S.K.Singh (Pearson Education)*
3. *Fundamentals of Database Management System –Gillenson, Wiley India*
4. *Database System Concepts - Sudarshan, Korth (McGraw-Hill Education) -6th, edition*

Module I

S. No.	Topic	Pedagogy	Details	Instructional Hrs			
				Theory	Practice	Video	Project
	INTRODUCTION TO DATABASES:						
1	Introduction to Database Systems and File Based Systems: Database Systems, Common uses of Database Systems,	PPT presentation	PPT	2	0	0	0
2	File Based Approach, Limitations of File Based Approach, File-oriented Systems vs. Database Systems.	PPT presentation, Demonstration, Practice	PPT, Demonstration of File oriented System and Database System, Examples	2	2	0	0
3	Database Approach: Database, Database Management System (DBMS), Database Application Programs, Components of DBMS Environment,	PPT presentation	PPT	5	0	0	0

(Comtd...)

S. No.		Pedagogy	Details	Instructional Hrs			
				Theory	Practice	video	Project
11	E-R models,						
12	Relational models,		PPT, Demonstration, Learn by Doing, Practice Assignments	1	2		
13	Network and Object Oriented Data models,		PPT presentation	2			
14	Mapping E-R model to Relational model		PPT, Demonstration	2	5		
15	Normalization: Normal forms: 1NF, 2NF, 3NF		Learn by Doing, Practice Assignments	3	1		
RELATIONAL MODEL AND SQL			Sub total	21	13	0	0
16	Terminologies of Relational Model: Relational Data Structure, Mathematical Relations, Database Relations, Properties of Relations, Relational Keys, Representing Relational Database Schema.	PPT presentation, Demonstration, Practice		4	2		
17	Integrity Constrains and Views: Nulls, Entity integrity, Referential Integrity, General Constraints, Views, Purpose of Views		PPT, Demonstration, Learn by Doing, Practice Assignments	2	3		
18	SQL: Introduction: Objectives of SQL, Writing SQL Command			1	2		
19	SQL: Data Definition: Data Definition,Creating a Database, Table Operations (Create, Alter, and Drop), Creating an Index, Removing an Index.						
20	SQL: Data Manipulation: SimpleQueries, Sorting Results (Order By), Aggregate Functions, Join, Grouping Results (Group By)						
21	Query-By-Example: Introduction to QBE,Building Select queries using QBE						
Sub total							

FCEN0405 MECHANICAL UNIT OPERATIONS

Pre –requisites	L+T+P	Credits
NA	3+2 + 0	5

OBJECTIVE:

The students will learn characterization of solids, size reduction, techniques of solid fluid separation and mixing.

OUTCOME:

1. The students would understand about solids, their characterization, handling and various Processes involving solids.
2. The students will have knowledge on basic theory, calculations and Machinery involved in various solid handling operations.

MODULE - I

General characteristics of solids, different techniques of size analysis, shape factor, surface area determination, estimation of particle size. Screening methods and equipment, screen efficiency, ideal and actual screens.

Laws of size reduction, energy relationships in size reduction, methods of size reduction, classification of equipments, crushers, grinders, disintegrators for coarse, intermediate and fine grinding, power requirement, work index; size enlargement - principle of granulation, briquetting, pelletisation, and flocculation. **(Topics related to size reduction experiment (Ball mill, Jaw crusher, smooth roll crusher will be through laboratory)**

MODULE - II

Gravity settling, sedimentation, thickening, elutriation, double cone classifier, rake classifier, bowl classifier. Centrifugal separation - continuous centrifuges, super centrifuges, design of basket centrifuges; industrial dust removing equipment, cyclones and hydro cyclones, electrostatic and magnetic separators, heavy media separations, floatation, jigging

Theory of filtration, Batch and continuous filters, Flow through filter cake and filter media, Compressible and incompressible filter cakes, filtration equipments - selection, operation and Design of filters and optimum cycle of operation, filter aids. **(Topics related to filtration , sedimentation cyclone separator experiment will be through practice mode)**

MODULE - III

II Mixing and agitation - Mixing of liquids (with or without solids), mixing of powders, selection of Suitable mixers, power requirement for mixing. Storage and Conveying of solids - Bunkers, Silos, bins and hoppers, transportation of solids in bulk, conveyer selection, different types of Conveyers and their

performance characteristics. **(Topics related to transportation and storage tanks will be through practice mode)**

TEXT BOOKS:

FCCE0406 BUILDING MATERIALS and CONSTRUCTION

Pre-requisites	Course type	Credits
Nil	Theory +Practice	4

Course Objectives: The objectives of this course is to

- Provide knowledge about development, production, standardisation of cost-effective innovative building materials and construction technologies in housing and building sector. Show the role of materials in construction.
- Demonstrate the different bonding of bricks
- Impart the knowledge on various methods of construction for conventional civil engineering structures. Provide the knowledge about maintenance of buildings.

Course Outcomes: At the end of this course the students will be able to

- Select proper constructional materials specific to the structure to be built.
- Decide on the type of foundation required for a specific structure.
- Select the proper type of brick bonds for a wall.
- Know about the construction of brick masonry and stone masonry and their causes of failure
Know about the grade and strength of concrete.
- Supervise the construction works using - brick, stone, concrete, tile, mosaic, terrazzo, asphalt
- Know about the methods of plastering and the materials used
- Know about different types of stairs and their essential requirements

Module I (26 Hrs)

Bricks: Brick as a construction material and its importance, materials suitable for manufacture of bricks, methods of brick manufacture, types of bricks, qualities of a good brick, testing of Bricks, uses of bricks.

Stone: Introduction, classification, composition and characteristics, useful Indian stone, method of quarrying and dressing

Cement: Classification, chemical composition, Manufacturing of cement, hydration, tests for cement, uses of cement, types of cement, Mortar: Definition, composition and uses of mortar.

Concrete: Quality of mixing water, Workability, Factors affecting workability, Measurement of workability, Segregation, Bleeding, Uniformity of mixing, Mixing time, vibration of concrete, concrete mix design, admixtures, Grade and strength of Concrete.

Module II (16 Hrs)

Foundation: Types of foundation, spread foundations, pile foundations, pier foundations, excavation of foundation
Brick Masonry: Terminology used, Materials used, Causes of failure of brick masonry, Types of bonds, Brick laying, Joints in brick work, Reinforced brickwork, Joint between old and new masonry, Maintenance of brick work.

Stone Masonry: Terminology used, Materials used, Cutting and dressing of stones, Types of stone masonry, Rubble and Ashlar, General principles of construction, Joints of stone, Stone lining, maintenance of stone work, Artificial stones. Cavity walls: Purpose and method of construction.

Module III (11 Hrs)

Damp Proofing: Causes and effects, materials used for damp proofing, methods of preventing Dampness, Damp Proof Course.

Stairs: Terms used types of stairs, essential requirements, wooden stairs, concrete stairs, and metal stairs.

Flooring: Types of flooring and their construction- brick, stone, concrete, tile, mosaic, terrazzo, asphalt Plastering: Definition. Materials used for plastering, types of plastering, methods of plastering, defects and remedial measures in plastering.

Maintenance of Buildings: Causes and prevention of cracks in building, special repair of buildings, annual maintenance.

Text Books:

1. "Engineering Materials" by S. C. Rangwala et al., Charot
2. "Engineering Materials . and C. Rangwalabuildingetal., Charotar Publishingconstruction"House by S
3. "Material of Construction ", D.N.Ghose, TMH Publishing C

Reference Books:

1. "Properties of concrete" by A M Neville, Low Price Editi
2. "Building Construction" by S P Arora.
3. "Building Materials" by S.K.Duggal, TMH Publication
4. A text book of Building Construction by S K Sharma and B.K Kaul, S Chand & Company Limited
5. Building Construction", Sushil Kumar, Standard Publisher

Module I

S. No.	Topic	Pedago gy	Deta ils	Instructional Hrs			
				Theory	Practice	video	Project
	Bricks: Brick as a construction material and its importance Ref:T.B.:1,pp-58	CRT	1				
	Materials suitable for manufacture of bricks Ref:T.B.:1,pp-59,60	CRT	1				
	Methods of brick manufacture Ref:T.B.:1, pp- 62 to 67, 69 to 73	CRT	Video			1	
	Types of bricks & Qualities of a good brick Ref:T.B.:1,pp-77,78,74	CRT	1				
	Testing & uses of Bricks Ref:T.B.:1, pp -76 to 78	PRA			3		
	Stone: Introduction & Classification Ref:T.B.:1,pp -10 to 13	CRT	1				
	Uses of stones, method of quarrying Ref:T.B.:1, pp - 17,24	CRT	1				
	Method of dressing Ref:T.B.:1, pp - 32 to 34	CRT	1				
	Cement:						

	Classification, chemical composition Ref:T.B.: 1 ,pp - 109,110	CRT	1				
	Manufacturing of cement Ref:T.B.:1, pp -113 to 117	CRT	1				
	Hydration of cement, Tests for cement, Uses of cement, Types of cement Ref:T.B.:1, pp -121 to 132	CRT+P RA			6		
	Mortar: Definition, composition and uses of mortar Ref:T.B.:1,pp - 138,142,147	PRA			3		
	Concrete: Quality of mixing water, Workability, Factors affecting workability, Measurement of workability Ref:T.B.:1,pp -160 to 162	CRT+P RA			3		
	Segregation, Bleeding, Uniformity of mixing, Mixing time, vibration of concrete Ref:T.B.:1	CRT	1				
	Concrete mix design, admixtures, Grade and strength of Concrete.Ref:T.B.:1	CRT	1				
			10	15	1	0	

Module II

S. NO.	Topic	Pedago gy	Det ails	Instructional Hrs			
				Theory	Practice	video	Project
	Foundation: Ref.: RB5pp -37,56,79 Types of foundation, spread foundations, pile foundations, pier foundations,	CRT	1				
	Excavation of foundation - Brick masonry						
	Terminology used Material used Failure of brick masonry Ref.: RB5pp -67,230	CRT	1				
	Types of bonds Brick Laying Joints in brick work Ref:R.B.5 pp -235 to 237, 239 to 243, 249	PRA			3		
	Reinforced brickwork Joint between old and new masonry, Maintenance of brick work Ref.: RB5pp -258	CRT	1				
	Stone Masonry:						
	Terminology used, Materials used, Ref.: RB5pp 00,201,202,203,204,205,206,207	CRT	1				
	Cutting and dressing of stones, Ref.:	CRT	1				

	Types of stone masonry, Rubble and Ashlar, Ref.: RB5pp -218 to 223	CRT	1				
	General principles of construction Ref.: RB5pp -216	CRT	1				
	Joints of stone, Stone lining, Ref.: RB5pp -2214	CRT	1				
	Maintenance of stone work Artificial stones Ref.:R.B. 5 Sushil Kumar.	CRT	1				
	Cavity walls Purpose Method of construction. Ref.: RB5pp-176,177,178,179,180	CRT	1				
	Test on aggregate Fineness modulus of fine aggregates Fineness modulus of coarse aggregates Crushing value of coarse aggregate Test on mortar	PRA		3			
				10	6	0	0

Module III

S. No.	Topic	Pedagogy	Details	Instructional Hrs			
				Theory	Practice	video	Project
	Damp Proofing: Ref.: RB5pp- 151,153,154 Causes and effects, materials used for damp proofing	CRT		1			
	Damp Proofing: Ref.: RB5pp-151 Methods of preventing Dampness, Damp Proof Course.	CRT		1			
	Stairs Ref.: RB5pp-296 to 303 Terms used types of stairs	CRT		1			
	Stairs Ref.:R.B.: 5 Sushil KumaR pp-304,309,310 Essential requirements, Wooden stairs, Concrete stairs, Metal stairs.	CRT		1			
	Flooring: Ref.:R.B.: 5 Sushil Kumar pp-281 Types of flooring	CRT		1			
	Flooring Ref.: RB5pp-283 Construction of brick, Construction of stone,	CRT		1			
	Flooring Ref.: RB5pp-287,284 Construction of concrete, Construction of tile,	PRO					6
	Flooring Ref.: RB5pp-289,290,292 Construction of mosaic	PRO					

Construction of terrazzo

Construction of asphalt

	Plastering: Ref:R.B: 5 Sushil Kumar pp-483,488,487 Definition. Materials used for plastering, Types of plastering	CRT		1			
	Plastering: Ref.: RB5pp-484,485 Methods of plastering	CRT		1			
	Plastering: Ref:T.B.: 1 Sushil Kumar pp-489,490 Defects and remedial measures in plastering.	CRT		1			
	Maintenance of Buildings: Causes and prevention of cracks in building Ref.: RB5pp-701,702,703,704,705,706,707,708	CRT		1			
	Maintenance of Buildings: Ref:R.B. 5 Sushil Kumar Special repair of buildings, annual maintenance.	CRT		1			
				11	0	0	6

FCEN0407 BASIC SURVEYING

Pre - requisites	Course Type	Credits
Nil	Theory + Pracice	4

Course objectives:

1. To make students able to apply knowledge of mathematics, science, and engineering to understand the measurement techniques and equipment used in land surveying.
2. To make students able to measure horizontal distances across clear landscape or across obstacles using surveying instruments like chain, tape etc.
3. To make students able to measure different elevation points
4. To enable students to sketch contour maps of the given topography using dumpy levelling instruments.

Course Outcomes:

On successful completion of course students will be able to

1. Apply math, science, and technology in surveying activities.
2. Measure horizontal distances across clear landscape and across obstacles.
3. Measure horizontal angles between geographical entities.
4. Plot given geographical area on drawing sheet.
5. Preparation of contour maps using Theodolite and Total station
6. Measure altitude of points at different elevation.
7. Function effectively as team members (or team leaders)

Module I (22hr)

Introduction to Surveying

Introduction to surveying: Classification, Basic Principle, List of Instruments used in surveying.

Linear measurement and chain survey: Use of various types of chains and tapes, measurement of correct length of lines, direct and indirect ranging, chaining along sloping ground. Obstacle in chaining, errors and their elimination. Compass surveying.

Module II (16hrs)

Levelling: Use of dumpy level and levelling staff. Temporary and Permanent adjustment of dumpy level, Reduction of levels by height of instrument and rise and fall method. Curvature and refraction error, sensitiveness of level tube, reciprocal levelling, levelling difficulties and common errors

Module III (17hrs)

Contouring: Characteristics, methods and types of contouring (topographical map study) Preparation of contours using auto level/Dumpy level through Surfer software

Text Books:

1. "A Text Book-I", of Surveying. K. Duggal, TMH Publisher chapters 2,3,6,
 2. Surveying- Vol-1, B.C. Punmia Chapters 4,5,6,9,11
- Reference Books:**
3. Surveying and Levelling Vol-1, T. P. Kanetkar and S. V. Kulkarni
 4. Surveying Vol-1 by R Agor

Module I

S. No.	Topic	Pedagogy	Details	Instructional Hrs			
				Theory	Practice	video	Project
	Linear measurements and Angular measurements						
1	Introduction to surveying: Classification, Basic Principle, List of Instruments used in surveying	CRT		1	0	0	0
2	Linear measurement and chain survey: Use of various types of chains and tapes, measurement of correct length of lines	CRT		1	0	0	0
3	direct and indirect ranging, chaining along sloping ground	CRT & PRA	Field survey	1	2	0	0
4	Obstacle in chaining			3	6	0	0
	Compass surveying	CRT		1		0	0
5	Open traversing and closed traversing using prismatic compass	CRT & PRA	Field survey	0	4	0	0
6	Determination of closing errors by graphical and filed method			1	2	0	0
	<u>Module II</u> Levelling	Sub total	22	8	14	0	0
1	Levelling: Use of dumpy level and levelling staff. Temporary and Permanent adjustment of dumpy level	CRT & PRA	Filed survey	1	2	0	0
2	Reduction of levels by height of instrument			1	2	0	0
3	Reduction of levels by rise and fall			1	2	0	0
4	Fly levelling and check levelling	PRA		0	4	0	0
5	Curvature and refraction error	CRT		1	0	0	0
6	Sensitiveness of level tube, reciprocal levelling	CRT & PRA		1	0	0	0
7	levelling difficulties and common errors	CRT		1	0	0	0
	<u>Module III</u>	Sub total	16	6	10	0	0
1	Contouring: Characteristics	CRT		1	0	0	0
2	Methods and types of contouring	CRT		1	2	0	0
3	Topographical map study			0	4	0	0
4	Preparation of contours using auto level/Dumpy level through Surfer software	CRT & PRA	Field survey & surfer software	1	8	0	0
	Sub total	17		3	14	0	0

Prerequisite: Nil

OBJECTIVES

develop understanding and provide scientific basics of the life processes at the molecular level and explain the structure, function and inter-relationships of biomolecules and their deviation from normal and their consequences for interpreting and solving clinical problems.

Module I: Biochemical Organization And Bioenergetics 13

Scope of clinical biochemistry, component of the cell, structure and biochemical functions, membrane structure and functions, transport through biological cell membrane, the concept of free energy, determination of change in free energy from equilibrium constant and reduction potential, bioenergetics and biological oxidation – general concept of oxidation and reduction, electron transport chain, oxidative phosphorylation, uncouplers and theories of biological oxidation and oxidative phosphorylation.

Module II: Biomolecules 17

Carbohydrates: classification, properties. starch, glycogen, dextrin, inulin, cellulose, metabolism of carbohydrates, gluconeogenesis, glycogenolysis, glycolysis. citric acid cycle and its biological significance, role of sugar in nucleotide biosynthesis and pentose phosphate pathway.

Lipids: Classification, properties. sterols, essential fatty acids, eicosanoids, phospholipids, sphingolipids, metabolism of lipids, - oxidation and biosynthesis of ketone fatty bodies, cholesterol, acids, α, β porphyrin biosynthesis, metabolism of bile pigments.

Amino acids and nucleic acids: Classification, properties, biosynthesis of amino acids and proteins, essential amino acids, metabolism of amino acids and proteins, Nitrogen balance.

Nucleic acids: genetic code, nucleic acids, and structure of DNA and RNA, purine biosynthesis and pyrimidine biosynthesis.

Module III Macromolecules, Vitamins, Hormones, Enzymes 15

Physical and chemical properties, structure of haemoglobin, immunoglobulins and nucleoprotein, classification and their properties, occurrence, functions, requirements, deficiency manifestations and role of vitamins as coenzyme, chemical nature and properties, hormones, Nomenclature, enzyme kinetics, Michelles-Menten equation, classification and their properties, mechanism of action, enzyme inhibition, coenzyme significance and enzymes of clinical importance.

TEXTBOOKS:

1. Lehninger A.L., Nelson D.L. and Cox M.M. Principles of Biochemistry. CBS publishers and distributors
2. Murray R.K., Granner D.K., Mayes P.A. and Rodwell V.W. Harpers Biochemistry. Appleton and Lange, Stanford, Conneticut.
3. Thomas M. Devlin. Textbook of Biochemistry with clinical correlations. Wiley Liss Publishers

REFERENCES:

1. Burtis & Ashwood W.B. Tietz Textbook of Clinical chemistry. Saunders Company
2. Lubert Stryer W.H. Biochemistry. Freeman and company, New york.
3. Donald Voet & Judith G. Voet. Biochemistry. John Wiley and Sons, Inc.

FCEN0409 CELL BIOLOGY Credits 5 Prerequisite: Nil

OBJECTIVES

1. To study cell structure and functions of organelle functions
2. Exposure on transportations through cell membrane
3. To focus on different receptors and model of signaling
4. To introduce the concept of cell signaling

MODULE 1: Cell Structure and function 15

Origin and evolution of cells, molecular composition of cells, central role of enzymes, metabolic energy, biosynthesis of cell constituents, cell membrane, Nucleus, Endoplasmic reticulum, Golgi apparatus and Lysosomes, Bioenergetics and Metabolism –Mitochondria, chloroplasts, Peroxisomes.

MODULE II: Cell Division 15

Cell cycle –Mitosis, Meiosis, Molecules controlling cell cycle, Extra cellular matrix, role of matrix in cell enthore : Gap junctions, Tight junctions, Plasmodesmata.

Trnport across cell membrane

Passive and Active Transport, Permeases, Ion channels, ATP pumps. Na^+ / K^+ / Ca^{2+} pumps uniport, symport antiporter system. Ligand gated / voltage gated channels, Agonists and Antagonists.

MODULE III Signal Trnaduction 15

Receptors –extracellular signaling, Cell surface / cytosolic receptors and examples, Different classes of receptors antocrine / paracrine / endocrine models, Secondary messengers molecules.

The Development and causes of cancer, tumour viruses, oncogenes, prevention and treatment.

Total Hours: 45

TEXT BOOK:

The Cell: A molecular approach by Geoffrey M.Cooper.ASM Press, Pages:673

REFERENCE BOOKS:

1. *Molecular Biology of the Cell Edition 4*, Roberts, Keith Alberts, Bruce Johnson, Alexander Raff, Martin Walter,
Peter Lewis, Julian, Garland
2. *Molecular Cell Biology*, Lodish, Harvey Krieger, Monty Kaiser, Chris A. Berk, Arnold, W H

**FCEN0410 Introduction to Web Technology (Theory +Pract)
Credit 4**

Code	Course Title	Course Type	Credits	Pre-requisite	T-P-Pr
FCEN0410	Introduction to Web Technology	Theory+ Practice	4	Nil	3-1-0

Learning Objective

This course is intended to teach the basics involved in publishing content on the World Wide Web. the fundamentals of how the Internet and the Web function, a basic understanding of graphic production with a specific stress on creating graphics for the grounding introduction to more advanced topics such as programming and scripting. This will also expose students to the basic tools and applications used in Web publishing.

The student will be able to Analyze a web page and identify its elements and attributes.Create web pages using XHTML and Cascading Style Sheets.Build dynamic web pages using JavaScript (Client side programming).Create XML documents and Schemas.Build interactive web applications using AJAX.

Syllabus

Unit 1: Introduction to Web (8hrs)

What is Web?, What is WWW, Web site - Static and Dynamic web site, Web application - Client-server, Web development

Technologies- Html, CSS, Js , XML, Servlet & JSP, PHP and Ajax.

Unit 2: HTML (7hrs)

Introduction to Html, Html structure, Html Editors, Html element/tag & attributes, Designing simple page - Html tag, Head

tag, Body tag; More Html tags - Anchor tag, Image tag, Table tag, List tag, Frame tag, Div tag ; Html forms - Input type,

Text area, Select , Button.

Unit 3: CSS (6hrs)

Introduction to CSS, Syntax, Selectors ,Embedding CSS to Html, Formatting fonts, Text & background colour, Borders &

boxing.

Unit 4: JavaScript (9hrs)

Introduction to JS, Embedding JS into Html, Variables, Data types, Operators, Conditional statements, Looping statements,

Strings, Arrays, Math Object, Date Object, Functions, Objects, Event Handling.

Unit 5: XML (9hrs)

Introduction to XML, Difference b/w Html & XML, XML editors, XML Elements & Attributes XML DTD, XML Schema,

XML DOM.

Reference Books:

HTML, XHTML & CSS Bible, Brian Pfaffenberger, Steven M.Schafer, Charles White, Bill Karow- Wiley Publishing Inc, 2010

HTML Black Book by Steven Holzner

Web Design with HTML, CSS, JavaScript and jQuery Set by Jon Duckett

Beginning Java Script with DOM scripting and Ajax By Christian Heilmann- Apress Publisher, 2010

Learning PHP & My SQL, Michele Davis, Jon Philips- O'Reilly Publisher, 2009

PHP Cook book By: David Sklar, Adam Trachtenberg- O'Reilly Publisher, 2008

Introduction to Web Technology Lab

List of Programs:

1. Create a simple web page using HTML
2. Create and HTML page with a table and a set of ordered and unordered list.
3. Use CSS in the above web page
4. Design a web page for a company XYZ
5. Develop a static web page that shows basic animation
6. Develop a web page for an audio company
7. Develop a dynamic web page
8. Develop a dynamic web page using DHTML and CSS
9. Consider a company ABC which is into selling movie CDs. Develop a web page for the company.
10. Create a web site in which you can navigate from one page to another
11. Create a dynamic web page for a college
12. Organize a set of data using XML

Pedagogy

Sl No.	Topic	Teaching Method	Instructional Hours		
			Theory	Practical	
	Introduction to Web Technology				
1	What is Web?, What is WWW, Web site - Static and Dynamic web site,	Class Room Teaching+ PPT	3	0	
2	Web application - Client-server, Web development Technologies- Html, CSS, Js , XML, Servlet & JSP, PHP and Ajax.	Class Room Teaching+ PPT	3	0	
3	Introduction to Html, Html structure, Html Editors, Html element/tag & attributes, Designing simple page - Html tag, Head tag, Body tag; More Html tags - Anchor tag, Image tag, Table tag, List tag,	Class Room Teaching+ Lab Practice	3	3	
4	Frame tag, Div tag ; Html forms - Input type, Text area, Select , Button.		3	3	
5	Introduction to CSS, Syntax, Selectors		3	3	
6	Embedding CSS to Html Formatting fonts Text & background colour, Borders & boxing.		3	3	
7	Introduction to JS, Embedding JS into Html, Variables, Data types,		3	3	
8	Operators, Conditional statements, Looping statements, Strings, Arrays, Math Object, Date Object, Functions, Objects		3	3	
10	Event Handling		Class Room Teaching+ PPT	3	0
11	Introduction to XML, Difference b/w Html & XML			3	0
12	XML editors, XML Elements	Class Room Teaching+ Lab Practice	3	3	
13	Attributes XML DTD, XML Schema, XML DOM		3	3	
		Total	30	24	

FCEN0411 Data Structures and algorithms (Theory+ Practice) Credit 4 L-T-P (3-0-1)

Unit I: Introduction to Data structures

Definition,

Classification of data structures: primitive and non primitive, Elementary data organization, Time and space complexity of an algorithm (Examples), String processing. Dynamic memory allocation and pointers: Definition of dynamic memory allocation, Accessing the address of a variable, Declaring and initializing pointers, Accessing a variable through its pointer, Meaning of static and dynamic memory allocation, Memory allocation functions: malloc(), calloc(), free() and realloc(). Recursion: Definition, Recursion in C (advantages), Writing Recursive programs –Binomial coefficient, Fibonacci, GCD.

Unit II: Searching and Sorting

Basic Search Techniques: Sequential search: Iterative and Recursive methods, Binary search: Iterative and Recursive methods, Comparison between sequential and binary search. Sort: General background and definition, Bubble sort, Selection sort, Insertion sort, Merge sort, Quick sort

Unit III: Stack and Queue

Stack Definition, Array representation of stack, Operations on stack: Infix, prefix and postfix notations, Conversion of an arithmetic expression from Infix to postfix, Applications of stacks. Queue: Definition, Array representation of queue, Types of queue: Simple queue, Circular queue, Double ended queue (deque) , Priority queue , Operations on all types of Queues

Unit IV: Linked List

Definition, Components of linked list, Representation of linked list, Advantages and Disadvantages of linked list. Types of linked list: Singly linked list, doubly linked list, Circular linked list, Operations on singly linked list: creation, insertion, deletion, search and display.

Unit V: Tree Graphs and their Applications:

Definition : Tree, Binary tree, Complete binary tree, Binary search tree, Heap Tree terminology: Root, Node, Degree of a node and tree, Terminal nodes, Non-terminal nodes, Siblings, Level, Edge, Path, depth, Parent node, ancestors of a node. Binary tree: Array representation of tree, Creation of binary tree. Traversal of Binary Tree: Preorder, Inorder and postorder. Graphs, Application of Graphs, Depth

First search, Breadth First search.

Books for References:

1. *Weiss, Data Structures and Algorithm Analysis in C, II Edition, Pearson Education, 2001*
2. *Lipschutz: Schaum's outline-Hillseries Data structur*

3. Robert Kruse *Data Structures and program designi*
4. Trembley and Sorenson *Data Structures*
5. E. Balaguruswamy *Programming in ANSI C.*
6. Bandyopadhyay, *Data Structures Using C Pearson Education, 1999*
7. Tenenbaum, *Data Structures Using C. Pearson Education, 200*
8. Kamthane: *Introduction to Data Structures in C. Pearson Education 2005.*
9. Hanumanthappa M., *Practical approach to Data Structures, Laxmi Publications, Fire Wall media 2006*
10. Langsam, Ausenstein Maoshe & M. Tanenbaum Aaron *Data Structures using C and C++ Pearson Education*

List of Programs

Part A

1. Use a recursive function to find GCD of two numbers.
2. Use a recursive function to find the Fibonacci series.
3. Use pointers to find the length of a string and to concatenate two strings.
4. Use pointers to copy a string and to extract a substring from a given a string.
5. Use a recursive function for the towers of Hanoi with three discs.
6. Insert an integer into a given position in an array.
7. Deleting an integer from an array.
8. Write a program to create a linked list and to display it.
9. Write a program to sort N numbers using insertion sort.
10. Write a program to sort N numbers using selection sort.

Part B

1. Inserting a node into a singly linked list.
2. Deleting a node from a singly linked list.
3. Pointer implementation of stacks.
4. Pointer implementation of queues.
5. Creating a binary search tree and traversing it using in order, preorder and post order.
6. Sort N numbers using merge sort.

Pedagogy

		Teaching	Refer	Instructional
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No.	Data Structures and algorithms	Method	Tool	Hours	
				Thy	Pral
1.	Definition, Classification of data structures: primitive and nonprimitive, Elementary data organization, Time and space complexity of an algorithm (Examples),	Class room teaching+ Lab Practice		2	0
2.	String processing. Dynamic memory allocation and pointers: Definition of dynamic memory allocation, Accessing the address of a variable, Declaring and initializing pointers, Accessing a variable through its pointer,			4	3
3.	Meaning of static and dynamic memory allocation, Memory allocation functions: malloc(), calloc(), free() and realloc(). Recursion: Definition, Recursion in C (advantages),	Class Room Teaching+ ppt		2	0
4.	Writing Recursive programs– Binomial coefficient, Fibonacci, GCD.			2	0
5.	Basic Search Techniques: Sequential search: Iterative and Recursive methods, Binary search: Iterative and Recursive methods, Comparison between sequential and binary search.			2	0
6.	Sort: General background and definition, Bubble sort, Selection sort, Insertion sort,	Class Room Teaching+ Lab Practice		2	3
7.	Merge sort, Quick sort			2	3
8.	Stack Definition, Array representation of stack, Operations on stack: Infix, prefix and postfix notations,			2	2
9.	Conversion of an arithmetic expression from Infix to postfix,	Class Room Teaching+ PPT		2	0
10.	Applications of stacks.			2	0
11.	Queue: Definition, Array representation of queue, Types of queue: Simple queue, Circular queue, Double ended queue (deque) , Priority queue , Operations on all types of Queues	Class Room Teaching+ Lab Practice		2	2
12.	Definition, Components of linkedlist, Representation of linked list, Advantages and Disadvantages of linked list.	Class Room Teaching+ PPT		2	0
13.	Types of linked list: Singly linked list, doubly linked list, Circular linked list, Operations on singly linked list: creation, insertion, deletion, search and display	Class Room Teaching+ Lab Practice		4	3
14.	Definition : Tree, Binary tree, Complete binary tree, Binary search tree, Heap Tree terminology: Root, Node, Degree of a node and tree, Terminal			4	3

	nodes, Non-terminal nodes, Siblings, Level, Edge,			
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	Path, depth, Parent node, ancestors of a node.			
15.	Binary tree: Array representation of tree, Creation of binary tree. Traversal of Binary Tree: Preorder, Inorder and postorder. .		2	2
16.	Graphs, Application of Graphs, Depth First search, Breadth First search		2	3
Total			39	24

FCEN0412 Designing Enterprise Network (Theory+ Practice) Credit 5 L-T-P (3-1-1)

Unit I: Networking Fundamentals

The TCP/IP and OSI Networking Models, Fundamentals of Ethernet LANs, Fundamentals of WANs, Fundamentals of IPv4 Addressing and Routing, Fundamentals of TCP/IP Transport and Applications

Unit II: Ethernet LANs and Switches

Building Ethernet LANs with Switches, Cisco LAN Switches, Configuring Ethernet Switching.

Unit III: IP Version 4 Addressing and Subnetting

Perspectives on IPv4 Subnetting, Analyzing Classfull IPv4 Networks, Analyzing Subnet Masks, Analyzing Existing Subnets, Implementing IP Version 4: Operating Cisco Routers, Configuring IPv4 Addresses and Routes, Implementing Ethernet

Virtual LANs, Troubleshooting Ethernet LANs, Spanning Tree Protocol Concepts, Troubleshooting LAN Switching

Unit IV: LAN Routing

Configure IPv4 Routing, Configure and Verify Host Connectivity, Advanced IPv4 Addressing Concepts, Describe the boot process of Cisco IOS routers; Operation status of a serial interface; Manage Cisco IOS files; Routing and Routing Protocols; OSPF (multi-area); EIGRP (single AS); Passive Interface

Unit V: IPv4 Services and IP Version 6

Basic IPv4 Access Control Lists, Advanced IPv4 ACLs and Device Security, Network Address Translation, Recognize high availability (FHRP); Describe SNMP v2 and v3, IPV6 addressing **Reference**

Books:

1. CCNA Cisco Certified Network Associate: Study Guide (With CD) 7th Edition (Paperback), Wiley India, 2011 **Text Books:**
2. CCENT/CCNA ICND1 640-822 Official Cert Guide 3 Edition (Paperback), Pearson, 2013

3. Routing Protocols and Concepts CCNA Exploration Companion Guide (With CD) (Paperback), Pearson, 2008
4. CCNA Exploration Course Booklet : Routing Protocols and Concepts, Version 4.0 (Paperback), Pearson, 2010

DESIGNING ENTERPRISE NETWORKS –Lab

1. Switch Configuration - Basic Commands
2. Switch Configuration - Switch Port Security
3. Router - Configuration
4. Configuration of IP Address for a Router
5. Setting up of Passwords
6. PPP Encapsulation, PPP PAP Authentication, PPP CHAP Authentication
7. Configuration of Static and Dynamic Routing
8. Configuration of Default Route
9. Implementation of EIGRP
10. Implementation of OSPF
11. VLAN Configuration
12. Switch Troubleshooting
13. Configuration of Access-lists - Standard & Extended ACLs
14. Cisco Discovery Protocol
15. DHCP, DHCP Relay & DHCP Exclusions
16. Configuring Logging to a Remote Syslog Server

FCEN0413 Installation and configuration of Linux Desktop

Code	Course Title	Course Type	Credits	Pre-requisite	T-P-Pr
FCEN0413	Installation and configuration of Linux Desktop	Theory+ Practice	4	Basic computer knowledge	3-1-0

Learning Objectives:

The course provides an overview of the Linux Operating System, geared toward new users as an exploration tour and getting started guide. This unit provides examples to help the learners get a better understanding of the Linux system. The unit also provides the guidelines for the learners to take up vendor certifications. The unit explores the basics of Linux, the underlying management of the Linux operating system and its network configuration. The complete system services of Linux is explained along with the troubleshooting.

Course Outcome:

To enable the students to have a hands on practical exposure to the Linux Red Hat Enterprise and make them prepared for the RHCE Certification.

Syllabus

Unit I: Linux Introduction (9hrs)

Introduction to

Multi user System, History of UNIX, Features & Benefits, Versions of UNIX, Features of UNIX File System,, Commonly Used Commands like who, pwd, cd, mkdir, rm, rmdir, ls, mv, ln, chmod, cp, grep, sed, awk ,tr, yacc etc. getting Started (Login/Logout) . Creating and viewing files using cat, file comparisons, View files, disk related commands, checking disk free spaces.

Exploring Linux Flavors

Introduction

to various

Linux flavors. , Debian and rpm packages, Vendors providing DEBIAN & RPM distribution & Features. Ubuntu.History, Versions, Installation, Features, Ubuntu one. Fedora: History, Versions, Installation, Features.

Unit II: The Unix File System (7hrs)

Inodes - Structure of a regular file –Directories - Conversion of a path name to an inode -Super block - Inode assignment to a new file - Allocation of disk blocks. System calls for the file System: Open –Read - Write - Lseek –Close - File creation - Creation of special files - Changing directory and root - changing owner and mode –stat and fstat - pipes - Dup - Mounting and Un mounting file systems - Link and Un link.

Unit III: Unix Process Management(6hrs) The Structure of Processes: Process States and Transitions - Layout of system memory - Context of a process. Process Control: Process Creation –Signals –Process Termination –Invoking other programs –PID & PPID –Shell on a Shell.

Unit IV: (7hrs)

VI editor

Vi Editor: Introduction to Text Processing, Command & edit Mode, Invoking vi, deleting & inserting Line, Deleting & Replacing Character, Searching for Strings, Yanking, Running Shell Command Macros, Set Window, Set Auto Indent, Set No. Communicating with Other Users: who, mail, wall, send, mesg, ftp.

Unit V: (10hrs)

System Administration

Common administrative tasks, identifying administrative files configuration and log files, Role of system administrator, Managing user accounts-adding & deleting users, changing permissions and ownerships, Creating and managing groups, modifying group attributes, Temporary disabling of monitoring system performance - file security & Permissions, becoming super user using su.

Getting system information with uname, host name, disk partitions & sizes, users, kernel, installing and removing packages with rpm command

Books for Reference

1. The Design of Unix Operating System, Maurice J. Bach, Pearson Education, 2010
2. Advance UNIX, a Programmer's Guide, S. Prata, BPB
3. Unix Concepts and Applications, Sumitabh Das, 2010
4. The UNIX Programming Environment, B.W. Kernighan & R. Pike, Prentice Hall of India. 2009
5. Guide to UNIX Using LINUX, Jack Dent Tony Gaddis, Vikas/ Thomson Pub. House Pvt. Ltd. 2010

List of Programs

1. Execute 25 basic commands of UNIX.
2. Basics of functionality and modes of VI Editor.
3. WAP that accepts user name and reports if user is logged in.
4. WAP which displays the following menu and executes the option selected by user:
1. ls 2. Pwd 3.ls -l 4. ps -fe
5. WAP to print 10 9 8 7 6 5 4 3 2 1 .
6. WAP that replaces all "*.txt" file names with "*".
7. WAP that echoes itself to stdout, but backwards.
8. WAP that takes a filename as input and checks if it is executable, if not make it executable.
9. WAP to take string as command line argument and reverse it.
10. Create a data file called employee in the format given below:

- a. EmpCode Character
- b. EmpName Character
- c. Grade Character
- d. Years of experience Numeric
- e. Basic Pay Numeric

\$vi employee

A001	ARJUN	E1	01	12000.00
A006	Anand	E1	01	12450.00
A010	Rajesh	E2	03	14500.00
A002	Mohan	E2	02	13000.00
A005	John	E2	01	14500.00
A009	Denial Smith	E2	04	17500.00
A004	Williams	E1	01	12000.00

Perform the following functions on the file:

- a. Sort the file on EmpCode.
- b. Sort the file on
 - (i) Decreasing order of basic pay
 - (ii) Increasing order of years of experience.
- c. Display the number of employees whose details are included in the file.
- d. Display all records with 'smith' a part of employ
- e. Display all records with EmpName starting with 'B
- f. Display the records on Employees whose grade is E2 and have work experience of 2 to 5

years.

g. Store in 'file 1' the names of all employees whos

h. Display records of all employees who are not in grade E2.

Pedagogy

S I . N o	Topic	Teaching Method	Refere nce/To OI	Instructional Hours	
	Installation and configuration of Linux Desktop			Theo ry	Pract ical

.					
1	Introduction to Multi user System, History of UNIX, Features & Benefits, Versions of UNIX, Features of UNIX File System,	Class Room Teaching + PPT		2	0
2	Commonly Used Commands like who, pwd, cd, mkdir, rm, rmdir, ls, mv, ln, chmod, cp, grep, sed, awk ,tr, yacc etc	Class Room Teaching + Lab Practice		2	3
3	getting Started (Login/Logout) . Creating and viewing files using cat, file comparisons, View files, disk related commands, checking disk free spaces.			2	3
4	Introduction to various Linux flavors. , Debian andrpm packages, Vendors providing DEBIAN & RPM distribution & Features. Ubuntu. History, Versions, Installation, Features, Ubuntu one. Fedora: History, Versions, Installation, Features. _	Class Room Teaching + ppt Lab Practice		3	3
5	Inodes - Structure of a regular file –Directories - Conversion of a path name to an inode -Super block - Inode assignment to a new file - Allocation of disk blocks. System calls for the file System: Open –Read - Write - Lseek – Close - File creation - Creation of special files -				4
6	Changing directory and root - changing owner and mode –stat and fstat - pipes- Dup - Mounting and Un mounting file systems - Link and Un link	Class Room Teaching + Lab Practice		3	3
7	The Structure of Processes: Process States and Transitions - Layout of system memory - Context of a process. _____	Class Room Teaching + PPT		2	0
8	Process Control: Process Creation –Signals – Process Termination			2	0
9	Invoking other programs –PID & PPID –Shell on a Shell			2	0
10	Vi Editor: Introduction to Text Processing, Command & edit Mode, Invoking vi, deleting & inserting Line,			3	0
11	Deleting & Replacing Character, Searching for Strings, Yanking, Running Shell Command Macros, Set Window, Set Auto Indent, Set No.			2	0
12	Communicating with Other Users: who, mail, wall, send, mesg, ftp			2	0
System Administration					

1 3	Common administrative tasks, identifying administrative files configuration and log files, Role of system administrator, Managing user			4	3
	accounts-adding & deleting users, changing permissions and ownerships,	Class Room Teaching + Lab Practice			
1 4	Creating and managing groups, modifying group attributes, T accounts, creating and mounting file system, checking and monitoring system performance -	Class Room Teaching + Lab Practice		2	2
1 5	file security & Permissions, becoming super user using su. Getting system information with uname, host name, disk partitions & sizes, users, kernel, installing and removing packages with rpm command	Class Room Teaching + Lab Practice		4	3
TOTAL				39	23

**FCEN 0414 Information Security-I (Theory+ Practice)
Credit 4**

T-P-Pr (3-1-0)

Code	Course Title	Course Type	Credits	Pre-requisite	T- P- Pr
FCEN 0414	Information Security-I	Theory+ Practice	4	Nil	3-1-0

Learning Objectives : The course primarily covers the Types of Threats, Vulnerabilities, Risks and various terminologies in Information Security. It explains the formation of Security policy at various levels inside the Organization and provides the definition Procedures, Standard and Guidelines. The units emphasize the need of Performing Asset Classification and Declassification, Retention and Disposal of Information Asset also it identifies the various levels of Authorization for access Viz., Owner, Custodian and User. The course covers the different types of Access Controls and Physical security measures to safeguard the Assets and conclusively, it deals with the Digital Rights Management also covering the concepts of Common Authentication protocols and Real world Protocols. This course enables the students to understand the concepts of IT security, Threats, Vulnerabilities, Impact and control measures. And also to get familiarized with Asset management along with the objective to create awareness in Digital Rights management.

Course Outcome:

To enable the students to have a hands on practical exposure towards Configuration and Security of Windows7, Password Cracking Techniques, Windows Registry, Firewall, Kelogger, Monitoring security.

Syllabus

Unit I: (6hrs)

Introduction:

Security Definition, Why Security, Security and its need, Current Trends and Statistics, Basic Terminology, The C I A of Security the Relation: Security functionality and Ease of Use Triangle.

Unit II : (11hrs)

USER IDENTITY AND ACCESS MANAGEMENT

User identity and Access Management: Authentication, Account Authorization, Validation, Access Control and Privilege management. Hashing and Cryptography- Encryption and Decryption

Unit III: (11hrs)

SYSTEM AND SERVER SECURITY

System Security, Desktop & Server Security, Firewalls, Password cracking Techniques, Key-logger, viruses and worms, Malwares & Spy wares, Windows Registry

Unit IV: INTERNET SECURITY (6hrs)

Internet Security: LAN Security, Email Security, Hacking attacks, preventive measures.

Unit V: RISK ASSESSMENT AND CYBER LAWS(6hrs)

Vulnerability Assessment, Penetration Testing, Cyber Laws

TEXT BOOK:

1. Information Systems Security: Security Management, Metrics, Frameworks And Best Practices - Nina Godbole, ISC2 Press, 2010

REFERENCE BOOK:

1. Information Security Management Handbook, Volume 4 - Micki Krause, ISC2 Press, 2007

List of Programs

1. System Security Configuration in Windows 7 I
2. System Security Configuration in Windows 7 II
3. Password based Authentication process
4. Hashes and message digests calculation using has calculators
5. Service Management of Windows 7 for prevention of attacks
6. Password cracking tool usage
7. Event logger analysis
8. Windows Registry analysis
9. Securing LAN using firewall
10. DOS attacks and its prevention
11. Install a key logger , capture useful information and analyze.
12. Usage of vulnerability assessment tool (nmap / wireshark) and analyze the results.

Pedagogy

S I . N o .	Topic	Teaching Method	Referenc e/To ol	Instructional Hours	
				Theor y	Practi cal
	Information Security-I				
1	Security Definition, Why Security, Security and its need, Current Trends and Statistics, Basic Terminology,	Class Room		3	0
2	The C I A of Security the Relation: Security functionality and Ease of Use Triangle.	Teaching + PPT		3	0
3	User identity and Access Management: Authentication, Account Authorization, Validation,	Class Room Teaching + Lab Practice		3	3
4	Access Control and Privilege management. Hashing	Class Room Teaching + PPT		3	0
5	Cryptography, Encryption and Decryption	Class		5	3
6	System Security, Desktop & Server Security, Firewalls,	Class		3	3

7	Password cracking Techniques, Key-logger, viruses and worms, Malwares & Spy wares.	Teaching + Lab		5	3
8	Windows Registry	Practice		3	3
9	Internet Security: LAN Security,	Class Room Teaching + PPT		3	0
	Email Security, Hacking attacks, preventive measures	Class Room Teaching + Lab Practice		3	3
	Vulnerability Assessment, Penetration Testing,	Class Room Teaching + PPT		3	0
	Cyber Laws			3	0
TOTAL				39	21

Python Programming

Subject Name	Code	Type of course	T-P-P (Credit)	Prerequisite
Python Programming	ENFC0411	Theory + Practice	1-2-0 (3)	Nil

1. Objective

- ✓ Learn problem solving using object-oriented concepts
- ✓ Implement object oriented programming using Python

2. Course Outcome

- ✓ Use object oriented concept to solve problems
- ✓ To quickly and easily draw plot or visualize the information through visualization Technique
- ✓ Write an error free program of minimum 200 lines of code

3. Evaluation Systems

Internal	Component	% of Marks	Method of Assessment
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Examination	Midterm Test	20	Written examination
	Assignment		Report and Presentation
	Experiments	30	Practice work, report
	Project		Report and presentation
	Quiz		Surprise/ preannounced ones
External Examination		30	Written examination
	Practice	20	Practice test with viva-voce
Total		100	

Projects

1. To create a text editor application
2. To create a Graphics Equalizers for Audio system
3. To a GUI based Calculator
4. Moving Ball Game
5. Students Phone Book
6. Result Analysis by GUI interface
7. Students Admission Analysis by GUI Interface

4. Course outline

Module-I (8 Hrs):

Familiarization of Python: Features and Installation, Setting up Path, Working with Python Basic Syntax, Variable and Data types, Basic operators, Numbers, Array, Tuples, Dictionary, Date and Time

Module-II (12 Hrs):

String Manipulation: Accessing Strings, Basic Operations, String slices

List: Accessing lists, Operations, Working with lists List (Functions)

Decision Making Statement: Boolean Expressions, if-else Statement, Nested if Else Statement, elif Statement, Switch Statement

Module-III (10 Hrs):

Iteration Statement: The while Statement, for Statement, Nested Loops, Break and Continue statement

Functions Operation: Types of Function, Function Arguments, Pass by reference vs value, Recursion Function

Module-IV (9 Hrs):

Object Oriented Concept: OOP Terminologies, Defining Classes, Creating Objects, Regular expressions, Constructors, Inheritance and Overloading

Module-V (8 Hrs):

Files Operation: Create Text & Binary Files, Different modes of opening a file, Reading and Writing into Files, File Positions

Module-VI (14 Hrs):

GUI Programming: Example GUI Program, Environment Variables, Label, Message Widget, Text Area, Button, Radio Button, CheckBox, Listbox/ DropDown Box, Frames, Menu Widget, Menu Button Widget, Scrollbar, Forms: GET method and POST method, Sliders (Tkinter), Uploading files, Database access, Sending email

Module-VII (14 Hrs):

Data Visualization: Visualization Libraries, Data frame: Data types, Attributes, methods (mean(), median(), std(), var(), cor(), min()/ max(), describe()), groupby method, Selecting Column, Filtering, Selecting row and column, Missing values, Data read from excel, CSV and txt file

Plotting: Basic plot(), Histogram, Bar Plot, Box Plots, Area Plot, Scatter Plot, Pie Chart

5. References

Text Books:

1. Fabrizio Romano, Learn Python Programming - Second Edition, Packt Publishing Limited, June 2018
2. Mark Lutz , Learning Python, O’Reilly 5th edition
3. Dr. R. Nageswara Rao, Core Python Programming, Dreamtech 2nd edition
4. Kirthi Raman, Mastering Python Data Visualization, PACKT publishing 2015

Reference Books:

Wes McKinney , “Python for Data Analysis, O’Reilly 2nd edition 2017

Online Source:

1. Michael Dawson, Python Programming for the Absolute Beginner, Premier Press (ebook)

6. Session Plan

Topic coverage and Internal Test	No. of Sessions (in hrs.)	Activity (lecture, tutorial, lab practice, field studies/field-trip, Workshop etc.)	Assignment (project, assignment, field study, seminar, etc.)	Suggested Reading (Book, Video, Online source, etc.)
Module-I (8 Hrs)				
Features and Installation, Setting up Path, Working with Python Basic Syntax, Variable and Data types	4	Lecture, lab practice	Assignment	TBI

Numbers, Array, Tuples, Dictionary, Date and Time	4	Lecture, practice	lab	Assignment	TB1
Module-II (12 Hrs)					
String Manipulation: Accessing Strings, Basic Operations, String slices	2	Lecture, practice	lab	Experiments	TB1, Online source
List: Accessing lists, Operations, Working with lists List (Functions).	3	Lecture, practice	lab	Experiments	TB1, Online source
Decision Making Statement: Boolean Expressions, if-else Statement	4	Lecture, practice	lab	Experiments	TB1, Online source
Nested if Else Statement, elif Statement, Switch Statement.	3	Lecture, practice	lab	Experiments	TB1, Online source
Module-III (10 Hrs)					
Iteration Statement: The while Statement, for Statement,	2	Lecture, practice	lab	Experiments	TB1, TB2
Nested Loops, Break and Continue statement.	3	Lecture, practice	lab	Experiments	TB1, TB2
Functions Operation: Types of Function, Function Arguments, Pass by reference vs value, Recursion Function.	5	Lecture, practice	lab	Experiments	TB1, TB2
Module-IV (9 Hrs)					
Object Oriented Concept: OOPS Terminologies, Defining Classes, Creating Objects,	3	Lecture, practice	lab	Experiments	TB1, Online source
Regular expressions, Constructors.	3	Lecture	lab	Experiments	TB1, TB2

		<i>practice</i>		
Inheritance and Overloading.	3	<i>Lecture, practice</i>	<i>lab</i>	<i>Experiments</i> <i>TB1, TB2</i>
Module-V (8 Hrs)				
Files Operation: Create Text & Binary Files, Different modes of opening a file.	4	<i>Lecture, practice</i>	<i>lab</i>	<i>Experiments</i> <i>TB1, TB2</i>
Reading and Writing into Files, File Positions.	4	<i>Lecture, practice</i>	<i>lab</i>	<i>Experiments</i> <i>TB1, TB2, Online sources</i>
Module-VI (14 Hrs)				
Example GUI Program, Environment Variables, Label	2	<i>Lecture, practice</i>	<i>lab</i>	<i>Project, Assignment</i> <i>TB2, TB3</i>
Message Widget, Text Area, Button, Radio Button, CheckBox	4	<i>Lecture, practice</i>	<i>lab</i>	<i>Project, Assignment</i> <i>TB2, TB3</i>
Listbox/DropDown Box, Frames, Menu Widget, Menu Button Widget, Scrollbar,	4	<i>Lecture, practice</i>	<i>lab</i>	<i>Project, Assignment</i> <i>TB2, TB3</i>
Forms: GET method and POST method, Sliders (Tkinter), Uploading files, Database access, Sending email.	4	<i>Lecture, practice</i>	<i>lab</i>	<i>Project, Assignment</i> <i>TB2, TB3</i>
Module-VII (14 Hrs)				
<ul style="list-style-type: none"> ✓ Data Visualization: ✓ Visualization Libraries, ✓ Data frame: Data types 	2	<i>Lecture, practice</i>	<i>lab</i>	<i>Project, Assignment</i> <i>TB2, TB3</i>

Attributes, groupby method, Selecting Column, Filtering, Selecting row and column, Missing values, Data read from excel, CSV and txt file.	4	Lecture, practice	lab	Project, Assignment	TB2, TB3
<ul style="list-style-type: none"> ✓ Filtering, Selecting row ✓ and column, Missing values, Data read from excel, CSV and txt file. 	4	Lecture, practice	lab	Project, Assignment	TB2, TB3
Plotting: Basic plot(), Histogram, Bar Plot, Box Plots, Area Plot, Scatter Plot, Pie Chart.	4	Lecture, practice	lab	Project, Assignment	TB2, TB3
Total (hrs): 75 Hours					

Sensors and IOT

Subject Name	Code	Type of Course	T-P-Pr (Credit)	Prerequisite
Sensors and IOT	ENFC0417	Theory & Practice	2-1-0(3)	NIL

1. Objective:

The objective of this subject is:

- ✓ To learn what “Internet of Things”, is.
- ✓ To introduce the implementation of web-based services on IOT devices.

2. Course Outcome:

Upon successful completion of this subject students should be able to:

- ✓ Write codes for the various interfacing of sensors, and how to access them through web.
- ✓ They will be able to make the smart controlling even smarter.
- ✓ They can float the data from sensors into the web or Google drive and can access the anywhere in a relatively secured manner.

3. Evaluation Systems:

Internal Examination	Component	% of Marks	Method of Assessment
	Midterm Test	20	Written examination

	Assignment		Report and Presentation
	Attendance		
	Experiments	30	Lab work, report
	Project		Report and presentation
	Quiz		Surprise/preannounced ones
External Examination		30	Written examination
		20	Lab Examination
Total		100	

4. Course Outline:

Module I (15 Hours)

[3 hrs. Theory + 12 hrs. Practice]

Introduction to Sensors (Description and Working principle): What is sensor? Types of sensors, URM 37 Sensor (Ultrasonic Sensor), Electro-Mechanical Switches, IR, PIR, Laser, Accelerometers, MQ2, MQ3, Temperature and Humidity Sensors (DHT-11), Stress Sensors, Load Sensors, Force Sensors, Wi-Fi modules.

Introduction to IOT: Background, what is IOT, what device makes it to IOT, IOT platforms, what IOT means for the developer, challenges of IOT.

Practice

1. Interfacing and testing the Ultrasonic Module, Relay and Infra-Red Module.
2. Interfacing and testing PIR, Laser LED, and Accelerometer.
3. Interface the LPG sensor, Monoxide sensor, Temperature and Humidity sensor.
4. Interfacing and testing stress sensor, load sensor, force sensor, Wi-Fi modules.

Module II (12 Hours)

[2 hrs.Theory + 10 hrs. Practice]

Connecting an Arduino to the Web: Introduction, setting up the Arduino development environment, Options for Internet connectivity with Arduino, interacting with basic sensors, interacting with basic actuators, configuring your Arduino board for the IoT.

Practice

5. Installing the Arduino IDE.
6. Learning the steps to interface the Controller board to the system through the interface.
7. Connecting the Arduino to the Internet.
8. Interacting of various sensors to the internet through the controller board.
9. Interfacing actuators to the Controller board and control through the internet.

Module III (5 Hours)

[1 hrs.Theory + 4 hrs. Practice] **Data extraction from**

Web: Grabbing the content from a web page, Sending data to the web, troubleshooting basic Arduino issues

Practice

10. Extracting data from a web page.
11. Sending data to a web page

Module IV (10 Hours)

[2 hrs.Theory + 10 hrs. Practice]

Internet Data Monitoring: Introduction, Internet of Things platforms for Arduino, Posting the sensor data online, Retrieving your online data, Securing your online data, Monitoring sensor data from a web based dashboard, Monitoring several Arduino boards at once, Troubleshooting issues with web data monitoring.

Practice

12. Posting the data to the internet through internet on-line.
13. Monitor the sensor output from a remote computer through Internet.
14. Parallel monitoring multiple controller boards connected to the internet.

Module V (7 Hours)

[3 hrs.Theory + 4 hrs. Practice]

Interacting with Web Services: Introduction, Discovering the Temboo platform, Tweeting from an Arduino board, Posting updates on Facebook, Automation with IFTTT, Sending push notifications

Practice

15. Posting an update to Facebook
16. Sending a Push notification through the controller by Internet

Module VI (15 Hrs.)

[1 hrs.Theory + 14 hrs. Practice]

Interacting with Web Services: Sending text message notifications, Storing data on Google Drive, Troubleshooting issues with web services.

Practice

17. Sending a text notification through Internet.
18. Control Light and Fan via Internet. (prototyped as LEDs)
19. Operate a DC motor to simulate the opening and closing of door using servo motor.

Module VII (11 Hours)

[3 hrs.Theory + 8 hrs. Practice]

Machine-to-Machine Interactions: Introduction, Types of IoT interaction, Basic local M2M interactions, Cloud M2M with IFTTT, M2M alarm system, Automated light controller, Automated sprinkler controller, Troubleshooting basic M2M issues.

Practice

20. Operate the smoke detector from internet.
21. Extract the reading of Temperature, Humidity and Monitoring through internet.
22. Automating the control of Light, Sprinkler.
23. Operate the robot through internet which has facility of communication to and fro through web and the sensor data.

5. Reference

Text Books:

1. Internet of Things with Arduino Cookbook, Marco Schwartz, ISBN 978-1-78528-658-2
2. Internet of Things- A Hands on Approach, Arshdeep Bahga and Vijay Madiseti , Universities Press , 2015.

Reference:

1. <https://www.arduino.cc/reference/en>.
2. Internet of Things with Arduino: Build Internet of Things Projects Using the Arduino Platform, Marco Schwartz.

6. Session Plan:

<i>Topic coverage and Internal Test</i>	<i>No. of Sessions (in hrs.)</i>	<i>Activity (Lecture, tutorial, lab practice, field studies/field -trip, Workshop etc.)</i>	<i>Assignment (Projects, assignment, field study, seminar, etc.)</i>	<i>Suggested Reading (Book, Video, Online source, etc.)</i>
Module I [3 hrs. Lecture + 12 hrs. Practice]				
What is Sensor? Types of sensors.	1	Lecture	Assignment	Text Book-1, Reference Book-1,2
URM 37 Sensor (Ultrasonic Sensor), Electro-Mechanical Switches, IR.	1	Lecture	Assignment	Text Book-1, Reference Book-1,2
Interfacing and testing the URM 37, Relay, IR Module.	4	Practice		
PIR, Laser, Accelerometers, MQ2, MQ3, Temperature and Humidity Sensors (DHT-11).	1	Lecture	Assignment	Text Book-1, Reference Book-1,2
Interfacing and testing PIR, Laser, Accelerometer, MQ2, MQ3, DHT-11	4	Practice		
Stress Sensors, Load Sensors, Force Sensors, Wi-Fi Modules.	1	Lecture	Assignment	Text Book-1, Reference Book-1,2
Interfacing and testing stress sensor, load sensor, force sensor, Wi-Fi modules.	4	Practice		
Background, What is IOT, What device makes it to IOT, IOT platforms, what IOT means for the developer.	1	Lecture	Assignment	Text Book-1, Reference Book-1,2
Module II [2 hrs. Lecture + 10 hrs. Practice]				
Introduction, Setting up the Arduino development environment.	2	Practice		
Interacting of various sensors to the internet through the controller board.	4	Practice		
Interacting with basic actuators, Configuring your Arduino board for the IoT.	4	Practice		
Module-III [1 hrs. Lecture + 4 hrs. Practice]				

Grabbing the content from a web page, sending data to the Web, Troubleshooting basic Arduino issues.	1	Lecture	Assignment	Text Book-1, Reference Book-1,2
Extracting data from a web page.	2	Practice		
Sending data to a web page.	2	Practice		
Module IV [2 hrs. Lecture + 8 hrs. Practice]				
Introduction, Internet of Things platforms for Arduino	1	Lecture	Assignment	Text Book-1, Reference Book-1,2
Posting the sensor data online, retrieving your online data, and Securing your online data, Monitoring sensor data from a web-based dashboard.	4	Practice		
Monitoring several Arduino boards at once, Troubleshooting issues with web data monitoring.	1	Lecture	Assignment	Text Book-1, Reference Book-1,2
Parallel monitoring multiple controller boards connected to the internet.	4	Practice		
Module V [3 hrs. Lecture + 4 hrs. Practice]				
Introduction, Discovering the Temboo platform, Tweeting from an Arduino board. Tweeting from an Arduino board	2	Lecture	Assignment	Text Book-1, Reference Book-1,2
Posting updates on Facebook, Automation with IFTTT, Sending push notifications.	1	Lecture	Assignment	Text Book-1, Reference Book-1,2
Posting updates on Facebook, Sending push notifications	4	Practice		
Module-VI [1 hrs. Lecture +14 hrs. Practice]				
Sending text message notifications, Storing data on Google Drive.	2	Practice		
Troubleshooting issues with web services.	1	Lecture	Assignment	Text Book-1, Reference Book-1,2
Control Light & Fan from the internet.	4	Practice		
Remote controlled door (opening & closing) using servo Motor.	4	Practice		
Smoke detector and Remote control room temperature from internet.	2	Practice		
Extract the reading of Temperature, Humidity and Monitoring through internet.	2	Practice		

Module VII [3 hrs. Lecture + 8 hrs. Practice]				
Introduction, Types of IoT interaction, Basic local M2M interactions.	1	Lecture	Assignment	Text Book-1, Reference Book-1,2
Cloud M2M with IFTTT, M2M alarm system, Troubleshooting basic M2M issues.	1	Lecture	Assignment	Text Book-1, Reference Book-1,2
Automated light controller, Automated sprinkler controller,	4	Practice		
Introduction, choosing a robotic platform, Building a mobile robot, Configuring your mobile robot, Basic robot control, Using distance sensors, Controlling your robot from anywhere, Troubleshooting basic robotic issues.	1	Lecture	Assignment	Text Book-1, Reference Book-1,2
Operate the robot through internet which has facility of communication to and fro through web and the sensor data.	4	Practice		
Total (hrs.)	75	15 hrs. Lecture	+ 60 hrs. Practice	

Programming for Problem solving- Java

Subject Name	Code	Type of course	T-P-P	Prerequisite
Programming for Problem solving- Java	ENFC0412	Theory + Practice	1-2-0(3)	Nil

1. Objective

- ✓ Learn problem solving using object-oriented concepts
- ✓ Implement object oriented programming using Java
- ✓ Analyze several alternative solutions to determine the best approach

2. Course Outcome

- ✓ Able to use object oriented concept to solve problems

· Write an error free program of minimum 200 lines of code

3. Evaluation System

<i>Internal Examination</i>	<i>Component</i>	<i>% of Marks</i>	<i>Method of Assessment</i>
	Midterm Test	20	Written examination
	Assignment	NIL	Report and Presentation
	Experiments	30	Practice work, report
	Project	NIL	Report and presentation
	Quiz	NIL	Surprise/preannounced ones
<i>External Examination</i>		30	Written examination
		20	Practice Exam with viva voce
<i>Total</i>		100	

Projects:

1. Simple Currency Converter
2. Designing a Calculator
3. Generating the mark sheet of a student
4. Create a phone directory and search a number
5. Create a tic tac toe game
6. Developing a library maintenance system
7. Desktop applications
8. Exam System (Without Database)
9. Create Country MAP and Different banners

Course outline

Module-I (10Hrs):

Problem Solving Techniques: Ask Questions, Look for things that are familiar, solve by analogy, Means-Ends Analysis, Divide and Conquer, The building block approach, Merging solutions, Mental Block: The Fear of Starting, Object Oriented Problem Solving, and Case Study.

Programming: Programming Language, Skeleton, Compilation, Interpretation, and Execution of Program.

Object-Oriented Programming: Object Oriented Concepts, Java Programming Environment, Feature of Java, Elements of Java Program: Identifier, Naming Conventions, Build-in Type, Variable, Operators, Control Statements, Loops, Typecasting, Arrays,

Module-II(15 Hrs):

Classes: Concept of Objects and Classes, Using Methods, Local Variables, Instance Variables, Constructor, Overloading Constructor, Overloading Methods, Garbage Collection, The Finalize Method, Static, Final and this Keyword.

Inheritance and Polymorphism: Basics, Access Modifier, The super Keyword, Method Overriding, Dynamic Method Dispatch, Abstract Classes, Inner Classes.

Module-III (10 Hrs):

Packages: Packages, Access Protection, Importing Package

Interfaces: Interface, Implementing Interfaces.

Module-IV (10 Hrs):

StringHandling: String, String Buffer, String Builder.

Excepting Handling: Fundamentals, Checked and Unchecked Exceptions, Using Try, Catch, MultipleCatches, Throw, Throws, Finally, Java's Built-In Exceptions, User-Defined Exception.

Module-V (10 Hrs):

Multi-Threading: Java Thread Lifecycle Model, Thread Priorities, Synchronization, Creating Threads, Using Different Thread Methods, Wrapper Classes, Clone (java.lang), Collection API, Vectors (java.util).

Module-VI (10 Hrs):

Java.IO: I/O Streams, Serialization

AWT: AWT Classes, Window Fundamental, Component, Container, Panel, Window, Frame, Canvas, Control Fundamentals, Layout Managers.

Module-VII (10 Hrs):

Event Handling: Delegation Event Model, Event Classes, Event Listener Interfaces, and Adapter Classes, Handling Events by Extending AWT Components.

Text Books:

Mark Lassoff, Java Programming for Beginners, Packt Publishing Limited, October 2017

Walter Savitch, "Java-An Introduction to Problem Solving & Programming", 8th edition, Pearson, 2017

Herbert Schildt, "Java Complete Reference", 10th edition, in McGraw-Hill Education, 2017

Reference Books:

Dr. Edward Lavieri, Peter Verhas, Mastering Java 9, Packt Publishing Limited, October 2017

Nell Dale, Chip Weems, "Programming and problem solving with Java", in Jones and Bartlett, 2008

Bhave&. Patekar, "Programming with Java" in Pearson Education, 2008

H.M. Deitel& Paul J. Deitel, "Java How to Program" in PHI, 9th Edition, 2012

Online Source: javatpoint.com,

http://www.corejavaguru.com

https://www.w3schools.in/java-tutorial/

Session Plan

<i>Topic coverage and Internal Test</i>	<i>No. of Sessions (in hrs.)</i>	<i>Activity (lecture, tutorial, lab practice, field studies/field-trip, Workshop etc.)</i>	<i>Assignment (project, assignment, field study, seminar, etc.)</i>	<i>Suggested Reading (Book, Video, Online source, etc.)</i>
<i>Problem Solving Techniques: Ask Questions, Look for things that are familiar, solve by analogy, Means-Ends Analysis, Divide and Conquer, The building block approach, Merging solutions, Mental Block: The Fear of Starting, Object Oriented Problem Solving, and Case Study</i>	<i>4</i>	<i>Lecture</i>		<i>Book</i>
<i>Installation of JDK, Configure runtime environment and Visualizing Java programming Environment (architecture)</i>	<i>1+1</i>	<i>Practice</i>		
<i>What is Programming,</i>	<i>1</i>	<i>Lecture</i>	<i>Assignment</i>	<i>Book</i>

<i>Programming Language, Skeleton, Compilation, Interpretation, and Execution of Program</i>				
<i>Constructing skeleton of Java Program, Object Oriented Concepts, Java Programming Environment, Feature of Java</i>	2+2	<i>Lecture, Practice</i>	<i>Assignment</i>	<i>Book</i>
<i>Share and execute India Map & CUTM Banner Sharing and Execute Calculator program</i>	2	<i>Practice</i>	<i>Assignment</i>	
<i>Elements of Java Program: Identifier, Naming Conventions, Build-in Type, Variable, Operators, more example</i>	2	<i>Practice</i>	<i>Assignment</i>	<i>Book</i>
<i>Conditional statement, looping statement,</i>	2	<i>Practice</i>	<i>Assignment</i>	<i>Book</i>
<i>Sharing and Execute calculate grade of students</i>	2	<i>Practice</i>		
<i>Concept of Objects and Classes, Using Methods, Local Variables, Instance Variables, Constructor, Overloading Constructor With Examples</i>	2+2	<i>Lecture, Practice</i>	<i>Assignment</i>	<i>Book</i>
<i>Overloading Methods, Garbage Collection, The</i>	2	<i>Practice</i>	<i>Assignment</i>	<i>Book</i>

<i>Finalize Method, Static, Final and this Keyword</i>				
<i>Sharing and Execute area of shapes</i>	<i>1</i>	<i>Practice</i>		
<i>Inheritance and Polymorphism: Basics, Access Modifier, The super Keyword, Method Overriding, Dynamic Method Dispatch</i>	<i>1+2</i>	<i>Lecture, Practice</i>	<i>Assignment</i>	<i>Book</i>
<i>Abstract Classes, Inner Classes</i>	<i>1+2</i>	<i>Lecture, Practice</i>	<i>Assignment</i>	<i>Book</i>
<i>ToDo list where you can calculate the completed task vs. pending tasks.</i>	<i>1</i>	<i>Practice</i>		
<i>Packages, Access Protection, Importing Package, Interface, Implementing Interfaces</i>	<i>1+4</i>	<i>Lecture, Practice</i>	<i>Assignment</i>	<i>Book</i>
<i>StringHandling: String, StringBuffer, StringBuilder</i>	<i>1+2</i>	<i>Lecture, Practice</i>	<i>Assignment</i>	<i>Book</i>
<i>Create a phone directory and search for a number.</i>	<i>1</i>	<i>Practice</i>		

<i>Excepting Handling: Fundamentals, Checked and Unchecked Exceptions, Using Try, Catch, Multiple Catches, Throw, Throws, Finally, Java's Built-In Exceptions, User- Defined Exception</i>	<i>1+4</i>	<i>Lecture, Practice</i>	<i>Assignment</i>	<i>Book</i>
<i>Create a tic tac toe game</i>	<i>1</i>	<i>Practice</i>		
<i>java.io: I/O streams, Serialization</i>	<i>1+4</i>	<i>Lecture, Practice</i>	<i>Assignment</i>	<i>Book</i>
<i>Producer/Consumer Problem</i>	<i>1</i>	<i>Practice</i>		
<i>Multi-Threading: Java Thread Lifecycle Model, Thread Priorities, Synchronization, Creating Threads, using Different Thread Methods</i>	<i>1+2</i>	<i>Lecture, Practice</i>	<i>Assignment</i>	<i>Book</i>
<i>Wrapper Classes, Clone (java.lang), Collection API, Vectors (java.util)</i>	<i>1+2</i>	<i>Lecture, Practice</i>	<i>Assignment</i>	<i>Book</i>
<i>Developing a library maintenance system.</i>	<i>1</i>	<i>Practice</i>		
<i>Event Handling: Delegation Event Model, Event Classes, Event</i>	<i>1+2</i>	<i>Lecture, Practice</i>	<i>Assignment</i>	<i>Book</i>

<i>Listener Interfaces, and Adapter Classes, Handling Events by Extending AWT Components</i>				
<i>AWT: AWT Classes, Window Fundamental, Component, Container, Panel, Window, Frame, Canvas, Control Fundamentals, Layout Managers</i>	2+6	<i>Lecture, Practice</i>	<i>Assignment</i>	<i>Book</i>
Total (Hrs)	75	(Theory -24 hrs + Practice -51 hrs =75)		

FCEN0603 Electrical Circuit Drawing (AutoCAD)

Credits: 02
42

Total Hours:

Course Objective

-To make student analyze the electrical system through computer simulation using software packages (AutoCAD)

Course Outcomes:

-Students should able to create an electrical wiring diagram by using AutoCAD software.

List of Experiments

1. Introduction to AutoCAD Electrical, Drawing Files, Electrical Components and Wires
2. Symbol creation
3. General lay out of a power system network.
4. Simple house wiring (1-phase): light, fan
5. Simple house wiring (3-phase): light, fan, AC, geezer, 3-phase motor
6. Agricultural pump-set wiring (star-delta) with panel wiring.
7. Workshop panel wiring for machine lab

8. Four wheeler electrical wiring
9. Forklift wiring harness
10. Substation lay out drawing with 4 incomer and 4 outgoing (Khordha Substation or nearby substation)
11. CIT new substation layout (schneider) or JITM Substation
12. Differential protection of transformer
13. Layout drawing of a power plant

				<i>Theor y</i>	<i>Practic e</i>	<i>Video</i>	<i>Project</i>
1	Introduction to AutoCAD Electrical, Drawing Files, Electrical Components and Wires	PRAC	AutoCAD	1	2	0	0
2	Symbol creation	PRAC	AutoCAD	1	2	0	0
3	General lay out of a power system network.	PRAC	AutoCAD	1	2	0	0
4	Simple house wiring (1-phase): light, Fan	PRAC	AutoCAD	1	2	0	0
5	Simple house wiring (3-phase): light, fan, AC, geezer, 3-phase motor	PRAC	AutoCAD	1	2	0	0
6	Agricultural pump-set wiring (stardelta) with panel wiring.	PRAC	AutoCAD	1	2	0	0
7	Workshop panel wiring for machine lab	PRAC	AutoCAD	1	2	0	0
8	Four wheeler electrical wiring	PRAC	AutoCAD	1	2	0	0
9	Forklift wiring harness	PRAC	AutoCAD	1	2	0	0
10	Substation lay out drawing with 4 incomer and 4 outgoing (Khordha Substation or nearby substation)	PRAC	AutoCAD	1	2	0	0
11	CIT new substation layout (schneider) or JITM Substation	PRAC	AutoCAD	1	2	0	0
12	Differential protection of transformer	PRAC	AutoCAD	1	2	0	0
13	Layout drawing of a power plant	PRAC	AutoCAD	1	2	0	0
	Sub Total			13	26	0	0

Product Development

Subject Name	Code	Type of course	T-P-P	Prerequisite
Product Development	ENFC0601	Practice + Project	0-2-1(3)	Nil

1. Objectives

- To educate the students on various stages of development of design of a product beginning from intent-to-actual design.
- Educate the students on usage of design software like ENOVIA, SIMULIA.

2. Course Outcome

- Students will have knowledge and skills to undertake design projects through making design decisions and evolve design of a product using the theoretical knowledge and hands-on-experience provided on design software.

3. Evaluation Systems

Internal Examination	Component	% of Marks	Method of Assessment
	Midterm Test		
	Assignment		
	Experiments		
	I PRO	40+10	Lab work & Report
	Quiz		
External Examination	EPRO	50	Project & Report
Total		100	

4. Course Outline

Module I (08 Hours)

Intent, Impact, Import & Use of Core Mechanical Principles for Concept Design, Engineering Design, Problems Engineering can Solve, How to Identify Opportunities for Design, Needs Assessment & Problem Definition.

Module II (10 Hours)

Defining Requirements & Problem Definition, Analytical Process Hierarchical Analysis, Developing Possible Design Solutions, Making Design Decisions.

Module III (08 Hours)

Introduction to CAD Process through 3D Experience Free Modeling, Modeling & Managing Subassemblies in the Robot

Module IV (09 Hours)

Modeling a Lathe Machine. Introduction to PLM through ENOVIA, Steps Involved in Controlling the Product Updates in ENOVIA.

Module V (20 Hours)

Introduction to FEA in Industry, Pre-Processing Using SIMULIA.

Module VI (15 Hours)

Understanding the Mathematical Modeling for Product in Physical Behavior

Module VII (15 Hours)

Introduction to Design of Experiments, How to Use SIMULIA to Make an Incremental Design Decision. Type of Engineering Analysis.

E-content: Peer Learning Experience by Dassault Systemes.

Text Books:

1. Chitale, A K, Product Design & Manufacturing, 2013, 6th Edition, PHI publication, India.
2. Ulrich, K T, Eppinger, S D, Product Design & Development, 2016, 5th edition, Tata McGraw-Hill Companies, Inc.

Reference Books:

- Kumar, P, Product Design - Creativity, Concepts & Usability, 2011, 2nd Edition, PHI publication, India.

7. Session Plan

Topic coverage and Internal Test	No. of Sessions (in hours.)	Activity (lecture, tutorial, lab practice, field studies/field-trip, Workshop etc.)	Assignment (project, assignment, field study, seminar, etc.)	Suggested Reading (Book, Video, Online source, etc.)
Module-I				
Intent, Impact, Import, Use of core Mechanical Principles for concept Design, What is Engineering Design, Problems Engineering can solve, How to identify opportunities for design, Needs Assessment & Problem Definition,	08	Tutorial	Project	
Module-II				
Defining requirements & Problem Definition, Analytical Process Hierarchical Analysis, Developing a possible design Solutions, Making Design Decisions.	10	Tutorial	Project	

Module-III				
Introduction to CAD Process through 3D Experience free modeling, Modeling & managing subassemblies in the Robot,	08	Tutorial , Practice	Project	
Module-IV				
Modeling a Lathe Machine. Introduction to PLM through ENOVIA, Steps involved in controlling the product updates in ENOVIA. Module-V	09	Tutorial , Practice	Project	
Introduction to FEA in Industry, Pre-processing using SIMULIA, Understanding the Mathematical modeling for Product in physical behavior, Introduction to design of experiments, How to use SIMULIA to make a incremental design decision. Type of Engineering analysis. Projects such as Disc Brake analysis by DOE, Door trim Substrate by DOE, MBD of Suspension by DOE.	20	Practice, tutorial	Project	
Module-VI				
Consumer Sentimental Analysis, Behavior Loyalty Metric, Emotional Loyalty Metric, Understanding decision making dashboards in NetVibes,	15	Lecture, Practice	Project	
Interpreting the Real time social data, Creation of different metric for business condition in Net Vibes, Automate Business logic to respond.	15	Lecture, Practice	Project	
Total (hours)	85			

Programming Internet of Things

Subject Name	Code	Type of course	T-P-P(Credit)	Prerequisite
Programming Internet of Things	ENFC1401	Workshop	0-2-0(2)	

1. Objective

- ✓ To familiarize the students with IoT (Internet of Things) and their applications
- ✓ To make students learn devices, programming and technology for IOT

2. Course Outcome

- ✓ Interface different sensors with Raspberry Pi and perform experiments
- ✓ Students will work together in teams
- ✓ Develop an IoT project which can be showcased at the end of the course

3. Evaluation Systems

<i>Internal Examination</i>	<i>Component</i>	<i>% of Marks</i>	<i>Method of Assessment</i>
	Midterm Test	<i>NIL</i>	Written examination
	Assignment	<i>NIL</i>	Report and Presentation
	Experiments (Internal)	<i>50</i>	Practice work, report and viva-voce
	Project	<i>50</i>	Report and presentation
	Quiz	<i>NIL</i>	Surprise/preannounced ones
<i>External Examination</i>	Semester	<i>NIL</i>	Written examination
	Practice	<i>NIL</i>	Practice test with viva-voce
Total		<i>100</i>	

Course outline

All the students shall be distributed in teams for project development. They will choose the project at the beginning of the course. A team shall not consist more than 4 members.

Module I: (20 Hours)
 Internet of Things: Definition and Characteristics of IoT, Physical Design of IoT – IoT Protocols, IoT communication models, IoT Communication APIs, IT enabled Technologies, Communication protocols
 Domain Specific IoTs: Home, City, Environment, Energy, Retail, Logistics, Agriculture, Industry, Health and Lifestyle.

Embedded Systems: Introduction, Sensors and Actuators, Different types of Sensors
Module II: (20 Hours)
 Raspberry Pi: Configuration of OS on to Raspberry Pi, Commands used in Raspberry Pi coding (Linux), Raspberry Pi pin descriptions.

Experiments like the following will be performed:
 Simple LED Blink Example, Simple Pattern of LED, Complex Pattern of LED, Simple Automated Light System using LDR, Simple project on Temperature Sensor using LCD display, LED action via Bluetooth.

Module III: (20 Hours)
 Experiments like the following will be performed:
 Ultra Sonic Sensor of Distance Finder, Data Logger with Temperature Sensor and LDR, Cloud Access and Storage of Sensor Data, IR Module Interfacing, PIR Module Interfacing, Relay Module Interfacing. Network setup WIFI/LAN, LED blinking using Pi, Web Monitoring of Sensor outputs through API keys, Sensor based automated E-Mail Sending through Pi.

Reference Books:

Maneesh Rao, Internet of Things with Raspberry Pi 3, Packt Publishing Limited, April 2018
McEwen Adrian and Cassimally Hakim, Designing the Internet of Things, Wiley Publication, 2013.
Bahga Arshdeep and Madiseti Vijay, Internet of Things - A Hands-on Approach, Universities Press, 2015.
Richardson Matt & Wallace Shawn, Getting Started with Raspberry Pi, O'Reilly (SPD), 2014.

Session Plan

Topic coverage and Internal Test	No. of Sessions (in hrs.)	Activity (lecture, tutorial, lab practice, field studies/field-trip, Workshop etc.)	Assignment (project, assignment, field study, seminar, etc.)	Suggested Reading (Book, Video, Online source, etc.)
Module-I (Practice-28 hours)				

<i>Introduction to Internet of Things – Definition and Characteristics of IoT, Physical Design of IoT – IoT Protocols</i>	<i>4</i>	<i>practice</i>	<i>Assignment</i>	<i>RB-1, RB-2, RB-3</i>
<i>IoT communication models, IoT Communication APIs, IoT enabled Technologies, Communication protocols</i>	<i>4</i>	<i>practice</i>	<i>Assignment</i>	<i>RB-1, RB-2, RB-3</i>
<i>Domain Specific IoTs – Home, City, Environment, Energy, Retail, Logistics, Agriculture, Industry, health and Lifestyle</i>	<i>4</i>	<i>practice</i>	<i>Assignment + Experiments</i>	<i>RB-1, RB-2, RB-3</i>
<i>Embedded Systems – Introduction, the basics of sensors and actuators</i>	<i>4</i>	<i>practice</i>	<i>Assignment + Experiments</i>	<i>RB-1, RB-2, RB-3</i>
<i>Different types of sensors</i>	<i>4</i>	<i>practice</i>	<i>Assignment + Experiments</i>	<i>RB-1, RB-2, RB-3</i>

Module-II (Practice- 28 hours)				
<i>Introduction to Raspberry Pi, Configuration of OS on to Raspberry Pi</i>	4	<i>practice</i>	<i>Assignment + Experiments</i>	<i>RB-1, RB-2, RB-3</i>
<i>Commands used in Raspberry Pi coding (Linux), Raspberry Pi pin descriptions</i>	4	<i>practice</i>	<i>Assignment + Experiments</i>	<i>RB-1, RB-2, RB-3</i>
<i>Simple LED Blink Example, Simple Pattern of LED</i>	4	<i>practice</i>	<i>Assignment + Experiments</i>	<i>RB-1, RB-2, RB-3</i>
<i>Complex Pattern of LED, Simple Automated Light System using LDR</i>	4	<i>practice</i>	<i>Assignment + Experiments</i>	<i>RB-1, RB-2, RB-3</i>
<i>Simple project on Temperature Sensor using LCD display, LED action via Bluetooth</i>	4	<i>practice</i>	<i>Assignment + Experiments</i>	<i>RB-1, RB-2, RB-3</i>
Module-III (Practice- 34 hours)				
<i>Ultra Sonic Sensor of Distance Finder, Data Logger with Temperature Sensor</i>	4	<i>practice</i>	<i>Assignment + Experiments</i>	<i>RB-1, RB-2, RB-3</i>

<i>and LDR</i>				
<i>Cloud Access and Storage of Sensor Data, IR Module Interfacing</i>	<i>4</i>	<i>practice</i>	<i>Assignment + Experiments</i>	<i>RB-1, RB-2, RB-3</i>
<i>PIR Module Interfacing, Relay Module Interfacing</i>	<i>4</i>	<i>practice</i>	<i>Assignment + Experiments</i>	<i>RB-1, RB-2, RB-3</i>
<i>Network setup WIFI/LAN, LED blinking using Pi</i>	<i>4</i>	<i>practice</i>	<i>Assignment + Experiments</i>	<i>RB-1, RB-2, RB-3</i>
<i>Web Monitoring of Sensor outputs through API keys, Sensor based automated E-Mail Sending through Pi</i>	<i>4</i>	<i>practice</i>	<i>Assignment + Experiments</i>	<i>RB-1, RB-2, RB-3</i>
Total (hrs)	60	Practice 60		

Build Your Computer

Subject Name	Code	Type of course	T-P-P	Prerequisite
Build Your Computer	ENFC1402	Workshop	0-2-0(2)	Nil

1. Objective

- ✓ Develop ability to understand the internals of Computer and peripherals
- ✓ To have an overall idea about networking concepts and devices
- ✓ To have an overall idea about secure computing

2. Course Outcome

- ✓ Build your computing device
- ✓ Troubleshoot various faults in a computer system and network
- ✓ Construct small LAN for resource sharing

3. Evaluation Systems

<i>Internal Examination</i>	<i>Component</i>	<i>% of Marks</i>	<i>Method of Assessment</i>
	Midterm Test		Written examination
	Assignment		Report and Presentation
	Experiments	50	Assessment based on Individual Lab sessions, Lab report
	Project	50	Report and presentation
	Quiz		Surprise/ preannounced ones
<i>External Examination</i>	<i>Practice</i>		Practice Test
Total		100	

Projects

1. *Developing your own computing device*
2. *Setup a camp to provide free servicing of laptops and desktops*
3. *Setup and configure a small secured LAN for file sharing*

4. Course outline

- I. **Build Computing Device:** Building computing device using Raspberry-Pi Board
- II. **Inside The PC:** Opening a Desktop/Laptop and Identification of Various Components, Study of

Different Blocks of PC

- III. **Assembling and Disassembling of PC:** Assembling and Disassembling of Different Components like Motherboard, Processor, RAM, Hard Disc and Other Components
- IV. **SMPS and Peripherals:** Identification of Various Power Supply Units and Peripherals along with Pin Configuration
- V. **BIOS:** Study of Basic Input Output System, Morden BIOS (UEFI), Security Features
- VI. **Installation of OS and Application Software:** Installation of GNU/Linux, Ubuntu LTS (Latest), Application Software
- VII. **Usage of Libreoffice:** Writer (Document), Calc (Spreadsheet), Impress (Presentation)
- VIII. **Basic Commands:** Working With Linux Commands, Vi Editor, Shell Scripting
- IX. **Basic Networking:** Wired LAN, Wireless LAN, Wireless Security and Troubleshooting
- X. **Introduction to Various Networking Devices:** Routers, Switches, Modems, Hubs, Firewall and Wireless devices
- XI. **Network Configuration:** Setting IP Addresses, Sharing Files and Folders, Network Troubleshooting, PING Test, ifconfig etc.
- XII. **Introduction To Servers and Network Security:** Files Servers, Email Servers, Proxy Servers; Essential Security Measures: Encrypt Critical Data, Secure Systems With Passwords, Back Up and Isolate Information

Session Plan

<i>Topic coverage and Internal Test</i>	<i>No. of Sessions (in hrs.)</i>	<i>Activity (lecture, tutorial, lab practice, field studies/field-trip, Workshop etc.)</i>	<i>Assignment (project, assignment, field study, seminar, etc.)</i>	<i>Suggested Reading (Book, Video, Online source, etc.)</i>
Build Your Own Device: Building Your First PC Using Raspberry Pi Board.	8	Workshop	project	https://howtoraspberrypi.com/build-pc-for-less-than-200-raspberry-pi/
Inside The PC: Opening a Desktop/Laptop and Identification of Various Components,	4	Demonstration and practice	Practice and Report writing.	https://web.stanford.edu/class/cs101/hardware-1.html

Study of Different Blocks of PC.				
Assembling and Disassembling of PC: Assembling and Disassembling of Different Components like Motherboard, Processor, Ram, Hard Disc and Other Components.	4	<i>Demonstration and practice</i>	Practice and Report writing.	https://www.youtube.com/watch?v=nBZovA_kMWA
SMPS and Peripherals: Identification of Various Power Supply Units and Peripherals along with Pin Structure.	4	<i>Demonstration and practice</i>	Practice and Report writing.	
BIOS: Study of Basic Input Output System, Modern BIOS (UEFI), Security Features.	4	<i>Demonstration and practice</i>	Practice and Report writing.	https://whatis.techtarget.com/definition/BIOS-basic-input-output-system

Installation of OS and Application Software: Installation of Ubuntu LTS (Latest), Application Software.	4	<i>Demonstration and practice</i>	Practice and Report writing.	https://tutorials.ubuntu.com/tutorial/tutorial-install-ubuntu-desktop#0
Usage of Libreoffice: Writer (Document), Calc (Spreadsheet), Impress (Presentation).	6	<i>Demonstration and practice</i>	Practice and Report writing.	
Basic Commands: Working With Linux Commands, Vi Editor, Shell Scripting.	6	<i>Demonstration and practice</i>	Practice and Report writing.	https://maker.pro/linux/tutorial/basic-linux-commands-for-beginners
Basic Networking: Wired LAN, Wireless LAN, Wireless	4	<i>Demonstration and practice</i>	Practice and Report writing.	

Security and Troubleshooting.				
Introduction to Various Networking Devices: Routers, Switches, Modems, Hubs, Firewall, wireless devices.	4	<i>Demonstration and practice</i>	Practice and Report writing.	https://www.geeksforgeeks.org/network-devices-hub-repeater-bridge-switch-router-gateways/
Network Configuration: Setting IP Addresses, Sharing Files and Folders, Network Troubleshooting, PING Test, ifconfig Etc.	4	<i>Demonstration and practice</i>	Practice and Report writing.	
Introduction To Servers and Network Security: Files Servers, Email Servers, Proxy	8	<i>Demonstration and practice</i>	Practice and Report writing.	https://w4university.wordpress.com/2013/07/01/http-dhcp-dns-ftp-smtp-proxy-and-client-server-architecture/

Servers; Essential Security Measures: Encrypt Critical Data, Secure Systems With Passwords, Back Up and Isolate Information.				
<i>Total (hrs)</i>	60hrs			

Cloud Computing Application

Subject Name	Code	Type of course	T-P-Pr (Credit)	Prerequisite
Cloud Computing Application	ENFC1403	Workshop	0-2-0(2)	

1. Objective

Key points: Briefly explain what the course covers. Indicate why the course is to be studied. Specify who should study the course and requirement of prior knowledge and skill, if any.

- | |
|---|
| <ul style="list-style-type: none"> · Learn fundamentals of cloud computing · Learn to build distributed applications and microservices with AWS Step Functions · Learn step-by-step to setup up AWS platform |
|---|

2. Course Outcome

Key points: State clearly what knowledge and skill a student is expected to learn at the end of the course.

- | |
|---|
| <ul style="list-style-type: none"> · Setup AWS Account and AWS infrastructure · Deploying serverless microservices · Implementing scalability and implementing high availability |
|---|

3. Evaluation Systems

Key points: State clearly the components, weights and methods of evaluation system.

<i>Internal Examination</i>	<i>Component</i>	<i>% of Marks</i>	<i>Method of Assessment</i>
	Midterm Test		Written examination
	Assignment		Report and Presentation
	Experiments	50	Lab work, report
	Project	50	Report and presentation
	Quiz		Surprise/preannounced ones
<i>External Examination</i>	<i>Practice Examination</i>		Written examination
Total		100	

Course outline

Module I (8 Hrs)

UNDERSTANDING CLOUD BASICS

Defining cloud computing, Introducing public, private, and hybrid clouds, Introducing cloud service models – IaaS, PaaS, and SaaS, Introducing multi-tenancy models, Compare cloud value proposition with conventional models. Understand Global Infrastructure – Region, Availability Zones, Edge Locations; Setting up AWS account, Getting Familiarity with AWS Management Console; Understanding cloud-based workloads

Module II (10 Hrs)

DESIGNING CLOUD APPLICATIONS

Introducing cloud-based multitier architecture, Designing for multi-tenancy, Understanding cloud applications design principles, Understanding emerging cloud-based application architectures, Estimating your cloud computing costs, A typical e-commerce web application

Module III (8 Hrs)

INTRODUCING AWS COMPONENTS

AWS components, Managing costs on AWS cloud, Application development environments
Setting up the AWS infrastructure

Module IV (8 Hrs)

DESIGNING FOR AND IMPLEMENTING SCALABILITY

Defining scalability objectives, Designing scalable application architectures, Leveraging AWS infrastructure services for scalability, Evolving architecture against increasing loads, Event handling at scale, Setting up Auto Scaling

Module V (8 Hrs)

DESIGNING FOR AND IMPLEMENTING HIGH AVAILABILITY

Defining availability objectives, Nature of failures, Setting up high availability

Module VI (8 Hrs)

DESIGNING FOR AND IMPLEMENTING SECURITY

Defining security objectives, Understanding the security responsibilities, Best practices in implementing AWS security, Setting up security

Module VII (10 Hrs)

DEPLOYING TO PRODUCTION AND GOING LIVE

Managing infrastructure, deployments, and support at scale, Creating and managing AWS environments using CloudFormation, Using CloudWatch for monitoring, Using AWS solutions for backup and archiving, Planning for production go-live activities, Setting up for production

E-content: www.awseducate.com

https://aws.amazon.com/getting-started/use-cases/?awsf.getting-started-content=*default

Text Books:

Aurobindo Sarkar, Amit Shah, *Learning AWS - Second Edition*, Packt Publishing Limited, February 2018, ISBN 9781787281066

Reference Books:

Vipul Tankariya, *AWS Certified SysOps Administrator - Associate Guide*, Packt Publishing Limited August 2018, ISBN 9781788990776

John Stamper, Sean Senior, Kevin E. Kelly, Biff Gaut, Tim Bixler, Hisham Baz, Joe Baron, *AWS Certified Solutions Architect Official Study Guide*, John Wiley & Sons, October 2016, ISBN: 9781119138556

Online Source: <https://aws.amazon.com/>

<https://www.awseducate.com/faqs?app=3>

4. Session Plan

Topic coverage and Internal Test	No. of Sessions (in hrs.)	Activity (lecture, tutorial, lab practice, field studies/field-trip, Workshop etc.)	Assignment (project, assignment, field study, seminar, etc.)	Suggested Reading (Book, Video, Online source, etc.)
<i>Defining cloud computing, Introducing public, private, and hybrid clouds</i>	2	<i>Lecture</i>	<i>Assignment</i>	<i>Text Book -I</i>
<i>Introducing cloud Service models – IaaS, PaaS, and SaaS, Introducing multi-tenancy models</i>	2	<i>Lecture</i>	<i>Assignment</i>	<i>T.B-I</i>
<i>Understanding cloud-based workloads, Setting up AWS account</i>	2	<i>Lab Practice</i>	<i>Experiment</i>	<i>T.B-I</i>
<i>Introducing cloud-based multitier architecture, Designing for multi-tenancy</i>	2	<i>Lab Practice</i>	<i>Experiment</i>	<i>T.B-I</i>
<i>Understanding cloud applications design principles, Understanding emerging cloud-based application architectures</i>	2	<i>Lab Practice</i>	<i>Experiment</i>	<i>T.B-I</i>
<i>Estimating your cloud computing costs, A typical e-</i>	2	<i>Lab Practice</i>	<i>Experiment</i>	<i>T.B-I</i>

<i>commerce web application</i>				
<i>AWS components, Managing costs on AWS cloud</i>	2	<i>Lab Practice</i>	<i>Experiment</i>	<i>T.B-1</i>
<i>Application development environments</i>	2	<i>Lab Practice</i>	<i>Experiment</i>	<i>T.B-1</i>
<i>Setting up the AWS infrastructure</i>	2	<i>Lab Practice</i>	<i>Experiment</i>	<i>T.B-1</i>
<i>Defining scalability objectives, Designing scalable application architectures</i>	4	<i>Lab Practice</i>	<i>Experiment</i>	<i>T.B-1</i>
<i>Leveraging AWS infrastructure services for scalability</i>	4	<i>Lab Practice</i>	<i>Experiment</i>	<i>T.B-1</i>
<i>Evolving architecture against increasing loads</i>	2	<i>Lab Practice</i>	<i>Experiment</i>	<i>T.B-1</i>
<i>Event handling at scale , Setting up Auto Scaling</i>	4	<i>Lab Practice</i>	<i>Experiment</i>	<i>T.B-1</i>
<i>Defining availability objectives, Nature of failures, Setting up high availability</i>	6	<i>Presentation, Lab Practice</i>	<i>Assignment, Experiment</i>	<i>T.B-1</i>
<i>Defining security objectives, Understanding the security responsibilities</i>	3	<i>Lab Practice</i>	<i>Experiment</i>	<i>T.B-1</i>
<i>Best practices in implementing AWS security, Setting up security</i>	4	<i>Lab Practice</i>	<i>Experiment</i>	<i>T.B-1</i>
<i>Managing infrastructure, deployments, and support at scale</i>	3	<i>Lab Practice</i>	<i>Experiment</i>	<i>T.B-1</i>
<i>Creating and managing AWS environments using CloudFormation</i>	3	<i>Lab Practice</i>	<i>Experiment</i>	<i>T.B-1</i>
<i>Using CloudWatch for monitoring</i>	2	<i>Lab Practice</i>	<i>Experiment</i>	<i>T.B-1</i>
<i>Using AWS solutions for backup and archiving</i>	2	<i>Lab Practice</i>	<i>Experiment</i>	<i>T.B-1</i>
<i>Planning for production go-live activities, Setting up for production</i>	3	<i>Lab Practice</i>	<i>Experiment</i>	<i>T.B-1</i>
<i>Total (hrs)</i>	60			

Software Development Methodologies

Subject Name	Code	Type of course	T-P-P	Prerequisite
Software Development Methodologies	ENFC1404	Workshop	0-2-0(2)	Programming for Problem solving- Java or Programming for Problem Solving - C++ or Python Programming

1. Objective

<ul style="list-style-type: none"> ✓ Learn software development processes: user requirements, specifications, design, coding, testing, maintenance, documentation, management ✓ Learn DevOps software development model

2. Course Outcome

<ul style="list-style-type: none"> ✓ Identify, collect requirements and prepare design documents required for managing a software ✓ Build software using DevOps model so as to release the software faster and more frequently
--

3. Evaluation Systems

<i>Internal Examination</i>	<i>Component</i>	<i>% of Marks</i>	<i>Method of Assessment</i>
	<i>Midterm Test</i>	<i>NIL</i>	<i>Written examination</i>
	<i>Assignment</i>	<i>NIL</i>	<i>Report and Presentation</i>
	<i>Experiments</i>	<i>50</i>	<i>Practice work, report and viva voce</i>
	<i>Project</i>	<i>50</i>	<i>Report and presentation</i>
	<i>Quiz</i>	<i>NIL</i>	<i>Surprise/preannounced ones</i>
<i>External Examination</i>	<i>Semester</i>	<i>NIL</i>	<i>Written examination</i>
	<i>Practice (External)</i>	<i>NIL</i>	<i>Practice Exam with viva voce</i>
<i>Total</i>		<i>100</i>	

Course outline

- All the students shall be distributed in groups for project development. They will choose the project from the list of projects (not exhaustive) to be given at the beginning of the session, which they need to develop along with the coverage of the course. A group shall not consist more than 4 members

- Some of the sample projects are:

School Management

E-Learning Web Portal

Reservation System (Railway, Airlines, etc.)

Accounting System

Voting System

Logistics Management

Contact Management

Module-I (8 Hrs.)

Integrated Development Environment, Version Control (Git), Documentation

Module-II (16 Hrs.)

Software Development Models: Principles of Life Cycle Models, Waterfall Software Development, Agile Software Development, Lean Software Development, DevOps

Module-III (12 Hrs.)

DevOps Processes and Continuous Delivery:

Requirements (Functional and Non-functional) and Specifications, Developers, Revision Control System, Build Server,

Module-IV (12 Hrs.)

Artifact Repository, Package Managers, Test Environments, Staging/Production, Release Management

Module-V (9 Hrs.)

DevOps – Architecture & Design:

DevOps Architecture, Separation of Concerns, DevOps Design (Modularity, Coupling, Cohesion)

Module-VI (9 Hrs.)

Three-tier Systems, Presentation Tier, Logic Tier, Data Tier, Handling Database Migrations

Module-VII (9 Hrs.)

Testing (Unit Testing, Integration Testing), Implementation, Deployment (Rollback, Cutover Strategies)

Text Books:

- Joakim Verona, *Practical DevOps*, Packt Publishing, 2nd Edition, 2018.

Reference Books:

Roger S. Pressman and Bruce R. Maxim, *Software Engineering – A Practitioner’s approach*, Mc Graw Hill Education, 8th Edition, 2015

Sanjeev Sharma and Bernie Coyne, *DevOps for Dummies*, John Wiley & Sons, Inc. 2nd Edition, 2015

7. Session Plan

Topic coverage and Internal Test	No. of Sessions (in hrs.)	Activity (lecture, tutorial, lab practice, field studies/field-trip, Workshop etc.)	Assignment (project, assignment, field study, seminar, etc.)	Suggested Reading (Book, Video, Online source, etc.)
Module-I (8 Hrs.)				
<i>Integrated Development Environment</i>	2 + 2	<i>lecture + practice</i>	<i>Assignment</i>	<i>TB-1, RB-1</i>
<i>Version Control (Git), Documentation</i>	4	<i>practice</i>	<i>Assignment + Experiments</i>	<i>TB-1, RB-1</i>
Module-II (16 Hrs.)				
<i>Principles of Life Cycle Models</i>	4	<i>Lecture</i>	<i>Assignment + Experiments</i>	<i>RB-1</i>
<i>Waterfall Software Development</i>	4	<i>practice</i>	<i>Assignment + Experiments</i>	<i>RB-1</i>
<i>Agile Software Development</i>	4	<i>practice</i>	<i>Assignment + Experiments</i>	<i>TB-1</i>
<i>Lean Software Development, DevOps</i>	4	<i>practice</i>	<i>Assignment + Experiments</i>	<i>TB-1</i>
Module-III (12 Hrs.)				
DevOps Processes and Continuous Delivery:				
<i>Requirements (Functional and Non-functional) and Specifications</i>	2 + 4	<i>lecture + practice</i>	<i>Assignment + Experiments</i>	<i>TB-1, RB-2</i>
<i>Developers, Revision Control System, Build</i>	6	<i>practice</i>	<i>Assignment +</i>	<i>TB-1, RB-2</i>

<i>Server</i>			<i>Experiments</i>	
Module-IV (12 Hrs.)				
<i>Artifact Repository, Package Managers</i>	4	<i>practice</i>	<i>Assignment + Experiments</i>	<i>TB-1</i>
<i>Test Environments, Staging/Production</i>	6	<i>practice</i>	<i>Assignment + Experiments</i>	<i>TB-1</i>
<i>Release Management</i>	2	<i>practice</i>	<i>Assignment + Experiments</i>	<i>TB-1</i>
Module-V (9 Hrs.)				
<i>DevOps – Architecture & Design: DevOps Architecture, Separation of Concerns</i>	2 + 2	<i>lecture + practice</i>	<i>Assignment + Experiments</i>	<i>TB-1, RB-1</i>
<i>DevOps Design (Modularity, Coupling, Cohesion)</i>	1 + 4	<i>lecture + practice</i>	<i>Assignment + Experiments</i>	<i>TB-1</i>
Module-VI (9 Hrs.)				
<i>Three-tier Systems, Presentation Tier,</i>	3 + 2	<i>lecture + practice</i>	<i>Assignment + Experiments</i>	<i>TB-1</i>
<i>Logic Tier, Data Tier</i>	2	<i>practice</i>	<i>Assignment + Experiments</i>	<i>TB-1</i>
<i>Handling Database Migrations,</i>	2	<i>practice</i>	<i>Assignment + Experiments</i>	<i>TB-1</i>
Module-VII (9 Hrs.)				
<i>Testing (Unit Testing, Integration Testing)</i>	1 + 2	<i>lecture + practice</i>	<i>Assignment + Experiments</i>	<i>TB-1</i>
<i>Implementation, Deployment (Rollback, Cutover Strategies)</i>	6	<i>practice</i>	<i>Assignment + Experiments</i>	<i>TB-1</i>
Total (Hrs.)	75	Theory (15 Hrs.) + Practice (60 Hrs.)		

Course Structure
[Common for EEE & EE]
2017

<i>Course Code</i>	<i>Course Title</i>	<i>Course Type</i>	<i>Credits</i>	<i>Prerequisite</i>
CCEE0101	Network Theory	Theory	3	Nil
CCEE0102	Electrical Machine-II	Theory	3	Nil
CCEE0103	Electrical Measurement & Instrumentation	Theory	3	Nil
CCEE0104	Control Systems	Theory	3	Nil
CCEE0105	Transmission & Distribution	Theory	3	Nil
CCEE0106	Power Electronics	Theory	3	Nil
CCEE0108	Power System Operation & Control	Theory	3	Nil
CCEE0109	Micro Processors & Micro Controllers	Theory	3	Nil
CCEE0110	Linear Integrated Circuits & Application	Theory	2	Nil
ELCC0103	Distributed Generation & Micro Grid (NEW)	Theory	2	Nil
CCEE0201	Network Theory Lab	Practice	2	CCEE0101 Network Theory (Co-requisite)
CCEE0202	Electrical Machine-II Lab	Practice	2	CCEE0102 Electrical Machines – II (Co-requisite)
CCEE0203	Measurement & Instrumentation Lab	Practice	2	CCEE0103 Electrical Measurement & Instrumentation (Co-requisite)
CCEE0204	Control Systems lab	Practice	2	Nil
CCEE0205	Power Electronics Lab	Practice	2	Nil
CCEE0207	Introduction to Linux	Practice	2	Nil
CCEE0208	Micro Processors & Micro Controllers Lab	Practice	2	Nil
ELCC0408	Power System Protection(NEW)	Theory+ Practice	3	Nil

**SYLLABUS
CCEE0101 NETWORK THEORY**

<i>Pre –requisites</i>	<i>Course Type</i>	<i>Credits</i>
<i>Nil</i>	<i>Theory</i>	<i>3</i>

Course Objectives:

To develop problem solving skills and understanding of circuit theory through the application of techniques and principles of electrical circuit analysis to common circuit problems.

Course Outcomes: (through simulation & Matlab programming) On successful completion of this course, students will be able to:

-Able to use network techniques, like node analysis and loop analysis, to write equations for large linear circuits.

-Able to apply Thevenin and Norton theorems to analyze and design for maximum power transfer.

-Able to analyze the transient behaviour of first and second order circuits -

Able to analyze the simple two port network.

-Able to apply the Laplace transform to linear circuits and systems -

Able to analyze the filter configuration.

Module-I (16 Hrs): NETWORK TOPOLOGY, NETWORK THEOREMS & COUPLED CIRCUITS NETWORK TOPOLOGY:

Graph of a network, Concept of tree, Incidence matrix, Tie-set matrix, Cut-set matrix, Formulation and solution of network equilibrium equations on loop and node basis (Most of the topics will be through Lectures, e-content)

NETWORK THEOREMS:

Substitution theorem, Reciprocity theorem, Maximum power transfer theorem, (Most of the topics will be through Lectures, e-content & laboratory) (All theorems will be through PSPICE, and Simulink)

COUPLED CIRCUITS:

Coupled Circuits, Dot Convention for representing coupled circuits, Coefficient of coupling, Series and parallel resonant circuits: Band Width and Q-factor (Most of the topics will be through Lectures, e-content & laboratory through PSPICE, and Simulink)

Module-II (14 Hrs): LAPLACE TRANSFORM & ITS APPLICATION, TWO PORT NETWORK LAPLACE

TRANSFORM & ITS APPLICATION:

Application of Laplace transform: Circuit Analysis (Steady State and Transient). (PSPICE, and Orcad), (Most of the topics will be through e-content & practice)

TWO PORT NETWORK FUNCTIONS & RESPONSES:

Z, Y, ABCD and h-parameters, Reciprocity and Symmetry, Interrelation of two-port parameters, Interconnection of two-port networks. (Most of the topics will be through Lectures, e-content & laboratory)

MODULE-III (12 Hrs): FOURIER SERIES & ITS APPLICATION, FILTERS

FOURIER SERIES & ITS APPLICATION: Fourier series, Fourier analysis and evaluation of coefficients, Steady state response of network to periodic signals, Fourier transform and convergence,

Fourier transform of some functions. (Most of the topics will be through Lectures, e-content)

FILTERS: Brief idea about network filters (Low pass, High pass, Band pass and Band elimination) and their frequency response. (Most of the topics will be through Lectures, e-content, videos & Projects) (Matlab programming)

TEXT BOOKS:

1. *Network Theory* –A K Chakraborty –DhanpatRai Publication. (2007 Edition Chapter-4,6,9,11,12,13,15,16,18,19)

REFERENCE BOOKS:

1. *Network Analysis* –M E Van Valkenburg –Pearson Education.
2. *Network Synthesis* –M E Van Valkenburg –Pearson Education.
3. *Engineering Circuit Analysis*-M.H.Hayt,JR.J.E.Kemmerly Tata McGraw Hill
4. *Fundamentals of Electric Circuits* –Alexander &Sadiku –Tata McGraw Hill.
5. *Network Theory* –P K Satpathy, P Kabisatpathy, S P Ghosh& A K Chakrabarty Tata McGraw Hill, New Delhi

Online Sources: <http://nptel.ac.in/courses/108102042/>

Module I

S. No.	Topic	Pedagogy	Details	Instructional Hrs			
				Th	Pract	video	Proj
NETWORK TOPOLOGY							
1	Graph of a network, Concept of tree, Incidence matrix	CRT & ematerial	With E-content	1	0	0	0
2	Tie-set matrix, Cut-set matrix		https://www.youtube.com/watch?v=9yLBiWnbJTs	1	0	1	0
3	Formulation and solution of network equilibrium equations on loop basis		With E-Content	1	0	0	0
4	Formulation and solution of network equilibrium equations on node basis	CRT	With E-Content	1	0	0	0
5	NETWORK THEOREMS Substitution theorem, Reciprocity theorem,	Practice	Software- PSPICE/MATLAB	0	1	0	0

6	Maximum power transfer theorem		Software- PSPICE/MATLAB	1	1	0	0
7	Tellegen's th	CRT	With E-Content	1	0	0	0
	Millman's th						
8	Compensation theorem	Practice	Through hardware(Lab)	0	1	0	0
9	COUPLED CIRCUITS	CRT	https://www.youtube.com/watch?v=Z0Glgwmm2gk	0	0	1	0
10	Dot Convention for representing coupled circuits	CRT	With E-Content	1	0	0	0
11	Coefficient of coupling	Practice	Through hardware(Lab)	0	1	0	0
12	RESONANCE Series resonant circuits	CRT & ematerial	With E-Content	1	0	0	0
13	parallel resonant circuits	CRT & ematerial	With E-Content	1	0	0	0
14	Band Width and Q factor	Practice	Through hardware(Lab)	0	1	0	0

Module II

S. No.	Topic	Pedagogy	Details	Instructional Hrs			
				Th	Pract	video	Proj
1	LAPLACE TRANSFORM & ITS APPLICATION: Introduction to Laplace Transform,	CRT	With E-Content	1	0	0	0
2	Laplace transform of some basic functions	CRT & e-material	With E-Content	1	0	0	0
3	Laplace transform of periodic functions	CRT	With E-Content	1	0	0	0
4	Inverse Laplace transform	CRT & e-material	With E-Content	1	0	0	0
5	Application of Laplace transform	CRT	With E-Content	2	0	0	0
6	Circuit Analysis (Steady State and Transient).	Practice	Through hardware(Lab)	1	1	0	0
7	TWO PORT NETWORK Z Parameter	CRT	https://www.youtube.com/watch?v=XXIEfOK0y_8	0	0	1	0
8	Y- parameter	Practice	Through hardware(Lab)	0	1	0	0
9	ABCD & h-Parameter		Through hardware(Lab)	0	1	0	0
10	Reciprocity and Symmetry, Interrelation of two port parameters	CRT & e-material	With E-Content	2	0	0	0
11	Interconnection of two-port networks.	CRT & e-material	https://www.youtube.com/watch?v=IiQLyj-myk	0	0	1	0

Module III

S. No.	Topic	Pedagogy	Details	Instructional Hrs			
				Th	Pract	video	Proj
1	FOURIER SERIES & ITS APPLICATION: Fourier series, Fourier analysis and evaluation of coefficients	CRT & e-material	https://www.youtube.com/watch?v=t5ehBsCdLAQ	2	0	0	0
2	Steady state response of network to periodic signals	CRT	With E-Content	1	0	0	0
3	Fourier transform and convergence	CRT	With E-Content	1	0	0	0
4	Fourier transform of some functions	CRT	With E-Content	1	0	0	0
5	FILTERS Brief idea about network filters	CRT & e-material	https://www.youtube.com/watch?v=OBM5T5_kgdI&list=PLC04BBD8B9D12DF14	0	0	1	0
6	Low pass, High pass filters	CRT	With E-Content	1	0	0	1
7	Band pass and Band elimination filters	CRT & e-material	With E-Content	1	0	0	0
8	Their frequency response.	CRT & e-material	With E-Content	1	0	0	0

CCEE0102 ELECTRICAL MACHINES -II

<i>Pre –requisites</i>	<i>Course Type</i>	<i>Credits</i>
<i>Nil</i>	<i>Theory</i>	<i>3</i>

Course Objectives:

- To introduce the students about principles of electromagnetism applied to alternating machines.
- To familiarize the students about the fundamental laws that governs the operation of AC machines and to extend its application to synchronous generator and motors.
- To introduce the students about the constraints associated with starting of Induction motors.
- To analyse the behaviour and the performance of the machine under different operating conditions and their remedial measures. **Course Outcomes:**

On completing this course, students will be able to:

- Distinguish the constructional similarity and dissimilarity between various alternators. -
- Perform different tests on a synchronous generator.
- Calculate voltage regulation of the machines by different methods
- Understand about direct axis and quadrature axis reactance which is essential for higher studies. -
- Run two or more alternators in parallel.
- Determine the power developed in a synchronous motor
- In the lab, 50% of the experiments will be verified by writing a software programme on the logic relating to the Mathematical equation.

Module-I (15 Hrs):

THREE PHASE SYNCHRONOUS GENERATORS

Synchronous Generator Construction (both Cylindrical Rotor and Salient Pole type), The Speed of Rotation of a Synchronous Generator, Induced voltage in A.C. Machines, The Effect of Coil Pitch on A.C. Machines, Distributed Windings in A.C. Machines, The Equivalent Circuit of a Synchronous Generator (Armature Reaction Reactance, Synchronous Reactance and Impedance).(Class room teaching)

CYLINDRICAL ROTOR TYPE THREE PHASE SYNCHRONOUS GENERATORS

The Phasor Diagram of a Synchronous Generator, Power and Torque in Synchronous Generators (Power Angle Equation and Power Angle Characteristic), Two reaction theory, Phasor diagram, Power angle characteristic of synchronous generators, Measuring Synchronous Generator Model Parameters (Open Circuit and Short Circuit Tests and Determination of Synchronous Impedance and Reactance), Voltage Regulation by Synchronous Impedance Method, Zero Power Factor = ZPF Method, Zero Power Factor characteristic, Potier Reactance.(Class room teaching+ Lab practice)

SALIENT POLE TYPE THREE PHASE SYNCHRONOUS GENERATORS

Two Reaction Concept, Development of the Equivalent Circuit of a Salient Pole type Three Phase Synchronous Generator (Direct axis and Quadrature axis Reactance, Phasor Diagram for various load power factors, Torque and Power Equations of Salient Pole Synchronous Generator (Power Angle Equation and Power Angle Characteristic with stator resistance neglected). Synchronous condenser, Hunting.(Class room teaching+ Lab practice) **Module-II (13Hrs):**

PARALLEL OPERATION OF THREE PHASE A.C. SYNCHRONOUS GENERATORS

The Conditions Required for Paralleling, The General Procedure for Paralleling Generators, Operation of Generators in Parallel with Infinite bus bar, Effect of excitation, effect of unequal voltage and steam power supply. Load Sharing between two generators. (Class room teaching+ Lab practice)

THREE PHASE SYNCHRONOUS MOTORS

Basic Principles of Motor operation, Construction, Starting Synchronous Motors, Equivalent circuit & phasor diagram. Effect of excitation on varying load, power developed in a synchronous motor, induction motor and Synchronous Motors, Synchronous Motor Ratings, Applications of synchronous motors(Class room teaching)

MODULE-III (14 Hrs):

THREE PHASE INDUCTION MACHINES

Constructional Features of Squirrel Cage Rotor type and Slip Ring/Wound Rotor type of Induction Motors, Principle of Operation, Slip Speed, Equivalent Circuit and Phasor Diagram, No-Load and Blocked Rotor tests, Determination of Parameters, Slip-Torque Characteristics Losses and Efficiency. Starting of Squirrel Cage Rotor type and Slip Ring/Wound Rotor type of Induction Motors, Speed Control of Induction Motors, Circle Diagram, Effect of rotor resistance, Starting and speed control methods, Cogging, Crawling and Electrical Braking of Induction Motors.(Class room teaching+ Lab practice)

SINGLE PHASE INDUCTION MOTORS :Starting of Single Phase Induction Motors, Speed Control of Single Phase Induction Motors, Circuit Model. Other types of Motors: Reluctance Motors.(Class room teaching)

TEXT BOOKS:

1. *Electrical Machines –D P Kothari and I J Nagrath –Tata McGraw Hill.*

REFERENCE BOOK

1. *Electrical Machinery –P S Bimbhra –Khanna Publishers.*
2. *Electrical Machines - P. K. Mukherjee, S. Chakravarti, Dhanpat Rai & Sons*
3. *Electrical Machines-I. - B.L.Theraja- S.Chand Publications.*

Module I

S. No.	Topic	Pedagogy	Details	Instructional Hrs			
				Th	Pract	video	Proj
THREE PHASE SYNCHRONOUS GENERATORS							
1	Synchronous Generator Construction (both Cylindrical Rotor and Salient Pole type), The Speed of Rotation of a Synchronous Generator,.	Class room teaching	content	2	0	0	0
2	Induced voltage in A.C. Machines, The Effect of Coil Pitch on A.C. Machines, Distributed Windings in A.C. Machines	Class room teaching	content	1	0	0	0
3	The Equivalent Circuit of a Synchronous Generator (Armature Reaction Reactance, Synchronous Reactance and Impedance).	Class room teaching	content	2	0	0	0
CYLINDRICAL ROTOR TYPE THREE PHASE SYNCHRONOUS GENERATORS							
4	The Phasor Diagram of a Synchronous Generator, Power and Torque in Synchronous Generators (Power Angle Equation and Power Angle Characteristic)	Class room teaching	content	2	0	0	0
5	Two reaction theory, Phasor diagram, Power angle characteristic of synchronous generators	Class room teaching	content	2	0	0	0
6	Measuring Synchronous Generator Model Parameters (Open Circuit and Short Circuit Tests and Determination of Synchronous Impedance and Reactance)	Video lecture	https://m.youtube.com/watch?v=mFqVD9W5MM	0	0	1	0

S. No.	Topic	Pedagogy	Details	Instructional Hrs			
				Theory	Practice	video	Project
SALIENT POLE TYPE THREE PHASE SYNCHRONOUS GENERATORS							
8	Two Reaction Concept,	Class room	econtent	1	0	0	0
9	Development of the Equivalent Circuit of a	teaching	Econtent+ lab				
10	Salient Pole type Three Phase Synchronous Generator (Direct axis and Quadrature axis Reactance, Phasor Diagram for various load power factors,)	Class room teaching & Lab Practice	practice	2	1	0	0
	Torque and Power Equations of Salient Pole Synchronous Generator (Power Angle Equation and Power Angle Characteristic with stator resistance neglected).	Class room teaching	econtent	2	0	0	0
7	Voltage Regulation by Synchronous Impedance Method, Zero Power Factor = ZPF Method, Zero Power Factor characteristic, Potier Reactance.	Class room teaching & Lab Practice	Econtent + lab practice	2	1	0	0

Module I (Contd...)

Module II

S. No.	Topic	Pedagogy	Details	Instructional Hrs			
				Theory	Practice	video	Project
PARALLEL OPERATION OF THREE PHASE A.C. SYNCHRONOUS GENERATORS							
1	The Conditions Required for Paralleling, The General Procedure for Paralleling	Video lecture & Lab Practice	https://www.youtube.com/watch?v=508604nfntA	0	1	2	0
2	Operation of Generators in Parallel with Infinite bus bar,	Class room teaching	econtent	1	0	0	0
3	Effect of excitation, effect of unequal voltage and steam power supply.	Class room teaching	econtent	2	0	0	0
4	Load Sharing between two generators.	Class room teaching	econtent	1	0	0	0
THREE PHASE SYNCHRONOUS MOTORS							
5	Basic Principles of Motor operation, Construction,	Video lecture	https://m.youtube.com/watch?v=VkJDXxZlhs	0	0	2	0
6	Starting Synchronous Motors,	Class room	econtent				

	Equivalent circuit & phasor diagram.	teaching		3	0	0	0
7	Effect of excitation on varying load, power developed in a synchronous motor, induction motor	Class room teaching	econtent	2	0	0	0
8	Synchronous Motor Ratings, Applications of synchronous motors	Class room teaching	econtent	1	0	0	0

Module III

S. No.	Topic	Pedagogy	Details	Instructional Hrs			
				Th	Pract	video	Proj
THREE PHASE INDUCTION MACHINES							
1	Constructional Features of Squirrel Cage Rotor type and Slip Ring/Wound Rotor type of Induction Motors	Class room teaching	econtent	2	0	0	0
2	Principle of Operation, Slip Speed		econtent	1	0	0	0
3	Equivalent Circuit and Phasor Diagram		econtent	1	0	0	0
4	No-Load and Blocked Rotor tests		econtent	1	0	0	0
5	Slip Torque Characteristics Losses and Efficiency.		econtent	1	0	0	0
6	Starting of Squirrel Cage Rotor type and Slip Ring/Wound Rotor type of Induction Motors,		econtent	1	0	0	0
7	Speed Control of Induction Motors, Circle Diagram, Effect of rotor resistance	Class room teaching & Lab Practice	econtent + Practice	1	1	0	0
8	Starting and speed control methods, Cogging, Crawling and Electrical Braking of Induction Motors.	Class room teaching	econtent	2	0	0	0
SINGLE PHASE INDUCTION MOTORS							
9	Starting of Single Phase Induction Motors	Class room teaching	econtent	1	0	0	0
10	Speed Control of Single Phase Induction Motors,		econtent	1	0	0	0
11	The Circuit Model of a Single Phase Induction Motor, Other types of Motors Reluctance Motors.		econtent	2	0	0	0

CCEE0103 ELECTRICAL MEASUREMENT & INSTRUMENTATION

Pre –requisites	Course Type	Credits
Nil	Theory	3

Course Objectives:

- To introduce the concepts & purpose of various electrical Instrumentation.
- To train the students to operate different types of electrical Instrument and how to measure different parameters & variables.

-To make the students understand various concepts related to construction and working of various parameter measuring devices.

Course Outcomes: On successful completion of this course, students will be able to:

-Students will be able to prepare professional quality graphical presentations of laboratory data and Computational results, incorporating accepted data analysis and synthesis methods.

-Students will work in teams to conduct experiments, analyze results, and develop technically sound reports of outcomes.

-Students can develop application oriented projects by using this instruments & devices & able to repair instrument

-Analyzing a problem and ability to propose solution.

-Able to demonstrate the use of machinery in different areas of application.

MODULE- I (15 Hours)

Basics of Measurements: Accuracy, Precision, resolution, reliability, repeatability, validity, Errors and their analysis. (Class room teaching)

GALVANOMETER: Construction, Theory and Principle of opera

Magnet & Moving Coil types), and Ballistic Galvanometer, Influence of Resistance on Damping, Logarithmic decrement, Calibration of Galvanometers, Galvanometer Constants, Measurement of Flux and Magnetic Field by using Galvanometers. (Class room teaching+ Lab Practice)

Bridge Measurement: DC bridges –Wheatstone bridge, AC bridges –Kelvin, Hay, Maxwell, Schering and Wien bridges .(class room teaching+ Lab Practice)

MODULE- II (12 Hours)

POTENTIOMETER: Construction, Theory and Principle of operation of DC Potentiometers

(Crompton, Vernier, Constant Resistance, & Deflection Potentiometer), and AC Potentiometers

(Drysdale-Tinsley & Gall-Tinsley Potentiometer).(class room teaching+ Lab Practice)

PMMC, moving iron, dynamometer and induction type instruments. (class room teaching+ Lab Practice) Measurement of Voltage, Current, Power (Single Phase & Three Phase) &Energy (class room teaching+ Lab Practice)

MODULE- III (13 Hours)

Instrument transformers: Current Transformer, Potential Transformer (class room teaching+ Lab Practice)

Frequency Meters: Vibration reed type, electrical resonance type (class room teaching+ Lab Practice) Oscilloscopes: Cathode Ray Tube, Vertical and Horizontal Deflection System, Delay lines, Probes and

Transducers, Specification of Oscilloscope, Oscilloscope Techniques. Lissajous Pattern.(class room teaching+ Lab Practice)

Measurement of earth resistance: Earth Megger. (class room teaching+ Lab and field Practice) Text

Books:

1. Modern Electronics Instrumentation & Measurement Techniques , by Albert D. Helstrick and William D. Cooper. Pearson Education.
2. Electronic Instrumentation, H.S. Kalsi, Tata McGraw-Hill Publishing Company Limited, New Delhi.
3. Electrical Measurements and Measuring Instruments –Golding &Widdis –5th Edition, Reem Publication

Reference Book(s):

1. Electronics Instruments and Instrumentation Technology –by Anand , PHI
2. Elements of Electronics Instrumentation and Measurement –3rd Edition by Joshph J. Carr. Pearson Education
3. A Course in Electrical and Electronic Measurements and Instrumentation –A K Sawhney –Dhanpat Rai & Co

11	Measurement of Voltage, Current, Power in Single Phase circuit & Energy	Practice	Hardware Practice	0	1	0	0
12	Measurement of Voltage, Current, Power in Three Phase circuit & Energy	Practice	Hardware Practice	0	1	0	0
	MODULE- III			3	8	0	2
	INSTRUMENT TRANSFORMERS						
1	Current Transformer	Practice	SubStation Visit	0	0	0	1
2	Potential Transformer	Practice		0	0	0	1
	FREQUENCY METERS						
3	Vibration reed type,	CRT	E-Content	1	0	0	0
4	Electrical resonance type	CRT	E-Content	1	0	0	0
	OSCILLOSCOPES						
5	Cathode Ray Tube.	CRT + Practice	E-Content and Hardware Practice	1	1	0	0
6	Vertical and Horizontal Deflection System,	Practice	Hardware Practice	0	1	0	0
7	Probes and Transducers	Practice		0	1	0	0

8	Specification of Oscilloscope	Practice		0	1	0	0
9	Delay lines	Practice		0	1	0	0
10	Oscilloscope Techniques	Practice		0	1	0	0
11	Lissajous Pattern	Practice		0	1	0	0
	MEASUREMENT OF EARTH RESISTANCE						
12	Measurement of earth resistance: Earth Megger	Practice		0	1	0	0

CCEE0104 Control System

Pre –requisites	Course Type	Credits
Nil	Theory	3

Course Objectives:

-To teach the fundamental concepts of Control systems and mathematical modelling of the system. - To teach students the characteristics of closed-loop control systems, including steady-state and transient response, parametric sensitivity, disturbances, error, and stability.

-To teach the basics of stability analysis of the system

-To study the concept of time response and frequency response of the systems and methods - Introduce students to the basic concepts of proportional, integral, and derivative (PID) control.

Course Outcomes:

On successful completion of this course, students will be able to: -Represent the mathematical model of a system.

-Determine the response of different order systems for various step inputs.

-Analyse the stability of the system.

MODULE-I: (12 Hours)

Introduction to Control Systems: Basic Concepts of Control Systems, Open loop and closed loop systems, Mathematical Models of Physical Systems: Differential Equations of Physical Systems: Mechanical Translational Systems, Rotational systems, Electrical Systems, Analogy between Mechanical and electrical quantises, Derivation of Transfer functions, Block Diagram Algebra, Signal flow Graphs, Mason’s Gain Formula. Control Components: D.C. S Synchros, Stepper Motors. (Class room teaching & practice based)(Matlab/Simulink)

MODULE-II: (14 Hours)

Time response Analysis: Standard Test Signals, Time response of first order systems to unit step and unit ramp inputs. Time Response of Second order systems to unit step input, Time Response specifications, Steady State Errors and Static Error Constants of different types of systems. Stability and Algebraic Criteria, concept of stability, Necessary conditions of stability, Hurwitz stability criterion, Routh stability criterion, Application of the Routh stability criterion to linear feedback system, Relative stability by shifting the origin in s-plane. Root locus Technique: Root locus concepts, Rules of Construction of Root locus, Determination of Roots from Root locus for a specified open loop gain. (Class room teaching & practice using Matlab Programming)

MODULE-III: (14 Hours)

Frequency Response Analysis: Frequency domain specifications, correlation between Time and Frequency Response with respect to second order system, Polar plots, Bode plot, Determination of Gain Margin & Phase Margin from Bode plot.

Stability in frequency domain: Principle of argument, Nyquist stability criterion, Application of Nyquist stability criterion for linear feedback system.

Controllers: Concept of Proportional, Derivative and Integral Control actions, P, PD, PI, PID controllers. (Class room teaching & practice based using Matlab Programming)

Text Book:

1. Control Systems Engg. by I.J. Nagrath and M.Gopal, 5th Edition, New Age International Publishers (2010).

Reference Books:

Design of Feedback Control Systems by R.T. Stefani, B. Shahian, C.J. Savator, G.H. Hostetter, Fourth Edition (2009), Oxford University Press.

1. Control Systems (Principles and Design) by M.Gopal 3rd edition (2008), TMH.

2. Analysis of Linear Control Systems by R.L. Narasimham, I.K. International Publications

3. Control Systems Engineering by S.P. Eugene Xavier and J. Josheph Cyril Babu, 1st Edition (2004), S. Chand Co. Ltd.

Module I

S. No.	Topic	Pedagogy	Details	Instructional Hrs			
				Theory	Practice	video	Project
1	Introduction to Control Systems: Basic Concepts of Control Systems.	CRT	e-content	2	0	0	0
2	Open loop and closed loop systems Mathematical Models of Physical Systems: Differential Equations of Physical Systems	CRT	Chalk and talk	1	0	0	0
3	Mechanical Translational Systems, Rotational systems,	CRT	Chalk and talk &	1	1	1	0

	<i>Mechanical and electrical quantises</i>		<i>simulink</i>				
4	<i>Derivation of Transfer functions, Block Diagram Algebra</i>	<i>CRT</i>	<i>Chalk and talk</i>	2	0	0	0
5	<i>Signal flow Grap Formula</i>	<i>CRT</i>	<i>Chalk and talk</i>	1	0	1	0
6	Control Components: <i>D.C. Servomotors, A.C. Servomotors, A.C.Tachometer, Synchros, Stepper Motors.</i>	<i>CRT + Practice</i>	<i>Practice in control system lab (Hardware based)</i>	1	1	0	0

Module II

S. No.	Topic	Pedagogy	Details	Instructional Hrs			
				Theory	Practice	video	Project
1	<i>Time response Analysis: Standard Test Signals, Time response of first order systems to unit step and unit ramp inputs.</i>	<i>CRT + Practice</i>	<i>Practice in simulation lab (software based with Matlab)</i>	1	1	0	0
2	<i>Time Response of Second order systems to unit step input</i>	<i>CRT + Practice</i>		1	1	0	0
3	<i>Time Response specifications electrical quantises</i>	<i>CRT</i>	<i>Chalk and talk</i>	1	0	0	0
4	<i>Steady State Errors and Static Error Constants of different types of systems</i>	<i>CRT</i>	<i>Chalk and talk</i>	1	0	0	0

5	<i>Stability and Algebraic Criteria, concept of stability, Necessary conditions of stability, Hurwitz stability criterion, Routh stability criterion</i>	<i>CRT</i>	<i>Chalk and talk</i>	2	0	1	0
6	<i>Application of the Routh stability criterion to linear feedback system, Relative stability by shifting the origin in s-plane</i>	<i>CRT</i>	<i>Chalk and talk</i>	1	0	0	0
7	Root locus Technique: <i>Root locus concepts, Rules of Construction of Root locus, Determination of Roots from Root locus for a specified open loop gain.</i>	<i>CRT + Practice</i>	<i>Practice in simulation lab (software based with Matlab)</i>	3	1	0	0

Module III

S. No.	Topic	Pedagogy	Details	Instructional Hrs			
				Theory	Practice	video	Project
1	Frequency Response Analysis: Frequency domain specifications	CRT	e-content	2	0	0	0
2	Correlation between Time and Frequency Response with respect to second order system.	CRT	Chalk and talk	1	0	0	0
3	Polar plots	CRT	Chalk and talk	1	0	0	0
4	Bode plot: Determination of Gain Margin & Phase Margin from Bode plot.	CRT + Practice	Practice in simulation lab (software based with Matlab)	3	1	0	0
5	Stability in frequency domain: Principle of argument, Nyquist stability criterion, Application of Nyquist stability criterion for linear feedback system.	CRT	Chalk and talk Matlab programming	2	0	1	0
6	Controllers: Concept of Proportional, Derivative and Integral Control actions, P, PD, PI, PID controllers.	CRT + Practice	Practice in control system lab (Hardware and Simulink based)	2	1	0	0

CCEE0105 TRANSMISSION & DISTRIBUTION

Pre-requisites	Course Type	Credits
Nil	Theory	3

Course Objectives:

-To know the power system operation: transmission and distribution.

-Students are instructed in the principles of calculating the electrical parameters required in the design of an electrical installation.

-To calculate the operating conditions of electrical installations as well as its design and protection, taking into account not only technical criteria based on the boundaries of the different components, but also energy efficiency criteria.

Course Outcomes:

-Students will come to know about smooth operation of basically undisturbed or smooth availability of power to consumer.

-The expected fault/ disturbance of transmission line.

-On successful completion of this course, students will be able to understand transmission line/cable and their parameters.

MODULE-I (16 hours)

Series impedance of transmission line: Types of conductors, Resistance, Tabulated Resistance value, Inductance of a conductor due to Internal Flux, Flux linkages between two points External to an Isolated Conductor, Inductance of a Single-phase Two-wire Line, Flux Linkages of One Conductor in a group, Inductance of composite conductor lines, The use of tables, Inductance of Three-phase Lines with Equilateral Spacing, Inductance of Three-phase Lines with Unsymmetrical Spacing, Inductance calculations for Bundled Conductor.

Capacitance of Transmission Lines: Electric field of a long, straight conductor, The potential Difference between Two Points Due to a Charge, Capacitance of a Two wire Line, , Capacitance of Three-phase Lines with Equilateral Spacing, Capacitance of Three-phase Lines with Unsymmetrical Spacing, Effect of Earth on the Capacitance of Three-phase Transmission line, capacitance calculation for bundled conductors, Parallel-circuit Three-phase Lines. (Most of the topics will be through power point presentation. 'C' programming and matlab)

MODULE-II (13 hours)

Current and Voltage Relations on a Transmission Line: Representation of Lines, Short Transmission Line, Medium Length Line, Long Transmission Line, Equivalent Circuit of a long Transmission Line, Power flow through a Transmission Line, Reactive compensation of Transmission Line, Transmission Line Transients, Travelling waves, Reflections, Direct current Transmission (Most of the topics will be through power point presentation) (C programming and matlab)

Skin and Proximity effects, Ferranti effect, Overhead Line Insulators: Types of Insulators, String efficiency and Methods for improvement (Most of the topics will be through power point presentation and field visit)

MODULE-III(11 hours)

Mechanical Design of Overhead Transmission Lines: Sag and Tension Calculations, with equal and unequal heights of towers, Effect of Wind and Ice on weight of Conductor, Numerical Problems (Most of the topics will be through power point presentation and field visit)

Corona: Description of the phenomenon, factors affecting corona, critical voltages and power loss, Radio Interference (Most of the topics will be through power point presentation)

Distribution: Comparison of various Distribution Systems, AC three-phase four-wire Distribution System, Types of Primary Distribution Systems, Types of Secondary Distribution Systems, Voltage Drop in DC & AC Distributors, Kelvin's Law (Most of the topics will be through power point presentation and field visit)

Text Books:

Power System Analysis- By John J. Grainger & W. D. Stevenson, Jr, Tata Mcgraw-Hill, 2003 Edition, Reprint, 2010.

Power System Analysis & Design- By B. R. Gupta, S. Chand Publications, 3rd Edition, Reprint, 2003.

Reference Books:

A Text Book on Power System Engineering by M.L.Soni, P.V.Gupta, U.S.Bhatnagar, A.Chakrabarthy, Dhanpat Rai & Co Pvt. Ltd.

Electrical power systems - by C.L.Wadhwa, New Age International (P) Limited, Publishers, 1998 R. K.

Rajput, 'A Text Book of Power Plant Engineering',

Module I

S. No.	Topic	Pedagogy	Details	Instructional Hrs			
				Theory	Practice	video	Project
1.	Series impedance of transmission line: Types of conductors, Resistance, Tabulated Resistance value,	ppt(using tab)	http://nptel.ac.in/courses/108102047/10,11,12	1	0	0	0
2.	Inductance of a conductor due to Internal Flux,	ppt(using tab)	http://nptel.ac.in/courses/108102047/10,11,12	1	0	0	0
3	Flux linkages between two points External to an Isolated Conductor,	Ppt(using tab)	http://nptel.ac.in/courses/108102047/10,11,12	1	0	0	0
4	Inductance of a Single-phase Twowire	Ppt(using	http://nptel.ac.in/co				

Line

tab)

urses/108102047/1

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			0,11,12				
5	Flux Linkages of One Conductor in a group,	Ppt(using tab)	http://nptel.ac.in/courses/108102047/10,11,12	1	0	0	0
6	Inductance of composite conductor lines, The use of tables,	Ppt(using tab)	http://nptel.ac.in/courses/108102047/10,11,12	1	0	0	0

S. No.	Topic	Pedagogy	Details	Instructional Hrs			
				Theory	Practice	video	Project
7	Inductance of Three-phase Lines with Equilateral Spacing, Inductance of Three-phase Lines with Unsymmetrical Spacing, Inductance	Ppt (using tab)	http://nptel.ac.in/courses/108102047/10,11,12	1	0	0	0
8	calculations for Bundled Conductor.		http://nptel.ac.in/courses/108102047/10,11,12	1	0	0	0
9	Capacitance of Transmission Lines: Electric field of a long, straight conductor		http://nptel.ac.in/courses/108102047/10,11,12	1	0	0	0
10	The potential Difference between Two Points Due to a Charge,		http://nptel.ac.in/courses/108102047/10,11,12	1	0	0	0
11	Capacitance of a Two wire Line,		http://nptel.ac.in/courses/108102047/10,11,12	1	0	0	0
12	Capacitance of Three-phase Lines with Equilateral Spacing,		http://nptel.ac.in/courses/108102047/10,11,12	1	0	0	0
13	Capacitance of Three-phase Lines with Unsymmetrical Spacing,		http://nptel.ac.in/courses/108102047/10,11,12	1	0	0	0
14	Effect of Earth on the Capacitance of Three-phase Transmission line,		http://nptel.ac.in/courses/108102047/10,11,12	1	0	0	0
15	capacitance calculation for bundled conductors, Parallel-circuit Three-phase Lines		http://nptel.ac.in/courses/108102047/10,11,12	1	0	0	0

Module II

S. No.	Topic	Pedagogy	Details	Instructional Hrs			
				Theory	Practice	video	Project
1	Current and Voltage Relations on a Transmission Line: Representation of Lines,	PPT / LAB		1	0	0	0
2	Short Transmission Line,	PPT / LAB		1	0	0	0
3	Medium Length Line, Long Transmission Line,	PPT / LAB		1	0	0	0

							0
4	<i>PPT / LAB</i>						
	<i>Equivalent Circuit of a long Transmission Line,</i>			1	0	0	0
5	<i>Power flow through a Transmission Line,</i>	<i>PPT / LAB</i>					
				1	0	0	0
6	<i>Reactive compensation of Transmission Line,</i>	<i>PPT / LAB</i>					0
				1	0	0	0
7	<i>Transmission Line Transients, Travelling waves,</i>	<i>PPT / LAB</i>					
				1	0	0	0

<i>S. No.</i>	<i>Topic</i>	<i>Pedagogy</i>	<i>Details</i>	<i>Instructional Hrs</i>			
				<i>Theory</i>	<i>Practice</i>	<i>video</i>	<i>Project</i>
8	<i>Reflections, Direct current Transmission</i>	<i>PPT</i>		1	0	0	0
9	<i>Skin and Proximity effects, Ferranti effect</i>	<i>PPT</i>		1	0	0	
11	<i>Overhead Line Insulators: Types of Insulators,</i>	<i>PPT / FIELD visit</i>		1	0	0	0
12	<i>String efficiency</i>	<i>PPT</i>		1	0	0	
13	<i>Methods for improvement</i>	<i>PPT</i>		1	0	0	0
							0

Module III

<i>S. No.</i>	<i>Topic</i>	<i>Pedagogy</i>	<i>Details</i>	<i>Instructional Hrs</i>			
				<i>Theory</i>	<i>Practice</i>	<i>video</i>	<i>Project</i>
1	<i>Mechanical Design of Overhead Transmission Lines:</i>	<i>PPT/LAB</i>					
				1	0	0	0
2	<i>Sag and Tension Calculations, with equal of towers, unequal heights of towers,</i>	<i>PPT/LAB</i>					
				1	0	0	0
3	<i>Effect of Wind and Ice on weight of Conductor,</i>	<i>PPT/LAB</i>					
				1	0	0	0
4	<i>Numerical Problems</i>	<i>PPT/LAB</i>					
				1	0	0	0
5	<i>Corona: Description of the phenomenon, factors affecting corona</i>	<i>PPT/LAB</i>					
				1	0	0	0
6	<i>critical voltages and power loss, Radio Interference</i>	<i>PPT/LAB</i>					
				1	0	0	0

7	Distribution: Comparison of various Distribution Systems,	PPT/LAB		1	0	0	0
8	AC three-phase four-wire Distribution System,	PPT/LAB		1	0	0	0
9	Types of Primary Distribution Systems, Types of Secondary Distribution Systems	PPT/LAB		1	0	0	0
10	Voltage Drop in DC & AC Distributors,	PPT/LAB		1	0	0	0
11	Kelvin's Law Limitations	ppt		1	0	0	0

CCEE0106 POWER ELECTRONICS

<i>Pre –requisites</i>	<i>Course Type</i>	<i>Credits</i>
<i>Nil</i>	<i>Theory</i>	<i>3</i>

Course Objectives:

-To understand and acquire knowledge about various power semiconductor devices. -To prepare the students to analyse and design different power converter circuits..

Course Outcomes:

On successful completion of this course, students will be able to:

-Acquire knowledge about fundamental concepts and techniques used in power electronics.

-Analysis of various single phase and three phase power converter circuits and understand their applications.

-Ability to identify basic requirements for power electronics based design application. -To develop skills to build, and troubleshoot power electronics circuits.

-Ability to understand the use of power converters in commercial and industrial applications. - Introduce the concept of switching losses.

MODULE –I (16 Hours)

Power semiconductor devices, control characteristics of power devices, characteristics and specifications of switches, types of power electronic circuit, design of power electronics equipment Diode characteristics, power diode types, freewheeling diode

Diode rectifier: introduction, single phase half wave rectifiers, single phase full-wave rectifiers, single phase full wave rectifier with RL Load, three phase bridge rectifier Comparisons of transistor (Above topics through Lecture & Simulink)

MODULE –II (12 Hours)

Phase controlled Converters: Introduction, control techniques, single phase half wave controlled rectifier, single phase full wave controlled rectifier, single phase half controlled bridge rectifier, three phase

controlled converters, three pulse converter(M₃ Connection), six pulse converters(M₆

Connection), three phase fully controlled bridge converter(with R and RL load), three phase half controlled bridge converter (with R load only)

Chopper: Introduction, basic chopper classification, basic chopper operation, control strategies, class A,B,C,D,E(principle of operation only)

Thyristor chopper circuit: Voltage commutated chopper, current commutated chopper, load commutated chopper (Above topics through Lecture & Simulink)

MODULE –III (12 Hours)

Inverter: classification of inverter, single phase half bridge voltage source inverters, single phase full bridge inverter, three phase inverter (180⁰ and 120⁰ conduction mode) with R Load, basic series inverter (circuit analysis, design aspect), modified series inverter, parallel inverter, single phase SCR bridge inverter(half bridge and full bridge) (Above topics through Lecture & Simulink)

Text Books:

1. *Power Electronics: Circuits, Devices and Applications* by M H Rashid, 3rd Edition, Pearson
2. *Power electronics* by MD Singh & K B Khanchandani, Tata McGraw-Hill **Reference**

Books:

1. *Power Electronics: Principles and Applications* by J. Vithayathil, TMH Edition
2. *Power Converter Circuits* by W Shepherd and L Zhang, CRC, Taylor and Francis, Special Indian Edition.
3. *Power Electronics: Converters , Applications, and Design* by Mohan, Undeland and Robbins, Wiley Student Edition.

Module I

S. No.	Topic	Pedagogy	Details	Instructional Hrs			
				Th	Pract	video	Proj
1	Power semiconductor devices	CRT	black board	1	0	0	0
2	control characteristics of power devices	CRT	black board	1	0	0	0
3	characteristics and specifications of switches,	CRT	black board				
	Comparisons of transistor			1	0	0	0
4	types of power electronic circuit	CRT	black board	1	0	0	0
5	design of power electronics equipment	Practice	Hardware Practice	0	1	0	0
6	Diode characteristics, power diode types, freewheeling diode	CRT	black board	1	0	0	0
7	Diode rectifier: introduction ,single phase half wave rectifiers	CRT & Practice	black board & Hardware Practice	1	1	0	0
8	single phase full-wave rectifiers, single phase full wave rectifier with RL Load	CRT & Project		2	1	0	0

9	three phase bridge rectifier	CRT , Practice ,Video	<a href="http://www.nptel
videos.in/2012/1
1/powerelectronics .html">http://www.nptel videos.in/2012/1 1/powerelectronics .html black board & Hardware Practice	3	1	1	0
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Module II

S. No.	Topic	Pedagogy	Details	Instructional Hrs			
				Theory	Practice	video	Project
1	Phase controlled Converters: Introduction , control techniques, single phase half wave controlled rectifier, single phase full wave controlled rectifier, single phase half controlled bridge rectifier	CRT , Practice	black board & Hardware Practice	2	1	0	0
2	three phase controlled converters, three pulse converter(M3 Connection), six pulse converters(M6 Connection), three phase fully controlled bridge converter(with R and RL load), three phase half controlled bridge converter (with R load only)	CRT , Practice & Video	<a href="http://www.nptel
videos.in/2012/1
1/powerelectronics .html">http://www.nptel videos.in/2012/1 1/powerelectronics .html black board & Hardware Practice	2	1	2	0
3	Chopper: Introduction, Basic chopper operation, basic chopper classification, Control strategies	CRT	black board	1	0	0	0

4	class-A,B,C,D,E(principle of operation only)	CRT	black board	1	0	0	0
5	Thyristor chopper circuit, Voltage commutated chopper	CRT	black board	1	0	0	0
6	current commutated chopper, load commutated chopper	CRT	black board	1	0	0	0

Module III

S. No.	Topic	Pedagogy	Details	Instructional Hrs			
				Th	Pract	video	Proj
1	Inverter: classification of inverter	CRT	black board	1	0	0	0
2	single phase half bridge voltage source inverters	CRT	black board	1	0	0	0
3	single phase full bridge inverter	CRT	black board	1	0	0	0
4	three phase inverter (180° and 120° conduction mode) with R Load	CRT , Practice & Video	<a href="http://www.nptelvide
os.in/2012/11/powerelectronics .html">http://www.nptelvide os.in/2012/11/powerelectronics .html black board & Hardware Practice	2	1	1	0
5	basic series inverter (circuit analysis, design aspect), modified series inverter	CRT, Practice	black board & Hardware Practice	1	1	0	0
6	parallel inverter			1	1	0	0
7	single phase SCR bridge inverter(half bridge and full bridge)	CRT	black board	1	0	0	0

CCEE0108 POWER SYSTEM OPERATION & CONTROL

Pre –requisites	Course Type	Credits
Nil	Theory	3

Course Objectives:

- To introduce the concepts of optimization techniques used in power systems. -To introduce the basic governing systems for automatic generation and control.
- To provide a solid foundation in mathematical and engineering fundamentals required to control the governing system in turbine models.
- To provide the knowledge of power system stability.
- To provide the knowledge of reactive power flow control.

Course Outcomes:

On successful completion of this course, students will be able to:

-Make Economic operation of power system and importance of LFC.

-Solve problems (numerical problems at present) by using different problem models related to Economic load despatch, reactive power control.

-Discuss about thermal and hydro power plant operation in meeting the load demand optimally. -Discuss about single area load frequency control and two area load frequency control.

-Apply their knowledge in PSOC for competitive exams like GATE, IES and PSUs etc.

MODULE-I(10 Hours)

Load Flow Studies:

\Network model formulation, Y bus formation (**MATLAB**) and singular matrix transformation, Load flow problem, Gauss Seidel (GS) method, Newton-Raphson method (NR) (Polar, Rectangular form), Decoupled, Fast Decoupled load flow and comparison(***Chalk duster class room teaching***). Concept of DC loads flow, (**Topics on Gauss Seidel (GS) method, Newton-Raphson method (NR) and Y bus formation will be through classroom teaching and MATLAB & Power world simulator**)

MODULE-II(20 Hours)

Economic System Operation:

Generator operating cost:- input-output, Heat rate and IFC curve, Constraints in operation, Coordinate equation, Exact coordinate equation, Bmn coefficients, transmission loss formula(***Chalk duster class room teaching***), Economic operation with limited fuel supply and shared generators, Economic exchange of power between the areas (***media presentation***). Optimal unit commitment (**MATLAB**) and reliability considerations (***Chalk duster class room teaching***) Automatic Generation and control:

Load frequency control problem, Thermal Governing system and transfer function(***media presentation***), Steam Turbine and Power system transfer function, Isolated power system:- static and dynamic response , PI control and implementation. (***Simulink***)

Two area load frequency control, static and dynamic response, Frequency biased Tie line Bias control implementation and effect, Implementation of AGC (***media presentation***), AGC in restructured power system(***media presentation***), under frequency load shedding, GRC, Dead band and its effect. (**Most of the topics will be through video presentation**)

MODULE-III (10 Hours)

Power System Stability:

Types of Stability Study, Dynamics of synchronous machine (***media presentation***), Power angle equation, Node elimination technique(***Chalk duster class room teaching***), Simple Systems, Steady state stability(***media presentation***), Transient stability(***media presentation***), Equal area criteria and its

applications, Numerical solution(***Most of the swing topics will be equation through video presentation and MATLAB programming***)

Text Books:

1. Kothari. D. P, Nagrath. I. J., *Modern Power System Analysis, TMH Publication, Third Edition, 2008*
2. Kothari. D. P, Nagrath. I. J., *Power System Engineering, TMH Publication, Second Edition, 2008*
3. George Kausic. *Computer Aided Power System Analysis, Prentice Hall Publication. 2008*
4. Chakrabarti .A, Halder. S, *Power System Analysis- Operation and Control, PHI, Second Edition 2008.*
5. Allen. J. Wood., Bruce. F. Wollenberg., *Power Generation operation and Control, Wiley India, Second Edition, 2007.*
6. PrabhaKundur , *Power System Stability and Control , TMH Publication, 2008.*

Reference Books:

1. Soman. S. A, Kharphade. S. A, and SubhaPandit Computer Methods for Large Power System Analysis, an Object Oriented Approach, Kluwer Academic Publisher New York 2001
2. Anderson P.M, Fouad A.A, Power System Control and Stability, Wiley Inter-Science, 2008 Edition
3. Kimbark E W, Power System Stability, Volume I, and III, Wiley Publication.
4. Jr W.D. Stevenson., G. J. Grainger. Elements of Power System. Mc-Graw-Hill Publication
5. Hadi Saadat, Power System Analysis, TMH Publication ,Second Edition, 2002

Module 1

Sl. No	Topic	Pedagogy	Details	Instructional Hrs			
				Th	Pract	Video	Pro
	<i>Load Flow Studies</i>						
1	Network model formulation	CRT	CRT	1	0	0	0
2	Y bus formation and singular matrix transformation	CR T+ PRA	CRT + MATLAB	1	1	0	0
3	Load flow problem, Gauss Seidel (GS) method			1	1	0	0
4	Newton-Raphson method (NR) (Polar, Rectangular form)			2	1	0	0
5	Decoupled, Fast Decoupled load flow and comparison. Concept of DC loads flow.	CRT	CRT + PPT	2	0	0	0
	Sub Total			7	3	0	0

Module 2

	<i>Economic System Operation-</i>						
1	Generator operating cost:- input-output, Heat rate and IFC curve	CRT	CRT	2	0	0	0
2	Constraints in operation, Coordinate equation, Exact coordinate equation.	CRT		1	0	0	0
3	Bmn coefficients. transmission loss formula	CRT		1	0	0	0
4	Economic operation with limited fuel supply and shared generators, Economic exchange of power between the areas.	CRT	CRT + PPT + Videos	2	0	0	0
5	Optimal unit commitment and reliability considerations	CRT	CRT + econtent	2	0	0	0
6	Automatic Generation and control:	PPT	PPT+ Videos	1	0	0	0
7	Load frequency control problem	PPT	PPT+ econtent	1	0	0	0
8	Thermal Governing system and transfer function	CRT+ Media Presentation	e-content + CRT	1	0	0	0
9	Steam Turbine and Power system transfer function, Isolated power system:- static and dynamic response , PI control and implementation.		PPT +Videos + CRT	3	0	0	0
10	Two area load frequency control, static and dynamic response,		PPT+ Videos + CRT	2	0	0	0
11	Frequencybiased TielineBiascontrol-implementation and effect, Implementation of AGC	CRT	Class room teaching	2	0	0	0
12	AGC in restructured power system, under frequency load shedding,	CRT+ Media Presentation	PPT	1	0	0	0
13	GRC, Dead band and its effect.	CRT	Class room teaching	1	0	0	0
	Sub Total			20	0	0	0

Module 3

Sl. No	Topic	Pedagogy	Details	Instructional Hrs			
				Th	Pract	Video	Proj
	<i>Power System Stability:</i>						
1	<i>Types of Stability Study, Dynamics of synchronous machine</i>	<i>CRT+ Media Presentation</i>	<i>PPT+ Videos</i>	2	0	0	0
2	<i>Power angle equation,</i>	<i>CRT</i>	<i>e-content</i>	1	0	0	0
3	<i>Node elimination technique</i>	<i>CRT</i>	<i>CRT</i>	1	0	0	0
4	<i>Simple Systems, Steady state stability, Transient stability,</i>	<i>CRT</i>	<i>e-content +PPT</i>	2	0	0	0
5	<i>Equal area criteria and its applications,</i>	<i>CRT</i>	<i>e-content+ PPT</i>	2	0	0	0
6	<i>Numerical solution of swing equation</i>	<i>CRT</i>	<i>CRT</i>	1	0	0	0
7	<i>Modified Euler'</i>	<i>CRT</i>	<i>CRT</i>	1	0	0	0

Sub Total				10	0	0	0
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CCEE0109 MICRO PROCESSORS & MICRO CONTROLLERS

<i>Pre –requisites</i>	<i>Course Type</i>	<i>Credits</i>
<i>Nil</i>	<i>Theory</i>	3

Course Objectives:

-To become familiar with the architecture and the instruction set of an Intel microprocessor 8085. -To learn and understand architecture and programming of 8051 microcontroller.

-To learn and understand generation of time delay, serial communication and interrupts.solving practical problems.

-To make the students understand assembly language programming technique and design of hardware interfacing circuit.

-To develop an in-depth understanding of the operation of microprocessor and microcontrollers, language programming and interfacing.

-To learn and understand the development of microprocessor and microcontroller based system

Course Outcomes:

On successful completion of this course, students will be able to:

-Understand the architecture of 8085 and 8051.

-Apply the programming techniques in designing simple assembly language programs for solving simple problems by using instruction sets of microprocessor and microcontroller.

-The students will learn the design of microprocessors/microcontrollers based systems.. -Analyze and design hardware and software for small digital systems involving microprocessors.

Module-I (10 Hrs): 8085/8086 Microprocessor Architecture And Instruction set

Microprocessor Architecture: Intel 8085, instruction cycle, Timing Diagram (**Most of the topics will be through classroom teaching**)

Instruction set of Intel 8085: Introduction, Instruction and data format, addressing modes, status flags, symbols and abbreviations, Intel 8085 instruction (**Topics will be through practical**)

Module-II (16 Hrs) : ASSEMBLY LANGUAGE PROGRAMMING AND PERIPHERAL INTERFACING

Examples of Assembly language programs: Introduction, simple examples, addition of two 8-bit numbers, 8-bit subtraction, Addition of two 16-bit numbers, 2's complement 1's-bit & 16-bit numbers, shift 8-bit & 16-bit number left by 1 bit and 2 bits, Mask off Least & Most significant 4 bits of an 8-bit number, to find larger & smaller of two numbers, to find largest & smallest number in a data series, Arrange a series of number in descending and ascending order,

sum of a series of 8-bit numbers, 8 bit multiplication and division, multibyte addition and

subtraction, to find square and square root of a number, move a block of data from one section of memory to another, signed arithmetic operation, 8-bit unsigned subtraction to consider positive as well as negative results. **(Topics will be through practical mode using hardware and simulation)**

Peripheral device and their interfacing: introduction, address space partitioning, memory and I/O interfacing, data transfer schemes, interrupts of Intel 8085, interfacing devices and I/O devices, I/O ports, programmable counter/interval timer. **(Topics will be through practical mode using hardware)**

MODULE-III (12 Hrs) : 8051 MICROCONTROLLER

Microprocessors and micro controllers: introduction, Microprocessor and micro controllers, the 280 and the 8051, a micro-controller survey **(Topics will be through classroom teaching)**

The 8051 architecture: introduction, 8051 microcontroller hardware, input output pins, ports, circuits **(Topics will be through classroom teaching)**

Moving data: introduction, addressing modes, external data moves, code memory read-only data move, PUSH & POP Opcodes, data exchange, example programme. **(Topics will be through practical mode using hardware)**

Logical Operations: introduction, byte level & bit level logical operations, rotate & swap operations, example programme **(Topics will be through practical mode using hardware and simulation)**

Arithmetic Operations: introduction, flags, incrementing & decrementing, addition, subtraction, multiplication & division

Jump & Call Opcodes: introduction, the jump & call programme range, jumps, calls & subroutines, interrupts and returns, examples programme **TEXT BOOKS:**

1. B. Ram, "Fundamentals of Microprocessor & Microcont
- 2.. Kenneth. J. Ayala, " The 8051 Microcontroller"

Module I

S. No.	Topic	Pedagogy	Details	Instructional Hrs			
				Th	Pract	video	Proj
1	8085 Microprocessor architecture: Intel 8085 architecture, instruction cycle, Timing Diagram.	CRT & Video	https://www.youtube.com/watch?v=I78iyzXOrP4&list=PL3g9pR7uPPjSUKzBEAvuEgRIKYhJPTS3U Details of links / software to be given here.	3	0	1	0
2	Instruction Set of INTEL 8085 -						

Introduction, Instruction and data format, addressing modes, status flags, symbols and	CRT	NPTEL Material, chalk and talk	4	2	0	0
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	abbreviations, Intel 8085 instruction					
	Sub total			7	2	1 0

Module II

S. No.	Topic	Pedagogy	Details	Instructional Hrs			
				Th	Pract	video	Proj
3	Assembly language programs						
	Introduction, simple examples, addition of two 8-bit numbers, 8-bit subtraction, Addition of two 16-bit numbers 2's complements-bitand16-bitnumbers,of shift8 8-bit & 16bit number left by 1 bit and 2 bits, Mask off Least & Most significant 4 bits of an 8-bit number, to find larger & smaller of two numbers, to find largest & smallest number in a data series,	PRO	<u>Hardware Programming, Simulation using Matlab Programming</u>	3	1	0	0
	Arrange a series of number in descending and ascending order, sum of a series of 8-bit numbers, 8 bit multiplication and division, multibyte addition and subtraction, to find square and square root of a number, move a block of data from on section of memory to another, signed arithmetic operation, 8-bit unsigned subtraction to consider positive as well as negative results.			3	1	0	0
4	Peripheral device and their interfacing						
	introduction, address space partitioning, memory and I/O interfacing,.	CRT	<u>Chalk and Talk</u>	2	0	0	0
	data transfer schemes, interrupts of Intel 8085,	PRO		3	0	0	0
	interfacing devices and I/O devices, I/O ports, programmable counter/interval timer	PRO	<u>Hardware Programmig</u>	3	0	0	0
Module III							
Microprocessors and micro controllers			Sub-Total I	14	2	0	0
5	introduction, Microprocessor and micro controllers, the 280 and the 8051, a micro-controller survey -	CRT	<u>NPTEL Material, Video Lecture</u>	2	0	0	0
6	The 8051 architecture: introduction, 8051 microcontroller hardware, input output pins, ports, circuits			1	0	0	0
7	Moving data: introduction, addressing modes, external data moves, code memory read-only data move, PUSH & POP Opcodes, data exchange, example programme	CRT	<u>Hardware Programming and software programming using Matlab</u>	2	0	0	0
8	Logical Operations: introduction, byte level & bit level logical operations, rotate & swap operations, example programme	CRT		2	0	0	0
9	Arithmetic Operations: introduction, flags, incrementing & decrementing, addition, subtraction, multiplication & division	CRT		2	0	0	0
10	Jump & Call Opcodes: introduction, the jump & call programme range, jumps, calls & subroutines, interrupts and returns, examples programme	CRT	2	0	0	0	
Sub-Total				11	0	0	0

CCEE0110 LINEAR INTEGRATED CIRCUIT & APPLICATION

<i>Pre –requisites</i>	<i>Course Type</i>	<i>Credits</i>
<i>Nil</i>	<i>Theory</i>	<i>2</i>

Course Objectives:

To make the students understand how to design a circuit using different ICs(Opamp, 555 Timer, PLL etc)

Course Outcomes:

On successful completion of this course, students will be able to: Understand how to

Design a linear circuit for different application

MODULE-I(12 Hours)

Operational Amplifier: Introduction, basic information of Op-Amp, The ideal operational amplifier.(**Crt+ Equipment Demonstration**)(MULTISIM)

Operational amplifier characteristics: introduction, DC characteristics, AC characteristics, analysis of datasheet of an Op-amp. (**Crt+ Equipment Demonstration**)(MULTISIM)

MODULE-II(12 Hours)

Operational Amplifier applications: Introduction, basic op-amp applications, instrumentation amplifier, AC amplifier, V to I & I to V converter, sample and hold circuits, log and anti-log amplifier, multiplier and divider, differentiator, integrator, electronic analog computation. (**Crt+ Equipment**

Demonstration)(PSPICE and Orcad)

Comparators and waveform generator: introduction, comparator, regenerative comparator, square wave generator, mono stable multivibrator, triangular wave generator, sine wave generator. (**Crt+ Equipment**

Demonstration)

MODULE-III(12 Hours)

Voltage regulator: introduction, series op-amp regulator, IC voltage regulators, 723 general purpose regulators.Active filter: Introduction, RC active filter. 555 Timer: Introduction, description of functional diagram, monostable operation, astable operation(**Crt+ Equipment Demonstration**)

Phase locked Loop: Introduction, basic principle, phase detector/comparator, VCO, LPF, monolithic PLL. D-A & A-D converter: Introduction, Basic DAC Techniques, A-D converter. (**Crt+ Equipment**

Demonstration) Text Books:

1. D.RoyChoudhary, SheilB.Jani, 'Linear Integrated Circ
2. RamakantA.Gayakward,-ampsand Linear'Op Integrated Circuits', IV PHI. 2000.

References:

1. Fiore,"Opamps& Linear Integrated Circuits Concepts &
2. Floyd ,Buchla,"Fundamentals of Analog Circuits, Pears
3. Jacob Millman, Christos C-An.Halogkias,and 'IntegratedDigital,TataMcGrawcircuitsElectr Hill, 2003.
4. Robert F.Coughlin, - ampFredrickandLinearF.Driscoll,ICs',PHI'OpLearning,

Module I

S. No.	Topic	Pedagogy	Details	Instructional Hrs			
				Th	Pract	video	Proj
1	Operational Amplifier: Introduction, basic information of Op-Amp, The ideal operational amplifier.	CRT+ PRAC	Black board teaching+ IC Practical demonstration	5	1	0	0
2	Operational amplifier characteristics: introduction, DC characteristics, AC characteristics, analysis of datasheet of an Opamp.	CRT+ PRAC		5	1	0	0
Module II			Sub total	10	2	0	0

3	Operational Amplifier applications: Introduction, basic op-amp applications, instrumentation amplifier, AC amplifier, V to I & I to V converter, sample and hold circuits, log and anti-log amplifier, multiplier and divider, differentiator, integrator, electronic analog computation.	CRT+ PRAC	Black board teaching+ IC Practical demonstration	5	1	0	0
4	Comparators and waveform generator: introduction, comparator, regenerative comparator, square wave generator, monostablemultivibrator, triangular wave generator, sine wave generator.	CRT+ PRAC		5	1	0	0
Sub total				10	2	0	0

Module III

S. No.	Topic	Pedagogy	Details	Instructional Hrs			
				Th	Pract	video	Proj
5	Voltage regulator: introduction, series op-amp regulator, IC voltage regulators, 723 general purpose regulators. Active filter: Introduction, RC active filter. 555 Timer: Introduction, description of functional diagram, monostable operation, astable operation	CRT+ PRAC	Black board teaching+ IC Practical demonstration	5	1	0	0
6	Phase locked Loop: Introduction, basic principle, phase detector/comparator, VCO, LPF, monolithic PLL. D-A & A-D converter: Introduction, Basic DAC Techniques, A-D converter.	CRT+ PRAC		5	1	0	0
Sub Total				10	2	0	0
Total				30	6	0	0

Distributed Generation & Micro Grid

Subject Name	Code	Type of course	T-P-Pr (Credits)	Prerequisite
Distributed Generation & Micro Grid	ELCC0103	Theory	2	Nil

1. Objective

<ul style="list-style-type: none"> To make students understand the integration between renewable sources with Micro-Grid

2. Course Outcome

<p><i>On successful completion of this course, students will be able to:</i></p> <ul style="list-style-type: none"> Understand the concepts behind distributed generation Understand the integration technique in micro grid
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3. Evaluation Systems

<i>Internal Examination</i>	<i>Component</i>	<i>% of Marks</i>	<i>Method of Assessment</i>
	Class Test	40	Written examination
	Experiments	NIL	
<i>External Examination</i>	End-Semester University Exam	60	Written examination
	Lab External Exam	NIL	
<i>Total</i>		100	

4. Course outline

Module I

Introduction: Conventional power generation: advantages and disadvantages, Non-conventional energy (NCE)

resources: review of Solar PV, Wind Energy systems, Fuel Cells, micro-turbines, biomass, and tidal sources.

Module II

Concept of distributed generations, Why integration of distributed generation? Active distribution network. Distributed generation, technology, value of distributed generation, application & issues, distributed resources, distributed capacity, factors of DG growth, general structure

Module III

Supply demand in Electric power grid: Understanding the grid, reliability concept, electric power dynamic demand, need of spinning reserve, local load control

Module IV

Basics of A Micro-Grid: Concept and definition of micro grid, classification, need & application of micro-grid, formation of micro grid, typical structure and configuration of a micro grid, AC and DC micro grids, Power Electronics interfaces in DC and AC micro grids.

Module V

DC micro grids: PV sources control, storage control, grid connection control, DC load control, Power balancing principle

Module VI

Control & operation of micro grid: Modes of operation and control of micro grid: grid connected and islanded mode, Active and reactive power control, protection issues

Module VII

Storage Technologies: classification of electrical energy storage, mechanical storage system, batteries, flywheels,

super conducting magnetic energy storage, super capacitors.

Text Books:

2. *Control and Optimization of Distributed Generation Systems* By Magdi S. Mahmoud, Fouad M. AL-Sunni

3. *Distributed Generation Systems: Design, Operation and Grid Integration* by Gevork B. Gharehpetian, S. Mohammad Mousavi Aga

4. Session Plan

Topic coverage and Internal Test	No. of Sessions (in hrs.)	Activity	Assignment	Suggested Reading
		(lecture, tutorial, lab practice, field studies/field-trip, Workshop etc.)	(project, assignment, field study, seminar, etc.)	(Book, Video, Online source, etc.)
Module – I				
Introduction: Conventional power generation: advantages and disadvantages, Non-conventional energy (NCE) resources: review of Solar PV, Wind Energy systems, Fuel Cells, micro-turbines, biomass, and tidal sources.	6	Lecture	Assignment	Book 2 Ch-1,4,5
Module – II				
Concept of distributed generations,	5	Lecture	Assignment	Book 1
Why integration of distributed generation? Active distribution network. Distributed generation, technology, value of distributed generation, application & issues, distributed resources, distributed capacity, factors of DG growth, general structure				Ch-1.1
Module – III				
Supply demand in Electric power grid:	5	Lecture	Assignment	Book 1
Understanding the grid, reliability concept, electric power dynamic demand, need of spinning reserve, local load control				Ch-1.2
Module – IV				
Basics of A Micro-Grid: Concept and definition of micro grid, classification ,need & application of micro-grid, formation of micro grid, typical structure and configuration of a micro grid, AC and DC micro grids, Power Electronics interfaces in DC and AC micro grids.	7	Lecture	Assignment	Book 1 Ch-1.3 Ch-3
Module – V				
DC micro grids: PV sources control, storage control, grid connection control, DC load control, Power balancing principle	4	Lecture	Assignment	Book 1 Ch-5
Module – VI				
Control & operation of micro grid: Modes of operation and control of micro grid: grid connected and islanded mode, Active and reactive power control, protection issues.	4	Lecture	Assignment	Book 1 Ch-6
Module – VII				

Storage Technologies: classification of electrical energy storage, mechanical storage system, batteries, flywheels, super conducting magnetic energy storage, super capacitors	4	Lecture	Assignment	Book 2 Ch-7
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CCEE0201 NETWORK THEORY LAB

<i>Pre –requisites</i>	<i>Course Type</i>	<i>Credits</i>
<i>CCEE0101 Network Theory (Co-requisite)</i>	<i>Practice</i>	<i>2</i>

Course Objective

Experimenting the theory by

1. Provide hands-on experience to the students so that they are able to put theoretical concepts to practice.
2. Understand the concept of circuit laws
3. Solve the electrical network using mesh and nodal analysis by applying network theorems
4. Understand the concept of resonance in series and parallel circuits.
5. Analyze the transient response of series and parallel A.C. circuits and to solve problems in time domain using Laplace Transform.

Course Outcomes:

On successful completion of this course, students will be able to:

1. Use basic laboratory equipment and techniques to measure electrical quantities using Laboratory test equipment such as multimeters, power supplies, signal generators, and
2. Explain the concept of circuit laws and network theorems and apply them to

LIST OF EXPERIMENTS

1. Verification of Super Position theorem & Norton Theorems
2. Verification of Maximum Power Transfer Theorem
3. Verification of Reciprocity Theorem.
4. Verification of compensation theorem
5. Study of DC Transients for RL, RC, RLC series Circuits.
6. Study of AC Transients for RL, RC, RLC series Circuits
7. Transient response of RLC Parallel circuit.
8. Determination of Impedance (Z) and Admittance(Y) parameters of two port network
9. Determination of circuit parameters: Hybrid & Transmission Parameters.
10. To plot frequency response of a series resonant circuit.
11. To plot frequency response of a Parallel resonant circuit
12. Determination of Self-inductance, mutual inductance and coupling coefficient of 1- \emptyset transformer representing coupled circuit.

Text Book/Required Material:

1. Lab manual Reference

Book(s):

1. A.Sudhakar & Shyanmugam S.Palli “Circuits & Hill,Network A 2010.
2. Joseph Edminster, “Electric Circuits” Schaum’s Outlin

EXPT. No.	Topic	Pedagogy	Details	Instructional Hrs		
1	Verification of Super Position theorem & Norton Theorems.			2	Verification of Maximum Power Transfer Theorem	

<i>Theory</i>	<i>Practice</i>	<i>video</i>	<i>Project</i>
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<i>0</i>	<i>3</i>	<i>0</i>	<i>0</i>
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<i>0</i>	<i>3</i>	<i>0</i>	<i>0</i>
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3	Verification of Reciprocity Theorem.	Practice	Through hardware Through software (PSPICE / MATLAB)	0	3	0	0	
4	Verification of compensation theorem			0	3	0	0	
5	Study of DC Transients for RL, RC, RLC series Circuits.			0	3	0	0	
6	Study of AC Transients for RL, RC, RLC series Circuits			0	3	0	0	
7	Transient response of RLC Parallel circuit.			0	3	0	0	
8	Determination of Impedance (Z) and Admittance(Y) parameters of two port network			0	3	0	0	
9	Determination of circuit parameters: Hybrid & Transmission Parameters.			0	3	0	0	
10	To plot frequency response of a series resonant circuit.			0	3	0	0	
11	To plot frequency response of a Parallel resonant circuit			0	3	0	0	
12	Determination of Self-inductance, mutual inductance and coupling coefficient of 1- ϕ transformer representing coupled circuit.			Through hardware	0	3	0	0

CCEE0202 ELECTRICAL MACHINES –II LABORATORY

<i>Pre –requisites</i>	<i>Course Type</i>	<i>Credits</i>
CCEE0102 Electrical Machines –II (Co-requisite)	Practice	2

Course Objective

-To get the students acquainted with the principles of operation of machine with self-operation.

-To analyze the relation of input and outputs obtained in each experiment and thereby get an understanding of the performance of the machine.

-To perform and get acquainted with various tests on the machine. Course

Outcomes:

On completion of the lab the students will be

-Able to determine the voltage regulation of alternators by different methods. -Able to determine the efficiency and characteristics of induction machine. -Able to synchronize two or more alternators.

-Able to determine the d-axis and q-axis reactance of a synchronous machine.

LIST OF EXPERIMENTS

1. Determination of the voltage regulation of an alternator by zero power factor (zpf) method
2. Speed Control of a 3 phase induction motor by rheostatic, cascading and pole changing methods.
3. Determination of Efficiency, Plotting of Torque-Slip Characteristics of Three Phase Induction motor by Brake Test.
4. Determination of parameters of synchronous machine
 - (a) Negative sequence reactance
 - (b) Zero sequence reactance
5. Determination of voltage regulation of alternator by direct loading method.
6. Determination of parameter of a single phase induction motor and study of
 - (a) Capacitor start induction motor
 - (b) Capacitor start and capacitor run induction motor
7. Determination of parameter of a single phase induction motor and study of

(a) Universal motor

CCEE0203 MEASUREMENT & INSTRUMENTATION LAB

<i>Pre –requisites</i>	<i>Course Type</i>	<i>Credits</i>
<i>CCEE0103 Electrical Measurement & Instrumentation (Co-requisite)</i>	<i>Practice</i>	<i>2</i>

Course Objective *Experimenting the theory by*

*Getting acquainted with the process and principles of operation of different instruments & devices
Analysis of input-output relation by experiments.*

Understanding and using procedures and analysis technique to perform and describe electromagnetic and electromechanical test.

Course Outcomes: *On successful completion of this course, students will be able to:*

Students will be able to prepare professional quality graphical presentations of laboratory data and computational results, incorporating accepted data analysis and synthesis methods.

Students will work in teams to conduct experiments, analyze results, and develop technically sound reports of outcomes.

Students can develop application oriented projects by using this instruments & devices.

LIST OF EXPERIMENTS

1. Measurement of Low Resistance by Kelvin's Double Method.
2. Measurement of unknown capacitance using WIEN BRIDGE 3.
Measurement of capacitance using SCHERING BRIDGE.
4. Calibration of the 1 Φ energy meter.
5. Measurement of Iron Loss from B-H Curve by using CRO.
6. Measurement of power and power factor in a 3- Φ AC circuit by two wattmeter.
7. Measurement of R, L, and C using Q-meter.
8. Measurement of power in a single phase circuit by using CTs and PTs.
9. Strain Gauge Application and Measurement of Unknown Load.

10. Measurement of inductance using MAXWELL BRIDGE.
11. Measurement of inductance using ANDERSON'S BRI
12. Study of CRO and lissajous pattern.

Text Books:

1. *Modern Electronics Instrumentation & Measurement Techniques* , by Albert D. Helstrick and William D. Cooper. Pearson Education.
2. *Electronic Instrumentation*, H.S. Kalsi, Tata McGraw-Hill Publishing Company Limited, New Delhi.
3. *Electrical Measurements and Measuring Instruments –Golding &Widdis –5th Edition*, Reem Publication

Reference Book(s):

1. *Electronics Instruments and Instrumentation Technology* –by Anand , PHI
2. *Elements of Electronics Instrumentation and Measurement –3rd Edition* by Joshph J. Carr. Pearson Education
3. *A Course in Electrical and Electronic Measurements and Instrumentation* –A K Sawhney – DhanpatRai& Co

EXPT. No.	Topic	Pedagogy	Details	Instructional Hrs			
				Theory	Practice	video	Project
1	Measurement of Low Resistance by Bridge Method _____	Practice	Practice in Electrical Measurement Lab	0	3	0	0
2	Measurement of unknown capacitance using WIEN BRIDGE			0	3	0	0
3	Measurement of capacitance using SCHERING BRIDGE.			0	3	0	0
4	Calibration o meter _____			0	3	0	0
5	Measurement of Iron Loss from B-H Curve by using CRO			0	3	0	0

CCEE0204 CONTROL SYSTEM LABORATORY

<i>Pre –requisites</i>	<i>Course Type</i>	<i>Credits</i>
<i>Nil</i>	<i>Practice</i>	<i>2</i>

Objective:

- Design different controllers for different control systems.
- Mathematical modeling of different physical systems.

Outcomes:

- Students will demonstrate the ability to apply Laplace transform, transfer functions, modeling RLC circuit, block diagrams for simulation and control.
- Students will demonstrate the ability to design and de by combining both theoretical and applied analysis that they have acquired in their control courses and in this lab.

List of Experiments

1. Study of a dc motor driven position control system.
2. Obtain the frequency response of a lag and lead compensator
3. To study and validate the controllers for a temperature control system
4. Study of Relay control system.
5. Study of process control simulator
6. Obtain the speed-torque characteristics of DC servo motor.
7. Study of LVDT
8. Study of Thermistor
9. Stability analysis of linear systems.
10. Design of P, PI, PID Controller.
11. Study of Synchros.
12. Study the unit step response of a given transfer functions and find peak over overshoot, peak time.

Project based control system Lab (Using MATLAB):

1. Modelling and simulation of Inverted Pendulam.
2. Design of controllers for CSTR Model.
3. Modelling and control of Suspension System.
4. Design of fuzzy controllers for different dynamic systems

EXPT. No.	Topic	Pedagogy	Details	Instructional Hrs			
				Th	Pract	Video	Proj
1	Study of a dc motor driven position control system	Practioce	Hardware & simulation Practice using Simulink	0	3		0
2	Obtain the frequency response of a lag and lead compensator			0	3		0
3	To study and validate the controllers for a temperature control system			0	3		0
4	Study of Relay control system			0	3		0
5	Study of process control simulator			0	3		0
6	Obtain the speed-torque characteristics of DC servo motor			0	3		0
7	Study of LVDT			0	3		0
8	Study of Thermistor			0	3		0
9	Stability analysis of linear systems			0	3		0
				0			0

10	Design of P, PI, PID Controller	0	3		0
11	Study of Synchros	0	3		0
12	Study the unit step response of a given transfer functions and find peak over overshoot, peak time	0	3		0

CCEE 0205 POWER ELECTRONICS LAB

<i>Pre –requisites</i>	<i>Course Type</i>	<i>Credits</i>
<i>Nil</i>	<i>Practice</i>	<i>2</i>

Course Objective

- Introduce basic topologies of power switching circuits.
- Study and implementation of Pulse-Width-Modulation for power electronic converters -Investigate integration of power electronic converters with electric machines
- Power electronics modelling, simulation and experimental verification

Course Outcomes:

-Ability to simulate characteristics of SCR, MOSFET, IGBT. -To simulate and design various gate firing circuits.

-To familiarize the students by introducing P-Sim and MultiSim and help them to simulate and –analyze different Converters

-To enable the student to study and simulate various Chopper Circuits using Matlab -Ability to simulate Cyclo-Converter and calculate harmonics

LIST OF EXPERIMENTS

1. Study of V_I characteristics of silicon controlled rectifier.
2. Study of different methods of triggering of SCR (a) RC-Triggering method
(b) UJT-Triggering method.
3. Study of single phase fully controlled converter using R & L load.
4. Study of single phase semi converter using R - L- E load.
5. Study of 3-phase full wave semi converter with R, R-L and D.C motor load with/ without freewheeling diodes.
6. Study of class-A, class-B, class-C, class-D, class-D, class-E commutation circuits.
7. Study of parallel inverter.
8. Study of series inverter.
9. Study of Jones chopper.
10. Study of Fly back converter using PWM technique.
11. Study of Step-up & step-down chopper with PWM technique.
12. Study of forward converter using PWM technique.
13. Study of AC voltage regulator using PWM technique.
14. Study of IGBT based 3-ph voltage source inverter.

Expt. No.	Topic	Pedagogy	Details	Instructional Hrs			
				Th	Pract	Video (Output DSO)	Proj
1	Study of V-I characteristics of silicon controlled rectifier.	Hardware & simulation Practice using Simulink		0	2	1	0
2	Study of different methods of triggering of SCR (a) RC-Triggering method (b) UJT-Triggering method.			0	2	1	0
3	Study of single phase fully controlled converter using R & L load.			0	2	1	0
4	Study of single phase semi converter using R - L - E load.			0	2	1	0
5	Study of 3-phase full wave semi converter with R, RL and D.C motor load with/ without freewheeling diodes.			0	2	1	0
6	Study of class-A, class-B, class-C, class-D, class-D, class-E commutation circuits.			0	2	1	0
7	Study of parallel inverter.			0	2	1	0
8	Study of series inverter.			0	2	1	0
9	Study of Fly back converter using PWM technique.			0	2	1	0
10	Study of forward converter using PWM technique.			0	2	1	0
11	Study of AC voltage regulator using PWM technique.			0	2	1	0
12	Study of forward converter using PWM technique			0	2	1	0
13	Study of AC voltage regulator using PWM technique			0	2	1	0
14	Study of IGBT based 3-ph voltage source inverter			0	2	1	0

CCEE0207 INTRODUCTION TO LINUX

Pre –requisites	Course Type	Credits
Nil	Practice	2

Course Objectives:

To make the students understand basics of LINUX Operating system.

Course Outcomes:

On successful completion of this course, students will be able to

Syllabus

Part 1: Introduction To Linux And Its Command Set (11 Hours) (CRT) Getting

Started:

1. Operating System Concepts
 2. Introduction To Linux
 3. Why Linux in Embedded systems?
 4. Linux Terminals & Shell
 5. Linux File System
 6. Concept of Process in Linux
- Linux Shell Command Set:**
1. Navigating File Systems
 2. Handling Files

12	Bourne shell Overview	CRT+PR AC	Black board+ Programming	1	1	0	0
13	User, Shell, And Read-Only Shell Variables	CRT+PR AC	Black board+ Programming	1	1	0	0
14	Positional Parameters	CRT+PR AC	Black board+ Programming	1	1	0	0
15	Control Constructs.	CRT+PR AC	Black board+ Programming	1	1	0	0
16	Linux Kernel Structure	CRT+PR AC	Black board+ Programming	1	1	0	0
17	System Calls	CRT+PR AC	Black board+ Programming	1	1	0	0
18	File Sub-System	CRT+PR AC	Black board+ Programming	1	1	0	0
19	Process Sub-System.	CRT+PR AC	Black board+ Programming	1	1	0	0
20	Linux Signals	CRT+PR AC	Black board+ Programming	1	1	0	0
21	Clocks & Timers	CRT+PR AC	Black board+ Programming	1	1	0	0
22	Memory Management	CRT+PR AC	Black board+ Programming	1	1	0	0
	Total			22	11	0	0

CCEE0208 MICRO PROCESSOR & MICRO CONTROLLER LAB

<i>Pre –requisites</i>	<i>Course Type</i>	<i>Credits</i>
<i>Nil</i>	<i>Practice</i>	<i>2</i>

Course Objectives:

Developing of assembly level programs and providing the basics of the processors.

To learn assembly language programming using 8051 microcontroller To study the PLC TYPE OPERATION Course

Outcomes:

On successful completion of this course, students will be able to: Analyze and apply working of 8085

Compare the various interface techniques. Analyze and apply the working of 8255

List of Experiments

1. Getting started with 8085 microprocessor kit & verification of all 256 instruction (4 lab class)
2. Interfacing of 8255 I/O device
3. Interfacing of 8253 Timer
4. Interfacing of ADC-0809 & DAC-0800
5. Development of programme for process control & realization of PLC type operation
6. Development of programme for using hardware and software interrupt.
7. Use 8085 as a measuring instrument

Text Book

1. B. Ram, "Fundamentals of Microprocessor & Microcon
2. Kenneth. J. Ayala, " The 8051 Microcontroller"

S. No.	Topic	Pedagogy	Details	Instructional Hrs			
				Theory	Practice	video	Project
1	Getting started with 8085 microprocessor kit & verification of all 256 instruction (4 lab class)	PRACTICE		0	12	0	0
2	Interfacing of 8255 I/O device:	PRACTICE		0	3	0	0
3	Interfacing of 8253 Timer	PRACTICE		0	3	0	0
4	Interfacing of ADC-0809 & DAC-0800	PRACTICE		0	3	0	0
5	Development of programme for process control & realization of PLC type operation	PRACTICE		0	3	0	0
6	Development of programme for using hardware and software interrupt.	PRACTICE		0	3	0	0
7	Use 8085 as a measuring instrument	PRACTICE		0	3	0	0

Power System Protection

Subject Name	Code	Type of course	T-P-Pr (Credit)	Prerequisite
Power System Protection	ELCC0408	Theory & Practice	3	Nil

1. Objective

- To cover the basic protection schemes in the power system like over-current, differential, distance protection employed in power system
- To make the student understand static and microprocessor based relay, which are new generation protection employed in the power system.

2. Course Outcome

Student will be able:

- To learn conventional and new age power system protection employed practically.
- To get knowledge to fill the void between legacy protection courses based on electromechanical and solid state relays and advanced courses based primarily on numerical relaying.
- To get the logic of a protection scheme.

3. Evaluation Systems

	Component	% of Marks	Method of Assessment
Internal Examination	Class Test	20	Written examination
	Experiments	30	Lab work, report and viva
External Examination	End-Semester		University Exam

Module I

Introduction: Need for protective scheme, nature and cause of faults, types of faults, effect of faults, zones of protection, primary and back-up protection, classification of protective relays, classification of protective schemes, CT & PT for protection, basic relays terminology(T1: 1-34)

Module-II

Operating principles and relay construction: Technique to produce time delays, Thermal relays(T1: 36-53)

Practice:

- Study of CT & PT

Module III

Over current Relays: Introduction, instantaneous over current relays, time current relays, application of different types of time-current characteristics, basic principles of time over current relays, practical circuit for time over current relays (T2: 116-123)

Module-IV

Differential relays: Introduction, operating characteristics, restraining characteristics, types of differential relays, Analysis of electromagnetic and static differential relays, static relay scheme(T2 : 150-157)

Practice:

- To perform differential protection of an equipment
- To operate an electro-mechanical type relay and draw its time current characteristics
- To perform over current protection of an equipment

Module V

Directional relays: Introduction, phase comparator directional units, amplitude comparator directional units, inputs to static directional relays for maximum output.(T2: 108-113)

Distance relays: Introduction, standard three zone protection, distance protection requirement, relay characteristics, types of distance relay (T2: 171-176)

Module VI

Comparators and signal mixing: Introduction, replica impedance, mixing transformer or circuits, phase and amplitude comparators-classification, general equation for comparator(T2 : 44-55)

Practice: (Lab mode teaching)

- Microprocessor Based Protective Relays (Numerical Relays): Introduction, Circuit interface and program algorithm of over current relays, Impedance, Mho relay relays (T1: 260-278)

Module VII

Circuit Breaker: Arc voltage, arc interruption, re-striking and recovery voltage, current chopping, interruption of capacitive current, classification of circuit breaker-oil CB, Air blast CB, SF6 CB, Vacuum CB, DC Circuit Breakers.(T1: 346-375)

Practice:

- Perform an overcurrent protection using microprocessor based relay
- Study the construction and operation of Circuit Breakers (OCB, ACB, SF6)

5. Reference

Text Books:

1. Power System Protection and Switchgear by Badri Ram & D. N. Vishwakarma, Tata-McGraw-Hill

Power System

2. Protection: Static Relays with microprocessor application by T. S. MadhavaRao, Tata-McGraw-Hill

Reference Books:

1. Power System Protection and Switchgear–B Ravindranath & M Chander–New Age International

Publishers.

2. *Fundamentals of Power system Protection—Y G Paithankar & S R Bhide, PHI Publishers.*

6. Session Plan

<i>Topic coverage and Internal Test</i>	<i>No. of Sessions (in hrs.)</i>	<i>Activity (lecture, tutorial, lab practice, field studies/field-trip, Workshop etc.)</i>	<i>Assignment (project, assignment, field study, seminar, etc.)</i>	<i>Suggested Reading (Book, Video, Online source, etc.)</i>
Module – I				
Introduction: Need for protective scheme, nature and cause of faults, types of faults, effect of faults, Zones of protection, primary and back-up protection,	1	Lecture	Assignment	Text Book 1
Classification of protective relays,	1	Lecture	Assignment	Text Book 1
classification of protective schemes, CT & PT for protection, basic relays terminology	2	Lecture	Assignment	Text Book 1
	1	Lecture	Assignment	Text Book 1
Module – II				
Operating principles and relay construction:	1	Lecture	Assignment	Text Book 1
Technique to produce time delays,	1	Lecture	Assignment	Text Book 1
Thermal relays	1	Lecture	Assignment	Text Book 1
Comparators and signal mixing-introduction, replica impedance, mixing transformer or circuits, phase and amplitude	2	Lecture	Assignment	Text Book 2
comparators-classification, general equation for comparator	2	Lecture	Assignment	Text Book 2
• <i>Study of CT & PT</i>	4	Practice	<i>Result of Experiments and Viva</i>	Text Book 1
Module – III				
Over current Relays-introduction, instantaneous over current relays, time current relays, application of different types of time-current characteristics, basic principles of time over current relays, practical circuit for time over current relays	2	Lecture	Assignment	Text Book 2
Differential relays-introduction, operating characteristics, restraining characteristics, types of differential relays, Analysis of electromagnetic and static differential relays, static relay scheme				
• <i>To perform differential protection of an equipment</i>				

3 Lecture
Text Book 2

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3 Lecture
Assignment Text Book 2

4 Practice

• <i>To perform over current protection of an equipment</i>				
Module – V				
Directional relays-introduction, phase comparator directional units, amplitude comparator directional units, inputs to static directional relays for maximum output.	2	Lecture		Text Book 2
Distance relays-introduction, standard three zone protection, distance protection requirement, relay characteristics, types of distance relay	4+2	Lecture+ Practice	Assignment	Text Book 2
Module – VI				
Comparators and signal mixing: Introduction, replica impedance, mixing transformer or circuits, phase and amplitude comparators- classification, general equation for comparator	3	Lecture	Assignment	Text Book 2
Microprocessor Based Protective Relays (Numerical Relays): Introduction, Circuit interface and program algorithm of over current relays, Impedance, Mho relay relays	6	Practice	Assignment	Text Book 1
Module – VII				
Circuit Breaker: Arc voltage, arc interruption, re-striking and recovery voltage, current chopping, interruption of capacitive current, classification of circuit breaker-oil CB, Air blast CB, SF6 CB, Vacuum CB, DC Circuit Breakers	2+6	Lecture+ Practice	Assignment	Text Book 1
• <i>Perform an overcurrent protection using microprocessor based relay</i> • <i>Study the construction and operation of Circuit Breakers (OCB, ACB, SF6)</i>	8	Practice	<i>Result of Experiments and Viva</i>	Text Book 1
Total (hrs)= 61 (Theory- 31 hours + Practice-30 hours)				

Domain D11 - Industrial Automation

Sl. No	Course Code	Course Title	Course Nature	Credits	Pre-requisite
1	DEIA0111	General PLC	Theory	2	
2	DEIA0211	Basic Electrical (Automation based) and Panel Designing	Practice	2	
3	DEIA0212	Variable Frequency Drive	Practice	2	
4	DEIA0413	Allen Bradley SLC 500	Theory + Practice	5	
5	DEIA0414	Siemens S7-300	Theory + Practice	5	
6	DEIA0415	SCADA Schneider Wonderware In Touch and Win CC Flexible	Theory + Practice	5	
7	DEIA0416	Schneider MODICON TSX-Micro, GE Versamax- Microplus	Theory + Practice	5	
8	DEIA0213	HMI-Allen Bradley-Panel View C600	Practice	2	
9	DEET0300	Project	Project	6	
10	DEET0800	Internship	Practice	4	
			Total	38	

Course Objective:

Recognizing the need to cultivate an industry and institution interaction, value addition and perpetual need to keep abreast with latest development in the field of Automation Technology.

Course Outcomes:

Students will be updated on the latest happenings on the industrial automation sector which include

- Popular hardware and software worldwide
- The technical advancement
- Automation solution providers in India
- Job prospects for the students

Students will be able to identify and implement industry level projects.

DEIA0111General PLC

Subject	Code	Type of course	Prerequisite	Credits	T-P-Pr (hrs)
General PLC	DEIA0111	Theory	Nil	2	2-0-0

Contents

What is PLC: History, Definition of PLC Brief description about Compact and modular, chassis etc. , how to choose a PLC.

PLC types:Block Diagram, Brief description of each components; Power Supply, Input & Output Modules and their role, Memory and types of them, CPU & its role, components.

PLC operation:Wiring, signal flow, internal structure.

PLC brands:Leading brands of plc Programming

Device:Importance of programming device

Communication:Brief discussion on serial & parallel, description about protocol, standard, baud rate with example.

Programming language: Programming standards by IEC, programming software examples.
 Number systems: Brief discussion on number systems and their conversions.

Pedagogy

Sl. No.	Topic	Teaching Method	Th	Pra
1	History, Definition of PLC	CRT, PPT	2	0
2	Brief description about Compact and modular, chassis etc. , how to choose a Plc	CRT, PPT	4	0
3	Block Diagram, Brief description of each components; Power Supply, Input & Output Modules and their role, Memory and types of them, CPU & its role	CRT, PPT	4	0
4	Wiring, signal flow, internal structure	CRT	3	0
5	leading brands of plc	CRT	1	0
6	Brief discussion on serial & parallel, description about protocol, standard, baud rate with example	CRT PPT	4	0
7	Programming standards by IEC, programming software examples.	CRT	3	2
8	Brief discussion on number systems and their conversions.	CRT, PPT	5	3
	Total	26		

DEIA0211 Basic Electrical (Automation Based) and Panel Designing

Subject	Code	Type of course	Prerequisite	credits	T-P-Pr (hrs)
Basic Electrical (Automation Based) and Panel Designing	DEIA0211	Practice	Nil	2	0-2-0

Contents

Introduction: Fundamental electrical quantities, voltage, current, Ohm's Law
 Basic Electronic: Active Components (Diode, Transistor, MOSFETS, TRIAC, IGBT),
 Components: Passive Components (Resistor, Capacitor, Inductor)
 Power Supply: Supply Systems, Conversion of 230 Vac to 24 V dc and vice-versa with circuit description.
Basic Industrial Switches: Pushbuttons, toggle switches, Limit switch etc
Relay: Types of Relay, Practical description of relay, Latching using relay, How to switch a 230Vac load using 24Vdc
Contactors: Basic description of contactors and auxiliary contacts, Holding (latching) circuit & interlocking with Aux contacts practical
Panel Designing: Introduction to Control & Power Circuit, Working Principle of contactor and relay
DOL Starter: Control Wiring with PLC Hands-on practical DOL starter & Connecting PLC output to contactor
Control Wiring with PLC: Connecting PLC output to contactor
Fwd Rev circuit: Wiring

Pedagogy
All sessions through Practice

Sl No	Topic	Pra
1	INTRODUCTION Fundamental electrical quantities, voltage, current, Ohm's Law	3
2	BASIC ELECTRONIC COMPONENTS:Active Components(Diode, Transistor, MOSFETS, TRIAC, IGBT), Passive Components(Resistor, Capacitor, Inductor)	3
3	POWER SUPPLY Supply Systems, Conversion of 230 Vac to 24 Vdc and vice-versa with circuit description	3
4	Basic Industrial Switches Pushbuttons, toggle switches, Limit switch etc	3
5	Relay Types of Relay, Practical description of relay, Latching using relay, How to switch a 230Vac load using 24Vdc	4
6	Contactors Basic description of contactors and auxiliary contacts, Holding(latching) circuit & interlocking with Aux contacts	3
7	Introduction of Panel Designing Introduction to Control & Power Circuit, Working Principle of contactor and relay	3
8	DOL Starter Control Wiring with PLC Hands-on practical DOL starter & Connecting PLC output to contactor	4
9	Control Wiring with PLC Connecting PLC output to contactor	3
10	Stardelta starter Wiring with hardware timer and PLC	3
11	Fwd Rev circuit Wiring	2
	Total: 34 Hours	34

DEIA0212Variable Frequency Drive

Subject	Code	Type of course	Prerequisite	credits	T-P-Pr (hrs)
Variable Frequency Drive	DEIA0212	Practice	Nil	2	0-2-0

Content:

INTRODUCTION TO DRIVES(VFD) Applications of VFD, Features, inside components of VFD, Block Diagram and Architecture.

INTRODUCTION TO AB POWERFLEX 4M Parameters in AB Power flex 4M, Display group parameters, parameter commissioning, local control, Ramp time, DC Brake, Skip Frequency, Freqn control. Remote mode control, connecting with pushbuttons and sensors, PLC VFD integration.

INTRODUCTION TO SIEMENS MICROMASTER 440 Parameters in Siemens Micro master 440, Display group parameters, parameter commissioning, local control, Ramp time, DC Brake, Skip Frequency, Freqn control. Remote mode control, connecting with pushbuttons and sensors, PLC VFD integration.

Pedagogy
All sessions through Practice

S. No.	Topic	Pra
1	INTRODUCTION TO DRIVES(VFD) Applications of VFD, Features, inside components of VFD, Block Diagram and Architecture	10
2	INTRODUCTION TO AB POWERFLEX 4M Parameters in AB Power flex 4M, Display group parameters, parameter commissioning, local control, Ramp time, DC Brake, Skip Frequency, Freqn control. Remote mode control, connecting with pushbuttons and sensors, PLC VFD integration	12
3	INTRODUCTION TO SIEMENS MICROMASTER 440 Parameters in Siemens Micromaster 440, Display group parameters, parameter commissioning, local control, Ramp time, DC Brake, Skip Frequency, Freqn control. Remote mode control, connecting with pushbuttons and sensors, PLC VFD integration.	12
Total - 34 Hrs		34

DEIA0413 Allen Bradley SLC 500

Subject	Code	Type of course	Prerequisite	Credits	T-P-Pr (hrs)
Allen Bradley SLC 500	DEIA0413	Theory + Practice	Nil	5	3-3-0

Content:

Introduction: Controller Family

Architecture: Rack, slot, channel, etc. full structure description and max expansion

SLC 500 features: Details about CPUs, Memory Organisation, Program files and Data files

Addressing: Physical I/O addressing (both Digital & Analog), Memory Instructions Addressing like
Timer, Counters, Binary, Integers etc.

Hardware linking: Using RSLinx, details about protocols AB_DF1-1, TCP-1, EMU-500

Programming Basics: Using RSLogix 500, Basics of Ladder Programming(rung, rail, rules etc.)

NO-NC concept, Logic Gates Implementation using Ladder diag.

User section: New rung, Rung branch, IC, XIO, OTE, OTL, OUT

Bit Logic: OSR

Timers: Timer basics, Detail programming of TON, TOF, RTO, RES with applications

Counters: Basics of Counter, Detail Programming of CTU, CTD, RES with applications

Comparators: Implementation of LIM, MEQ, EQU, NEQ, LES, GRT, LEQ, GEQ in ladder diag

Compute: Implementation of CPT for linear equation solving in ladder diag

Pedagogy

Sl. No.	Topic	Pedagogy	Th	Pr a
1	INTRODUCTION Controller Family ,Architecture Rack, slot, channel, etc. full structure description and max expansion	CRT	2	0
2	SLC 500 FEATURES Details about CPUs, Memory Organisation, Program files and Data files Addressing Physical I/O addressing (both Digital &Analog), Memory Instructions Addressing like Timer, Counters, Binary, Integers etc.	CRT	3	0
3	HARDWARE LINKING Using RSLinx, details about protocols AB_DF1-1, TCP-1, EMU-500	CRT PPT	2	2
4	PROGRAMMING BASICS UsingRSLogix 500, Basics of Ladder Programming(rung, rail, rules etc.) Basics NO-NC concept, Logic Gates Implementation using Ladder diag.		3	2
5	USER SECTION New rung, Rung branch, IC, XIO, OTE, OTL, OUT BIT LOGICLogic gates and OSR		2	3
6	TIMERS: Timer basics, Detail programming of TON, TOF, RTO, RES with applications	CRT	2	2
7	COUNTERS Basics of Counter, Detail Programming of CTU, CTD, RES with applications	CRT	2	2
8	COMPUTE Implementation of CPT for linear equation solving in ladder diag	CRT	2	2
9	MATH Implementation of ADD, SUB, MUL, DIV, SQR, NEG, TOD, FRD instructions in ladder diag., Advance Math LN, LOG, DEG, RAD, XPY, ABS	CRT	2	3
9	MOVE MOV, MVM operations	CRT	2	2
10	LOGICAL AND, OR, XOR, NOT, CLR	CRT,PPT	1	2
11	FILE/MISC. COP, FLL, DDV ,File Shift BSL, BSR SEQUENCER SQL & SQO, FFL & FFU, LFL & LFU	CRT	3	3
12	PROGRAM CONTROL Implementation of JMP & LBL, JSR & SBR,RET and TND, MCR using ladder	CRT PPT	3	3
13	TRIG FUNCTIONS SIN, COS, TAN, ASN, ACS, ATN	CRT	2	3
14	ANALOG OPERATION Description of analog standards for field signals and SCP instruction implementation in ladder		3	3
15	ADDITIONAL STUDIES Forcing of I/Os, Uploading, simulation Device Connectivity with SCADA		3	3
Total : 72 Hours			37	35

DEIA0414 Siemens S7-300

Subject	Code	Type of course	Prerequisite	Credits	T-P-Pr (hrs)
Siemens S7-300	DEIA0414	Theory + Practice	Nil	5	3-2-0

Content:

Introduction: Siemens Family controllers, S7-200, s7-300, S7-400 etc.

PLC Components: PLC components like Power Supply, CPU, rail, IM, SM, CP etc.

Architecture: S7-300 architecture, multi rail configuration.

Addressing: Physical I/O addressing, byte assignment for digital &analog SMs

Config: Memory Mapping, Communication & Hardware configuration, Linking with PG using MPI and simulation

Programming: with SIMATIC MANAGER, basics about the editor, networks, etc.

Bitlogic: NO, NC, NOT, MIDLINE OP, SET & RESET COIL, POSITIVE & NEGATIVE COIL, RS & SR FLIPFLOPS, POS & NEG BLOCKS

Timers: Implementation of Block type (S_PULSE, S_PEXT, S_ODT, S_ODTS, S_OFFDT) & Coil type TIMERS, application

Counters: Implementation of Block type (S_CTU, S_CTD, S_CTUD) & Coil type COUNTERS, application

Comparators(_I, _DI & _R) types: EQ, NE, GT, LT, GE, LE for all types of data(Integer, Double Integer, Real), Use of Variable Tables for Value modification

Integer Functions: ADD, SUB, MUL, DIV, MOD for both integer & double integer types of data

Floating-point functions: ADD, SUB, MUL, DIV, ABS, LOG, LN, SIN, COS, TAN, ASIN, ACOS, ATAN, EXP for real types of data

Move: Implementation of MOVE instruction in ladder

Jumps: JMP, JMPN, LBL

Program control: MCR, CALL, RET

Converters: BCD_I, I_BCD, BCD_DI, DI_BCD, INV_I, INV_DI, NEG_I, NEG_DI, NEG_R, ROUND, TRUNC, CEIL, FLOOR

Word Logic: AND, OR, XOR (for both word and double word data types)

Shift/Rotate: SHR, SHL, ROL, ROR (for integer, double integer and real data types)

Function block & Data block: develop an application using these two blocks

DB call: Open

LIFO & FIFO operations: TI-S7 converting blocks- FC84, FC85, FC87

Scale & Unscale: use of FC105 & FC106

Device connectivity: Linking with In Touch SCADA

Pedagogy

Sl. No.	Topic	Pedagogy	Th	Pr
1	Siemens Family controllers, S7-200, s7-300, S7-400 etc.	CRT	2	0
2	PLC components like Power Supply, CPU, rail, IM, SM, CP etc. Architecture S7-300 architecture, multi rail config., Addressing Physical I/O addressing, byte assignment for digital & analog SMs Memory Mapping	CRT	4	0
3	COMMUNICATION & CONFIG Hardware configuration Linking with PC using MPI and simulation Programming with SIMATIC MANAGER, basics about the editor, networks, etc.	CRT PPT	3	2
4	BITLOGIC NO, NC, NOT, MIDLINE OP, SET & RESET COIL, POSITIVE & NEGATIVE COIL, RS & SR FLIPFLOPS, POS & NEG BLOCKS	CRT, PRAC	3	4
5	TIMERS Implementation of Block type (S_PULSE, S_PEXT, S_ODT, S_ODTS, S_OFFDT) & Coil type TIMERS, application	CRT	3	3
6	COUNTERS Implementation of Block type (S_CTU, S_CTD, S_CTUD) & Coil type COUNTERS, application Comparators(_I, _DI & _R) types EQ, NE, GT, LT, GE, LE for all types of data(Integer, Double Integer, Real), Use of Variable Tables for Value modification	CRT	3	3
7	INTEGER FUNCTIONS ADD, SUB, MUL, DIV, MOD for both integer & double integer types of data Floating-point ADD, SUB, MUL, DIV, ABS, LOG, LN, SIN, COS, TAN, ASIN, ACOS, functions ATAN, EXP for real types of data	CRT	3	4
8	MOVE Implementation of MOVE instruction in ladder ,Jumps JMP, JMPN, LBL PROGRAM CONTROL MCR, CALL, RET	CRT	3	3
9	CONVERTERSBCD_I, I_BCD, BCD_DI, DI_BCD, INV_I, INV_DI, NEG_I, NEG_DI, NEG_R, ROUND, TRUNC, CEIL, FLOOR	CRT	3	3
10	WORD LOGIC AND, OR, XOR (for both word and double word data types) Shift/Rotate SHR, SHL, ROL, ROR (for integer, double integer and real data types)	CRT PPT	3	3
11	FUNCTION BLOCK & DATA BLOCK develop an application using these two blocks	CRT	3	3
12	DB call Open, LIFO & FIFO operations TI-S7 converting blocks- FC84, FC85, FC87	CRT, PPT	3	3
13	SCALE & UNSCALE use of FC105 & FC106, Device connectivity Linking with InTouch SCADA	CRT	3	3
TOTAL: 73 Hours			39	34

DEIA0415 SCADA - Schneider-Wonder ware In Touch

Subject	Code	Type of course	Prerequisite	Credits	T-P-Pr (hrs)
SCADA -Schneider-Wonder ware In Touch	DEIA0415	Theory + Practice	Nil	5	3-2-0

Content:

Introduction and SCADA Basics: General SCADA theory, Importance of SCADA in Industrial Automation, Benefit of SCADA, DATA ACQUISITION, Features of SCADA, SCADA Cost Analysis - Tag & Tag types & Packages of SCADA, Leading SCADA Vendors, Architecture of SCADA (Open & Proprietary)

Introduction to In-Touch: Basic operations related to InTouch Editor, types of windows, How to Open window, windows property,

General toolbar: New window, Open window, close window, save window, save all, duplicate selection, cut to clipboard, copy, paste, undo and redo.

Wizard ActiveX toolbar: Alarm display, Buttons, clock, lights, meter, runtime tools(for alarm monitor), slider, switches, SYMBOL FACTORY, Text Display, Trend, Value Display Fonts, Bold/Italic/Underline, Enlarge/ reduce font, Left/Center/Right

Format toolbar: Justification, Line colour /fill colour / text colour / window colour

Draw object toolbar: Select mode, rectangle, rounded rectangle, ellipse, line, H/V line, poly line, polygon, text, bitmap, real-time trend/ hist trend, button

View toolbar: classic view, project view, hide/restore all, full screen, snap to grid, ruler

Arrange toolbar: Align left/centre/right/top/middle/button, align CenterPoint, send to back, bring to front, space horizontal/ vertical, Make/break symbol, Make/break cell rotate clockwise/counter clockwise, flip horizontal/vertical

Pan & Zoom: Zoom in/out, zoom normal, hand tool

Status bar: XY co-ordinate, height/width

SCADA Features

Dynamic representation: Discrete properties-User Inputs, Line Colour, fill Colour, touch push button, user defined object, system defined objects, blink property with different types of conditions, Key equivalent, value display, text Colour, discrete alarm(for alarm), examples: Analog properties- User Inputs, Line Colour, fill Colour, text Colour, Percentage fill (vertical/ horizontal), Location (vertical/ horizontal), Object size(height/ width), Slider(vertical/horizontal), Misc. (blink, orientation, value display, user defined/ predefined object, analog alarm, example: String properties- User Inputs, value display, tooltip Additional properties- Action, show window, hide window, visibility, disable Develop some applications

Alarm: Alarm Basics, types, Priorities, alarm generation, alarm printing

Trends: Trend Basics, types, formula for time setting, Real time & Historical trend, historical scooter, trend zoom/control panel , 16 - pen trend

Scripts: Basics, types, conditions, Details about Window, Application, Key, Condition, Data change & Quick Function scripts with examples

Recipe: Basics, Template definition, recipe definition, unit definition and some application with procedures

Data connectivity: with MS excel by using Memory & IO tag

Device Connectivity: SCADA to PLC Communication with applications

Networking: SCADA to SCADA 2 pc application

Security Report: Basics of security, access level, application development using InTouch security

Generation: in Excel

Sr No.	Topic	Pedagogy	Th	Pra
1	INTRODUCTION AND SCADA BASICS General Scada theory , Importance of Scada , Benefits of Scada ,Features of Scada , Scada cost Analysis - tag, types of tags and Package of Scada ,LeadindScada vendors , Architecture of Scada	CRT	4	2
2	INTRODUCTION TO INTOUCH AND GENERALTOOLBAR: Basics,Operation related to Intouch in Editor,types of windows,How to open window and properties	CRT	4	3
3	DYNAMICREPRESENTATION Discrete properties- Predefined object, user defined object, blinking property with different types of condition, value display, line colour, fill colour, button, Analog properties- User Inputs, Line colour, fill colour, text colour, Percentage fill (vertical/ horizontal), Location (vertical/ horizontal), Object size(height/ width), Slider(vertical/horizontal), Misc. (blink, orientation, value display, user defined/ predefined object, analog alarm, example	CRT PPT	5	4
4	DYNAMIC REPRESENTATION String properties- User Inputs, value display, tooltip, Additional properties- Action, show window, hide window visibility, disable , applications development	CRT	4	4

5	ALARM	Alarm Basics, types, Priorities, alarm generation, alarm printing	CRT	3	3
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Pedagogy

Sl. No.	Topic	Pedagogy	Th	Pra
6	TRENDS Trend Basics, types, formula for time setting, Real time & Historical trend, historical scooter, trend zoom/control panel , 16 - pen trend	CRT	4	4
7	SCRIPTS Basics, types, conditions, Details about Window, Application, Key, Condition, Data change & Quick Function scripts with examples	CRT	4	5
8	RECIPE Basics, Template definition, recipe definition, unit definition and some application with procedures	CRT PPT	3	4
9	DATA CONNECTIVITY AND DEVICE CONNECTIVITY with MS excel by using Memory & IO tag and SCADA to PLC Communication with applications	CRT	3	4
10	SECURITY AND REPORT GENERATION Basics of security, access level, application development using InTouch security and report generation in Excel	CRT PPT	4	4
Total: 75 Hours			38	37

DEIA0416 Schneider MODICON TSX-Micro, GE Versamax – MicroPlus

Subject	Code	Type of course	Prerequisite	Credits	T-P-Pr (hrs)
Schneider MODICON TSX-Micro, GE Versamax – Micro Plus	DEIA0416	Theory + Practice	Nil	5	3-2-0

Content

Schneider MODICON TSX-Micro

Introduction: History and basics

Family: Details about all the controllers from MODICON family

Architecture: Details about controller TSX micro series, wiring

Addressing: Both Physical and Memory I/O addressing

Programming, Bit Logic: Hardware linking with X-way driver Manager, Programming with PL7 Pro v3.4 and gets familiar with the editor, Mouse selection mode, Normally Open Contact, Normally Closed contact,

Instructions: Rising Edge, Falling Edge, Horizontal Connection, Vertical connection, Horizontal connections, Direct/Transition condition coil, Negated coil, Set coil, Reset coil

Timers: Introduction, Software configuration for total no of timers & assigning timers, Use of application browser & predefined function block, Details on Timer (TM), Monostable (MN), Series7 (T) and their usage.

Counters: Basics of counter, Operation of UPDOWN counter

Comparator: Use of both Horizontal & Vertical comparators with syntaxes, use of <, >, <>, =, >=, <=

Math operations: Use of Operate block with its syntax, +, -, *, /, :=, SQRT & trigonometry, functions, move

Converters, Bit movement operation, Program control: BCD_TO_INT, INT_TO_BCD, SHL, SHR, ROL, ROR, Jump & Label, creation & Call of subroutine

Registers, Sequencer: Basics and Use for LIFO & FIFO operation, Use of DRUM controller and Runtime Screen(PL7 Visualisation) for sequencer out and Implementation of seven segment display with it

GE Versamax– MicroPlus

Introduction: History and basics

Family: Details about all the controllers from GE family

Architecture: Details about controller GE Versamax - MicroPlus, wiring

Addressing: Both Physical and Memory I/O addressing

Programming: Hardware linking with driver, Programming

Bit Logic: Selection mode, Normally Open Contact, Normally Closed contact, Rising

Instructions: Edge, Falling Edge, Horizontal Connection, Vertical connection, Horizontal connections,

Direct/Transition condition coil, Negated coil, Set coil, Reset coil

Timers: Introduction, Software configuration for total no of timers & assigning timers, Use of application browser & predefined function block, Details on Timer, Programming with timers.

Counters: Basics of counter, Operation of UPDOWN counter

Comparator: Horizontal & Vertical comparators with syntaxes, use of <, >, <>, =, >=, <=

Math operations: Use of Operate block with its syntax, +, -, *, /, :=, SQRT & trigonometry functions, move

Converters, Bit movement, operation, Program control: BCD_TO_INT, INT_TO_BCD, SHL, SHR, ROL, ROR, Jump & Label, creation & Call of subroutine

Registers : Basics and Use for LIFO & FIFO operation

Pedagogy

Sl. No.	Topic (All topics through CRT + Practice)	Th	Pra
1	INTRODUCTION, Family, Architecture, Addressing, Programming, Bit Logic instructions History and basics, Details about all the controllers from MODICON family, Details about controller TSX micro series, wiring, Both Physical and Memory I/O addressing, Hardware linking with X-way driver Manager, Programming with PL7 Pro v3.4 and gets familiar with the editor, Mouse selection mode, Normally Open Contact, Normally Closed contact, Rising Edge, Falling Edge, Horizontal Connection, Vertical connection, Horizontal connections, Direct/Transition condition coil, Negated coil, Set coil, Reset coil	3	3
2	TIMERS Introduction, Software configuration for total no of timers & assigning timers, Use of application browser & predefined function block, Details on Timer (TM), Monostable (MN), Series7 (T) and their usage.	3	4
3	COUNTERS, Comparator, Math operations Basics of counter, Operation of UPDOWN counter, Use of both Horizontal & Vertical comparators with syntaxes, use of <, >, <>, =, >=, <=, Use of Operate block with its syntax, +, -, *, /, :=, SQRT & trigonometry functions, move	3	3
4	CONVERTERS, Bit movement operation, Program control BCD_TO_INT, INT_TO_BCD, SHL, SHR, ROL, ROR, Jump & Label, creation & Call of subroutine	3	3
5	REGISTERS AND SEQUENCER Basics and Use for LIFO & FIFO operation, Use of DRUM controller and Runtime Screen(PL7 Visualisation) for sequencer out and Implementation of seven segment display with it.	3	3
	GE Versamax–MicroPlus		
1	Introduction : History and basics	1	1
2	Family: Details about all the controllers from GE family	1	1
3	Architecture: Details about controller GE Versamax - MicroPlus, wiring	2	2
4	Addressing: Both Physical and Memory I/O addressing	3	2
5	Programming: Hardware linking with driver, Programming Bit Logic: Selection mode, Normally Open Contact, Normally Closed contact, Rising	2	2
6	Instructions: Edge, Falling Edge, Horizontal Connection, Vertical connection, Horizontal connections, Direct/Transition condition coil, Negated coil, Set coil, Reset coil Introduction, Software configuration for total no of timers & assigning timers,	3	3
7	Timers: Use of application browser & predefined function block, Details on Timer, Programming with timers.	2	2
8	Counters: Basics of counter, Operation of UPDOWN counter	1	1
9	Comparator: Horizontal & Vertical comparators with syntaxes, use of <, >, <>, =, >=, <= Use of Operate block with its syntax, +, -, *, /, :=, SQRT & trigonometry	3	3
10	Math operations: functions, move	1	1
11	Converters, Bit movement : BCD_TO_INT, INT_TO_BCD	2	2
12	Operation: SHL, SHR, ROL, ROR,	1	1
13	Program control: Jump & Label, creation & Call of subroutine	1	1
14	Registers: Basics and Use for LIFO & FIFO operation	1	1
	Total: 77 Hours	38	39

DEIA0213 HMI – Allen Bradley- Panel View C600

Subject	Code	Type of course	Prerequisite	Credits	T-P-Pr (hrs)
HMI – Allen Bradley- Panel View C600	DEIA0213	Practice	Nil	2	0-2-0

Content

Introduction Details of PanelView: HMI Basics, Difference between SCADA & HMI, Requirements, Leading Vendors, Specification of Panel view family, Features, Communication settings in HMI & PC

Application Development: New application development, HMI Screen development, Dashboard, Terminal setting, file transfer

Introduction to software: tag declaration, tag type, screen type, control, screen, property

Controls window: Entry, display, Drawing tools, Advance, Library

Property window: Appearance, Common, Navigation, Connections, Screen,

Application Development: Discrete type, Analog type

Alarm, Trend, Security, Recipe, Device Connectivity: example with application

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Sl. No.	Topic	Teaching Method	Instr. Hrs	
			Th	Pra
1	HUMAN MACHINE INTERFACE: Introduction to HMI, Introduction to panel view C600, HMI Basics, Difference between SCADA & HMI, Requirements, Leading Vendors, Specification of Panelview family, Features, Communication settings in HMI & PC	CRT	2	8
2	New application development, HMI Screen development, Dashboard, Terminal setting, file transfer.	CRT	3	6
3	Tag declaration, tag type, screen type, control, screen, property	CRT PPT	2	5
Total : 26 Hours			7	19

Domain D15 - Operation and Maintenance of Transmission and Distribution Systems

S. No.	Course Code	Course Title	Course Nature	Credits
1	DEOM0131	Overview of Transmission System	Theory	2
2	DEOM0132	Overview of Distribution System	Theory	3
3	DEOM0431	Power and Distribution Transformer Operation and Testing	Theory + Practice	5
4	DEOM0432	System Protection and Auxiliaries	Theory + Practice	5
5	DEOM0433	Construction Details of HT and LT lines, Cables and Testing	Theory + Practice	5
6	DEOM0231	Safety Practice and First Aid	Practice	2
7	DEOM0232	Electrical System Layout and Drawing	Practice	2
8	DEOM0434	Power system market, economics and energy audit	Theory +Practice	4
9	DEETM0300	Project	Project	6
10	DEET0800	Internship	Practice	4

Total	38
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Course Objective:

To create technically trained manpower readily available for recruitment to the power companies in the area of Transmission & Distribution of electrical power

Course

Outcome:

- After completion of the course the students will acquire extensive basic and advanced knowledge of
- Operation & Maintenance of Transmission and Distribution accessories
- Necessary safety aspects required in T&D
- Details of associated equipments
- T&D project management Process flow

DEOM0131 Fundamentals and Overview of Transmission System

Subject	Code	Type of course	Prerequisite	Credits	T-P-Pr (hrs)
Overview of Transmission System	DEOM0131	Theory	Nil	2	2-0-0

Module-1

GENERAL INTRODUCTION Generation, Transmission & Distribution Scenario of India

POWER GENERATION Types of generation: Conventional and Non-conventional, Thermal Power Plant, Hydro Power Plant, Gas Power Plant, Nuclear Power Plant, Co-generation Various sources Non-conventional Energy Sources.

POWER TRANSMISSION (A) SWITCHYARD/SUBSTATION I. Types: Generation sub-station, Grid sub-station, Gas Insulated s/s etc. Indoor/outdoor, general comparison.

Module-2

SUB-STATION/TRANSMISSION EQUIPMENTS Switchgears - Circuit breaker: Types (MOCB, ABCB, VCB, SF6), constructional details, specifications, interlocks (a) Isolator: Types earth switch, Bus bar (b) CT/CVT. Lighting Arrestors/Lighting Mask (c) Fibre optics :- Principle, purpose, types of coupling (d) Relays: Types, functions, constructional details, (e) Protection System: Philosophy, types, protection of transformer/reactor, motor, line/feeder generator, bus etc.

Grounding:- Types of grounding, earth testing & treatment, earthmat design, step potential, Neutral grounding reactor Auxiliary facilities: DG Set Station Battery System etc. V. Cables-Types, Control cables, power cables, cable termination & jointing.

Module-3

Sub-station operation: Grid operation, communication with RLDC/SLDC etc.

Sub-Station Maintenance:

(a) Types-Routine, preventive, planned, predictive, break-down, emergency maintenance, online maintenance of different equipments,

(b) Transformer/ Reactor Maintenance-Factors affecting the life of transformer/Reactor. Inspection/preliminary testing of various components-oil sampling and testing, oil filtration, Dissolved Gas Analysis (DGA), maintenance schedule

(c) Switchgear & protection Maintenance:- Maintenance of CB, Isolator, Earthswitch, Support Insulators, CT/CVT,LA,LM, Protective relay maintenance testing

Erection and commissioning pre-commissioning checks/Tests of sub-station;

Pedagogy

Sl. No.	Topic	Pedagogy	Th
Module 1			
1	General introduction Generation, Transmission & Distribution Scenario of India	CRT + PPT	2
2	POWER GENERATION Types of generation: Conventional and Non-conventional, Thermal Power Plant, Hydro Power Plant, Gas Power Plant, Nuclear Power Plant, Co-generation Various sources Non-conventional Energy Sources.	CRT + PPT + Video	2
3	POWER TRANSMISSION (A) SWITCHYARD/SUBSTATION I. Types: Generation sub-station, Grid sub-station, Gas Insulated s/s etc. Indoor/outdoor, general comparison	CRT + PPT + Video	2
Module 2			
4	STATION/TRANSMISSION EQUIPMENTS Switchgears - Circuit breaker: Types (MOCB, ABCB, VCB, SF6) constructional details, specifications	CRT	2
5	(a) Isolator: Types earth switch, Bus bar	CRT	1
6	CT/CVT. Lighting Arrestors/Lighting Mask	CRT	1
7	Relays: Types, functions, constructional details	CRT	2
8	Protection System: Philosophy, types, protection of transformer/reactor, motor, line/feeder generator, bus etc	CRT	3
9	Grounding:- Types of grounding, earth testing & treatment, earthmat design, step potential, Neutral grounding reactor Auxiliary facilities: DG Set Station Battery System etc. V. Cables-Types, Control cables, power cables, cable termination & jointing	CRT	3
Module 3			
10	Sub-station operation: Grid operation, communication with RLDC/SLDC etc.. VII, (b) (c) VIII. Erection and commissioning pre-commissioning checks/Tests of sub-station;	CRT + PPT	2
11	. Sub-Station Maintenance: (a) Types-Routine, preventive, planned, predictive, break-down, emergency maintenance, online maintenance of different equipments		2
12	Transformer/ Reactor Maintenance-Factors affecting the life of transformer/Reactor. Inspection/preliminary testing of various components-oil sampling and testing, oil filtration, Dissolved Gas Analysis (DGA), maintenance schedule		3
13	Switchgear & protection Maintenance:- Maintenance of CB, Isolator, Earthswitch, Support Insulators, CT/CVT,LA,LM, Protective relay maintenance testing		2
14	Erection and commissioning pre-commissioning checks/Tests of sub-station;		2
Total			29

DEOM0132 Overview of Distribution System

Subject	Code	Type of course	Prerequisite	Credits	T-P-Pr (hrs)
Overview of Distribution System	DEOM0132	Theory	Nil	3	3-0-0

MODULE-1

General : Introduction to Distribution systems, an overview of the role of computers in distribution system planning- Load modelling and characteristics: definition of basic terms like demand factor, utilization factor, load factor, plant factor, diversity factor, coincidence factor, contribution factor and loss factor-Relationship between the load factor and loss factor - Classification of loads (Residential, Commercial, Agricultural and Industrial) and their characteristics. Distribution Feeders and Substations: Design consideration of Distribution feeders: Radial and loop types of primary feeders, voltage levels, and feeder-loading.

MODULE-2

Design practice of the secondary distribution system. Location of Substations: Rating of a Distribution Substation, service area with primary feeders. Benefits derived through optimal location of substations. System analysis: Voltage drop and power loss calculations, Derivation for volt-drop and power loss in lines, manual methods of solution for radial networks, three-phase balanced primary lines, non-three-phase primary lines. Protective devices and coordination: Objectives of distribution system protection, types of common faults and procedure for fault calculation.

MODULE-3

Protective Devices: Principle of operation of fuses, circuit reclosers, line sectionalizer and circuit breakers. Coordination of protective devices: General coordination procedure. Capacitive compensation for power factor control: Different types of power capacitors, shunt and series capacitors, effect of shunt capacitors (Fixed and switched) power factor correction, capacitor location. Economic justification. Procedure to determine the best capacitor location. Voltage control : Equipment for voltage control, effect of series capacitors, effect of AVB/AVR, line drop compensation.

HT & LT Metering CT Meters and Advanced Metering Technologies, Latest Techniques in Metering, Billing & Collection through IT applications, Methods to prevent Pilferages of Electricity

Pedagogy

Sl. No.	Topic	Teaching Method	Th
Module 1			
1	Introduction to Distribution systems,	CRT	1
2	an overview of the role of computers in distribution system planning-Load modeling and characteristics:	CRT Using PPT	3
3	definition of basic terms like demand factor, utilization factor, load factor, plant factor, diversity factor, coincidence factor, contribution factor and loss factor- Relationship between the load factor and loss factor -	CRT	5
4	Classification of loads (Residential, Commercial, Agricultural and Industrial) and their characteristics.	CRT	3
5	Distribution Feeders and Substations: Design consideration of Distribution feeders: Radial and loop types of primary feeders, voltage levels, and feeder-loading.	PPT CRT	4
Module -2			
6	Design practice of the secondary distribution system	CRT	2
7	Location of Substations: Rating of a Distribution Substation, service area with primary feeders. Benefits derived through optimal location of substations	CRT	4
8	System analysis: Voltage drop and power loss calculations, Derivation for volt-drop and power loss in lines, manual methods of solution for radial networks, three-phase balanced primary lines, non-three-phase primary lines.	CRT	5
9	Protective devices and coordination: Objectives of distribution system protection, types of common faults and procedure for fault calculation.	CRT	4
Module-3			
10	Protective Devices: Principle of operation of fuses, circuit reclosers, line sectionalizer and circuit breakers. Coordination of protective devices: General coordination procedure	CRT	4
11	Capacitive compensation for power factor control: Different types of power capacitors, shunt and series capacitors, effect of shunt capacitors (Fixed and switched) power factor correction, capacitor location	CRT	5
11	Voltage control : Equipment for voltage control, effect of series capacitors, effect of AVB/AVR, line drop compensation	CRT	5
TOTAL: 45 Hours			45

DEOM0431 Power and Distribution Transformer Operation and Testing

Subject	Code	Type of course	Prerequisite	Credits	T-P-Pr (hrs)
Power and Distribution Transformer Operation and Testing	DEOM0431	Theory+ Practice	Nil	5	2-3-0

Notes:

Transformer: Basic principles of transformer, magnetization and hysteresis, electromagnets. Flux density Ampere-turn Ratio – Equation for transformation Two/ three winding & Auto Transformer – Grounding transformers – silent features of core & shell type, transformer constructional details.

Module-

Transformer fixtures – buchholz relay, breather, conservators, bushing of different types, thermometers, indicators, alarms. Cooling of Transformer, Importance of Oil Filtration & drying out of transformer. Working principles of OLTC & its" O/M.

Modules-

Transformer Test - Failures and causes, maintenance & repairs.

Power Transformers Testing and commissioning - Significance & importance of tests protection of transformers - Insulation resistance measurement, winding resistance measurement, magnetic current test, magnetic balance test, vector group confirmation short circuit test and differential stability test, etc., Conditions leading to faults, protective relays, differential protection, overcurrent protection , ground fault protection and monitors for protection – Factory testing of power transformers

Transformer Oil.- Specifications & Characteristics.. Sources, manufacturing and Handling.Methodsof Sampling and testing.Maintenance of Transformer Oil. Filter Machine O&M,DGA.

Maintenance.ofTransformer,Parallel Operation

Pedagogy

Sl. No.	Topic	Teaching Method	Th	Pra
	Module 1			
1	Transformer: Basic principles of transformer, magnetization and hysteresis, electromagnets. Flux density Ampere-turn Ratio – Equation for transformation Two/ three winding & Auto Transformer	CRT, PPT ANIMATION	3	6
2	Grounding transformers – silent features of core & shell type, transformer constructional details.	CRT, PPT ANIMATION	2	3
Module 2				
3	Transformer fixtures – buchholz relay, breather, conservators, bushing of different types, thermometers, indicators, alarms. Cooling of Transformer, Importance of Oil Filtration & drying out of transformer. Working principles of OLTC & its" O/M.	PPT Field Visit	2	6
Module -3				
4	Transformer Test - Failures and causes, maintenance & repairs.	CRT	2	2
5	Power Transformers Testing and commissioning - Significance & importance of tests protection of transformers - Insulation resistance measurement, winding resistance measurement, magnetic current test, magnetic balance test, vector group confirmation short circuit test and differential stability test, etc.,	CRT, Practice PPT, Animation	3	15
6	Conditions leading to faults, protective relays, differential protection, overcurrent protection , ground fault protection and monitors for protection – Factory testing of power transformers	CRT, PPT Animation Practice	3	8
7	Transformer Oil.- Specifications & Characteristics.. Sources, manufacturing and Handling. Methods of Sampling and testing. Maintenance of Transformer Oil. Filter Machine O&M,DGA	CRT, PPT Animation Practice	2	6
TOTAL: 63 Hours			17	46

DEOM0432 System Protection and Auxiliaries

Subject	Code	Type of course	Prerequisite	Credits	T-P-Pr (hrs)
System Protection and Auxiliaries	DEOM0432	Theory + Practice	Nil	5	3-2-0

Syllabus

Module-1

CT & PTs: Types of CT & PTs – their working principles, ratings and accuracy. Functions of CT & PTs – Failures of CT & PTs – their causes. Metering Schemes. Protection of Transmission Line with Schemes. Protection of Transformer with different Schemes. Local & Back-up Protection. New Generation Relays..

Module-2

Breakers- Function of breakers. Different types of indoor and outdoor breakers e.g. Bulk oil, MOCB, Air blast, SF6 and Vacuum Breaker - principle and their application. Operating Mechanism – springs, hydraulic, pneumatic, Current ratings, rupturing capacity, clearance time, Commissioning procedures. Breaker Maintenance, failures and their causes. CB Control Circuit description and fault finding procedures

Lightening Arrestors/Surge Arrestors- Simple description of lightening phenomena and surges. Constn. of S.As – and principles of their working. Different types of Surge Arrestor and ratings. Earthing and Location of S.A. Testing & Maint. of S.As –

Module-3

Isolators : Tilting and rotating isolators with & without arcing horns – earth blades – current ratings. Breaking of circuits by isolators. Interlocking with circuit Breaker. Maintenance of isolators.

Insulators : Types - their electrical & mechanical characteristics.

Auxiliary facilities: DG Set Station Battery System etc. V. Cables-Types, Control cables, power cables, cable termination & jointing. Auxiliary D.C. Supply. Battery:- Current & Ampere Hours Ratings. Battery Charging Equipment – Checking of Specific Gravity of Electrolyte – Maintenance of batteries – Trouble Shootings. Condition monitoring and hotline maintenance

Pedagogy

Sl. No.	Topic	Teaching Method	Th	Pra
Module 1				
1	CT & PTs: Types of CT & PTs – their working principles, ratings and accuracy. Functions of CT & PTs – Failures of CT & PTs – their causes	CRT, PPT	3	2
2	Metering Schemes	CRT, PPT	4	2
3	Protection of Transmission Line with Schemes.	CRT, PPT	4	2
4	Protection of Transformer with different Schemes Local & Back-up Protection.	CRT, PPT	4	2
5	New Generation Relays.	PPT, Hands on Practice	0	2
Module 2				
6	Breakers- Function of breakers., Commissioning procedures. Breaker Maintenance, failures and their causes. CB Control Circuit description and fault finding procedures	CRT, PPT Video	1	3
7	Different types of indoor and outdoor breakers e.g. Bulk oil, MOCB, Air blast, SF6 and Vacuum Breaker - principle and their application		1	2
8	Operating Mechanism – springs, hydraulic, pneumatic, Current ratings, rupturing capacity, clearance time		1	2
9	Lightening Arrestors/Surge Arrestors- Simple description of lightening phenomena and surges. Constn. of S.As –	CRT, PPT Video Field Visit	2	1
10	Principles of their working. Different types of Surge Arrestor and ratings.	CRT, PPT	2	1
11	Earthing and Location of S.A. Testing & Maintenance of S.As	Video	2	3

Sl. No.	Topic	Teaching Method	Th	Pra
Module 3				
12	Isolators : Tilting and rotating isolators with & without arcing horns – earth blades – current ratings.Breaking of circuits by isolators.	CRT, PPT Animation	2	3
13	Interlocking with circuit Breaker.Maintenance of isolators	CRT, PPT Animation	2	2
14	Insulators : Types - their electrical & mechanical characteristics.	CRT PPT	1	2
15	Auxiliary facilities: DG Set Station Battery System etc.	CRT	1	2
16	Auxiliary D.C. Supply.Battery:- Current & Ampere Hours Ratings.Battery Charging Equipment – Checking of Specific Gravity of Electrolyte – Maintenance of batteries – Trouble Shootings.condition monitoring and hotline maintenance	CRT	4	3
Total: 74 Hours			34	40

DEOM0433 Construction of HT and LT lines, Cables and its Testing

Subject	Code	Type of course	Prerequisite	Credits	T-P-Pr (hrs)
Construction of HT and LT lines, Cables and its Testing	DEOM0433	Theory + Practice	Nil	5	3-2-0

Module 1

TRANSMISSION LINES EHV Transmission system in India, Tower types, Conductors, Earth wire, Insulators, IE rules and Acts, Statutory clearances, Surveying, Route Alignment Maintenance of transmission line, Thermo vision scanning

Module 2

Modern trends in Underground Cabling Basic Concepts, Selection, Types and Design of Underground including Standards of Cables Primary & Detailed Survey, Laying of Cable, Jointing, Testing and Commissioning Fault Location of Cables Maintenance & Trouble Shooting & Earthing of Underground Cables Problems encountered during conversion of overhead lines to underground cables.

Module 3

THEORY, DESIGN OF HT and LT CABLE

Materials Used in Cables, Conductors; Voltage Drop; Conductor Ampacity calculation; Conductor resistance; Conductor Inductance and capacitance calculation

Testing: Ampacity, Calculation of losses, AC resistance of conductor, Dielectric losses, Loss factor, Thermal resistance Test

Buried cables where drying-out of the soil does not occur, Buried cables where partial drying-out of the soil occurs

Ampacity in two cases

Padagody

Sl. No.	Topic	Instructional Hours	
		Th	Pra
1	TRANSMISSION LINES EHV Transmission system in India, Tower types, Conductors, Earth wire, Insulators, IE rules and Acts, Statutory clearances, Surveying, Route Alignment Maintenance of transmission line, Thermo vision scanning	20	0
2	Modern trends in Underground Cabling Basic Concepts, Selection, Types and Design of Underground including Standards of Cables Primary & Detailed Survey, Laying of Cable, Jointing, Testing and Commissioning Fault Location of Cables Maintenance & Trouble Shooting & Earthing of Underground Cables Problems encountered during conversion of overhead lines to underground cables.		30
3	Materials Used in Cables, Conductors; Voltage Drop; Conductor Ampacity calculation; Conductor resistance; Conductor Inductance and capacitance calculation Testing: Ampacity, Calculation of losses, AC resistance of conductor, Dielectric losses, Loss factor, Thermal resistance Test Buried cables where drying-out of the soil does not occur, Buried cables where partial drying-out of the soil occurs Ampacity in two cases	0	20
Total: 70 Hours		20	50

DEOM0231 Safety Practice & First Aid

Subject	Code	Type of course	Prerequisite	Credits	T-P-Pr (hrs)
Safety Practice & First Aid	DEOM0231	Practice	Nil	2	0-2-0

Contents

Safety Requirement, Hazards, Electrical Accidents and prevention, First Aid, Firefighting-Types of fire, firefighting/system, fire extinguishers

Safety : Safety Philosophy, Safety Procedures, GRID Safety Norms, Procedures for issuing L.C.P. and cancellation, Maintenance of Safety records.

First Aid : Places of Potential Hazards, Electric Shock Treatment, Artificial Respiration, Handling Emergency Conditions, Treatment of Wounds, Injuries & Burns.

Fire Fighting: Causes of Fire, Fire Extinction, Classification of Fires, Fire Fighting, Equipment: their operation – maintenance & refilling, Fire prevention.

Pedagogy (All sessions through Practice)

Sl. No.	Topic	Practical hrs
1	Safety Requirement, Hazards, Electrical Accidents and prevention, First Aid, Firefighting-Types of fire, firefighting/system, fire extinguishers	3
2	Safety Safety Philosophy. Safety Procedures. GRID Safety Norms. Procedures for issuing L.C.P. and cancellation. Maintenance of Safety records.	6
3	First Aid Places of Potential Hazards. Electric Shock Treatment. Artificial Respiration. Handling Emergency Conditions. Treatment of Wounds, Injuries & Burns	9
4	Fire Fighting Causes of Fire. Fire Extinction. Classification of Fires. Fire Fighting Equipment: their operation – maintenance & refilling. Fire prevention.	3
	Total: 21 Hours	21

DEOM0232 Electrical System Layout and Drawing

Subject	Code	Type of course	Prerequisite	Credits	T-P-Pr (hrs)
Electrical System Layout and Drawing	DEOM0232	Practice	Nil	2	0-2-0

Contents

Single line diagram/equipments [Equipments-transformer, CB, fuse etc.]

Relays, Relaying schemes and auxiliaries Wiring Diagram

Layout of Sub-Station(33/11KV S/S, 220/33KV S/S)

Indoor and outdoor busbars — bus-bar mountings and their clearances.

Designing Electrical Transmission Tower Types and Design

Note: Using AUTOCAD and Smart Draw

Pedagogy
(All sessions through Auto CAD & Computer)

Sl. No.	Topic	Pract hrs
1	Single line diagram/equipments [Equipments-transformer, CB, fuse etc.]	3
2	Relays, Relaying schemes and auxiliaries Wiring Diagram	6
3	Layout of Sub-Station(33/11KV S/S, 220/33KV S/S)	9
4	Indoor and outdoor busbars — bus-bar mountings and their clearances	6
5	Designing Electrical Transmission Tower Types and Design	9
Total: 33 Hours		33

DEOM0434 Power system market, economics and energy audit

Subject	Code	Type of course	Prerequisite	Credits	T-P-Pr (hrs)
Power system market, economics and energy audit	DEOM0434	Theory + Practice	Nil	4	2-2-0

Course Objective

To make students gain functional knowledge about Electricity Market & about energy audit

Course Outcome

On completing this course, students will be able to:

Describe how mathematical optimization techniques can be applied to the economic operation of power systems

Discuss how security considerations affect the operation of a power system

Explain the techniques used to balance supply and demand in a power system over different time scales

Explain the objectives/principles of market-based operation of power systems

Explain the foundations of locational marginal pricing and its use in transmission congestion management

To carry out energy audits for optimal use of energy.

An ability to understand billing process for various industrial applications and selection of the factors for better utilization of energy.

Carry out performance analysis of electrical appliances and related case studies for improvement.

Contents

Module I (5 Hours)

Overview, Types of Markets: Spot market, Forward contracts and forward , Future contracts and futures markets, Options, Contracts for difference, MARKETS FOR ELECTRICAL ENERGY: Difference Between a Megawatt-Hour and a Barrel of Oil, The Need for a Managed Spot Market, Operation of the managed spot market, Open Electrical Energy Markets, Bilateral trading, Electricity pools, Comparison of pool and bilateral trading , The Settlement Process.

Module II (7 Hours)

PARTICIPATING IN MARKETS FOR ELECTRICAL ENERGY: The Consumer's Perspective, Retailers of electrical energy, The Producer's Perspective, Perfect competition, The production versus purchase decision, Imperfect competition.

SYSTEM SECURITY AND ANCILLARY SERVICES: Describing the Needs, Balancing issues, Network issues, System restoration, Obtaining Ancillary Services, Compulsory provision of ancillary services, Market for ancillary services, Demand-side provision of ancillary services, Selling Ancillary

Module III Courses

Energy conservation, Energy Audit Basic, Energy Accounting & Analysis, Understanding the utility bill: energy charge, Demand charge, fuel cost arrangement, power factor charge. Electricity rate structure: state example, Energy Economics: LCC, IRR, Energy & taxation: tax consideration & analysis. General Procedure of detail energy audit. Common Energy conservation measures. Case analysis.

Energy costing: Block pricing rate, seasonal pricing rate, innovative rate, Real time pricing rate, Electric lighting

system, energy efficient lighting, lighting control & illumination engineering, energy efficient electrical appliances.

Text Book:

1. Moncef Krarti, "Energy Audit of Building Systems: An Engineering Approach", Second Edition, CRC Press.
2. James Momoh, Lamine Mili, "Economic Market Design and Planning for Electric Power Systems", Wiley & IEEE

Pedagogy

Sl. No.	Topic (All sessions through CRT + Practice)	Instructional Hours	
		Th	Pra
1	Overview, Types of Markets: Spot market, Forward contracts and forward, Future contracts and futures markets, Options, Contracts for difference, MARKETS FOR ELECTRICAL ENERGY: Difference Between a Megawatt-Hour and a Barrel of Oil, The Need for a Managed Spot Market, Operation of the managed spot market, Open Electrical Energy Markets, Bilateral trading, Electricity pools, Comparison of pool and bilateral trading, The Settlement Process.	8	7
2	PARTICIPATING IN MARKETS FOR ELECTRICAL ENERGY: The Consumer's Perspective, Retailers of electrical energy, The Producer's Perspective, Perfect competition, The production versus purchase decision, Imperfect competition. SYSTEM SECURITY AND ANCILLARY SERVICES: Describing the Needs, Balancing issues, Network issues, System restoration, Obtaining Ancillary Services, Compulsory provision of ancillary services, Market for ancillary services, Demand-side provision of ancillary services, Selling Ancillary	8	9
3	Energy conservation, Energy Audit Basic, Energy Accounting & Analysis, Understanding the utility bill: energy charge, Demand charge, fuel cost arrangement, power factor charge. Electricity rate structure: state example, Energy Economics: LCC, IRR, Energy & taxation: tax consideration & analysis. General Procedure of detail energy audit. Common Energy conservation measures. Case analysis. Energy costing: Block pricing rate, seasonal pricing rate, innovative rate, Real time pricing rate, Electric lighting system, energy efficient lighting, lighting control & illumination engineering, energy efficient electrical appliances.	5	15
Total		21	31

Domain D22 - Design, Fabrication and Repair of Transformer up to 33KV

S. No.	Course Code	Course Title	Course Nature	Credits	Prerequisite
1	DETD0121	Design of transformer core	Theory	3	
2	DETD0122	Design of transformer winding	Theory	3	
3	DETD0123	Design of transformer tank & Accessories	Theory	5	
4	DETD0421	Testing and Commissioning	Theory	5	
5	DETD0422	Safety and protection	+	5	
6	DETD0423	Transformer Repair & Maintenance	Practice	5	
7	DEET0300	Project	Project	6	
8	DEET0800	Internship	Practice	4	
Total				36	

DETD0121 Design of Transformer Core

Subject	Code	Type of course	Prerequisite	Credits	T-P-Pr (hrs)
Design of Transformer Core	DETD0121	Theory	FCEN0106: Electrical Machine-I	3	3-0-0

Course Objective:

Students will acquire the skill of designing of transformer core

Course Outcome:

Students will be able to:

Perform different tests for Transformer Testing and Maintenance.

To design an efficient transformer.

To get the idea on name plate and specification details.

Content

Comparing Transformer with different physical size of different Capacity

Phase Current, Line Current and Voltage in a Delta System

Phase Voltage, Line Voltage and Current in a Wye System

Area Product and Core Geometry for Three-Phase Transformers

Output Power Versus Apparent Power and Capability

Conductor Cross-Section Calculation

Calculation of Volts per Turn and Thickness of Core Leg

Design Specification for a Three-phase Transformer with Core Geometry Method

Recommended Books:

1. Transformer Engineering: Design and Practice by S.V. Kulkarni, S.A. Khaparde, Marcel & Dekker Inc.
2. Operation Manuals of Devices, system and utilities
3. Transformer Design, Third Edition, Revised and Expanded by WM. T. MCLYMAN Kg Magnetics, Inc. Idyllwild, California, U.S.A

Text Book:

1. Transformer Engineering: Design and Practice by S.V. Kulkarni, S.A. Khaparde, Marcel & Dekker Inc.

Reference:

1. Design of Transformer by Indrajit Dasgupta, McGraw-Hill Education (India) Private Limited

Online source: www.nptel.ac.in

Pedagogy

Sl. No.	Topic	Teaching Method	Reference/Tool	Instructional Hours		
				Theory	Pract	video
1.	Introduction on Transformer related to design	CRT+ Video animation	www.youtube.com/watch?v=yeXCIR759SA https://www.youtube.com/watch?v=U3CubKnkO4c	1	0	2
2.	Comparing Transformer with different physical Size	CRT+ video+ practical view	PPT/Blackboard www.youtube.com/watch?v=3Tj-LsUrYxM www.youtube.com/watch?v=Q1_rBwuk3AE	3	2	2
3	Phase Current, Line Current, and Voltage in a Delta System	CRT	ppt	3	0	0
4	Phase Voltage, Line Voltage, and Current in a Wye System	CRT	ppt	2	0	0
5	Concept of Area Product, and Core Geometry, for Three-Phase Transformers	CRT+ Video		3	0	1
6	Output Power Versus Apparent Power, Capability	CRT		3	0	
7	Conductor Cross-Section Calculation	CRT & Lab Practice	lab practice	4	1	0
8	Calculation of Volts per Turn and Thickness of Core Leg	CRT		4	1	0
9	Design specification for a three-phase transformer, core geometry method	CRT & Lab Practice	www.youtube.com/watch?v=hJsPQdAhTkQ www.youtube.com/watch?v=hJsPQdAhTkQ&list=RDhJsPQdAhTkQ#t=158	6	1	2
Total: 41 Hours				29	5	7

DETD0122Design of Transformer Winding

Subject	Code	Type of course	Prerequisite	Credits	T-P-Pr (hrs)
Design of transformer winding	DETD0122	Theory	FCEN0106: Electrical Machine-I	3	3-0-0

Course Objective:

Describe how a transformer is constructed and how it works

Design specification for a three-phase transformer, with core geometry method

Course Outcome:

Students will be able to:

Know the different tests and their requirements in transformer.

How to design an efficient transformer.

Can recognize variety of transformer core and type of windings

Content

- Introduction on transformer related to winding design
- Winding Types, Cooling of Winding
- Layer Insulation of LV/HV Winding
- Calculation of Winding and Core Dimension
- Calculation of Core Weight and No-Load Loss
- Calculation of Inductive Part of Impedance Voltage
- Calculation of Load Loss
- Calculation of Impedance Voltage
- Calculation of Coil Length
- Calculation of Winding Gradient and Oil Gradient

Recommended Books:

1. Transformer Engineering: Design and Practice by S.V. Kulkarni, S.A. Khaparde, Marcel & Dekker Inc.
2. Operation Manuals of Devices, system and utilities
3. Transformer Design, Third Edition, Revised and Expanded by WM. T. MCLYMAN Kg Magnetics, Inc. Idyllwild, California, U.S.A

Pedagogy

Sl. No.	Topic	Teaching Method	Reference / Tool	Th	Pra	video
	Introduction on transformer related to winding design	CRT+ Video animation	@@=yeXCIR759SA @@=U3CubKnkO4c	3	0	2
2	Winding types and cooling of windings	CRT+video+practical view	PPT/Blackboard @@=3Tj-LsUrYxM @@=Q1_rBwuk3AE	4	2	2
3	Layer Insulation of LV/HV Winding	CRT+ Video+practice	Ppt @@=bWwlfSt9mBA	4	2	1
4	Tank cooling	CRT	Ppt with animation	2	0	0
5	Oil mixing in the tank	CRT+Video	@@=FG_n_uUejV8	2	0	1
6	Calculation of Winding and Core Dimension	CRT		4	0	0
7	Calculation of Core Weight and No-Load Loss	CRT		4	0	0
8	Calculation of Inductive Part of Impedance Voltage	CRT		4	0	0
9	Calculation of Load Loss	CRT		2	0	0
10	Calculation of Impedance Voltage	CRT		3	0	0
11	Calculation of Coil Length	CRT		2	0	0
12	Calculation of Winding Gradient and Oil Gradient	CRT		4	0	0
	Total: 48 Hours			38	4	6

@@ -www.youtube.com/watch?v

DETD0123 Design of Transformer Tank and accessories

Subject	Code	Type of course	Prerequisite	Credits	T-P-Pr (hrs)
Design of transformer tank & Accessories	DETD0123	Theory	FCEN0106: Electrical Machine-I	5	5-0-0

Course Objective:

Describe how a transformer is constructed and how it works
Explain how a step-up transformer designed
Explain how a step-down transformer designed
Comparing Transformer with different physical Size
Phase Current, Line Current, and Voltage in a Delta System
Phase Voltage, Line Voltage, and Current in a Wye System
Area Product, A_p , and Core Geometry, K_g , for Three-Phase Transformers
Output Power Versus Apparent Power, Capability
Conductor Cross-Section Calculation Variables
Calculation of Volts per Turn and Thickness of Core Leg
Design specification for a three-phase transformer, with core geometry method

Course Outcome:

Students will be able to:

- Know the different tests and their requirements in transformer.
- How to design an efficient transformer.
- Idea on name plate and specification details.
- Can recognize variety of transformer core and type of windings

Content

Introduction on transformer related to tank & accessories design
Calculation of Tank Dimension
Calculation of Heat Transfer
Calculation of the Weight of Insulating Materials, Weight of Duct, Weight of Oil, Weight of Sheet Steel, etc

Recommended Books:

1. Transformer Engineering: Design and Practice by S.V. Kulkarni, S.A. Khaparde, Marcel & Dekker Inc.
2. Operation Manuals of Devices, system and utilities
3. Transformer Design, Third Edition, Revised and Expanded by WM. T. MCLYMAN Kg Magnetics, Inc. Idyllwild, California, U.S.A

Pedagogy

Sl. No.	Topic	Teaching Method	Reference/Tool	Instructional Hrs		
				Theory	Prac	video
1	Introduction on transformer related to tank & accessories design	CRT+ video	www.youtube.com/watch?v=XYkUnm_KV90 www.youtube.com/watch?v=lyZ7nM6Fo94&t=1634s	10	0	2
2	Calculation of Tank Dimension	CRT	PPT/Blackboard	12	3	0
3	Calculation of Heat Transfer	CRT+Practice+video	PPT/Blackboard www.youtube.com/watch?v=UEWMIyrVPzU	18	3	2
4	Calculation of the Weight of Insulating Materials, Weight of Duct, Weight of Oil, Weight of Sheet Steel, etc	CRT+video	PPT/Blackboard www.youtube.com/watch?v=ldLZ3ynObKs	18	0	2
Total : 70 Hours				58	6	6

DETD0421 Testing and Commissioning

Subject	Code	Type of course	Prerequisite	Credits	T-P-Pr (hrs)
Testing and Commissioning	DETD0421	Theory+Practice	FCEN0106: Electrical Machine-I	5	3-2-0

Course Objective:

- Describe how a transformer is constructed and how it works
- Explain how a step-up transformer designed
- Explain how a step-down transformer designed
- Comparing Transformer with different physical Size
- Phase Current, Line Current, and Voltage in a Delta System
- Phase Voltage, Line Voltage, and Current in a Wye System
- Area Product, A_p , and Core Geometry, Kg, for Three-Phase Transformers
- Output Power Versus Apparent Power, Capability
- Conductor Cross-Section Calculation Variables
- Calculation of Volts per Turn and Thickness of Core Leg
- Design specification for a three-phase transformer, with core geometry method

Course Outcome:

Students will be able to

- Know the different tests and their requirements in transformer.
- How to design an efficient transformer.
- Idea on name plate and specification details.
- Can recognize variety of transformer core and type of windings

Content

- Introduction to transformer testing and commissioning
- Capacitance Test
- Transformer turns ratio Test
- Magnetizing current Test
- Magnetic balance Test
- Verification of vector group and polarity Test
- Short circuit impedance test

Measurement of winding resistance test
 Winding Insulation Resistance measurement
 Core Insulation Resistance measurement
 Oil characteristic test

Recommended Books:

1. Transformer Engineering: Design and Practice by S.V. Kulkarni, S.A. Khaparde, Marcel & Dekker Inc.
2. Operation Manuals of Devices, system and utilities
3. Transformer Design, Third Edition, Revised and Expanded by WM. T. MCLYMANKg Magnetics, Inc. Idyllwild, California, U.S.A

Pedagogy

Sl. No.	Topic	Teaching Method	Reference / Tool	Instructional Hrs	
				Th	Pra
1	Introduction to transformer testing and commissioning	CRT		3	0
2	Capacitance Test	CRT+ Practice	PPT/Blackboard	4	6
3	Transformer turns ratio Test	CRT+Practice		3	3
4	Magnetizing current Test	CRT+Practice		2	2
5	Magnetic balance Test	CRT+Practice		4	3
6	Verification of vector group and polarity Test Short circuit impedance test	CRT+Practice		4	9
7	Measurement of winding resistance test	CRT+Practice		3	5
8	Winding Insulation Resistance measurement	CRT+Practice		2	6
9	Core Insulation Resistance measurement	CRT+Practice		2	4
10	Oil characteristic test	CRT+Practice		2	6
Total 72 Hours				29	43

DETD0422Safety and Protection

Subject	Code	Type of course	Prerequisite	Credits	T-P-Pr (hrs)
Safety and protection	DETD0422	Theory+Practice	Electrical Machine-I	5	3-2-0

Course Objective:

Describe how a transformer is constructed and how it works
 Explain how a step-up transformer designed
 Explain how a step-down transformer designed
 Comparing Transformer with different physical Size
 Phase Current, Line Current, and Voltage in a Delta System
 Phase Voltage, Line Voltage, and Current in a Wye System
 Area Product, A_p , and Core Geometry, K_g , for Three-Phase Transformers
 Output Power Versus Apparent Power, Capability
 Conductor Cross-Section Calculation Variables
 Calculation of Volts per Turn and Thickness of Core Leg
 Design specification for a three-phase transformer, with core geometry method

Course Outcome:

Students will be able to:

- Know the different tests and their requirements in transformer.
- How to design an efficient transformer.
- Idea on name plate and specification details.
- Can recognize variety of transformer core and type of windings.

Content

- Introduction to transformer safety and protection
- Condition's leading to faults
- Fault current
- Protective Relay & Schemes
- Monitors & Alarms
- Failure Statistics

Recommended Books:

1. Transformer Engineering: Design and Practice by S.V. Kulkarni, S.A. Khaparde, Marcel & Dekker Inc.
2. Operation Manuals of Devices, system and utilities
3. Transformer Design, Third Edition, Revised and Expanded by WM. T. MCLYMANKg Magnetics, Inc. Idyllwild, California, U.S.A

Pedagogy

(Teaching method for all sessions through CRT + Practice)

Sl. No.	Topic	Th	Pra
1	Introduction to transformer safety and protection	4	4
2	Condition's leading to faults	4	9
3	Fault current	4	6
4	Protective Relay & Schemes	5	6
5	Monitors & Alarms	6	6
6	Failure Statistics	6	9
Total 67 Hours		27	40

DETD0423 Transformer Repair and Maintenance

Subject	Code	Type of course	Prerequisite	Credits	T-P-Pr (hrs)
Transformer Repair & Maintenance	DETD0423	Theory+Practice	Electrical Machine-I	5	2-3-0

Course Objective

- Describe how a transformer is constructed and how it works
- Explain how a step-up transformer designed
- Explain how a step-down transformer designed
- Comparing Transformer with different physical Size
- Phase Current, Line Current, and Voltage in a Delta System
- Phase Voltage, Line Voltage, and Current in a Wye System
- Area Product, Ap, and Core Geometry, Kg, for Three-Phase Transformers
- Output Power Versus Apparent Power, Capability
- Conductor Cross-Section Calculation Variables
- Calculation of Volts per Turn and Thickness of Core Leg
- Design specification for a three-phase transformer, with core geometry method

Course Outcome

On completing this course, students will be able to:

- Know the different tests and their requirements in transformer.
- How to design an efficient transformer.
- Idea on name plate and specification details.
- Can recognize variety of transformer core and type of windings

Sl. No.	Topic	Teaching Method	Reference / Tool	Instructional Hrs	
				Th	Prac
1	Transformer O&M Cycle	CRT	Ppt with animation	3	3
2	Preventive maintenance program	CRT + Practice		2	6
3	Periodicity of the Inspection			2	6
4	Maintenance procedures for the insulating oil			3	6
5	Maintenance and inspection of the bushings, cooling equipment, etc			3	6
6	Testing for transformer Repair			3	9
7	Identification of fault.			3	6
8	Repair Process, On-site & off Site, Economic.			2	9
Total 72 Hours					21

Content:

Transformer O&M Cycle

Preventive maintenance program

Periodicity of the Inspection

Maintenance procedures for the insulating oil

Maintenance and inspection of the bushings, cooling equipment, etc

Testing for transformer Repair

Identification of fault.

Repair Process, On-site & off Site, Economic

Recommended Books:

1. Transformer Engineering: Design and Practice by S.V. Kulkarni, S.A. Khaparde, Marcel & Dekker Inc.
2. Operation Manuals of Devices, system and utilities

**CENTURION UNIVERSITY OF TECHNOLOGY & MANAGEMENT:: PARALAKHEMUNDI
ODISHA**

CHOICE BASED CREDIT SYSTEM

COURSE STRUCTURE

BASKET V - Domain D19 - Renewable Energy



**Centurion
UNIVERSITY**

**School of Engineering &
Technology JUNE 2017**

Domain D19 - Renewable Energy

S. No.	Course Code	Course Title	Course Nature	Credits	Prerequisite
1	DERE0161	Renewable Energy Sources and Technology	Theory	3	
2	DERE0162	Solar Photovoltaic Technology	Theory	3	
3	DERE0163	Solar Thermal Technology	Theory	3	
4	DERE0464	Solar Systems for Buildings	Th. + Pra.	5	
5	DERE0465	Solar Power Plant	Th. + Pra.	5	
6	DERE0466	Decentralized and Smart Power Grids	Th. + Pra.	5	
7.	DERE0267	Solar Photovoltaic Laboratory	Practice	2	
8.	DERE0268	Solar Thermal Laboratory	Practice	2	
9.	DEET0300	Project	Project	6	
10.	DEET0800	Internship	Practice	4	
			Total	38	

Introduction

Energy growth is directly linked to well-being and prosperity across the globe. Meeting the growing demand for energy in a safe and environmentally responsible manner is a key challenge. To support economic and social progress and build a better quality of life, in particular in developing countries energy plays vital role. For developed nations such as Canada, reliable and affordable energy enables the products and services that enrich and extend life. Energy is being powering computers, transportation, communications, cutting edge medical equipment and much more.

For developing nations, the need for reliable and affordable energy is more fundamental. It can improve and even save lives. In these countries, reliable energy supports expanded industry, modern agriculture, increased trade and improved transportation. These are the building blocks that help people escape poverty and create better lives.

Today most of the energy the world consumes comes from hydrocarbons, with crude oil being the dominant source of transportation fuels. Even with significant strides in improved energy efficiency, global energy demand is expected to rise by about 25 percent from 2014 to 2040.

Renewable energies are sources of clean, inexhaustible and increasingly competitive energy. They differ from fossil fuels principally in their diversity, abundance and potential for use anywhere on the planet, but above all in that they produce neither greenhouse gases – which cause climate change – nor polluting emissions. Their costs are also falling and at a sustainable rate, whereas the general cost trend for fossil fuels is in the opposite direction in spite of their present volatility.

DERE0161 RENEWABLE ENERGY SOURCES AND TECHNOLOGY

Code	Course Title	Course Type	Credits	Pre-requisite	T-P-Pr (hrs)
DERE0161	Renewable Energy Sources And Technology	Theory	3	NIL	3-0-0

Course Objectives:

The objectives of this subject are:

- 1.To understand the importance of renewable energy both I national and international scenario.
- 2.To explain basics of renewable energy resources.
- 3.To understand different government policies for renewable energy application.

Course Outcomes:

Upon successful completion of this subject, students should be able to:

- 1.To understand the importance of energy both I national and international scenario.
- 2.To explain basics of renewable energy resources.
3. To understand different government policies for renewable energy application.

Energy Scenario: Classification of Energy Sources, Energy resources (Conventional and nonconventional, Energy needs of India, and energy consumption patterns. Worldwide Potentials of these sources. Energy efficiency and energy security. Energy and its environmental impacts. Solar Energy Regulations and Policy Programme: Jawaharlal Nehru National Solar Mission (JNNSM), JNNSM Regulations regarding grid interconnected solar energy systems Solar Energy policy, 2012, Policies implementation by MNRE.

Solar Energy: Solar radiation at the earth's surface solar radiation measurements estimation of average solar radiation solar thermal flat plate collectors concentrating collector's solar thermal applications heating, cooling, desalination, drying, cooking, and solar thermal electric power plant. Principle of photovoltaic conversion of solar energy, types of solar cells Photovoltaic applications: battery charger, domestic lighting, street lighting, water pumping etc. Solar PV power plant Net metering Concept.

Wind Energy: Nature of wind, Wind speed and power relation, power extracted from wind, wind distribution and wind speed predictions. Wind power systems: system components, Types of Turbine, Turbine rating. Choice of generators, turbine rating, electrical load matching, Variable speed operation, maximum power operation, control systems, system design features, stand alone and grid connected operation. Small Hydro Systems.

Bio-Energy: Biomass resources and their classification Biomass conversion processes - Thermo chemical conversion direct combustion biomass gasification pyrolysis and liquefaction biochemical conversion anaerobic digestion types of biogas Plants applications alcohol production from biomass bio diesel production Urban waste to energy conversion Biomass energy programme in India.

Other Types of Energy: Ocean energy resources principle of ocean thermal energy conversion (OTEC) - ocean thermal power plants ocean wave energy conversion tidal energy conversion small hydro geothermal energy geothermal power plants hydrogen production and storage Fuel cell principle of working - various types construction and applications.

Text Books:

1. Non-conventional energy sources by G.D. Rai, Khanna Publishers.
2. Biomass Gasification and Pyrolysis: Practical Design and Theory, Prabir Basu, Academic Press.
3. Johnson GL. Wind Energy Systems, (Electronic Edition), Prentice Hall Inc, 2006
4. Mathew S. Wind Energy: Fundamentals, Resource Analysis and Economics. Springer, 2006

Reference Books:

1. Moran, H. and Rawn, S. P. 2006. Principles of Biochemistry, Pearson Education
2. Kothari, D.P., Singal, K.C. and Ranjan, R. 2008. Renewable Energy Sources and Emerging Technologies, Prentice hall, New Delhi
3. Biogas Systems: Principles And Applications, Author: Mittal, K M Publisher: New Age International Publishers Ltd.-New Delhi.
4. Burton T. Sharpe D. Jenkins N. Bossanyi E. Wind Energy Handbook. John Wiley, 2001
5. Kothari DP. Renewable energy sources and emerging technologies, PHI learning, 2014

Pedagogy (All sessions through CRT + Practice)

Sl. No.	Topic	Th +Tut

01	Energy Scenario: Classification of Energy Sources, Energy resources (Conventional and nonconventional), Energy needs of India, and energy consumption patterns. Worldwide Potentials of these sources. Energy efficiency and energy security. Energy and its environmental impacts. Solar Energy Regulations and Policy Programme: Jawaharlal Nehru National Solar Mission (JNNSM) - JNNSM Regulations regarding grid interconnected solar energy systems –Solar Energy policy, 2012, Policies implementation by MNRE.	8
02	Solar Energy: Solar radiation at the earth's surface – solar radiation measurements – estimation of average solar radiation –solar thermal flat plate collectors - concentrating collectors –solar thermal applications - heating, cooling, desalination, drying, cooking, and solar thermal electric power plant. Principle of photovoltaic conversion of solar energy, types of solar cells – Photovoltaic applications: battery charger, domestic lighting, street lighting, water pumping etc. Solar PV power plant – Net metering Concept.	9

Sl. No.	Topic	Th +Tut
03	Wind Energy: Nature of wind, Wind speed and power relation, power extracted from wind, wind distribution and wind speed predictions. Wind power systems: system components, Types of Turbine, Turbine rating. Choice of generators, turbine rating, electrical load matching, Variable speed operation, maximum power operation, control systems, system design features, stand alone and grid connected operation. Small Hydro Systems.	9
04	Bio-Energy: Biomass resources and their classification –Biomass conversion processes - Thermo chemical conversion - direct combustion – biomass gasification - pyrolysis and liquefaction –biochemical conversion - anaerobic digestion – types of biogas Plants - applications - alcohol production from biomass – bio diesel production –Urban waste to energy conversion –Biomass energy programme in India.	8
05	Other Types of Energy : Ocean energy resources –principle of ocean thermal energy conversion (OTEC) - ocean thermal power plants –ocean wave energy conversion - tidal energy conversion small hydro –geothermal energy - geothermal power plants –hydrogen production and storage – Fuel cell – principle of working - various types –construction and applications.	8
	Total	42

DERE0162 SOLAR PHOTOVOLTAIC TECHNOLOGY

Code	Course Title	Course Type	Credits	Pre-requisite	T-P-Pr (hrs)
DERE0162	Solar Photovoltaic Technology	Theory	3	NIL	3-0-0

Course Objectives:

The objectives of this subject are to:

1. To explain basics of solar photovoltaic systems.
2. To know in depth of its types and design of various PV-interconnected systems.

Course Outcomes:

Upon successful completion of this subject, students should be able :

1. To explain basics of solar photovoltaic systems.
2. To know in depth of its types and design of various PV-interconnected systems.

Syllabus

Basic of Photovoltaic: fundamentals of semiconductor and basic electrical quantities Structure and working of Solar Cells Types, Electrical properties and Behavior of Solar Cells Cell properties and design PV Cell Interconnection and Module Fabrication - PV Modules and arrays –Basics of Load Estimation.

Stand Alone PV systems: Schematics, Components, Batteries, and Charge Conditioners Balance of system components for DC and/or AC Applications Typical applications for lighting, Design of Typical Stand Alone PV System. (10) Water pumping.

Grid Connected PV systems: Schematics, Components, Charge Conditioners and Interface Components – Balance of system Components Design of grid interacting systems –PV System in Buildings.

Hybrid Systems: Solar, Biomass, Wind, Diesel Hybrid systems Comparison and selection criteria for a given application.

Design of PV systems: Radiation and load data –Design of System Components for different PV Applications Sizing and Reliability –Simple Case Studies.

Text Books:

1. CS Solanki: Solar Photovoltaic – Fundamentals, Technologies and Applications, PHI Learning Pvt. Ltd.,

2011.

2. Martin A. Green, Solar Cells Operating Principles, Technology, and System Applications Prentice- Hall, 2008.

Reference Books:

1. Nelson, J The Physics of Solar Cells. Imperial College Press, 2003. Thomas Markvart, Solar Electricity, John Wiley and Sons, 2001.
2. Stuart R. Wenham, Martin A. Green, Muriel E. Watt, Richard Corkish (Editors), Applied Photovoltaic, Earthscan, 2008.
3. Michael Boxwell, The Solar Electricity Handbook, Code Green Publishing, UK, 2009.
4. Rik De Gunther, Solar Power Your Home for Dummies, Wiley Publishing Inc, 2008.
5. Photovoltaic: Design and Installation Manual, Published by Solar Energy International.

Pedagogy

Sl. No.	Topic	Teaching Method	Reference/ Tool	Th.+ Tut
01	Basic of Photovoltaic: fundamentals of semiconductor and basic electrical quantities Structure and working of Solar Cells –Types, Electrical properties and Behavior of Solar Cells –Cell properties and design –PV Cell Interconnection and Module Fabrication - PV Modules and arrays –Basics of Load Estimation.	CRT	Chalk & Talk and PPT	8
02	Stand Alone PV systems: Schematics, Components, Batteries, Charge Conditioners –Balance of system components for DC and/or AC Applications –Typical applications for lighting, Design of Typical Stand Alone PV System. (10) Water pumping.	CRT& Lab	Chalk & Talk , PPT CAD tool	9
03	Grid Connected PV systems: Schematics, Components, Charge Conditioners and Interface Components – Balance of system Components Design of grid interacting systems –PV System in Buildings.	CRT& Lab		9
04	Hybrid Systems: Solar, Biomass, Wind, Diesel Hybrid systems – Comparison and selection criteria for a given application.	CRT& Lab		8
05	Design of PV systems: Radiation and load data –Design of System Components for different PV Applications Sizing and Reliability –Simple Case Studies.	CRT& Lab		8
Total		42		

DERE0163 Solar Thermal Technology

Code	Course Title	Course Type	Credits	Pre-requisite	T-P-Pr (hrs)
DERE0163	Solar Thermal Technology	Theory	3	NIL	3-0-0

Course Objectives:

The objectives of this subject are to:

1. To clarify impression of various solar thermal energy collectors.
2. To delineate the other applications and the devices used to collect solar energy.
3. To summarize the basic economics of solar energy collection system.

Course Outcomes:

Upon successful completion of this subject, students should be able to:

1. Understand The impression of various solar thermal energy collectors
2. Understand other applications and the devices used to collect solar energy
3. Know basic economics of solar energy collection system

Solar Collector: Fundamentals of solar collectors as devices to convert solar energy to heat. Non-concentrating low temperature flat-plate and evacuated tube collectors. Design and structures of collectors for heating liquids and air. Flat plate – Evacuated tube (Concentrated) Pool and Air collectors Construction Function -Suitability – Comparison - Storage Tank –Solar Fluids.

Solar Water Heating System: Integral Collector Storage System Thermo syphon System - Open Loop, Drain Down, Drain Back, Antifreeze Systems Refrigerant Solar Water Heaters –Solar Heated Pools Solar Heated Hot Tubs and Spas.

Solar Space Conditioning Systems: Liquid Type Solar Heating System With / Without Storage Heat Storage Configurations Heat Delivery Methods - Air-Type Solar Heating Systems Solar Refrigeration and Air Conditioning. Other Solar Applications: Solar Cooking Distillation Desalination Solar Ponds Solar Passive Architecture –

Solar Drying Solar Chimney.

Solar Economics : Application Of Economic Methods To Analyze The Feasibility Of Solar Systems To Decide Project Policy Alternatives Net Energy Analysis - And Cost Requirements For Active And Passive Heating And Cooling - For Electric Power Generation And For Industrial Process-Heating.

Text Books:

1. H P Garg, M Dayal, G Furlan, Physics And Technology Of Solar Energy- Volume I: Solar Thermal Applications, Springer, 2007.
2. Sukhatme And Nayak, Solar Energy: Principles Of Thermal Collection And Storage, Tata Mcgraw.Hill, 2008.

Reference Books:

1. Bob Ramlow & Benjamin Nusz, Solar Water Heating, New Society Publishing, 2006.
2. John Canivan, Solar Thermal Energy, Sunny Future Press - 2003.
3. Charles Christopher Newton - Concentrated Solar Thermal Energy- Published by VDM Verlag, 2008.
4. H.P.Garg, S.C.Mullick, A.K.Bhargava, D.Reidal, Solar Thermal Energy Storage Springer, 2005.
5. Anne Grete Hestnes, Robert Hastings, Bjarne Saxhof, Solar Energy Houses: Strategies, Technologies Examples, Earthscan Publications, 2003.

Pedagogy

Sl. No.	Topic	Teaching Method	Reference / Tool	Th +Tut
01	Solar Collector: Fundamentals of solar collectors as devices to convert solar energy to heat. Non-concentrating low temperature flat-plate and evacuated tube collectors. Design and structures of collectors for heating liquids and air. Flat plate – Evacuated tube (Concentrated) Pool and Air collectors Construction Function - Suitability – Comparison - Storage Tank –Solar Fluids.	CRT	Chalk & Talk and PPT	14
02	Solar Water Heating System: Integral Collector Storage System Thermo syphon System - Open Loop, Drain Down, Drain Back, Antifreeze Systems Refrigerant Solar Water Heaters –Solar Heated Pools Solar Heated Hot Tubs and Spas.	CRT & Lab	Chalk & Talk , PPT CAD tool	8
03	Solar Space Conditioning Systems: Liquid Type Solar Heating System With / Without Storage Heat Storage Configurations Heat Delivery Methods - Air-Type Solar Heating Systems Solar Refrigeration and Air Conditioning.	CRT & Lab		6
04	Other Solar Applications: Solar Cooking Distillation Desalination Solar Ponds Solar Passive Architecture – Solar Drying Solar Chimney.	CRT & Lab		7
05	Solar Economics : Application of economic methods to analyze the feasibility of solar systems to decide project policy alternatives Net energy analysis - and cost requirements for active and passive heating and cooling - for electric power generation and for industrial process-heating.	CRT & Lab		7
	Total	42		

DERE0464 Solar Systems for Buildings

Code	Course Title	Course Type	Credits	Pre-requisite	T-P-Pr (hrs)
DERE0464	Solar Systems For Buildings	Theory + Practice	5	NIL	2-2-0

Course Objectives:

The objectives of this subject are to:

1. To explain the concept of solar thermal and electrical applications of buildings.
2. To summarize basic economics of solar buildings.

Course Outcomes:

Upon successful completion of this subject, students should be able to:

1. Explain the concept of solar thermal and electrical applications of buildings and
2. Sort out the basic economics of solar buildings and its components

Syllabus

Introduction: Elements of Buildings Traditional, Modern and Alternative Buildings Concepts and Elements of Thermal Comfort → Materials and Methods of Construction Thermal Properties of Building Elements.

Solar Heat Gain in Buildings: Building orientations Geometric Shapes / Factors –Building Thermal Resistance Computation of R and U Values for Building Elements and their comparison –Calculation of Solar Heat incident on various building surfaces –Diurnal and Seasonal Variation –Solar Space Conditioning.

Solar Thermal Systems for Buildings: Intuitive and responsive building design –Solar Collectors, Cookers, Thermal Energy Storage Systems and their Integration with Buildings – Advantages and Limitations → Sizing, Area and Performance Calculations.

Solar PV Systems for Buildings: Solar PV Systems for standalone and Grid Interconnected Applications – Integration of SPV components with buildings. Sizing,) Area and Performance Calculations.

Economic Analysis: Economic analysis for alternative selection of materials Life Cycle Analysis for Thermal and Electrical Solar Systems.

Payback period calculations: energy tariff calculations for grid electricity and designed renewable energy system. Different aspects of payback period calculations

Text Books:

1. Jan F. Kreider, The solar heating design process: active and passive systems, McGraw- Hill, 2007.
2. David A. Bainbridge, Ken Haggard, Kenneth L. Haggard, Passive Solar Architecture: Heating, Cooling, Ventilation, Day lighting, and More Using Natural Flows, Chelsea Green Publishing, 2011.

Reference Books:

1. John Schaeffer, Doug Pratt, Douglas R. Pratt, Solar living sourcebook,2007.
2. A common-sense guide to alternative homebuilding, Thegoodhouse.
3. Joseph F. Kennedy, Catherine Wanek, Michael G. Smith, The art of natural building: design, construction, resources, New Society Publishers, 2004.
4. Sukhatme and Nayak , Solar Energy: Principles Of Thermal Collection & Storage, Tata McGraw- Hill, 2008.
5. Ibrahim Dincer and Marc A Rosan, Thermal Energy Storage: Systems & Applications, John Wiley, 2006.
6. Duffie J.A. and Beckman W.A., „Solar Engineering of Thermal Processes“, Wiley, New York.1, 2006.

Pedagogy

Sl. No	Topic	Teaching Method	Reference / Tools	Th +Tut	Pra
01	Introduction: Elements of Buildings Traditional, Modern and Alternative Buildings Concepts and Elements of Thermal Comfort Materials and Methods of Construction Thermal Properties of Building Elements	CRT	Chalk & Talk and PPT	6	6
02	Solar Heat Gain in Buildings: Building orientations Geometric Shapes / Factors Building Thermal Resistance Computation of R and U Values for Building Elements and their comparison – Calculation of Solar Heat incident on various building surfaces – Diurnal and Seasonal Variation –Solar Space Conditioning.	CRT and Lab	Chalk & Talk , PPT, Simulation through CAD tool	36	6
03	Solar Thermal Systems for Buildings: Intuitive and responsive building design –Solar Collectors, Cookers, Thermal Energy Storage Systems and their Integration with Buildings – Advantages and Limitations –) Sizing, Area and Performance Calculations.	CRT	Chalk & Talk and PPT	6	6
04	Solar PV Systems for Buildings: Solar PV Systems for standalone and Grid Interconnected Applications –Integration of SPV components with buildings. Sizing,) Area and Performance Calculations.	CRT and Lab	Chalk & Talk , PPT, Simulation through CAD tool	6	6
05	Economic Analysis : Economic analysis for alternative selection of materials Life Cycle Analysis for Thermal and Electrical Solar Systems.	CRT	Chalk & Talk and PPT	6	6
06	Payback period calculations: energy tariff calculations for grid electricity and designed renewable energy system. Different aspects of payback period calculations.	CRT	Chalk & Talk and PPT	6	6
		Total	72	36	36

DERE0465 Solar Power Plant

Code	Course Title	Course Type	Credits	Pre-requisite	T-P-Pr (hrs)
DERE0465	Solar Power Plant	Theory + Practice	5	NIL	3-2-0

Course Objectives:

The objectives of this subject are to:

1. To explain concept of various power cycles involved in the solar power plants.
2. To outline the variety of solar systems used to collect solar energy.
3. To summarize basic economics of solar power plants.

Course Outcomes:

Upon successful completion of this subject, students should be able to:

1. Explain the concept of various power cycles involved in the solar power plants
2. Understood the variety of solar systems used to collect solar energy
3. Know the basic economics of solar power plants

Syllabus

Design, controlling,

Introduction: Power Plant Scenario Classification, Basic Principles and Features Comparison and selection Criteria.

Solar PV Power Plants: National / International PV Power Programmes Photovoltaic Power Systems System Integration Energy Storage Power Electronics Stand-Alone Systems

Planning and design of solar PV plant: site survey, soil survey, shadow analysis and ambient analysis. Plant sizing and installation procedure, Operation maintenance of Solar PV plant, Instrumentation for solar PV plant. automation and control of solar PV plant. Grid-Connected Systems –Concentrating Photovoltaic (CPV) - Electrical Performance.

Economics of Power Plants: Methods of fixing power tariff Simple Methods to Calculate the Plant Economy Life Cycle Cost - Payback Period Economic Analysis for the Selection of Alternative Decisions and the future of the Power Plants.

Text Books:

1. Duffie, J.A., and Beckman, W.A. Solar Energy Thermal Process, John Wiley and Sons, New York, 2006.
2. Kosuke Kurokawa (Ed.), Eergy from the Desert – Feasibility of very large scale photovoltaic power generation systems, James and James 2003.
3. Sukhatme S.P., Solar Energy, Tata McGraw Hills P Co., 3rd Edition, 2008.

Reference Books:

1. C.J. Winter, R.L. Sizmann, L.L. Vant-Hull, Solar Power Plants, Springer- Verlag Berlin and Heidelberg GmbH & Co. K, 2001.
2. Tomas Markvart, Solar electricity, John Wiley & Sons, 2003.
3. JorgSchlaich, The solar chimney: Electricity from the sun, Edition Axel Menges, 2005.
4. John McBrewster , Frederic P. Miller, Agnes F. Vandome (Eds.) Renewable EnergyCommercialization, Alpha script Publishing 2009

Pedagogy

Sl. No	Topic	Teaching Method	Reference / Tools	Th +Tut	Pra
01	Introduction: Power Plant Scenario –Classification, Basic Principles and Features Comparison and selection Criteria.	CRT	Chalk & Talk and PPT	8	8
02	Solar Power Cycles: Vapour cycles. Organic cycles. Combined cycles.)Binary Cycles. Striling and other cycles.	CRT and Lab	Chalk & Talk , PPT, Simulation through CAD tool	9	9
03	Solar Thermal Power Plants: Collector, Receiver, Energy Transfer Power cycles Tower, Trough and Dish Systems Concentrating Dish Systems Concentrating Linear Fresnel Reflectors Combined and Binary Cycles Solar Chimneys - Hybrid Systems.	CRT and Lab	Chalk & Talk and PPT	10	10
04	Solar PV Power Plants: National / International PV Power Programmes Photovoltaic Power Systems – System Integration Energy Storage Power Electronics Stand-Alone Systems Grid-Connected Systems – Concentrating Photovoltaic (CPV) - Electrical Performance.	CRT& Lab	Chalk & Talk , PPT CAD tool	10	0
05	Economics of Power Plants: Methods of fixing power tariff Simple Methods to Calculate the Plant Economy Life Cycle Cost - Payback Period Economic Analysis for the Selection of Alternative Decisions and the future of the Power Plants.	CRT& Lab	Chalk & Talk , PPT CAD tool	5	0
Total(84)				42	42

DERE0466 Decentralized and Smart Power Grids

Code	Course Title	Course Type	Credits	Pre-requisite	T-P-Pr (hrs)
DERE0466	Decentralized And Smart Power Grids	Theory + Practice	5	NIL	3-2-0

Course Objectives:

The objectives of this subject are:

1. To explain the importance of decentralized power grid.
2. To explain technology and protocols for smart grid.

Course Outcomes:

Upon successful completion of this subject, students should be able:

1. To explain the importance of decentralized power grid.
2. To explain technology and protocols for smart grid.

Syllabus

Introduction: Decentralized generation technologies; Costs and choice of technology, Demand and benefits forecasting and program development, Principles of cost-benefit calculations, Economic and financial analysis of stand-alone electrification projects, Decentralized versus central station generation, Traditional power systems, Load curves and load curve analysis

Different distributed generators: Basic gas turbine generator concepts; Utility system turbine generators; Mini and micro gas turbine generators; Solar thermal power generation, utility scale photovoltaic (USPV) generation; Wind-powered generation; Biomass based generation; DG Evaluation: Cost from past, present, and future, basic DG cost analysis, cost Evaluation and schedule of demand, Grid interconnection options. The power grid; DG- Grid interconnection issues; Case Study.

Smart grid: Driving the move towards Smart Grids globally and in India Smart Grid. Distribution Management Systems (DMS) and Meter Data Management (MDM) are improving energy efficiency and security of supply in Distribution Systems Overview of Power Electronics in Electrical T&D Systems, Power Electronics in emerging Smart Grids, (6)Transmission (DC Super Grids) , Distribution (PE facilitating the integration of, (Distributed Generation, Renewables, Micro grids, Virtual Power Plants (VPP), Storage, Fault Current Limitation, Power Electronics, Super Conducting and Magnetic types)

Developing technology and systems that will enable grids to work smarter in the future: Storage: Organic and Inorganic Salts & Synthetic Heat Storage, Developing technology and systems that will enable grids to work smarter in the future (Smart Meters, Recording consumption, Advanced payback options for load-management, Communication between the utility and customer's home (for home automation)), Challenges faced by the Transmission System Developing technology and systems that will enable smarter transmission of bulk energy (Metering, Trading mechanisms, AC – FACTS (Statcom) Challenges faced by the Distribution Networks:(How to be more energy efficient, stable, reliable and environmentally friendly, Reducing losses, Integration of renewables Connecting/disconnecting micro-grids and virtual power plants, manage bi-directional energy flows), Developing technology and systems that will enable smarter distribution networks (DC – MVDC, Fault Current Limiters, Others (AC/DC TXs etc))

Text Books:

1. Subhes Bhattacharyya“Rural Electrification ThroughDecentralised Off-grid Systems in Developing Countries”Springer-Verlag London publication.
2. B. Robyns, B. François, G.Delille, C.SaudemontJorgSchlaich, “Energy storage in Electric Power Grids”Wiley-ISTEJune 2015.

Reference Books:

1. James A. Momoh “Smart Grid: Fundamentals of Design and Analysis” Wiley January 2012.
2. Peter Fox-Penner “Smart Power: Climate Change, the Smart Grid, and the Future of Electric Utilities”5 April 2010.

Pedagogy

Sl. No.	Topic	Teaching Method	Reference/ Tool	The +Tut	Pra
01	Introduction: Decentralized generation technologies; Costs and choice of technology, Demand and benefits forecasting and program development, Principles of cost-benefit calculations, Economic and financial analysis of stand-alone electrification projects, Decentralized versus central station generation, Traditional power systems, Load curves and load curve analysis.	CRT	Chalk & Talk and PPT	12	13
02	Different distributed generators: Basic gas turbine generator concepts; Utility system turbine generators; Mini and micro gas turbine generators; Solar thermal power generation, utility scale photovoltaic (USPV) generation; Wind-powered generation; Biomass based generation; DG Evaluation: Cost from past, present, and future, basic DG cost analysis, cost Evaluation and schedule of demand, Grid interconnection options. The power grid; DG-Grid interconnection issues; Case Study.	CRT& Lab	Chalk & Talk , PPT CAD tool	10	12
03	Smart grid: Driving the move towards Smart Grids globally and in India Smart Grid. Distribution Management Systems (DMS) and Meter Data Management (MDM) are improving energy efficiency and security of supply in Distribution Systems Overview of Power Electronics in Electrical T&D Systems, Power Electronics in emerging Smart Grids, (6)Transmission (DC Super Grids) , Distribution (PE facilitating the integration of, (Distributed Generation, Renewables, Micro grids, Virtual Power Plants (VPP), Storage, Fault Current Limitation, Power Electronics, Super Conducting and Magnetic types)	CRT& Lab	Chalk & Talk , PPT CAD tool	12	8
04	Developing technology and systems that will enable grids to work smarter in the future: Storage: Organic and Inorganic Salts & Synthetic Heat Storage, Developing technology and systems that will enable grids to work smarter in the future (Smart Meters, Recording consumption, Advanced payback options for load-management, Communication between the utility and customer's home (for home automation)), Challenges faced by the Transmission System Developing technology and systems that will enable smarter transmission of bulk energy (Metering, Trading mechanisms, AC – FACTS (Statcom) Challenges faced by the Distribution Networks:(How to be more energy efficient, stable, reliable and environmentally friendly, Reducing losses, Integration of renewables Connecting/disconnecting micro-grids and virtual power plants, manage bi-directional energy flows), Developing technology and systems that will enable smarter distribution networks (DC – MVDC, Fault Current Limiters, Others (AC/DC TXs etc))	CRT& Lab	Chalk & Talk , PPT CAD tool	8	9
	Total			42	42

DERE0267 Solar Photovoltaic Laboratory

Code	Course Title	Course Type	Credits	Pre-requisite	T-P-Pr (hrs)
DERE0267	Solar Photovoltaic Laboratory	Practice	2	NIL	0-2-0

Course Objectives:

The objectives of this subject are :

1. To construct a practical knowledge on various devices of solar PV systems and trying with an assortment of parameters
2. To re-iterate and analyze the numerical results from trial and error.
3. Generate perception on practice usages of solar PV gadgets/ industrial utilities

Course Outcomes:

Upon successful completion of this subject, students should be able to understand:

1. The various characteristics of the solar cell under local climatic working conditions.
2. The performance of the Solar PV cell under various specified operating temperature ranges and will be able to relate it with nominal values.
3. The various radiation measuring instruments related to solar photovoltaic.

Syllabus

Experiments:

1. Power Output Vs Exposed Area.
2. Power Output Vs Azimuthal and Tilt Angle
3. Testing of SPV Standalone Systems
4. Spectral Response of a PV Cell.
5. Testing on Solar Home Systems
6. To Study the Effect of Temperature on Module Output.
7. Optimization of SPV Systems with Load Resizing
8. Testing of Simple Hybrid Systems
9. Testing of Solar PV Water Pumps
10. Studies on Charging and Discharging Cycles of the batteries.
11. Study of watt lumen characteristics of LED and CFL.

Pedagogy (All sessions through Practice)

Sl. No.	Topic	Pra hrs
01	Power Output Vs Exposed Area	3
02	Power Output Vs Azimuthal and Tilt Angle	3
03	Testing of SPV Standalone Systems	3
04	Spectral Response of a PV Cell	3
05	Testing on Solar Home Systems	6
06	To Study the Effect of Temperature on Module Output.	3
07	Optimization of SPV Systems with Load Resizing	6
08	Testing of Simple Hybrid Systems	3
09	Testing of Solar PV Water Pumps	6
10	Studies on Charging and Discharging Cycles of the batteries.	3
11	Study of watt lumen characteristics of LED and CFL	3
	Total	42

DERE0268 Solar Thermal Laboratory

Code	Course Title	Course Type	Credits	Pre-requisite	T-P-Pr (hrs)
DERE0268	Solar Thermal Laboratory	Practice	2	NIL	0-2-0

Course Objectives:

The objectives of this subject are:

1. To produce an ultimate practical knowledge on various gadgets of solar systems and trying with assorted parameters
2. To analyze of analyzing the numerical results from experimentation
3. To generate consciousness on routine usages of solar energy gadgets/ industrial utilities

Course Outcomes:

Upon successful completion of this subject, students should be able to understand:

1. The working principle behind the existing collector systems practically.
2. The domestic and industrial purposes and usages of solar gadgets available.
3. The various radiation measuring instruments and storages related to solar thermal studies.

Experiments:

1. Solar Radiation Measurements
2. Determination of Thermal Efficiency of Flat Plate Collector.
3. To Determine the Heat Loon Factor and Heat Removal Factor of a Flat Plate Solar Collector.
4. Flat Plate Solar Water Heater
5. Flat Plate Solar Air Heater
6. Flat Plate Collector with Reflector
7. Parabolic Trough Collector
8. Evacuated Tube Collector
9. Drying Performance of a Solar Dryer.
10. Solar Cookers
11. Thermal Storage Systems

Pedagogy (All sessions through Practice)

Sl. No.	Topic	Pra hrs
01	Solar Radiation Measurements	3
02	Determination of Thermal Efficiency of Flat Plate Collector	3
03	To Determine the Heat Loon Factor and Heat Removal Factor of a Flat Plate Solar Collector.	3
04	Flat Plate Solar Water Heater	3
05	Flat Plate Solar Air Heater	6
06	Flat Plate Collector with Reflector	3
07	Parabolic Trough Collector	6
08	Evacuated Tube Collector	3
09	Drying Performance of a Solar Dryer.	6
10	Solar Cookers	3
11	Thermal Storage Systems	3
	Total	42

The following colour represents the syllabus revision, skill, employability and entrepreneurship.

Green : Skill

Pink : Employability

Sky : Entrepreneurship

**CENTURION UNIVERSITY OF TECHNOLOGY
& MANAGEMENT:: PARALAKHEMUNDI
ODISHA**

CHOICE BEASED CREDIT SYSTEM

COURSE STRUCTURE & SYLLABUS

BASKET I

[With effect from 2016-17 Admitted Batch]



**Centurion
UNIVERSITY**

*Shaping Lives...
Empowering Communities...*

School of Engineering & Technology

2016

BASKET - I
(Basic Sciences)

<i>Course Code</i>	<i>Course Title</i>	<i>Course Type</i>	<i>Credits</i>	<i>Prerequisite</i>	<i>Department Offering</i>
<i>FCBS0401</i>	<i>Applied Analytical Chemistry</i>	<i>Theory + Practice</i>	<i>3</i>	<i>Nil</i>	<i>Chemistry</i>
<i>FCBS0402</i>	<i>Industrial Chemistry</i>	<i>Theory + Practice</i>	<i>3</i>	<i>Nil</i>	<i>Chemistry</i>
<i>FCBS0403</i>	<i>Applied Engineering Materials</i>	<i>Theory + Practice</i>	<i>3</i>	<i>Nil</i>	<i>Chemistry</i>
<i>FCBS0404</i>	<i>Electricity and Magnetism</i>	<i>Theory + Practice</i>	<i>4</i>	<i>Nil</i>	<i>Physics</i>
<i>FCBS0405</i>	<i>Basic Mechanics and Properties of Matter</i>	<i>Theory + Practice</i>	<i>4</i>	<i>Nil</i>	<i>Physics</i>
<i>FCBS0406</i>	<i>Optics and Optical Fibres</i>	<i>Theory + Practice</i>	<i>4</i>	<i>Nil</i>	<i>Physics</i>
<i>FCBS 0101</i>	<i>Environmental Science</i>	<i>Theory</i>	<i>3</i>	<i>Nil</i>	<i>Chemistry</i>
<i>FCBS 0102</i>	<i>Differential Equations</i>	<i>Theory</i>	<i>3</i>	<i>Nil</i>	<i>Mathematics</i>
<i>FCBS 0103</i>	<i>Linear Algebra & Vector Calculus</i>	<i>Theory</i>	<i>3</i>	<i>Nil</i>	<i>Mathematics</i>
<i>FCBS 0104</i>	<i>Integral Transform</i>	<i>Theory</i>	<i>3</i>	<i>Nil</i>	<i>Mathematics</i>
<i>FCBS 0105</i>	<i>Complex Analysis</i>	<i>Theory</i>	<i>3</i>	<i>Nil</i>	<i>Mathematics</i>
<i>FCBS0106</i>	<i>Discrete Mathematics</i>	<i>Theory</i>	<i>3</i>	<i>Nil</i>	<i>Mathematics</i>

SYLLABUS

FCBS0401 APPLIED ANALYTICAL CHEMISTRY

<i>Pre-requisite</i>	<i>Course Type</i>	<i>Credits</i>
<i>Nil</i>	<i>Theory + Practice</i>	<i>3</i>

Course Objective

The aim of this course is to give students that are going to carry out an experimental work the necessary comprehension in analytical chemistry.

The course will also provide the student with knowledge to be able to understand and critically evaluate experimental data produced by others.

Module-1

Water Analysis: Importance of water, different types of water, sources and uses of water, types of water pollutants and domestic and industrial significance of analysis of water. Removal of hardness by Lime-Soda, Zeolite and Ion exchange methods. Removal of DO and dissolved CO₂ from water by De-aeration method. Desalination of brackish water by Reverse osmosis and electro dialysis process. Water disinfection by bleaching powder, liquid Cl₂, and chloramine.

Practice:

1. Determination of total hardness by EDTA method, total dissolved solids, total alkalinity
2. Determination of Turbidity by nephelometer, pH, Conductivity.
3. Determinations of BOD, COD, DO.

NB: The above parameters can also be determined by using water kits and the results are to be compared with those obtained manually.

Module-2

Soil Analysis: Composition of rocks and minerals, soil profile and properties.

Practice:

1. Determination of texture of soil.
2. Determination of moisture content in a soil sample, pH, electrical conductivity,
3. Determination of water holding capacity of soil.
4. Measurement of Calcium and Magnesium Using EDTA methods.

Module-3

Chemistry of fuels: Classification of fuels, composition and properties of Petroleum, LPG, Water gas, producer gas, CNG. Knocking – Mechanism of knocking, harmful effects, Anti knocking agents – TEL, Catalytic converters – Principle & working, Unleaded petrol, Power alcohol & Biodiesel. Photovoltaic cells - construction & working of a PV cell

Practice:

1. Proximate analysis of fuel (Coal, biomass etc.) Moisture, Volatile content, Ash, fixed carbon
2. Testing of fuel properties of the plastic oil and bio diesel: Specific gravity by picnometer, flash point and fire point by pesky-Marten flash point apparatus, viscosity by Redwood viscometer, calorific value by bomb calorimeter

Course outcome

Explain fundamental principles for environmental analytical methods (titration, electro-chemistry, instrumentation and basic parameters of water, soil, fuel etc)

Point out suitable analytical techniques for analyzing a specific compounds in an environmental matrix

*Point out suitable techniques for sampling and handling of environmental samples
 Apply quality control on chemical analysis and laboratory work and explain its importance
 Plan and carry out laboratory experiments, including data analysis and conclusions
 Describe simple approaches for troubleshooting*

FCBS0402 INDUSTRIAL CHEMISTRY

<i>Pre-requisite</i>	<i>Course Type</i>	<i>Credits</i>
<i>Nil</i>	<i>Theory + Practice</i>	<i>3</i>

Course Objective

Students may also explore in depth specialized areas of chemistry of materials, including ores, metals, cement as well as dyes, oils, soaps

Introduce the students to industrial processing principles as applicable to chemical and allied industries.

Provide the students with the knowledge of how raw materials are sourced for various chemical industries and how these materials are processed.

Provide students with advanced technical skills in Chemical Engineering that will enable them to (a) translate fundamental discoveries in materials and other high technology areas to commercial exploitation, and (b) adapt readily to the challenges presented in a diverse range of industrial sectors that can benefit from process engineering approaches.

Module 1: Preparation of soap, dyes and oil analysis :

Introduction: Types of soap (soft and hard soap), methods of preparation of soap, mechanism, difference between fats and oils, physical properties of fats and oil, general introduction to chemistry of dye, various example of dyes, types of dyes.

Practice:

Preparation of soap by saponification

Determination of the properties different type of soap

1. pH test

2. Foam test

Hard water test

Determination of iodine number of oil

Preparation of dyes (azo dyes): 2- naphthol + 4 - nitro aniline: salicylic acid + 4- nitro aniline

Preparation of Phenyle.

Applications: Effect of water hardness in cleansing action of soap. Application of dyes to cloth

Module 2: Metals estimation from ores

Introduction: General introduction on ores, types of ore, important ore minerals, application of ores.

Practice:

Estimation of Cu in copper ore

Determination of Fe as ferrous iron in an ore sample

Determination of Zn in Zinc ore by EDTA complex metric method

Module 3: Analysis of cement

Introduction: what is cement? types of cement, composition of cement, preparation of cement, applications.

Practice:

Estimation of calcium in Portland cement
 Cement hydration and pH evaluation during curing
 To check the quality of cement (colour, texture, smell test, float test, shape test and strength test)

Course outcome

Appreciate better their future roles as chemists in Industrial establishments
 Be able to explain the origin of raw materials used in the chemical and allied industries
 Have a good understanding of how chemical raw materials are processed into finished products.
 Graduates find employment in, quality control, oil and petroleum industry, textile industry, dyes and paints industry, cement industry, just to name a few.

FCBS0403 APPLIED ENGINEERING MATERIALS

<i>Pre-requisite</i>	<i>Course Type</i>	<i>Credits</i>
<i>Nil</i>	<i>Theory + Practice</i>	<i>3</i>

Course Objective

To understand the importance of the chemical approach to nanomaterials
 To study the preparation, analysis and applications of metal nanoparticles
 To develop an understanding of conjugated polymers and their applications
 To understand how polymer composition and architecture imparts unique properties and behavior
 To study organic-inorganic hybrid materials (COMPOSITES) and how the incorporation of metals in the polymer architecture leads to new properties and applications

Module 1: Nano Materials:

Introduction, nano scale, applications in various fields.

Practice:

Synthesis of Ag, Au nano particles by wet chemical methods.
 Synthesis of ZnO Nanoparticles by Precipitation Method
 Synthesis of Cu nano particles Sonochemical method.
 Synthesis of Fe nano particles Co-precipitation method.
 Thickness measurement by sol-gel process of coating.

Module 2: Polymers

Introduction, types of polymers, Polymerisation mechanisms.

Practice:

Synthesis of Thiokol Rubber
 Synthesis of a Rubber Ball from Rubber Latex
 Synthesis of Polystyrene (PS)
 Synthesis of Polymethyl Methacrylate (PMMA)
 Synthesis of Nylon-6:6.
 Determination of molecular weight of polymers by visometry method.

Module 3: Composites

Introduction :Biopolymers or synthetic polymers reinforced with natural or biofibers(termed as bio composites) as a viable alternative to glass fibre composites.Biocomposites“ refers to those composites that can be employed in bioengineering.Biocomposites are composite materials, that is, materials formed by a matrix (resin) and a reinforcement of natural fibers (usually derived from plants or cellulose). Bio composites are the combination of natural fibers (biofibers) such as wood fibers (hardwood and softwood) or non - wood fibers (e.g., wheat, kenaf, hemp, jute, sisal, and flax) with polymer matrices from both renewable and non-renewable resources.

Practice:

Synthesis of bio composite materials by using jute fibres and wood fibres

Course outcome

- Know what it takes to have a career in nanotechnology
- Understand the need to increase Nanotechnology awareness
- Understand the definition of Nanotechnology
- Know the processing of Nanoparticles and Nanomaterials
- Know the application of Nanotechnology and nanomaterials

FCBS0404 ELECTRICITY AND MAGNETISM

<i>Pre-requisite</i>	<i>Course Type</i>	<i>Credits</i>
<i>Nil</i>	<i>Theory + Practice</i>	<i>4</i>

Course Objective

- To understand electric circuit components and their use.*
- To learn and verify the fundamental laws of electricity, learn how to use certain electrical devices.*
- Understanding magnetic properties of matter and performing experiments to realize magnetism.*

Practice I

Theory:

Electric field, Potential, EMF, capacitance, resistance, series connection, parallel connection, Kirchhoff's laws, RC circuits, LC circuits.

Lab:

1. Use a Multi-meter for measuring (a) Resistance, (b) AC and DC Voltages, (c) DC Current, (d) Capacitance and (e) Checking electrical fuses.
2. To determine an unknown Low Resistance using Potentiometer.
3. To determine an unknown Low Resistance using Carey Foster's Bridge.

Practice II

Theory: Electrical Circuits: AC Circuits: Kirchhoff's laws for AC circuits. Complex Reactance and Impedance. Series LCR Circuit: (1) Resonance, (2) Power Dissipation and (3) Quality Factor, and (4) Band Width. Parallel LCR Circuit.

Lab:

1. To verify the Superposition, and Maximum power transfer theorems.
2. To determine self-inductance of a coil by Anderson's bridge.

- To study response curve of a Series LCR circuit and determine its (a) Resonant Frequency, (b) Impedance at resonance, (c) Quality factor Q, and (d) Band width.
- To study the response curve of a parallel LCR circuit and determine its (a) Anti-resonant frequency and (b) Quality factor Q.

PRACTICE III

Theory: Magnetic Properties of Matter: Magnetization vector (**M**). Magnetic Intensity (**H**). Magnetic Susceptibility and permeability. Relation between **B**, **H**, **M**. Ferromagnetism. B-H curve and hysteresis.

Electromagnetic Induction: Faraday's Law. Lenz's Law. Self Inductance and Mutual Inductance. Reciprocity Theorem. Energy stored in a Magnetic Field.

Lab:

- To study the induced e.m.f. as a function of the velocity of the magnet.
- Measurement of field strength B and its variation in a solenoid.
- Determination of ratio.

Course outcome

Realizing the importance and use of electrical components in a circuit.

Learning how to do different connections and their purpose.

Understanding magnetism of matter and its applications

Text Book:

- Electricity and Magnetism By K. K. Tiwari, S. Chand Publishing

References:

- Electricity and Magnetism, By M. C. Saxena, Satya Prakash, V. P. Arora, Publisher: Pragati Prakashan
- Introduction to Electrodynamics, by David J. Griffiths Prentice-Hall; 3 edition (2011)
- Electricity and Magnetism by - D. C. Tayal, Himalaya Publishing, 2009.

FCBS0405 BASIC MECHANICS AND PROPERTIES OF MATTER

<i>Pre-requisite</i>	<i>Course Type</i>	<i>Credits</i>
<i>Nil</i>	<i>Theory + Practice</i>	<i>4</i>

Course Objective

To give the students overall idea about material properties and also hands on experience to measure them.

To make them realize the applications of material properties.

To expose them to phenomena like hydrostatics, elasticity, viscosity, surface tension and their applications in various places.

Encouraging them to build simple models to explain the mechanical properties.

Theory:

Elasticity: Elastic constants, Relation among elastic constants, torsion of right circular cylinder, bending of beams, Vibration of loaded cantilever.

Lab:

- Young's modulus by single/double cantilever
- Young's modulus by Searle's method
- Rigidity modulus using Barton's apparatus
- Poisson's ratio

Practice II

Theory:

Hydrostatics: hydrostatic force on a body, buoyancy, metacentric height, hydrostatic pressure, pressure measurement: manometer

Viscosity: Viscosity of fluids, Stoke's law, terminal velocity, Poiseulle's equation, Searle's viscometer.

Surface tension & surface energy: Pressure difference across curved liquid surface.

Lab:

1. Viscosity by Stokes method
2. Viscosity by Poiseulle's method
3. Metacentric height of floating body
4. Measurement of Pressure by manometer
5. Surface tension by capillary rise method
6. Determination of surface tension by Quincke's method

Practice III:

Basic Mechanics

Theory: Kinematics and Kinetics, Effort amplification using levers and pulleys, Friction, Laws of friction.

Rotational Motion: Moment of Inertia, Theorem of Parallel and Perpendicular axes. Moment of inertia of circular disc.

Lab:

1. Effort-output ratio using combination of pulleys
2. Verification of laws of static and dynamic friction
3. Moment of inertia of fly wheel

Course outcome

To understand material properties and perform experiments on them.

To understand the applications of material properties in real life.

To be able to make small models for explain few mechanical properties.

Text Book:

1. *Elements of Properties of Matter, Dec 2010 by D.S. Mathur, S.Chand (G/L) & Company Ltd*

Reference Books:

1. *A Text Book of Fluid Mechanics by R.K. Bansal, Laxmi Publishers, 2005*
2. *Engineering Mechanics Statics and Dynamics by A. K. Tayal, Umesh Publications.*

FCBS0406 OPTICS AND OPTICAL FIBRE

<i>Pre-requisite</i>	<i>Course Type</i>	<i>Credits</i>
<i>Nil</i>	<i>Theory + Practice</i>	<i>4</i>

Course Objective

To understand optical phenomena.

To understand different light sources and their use

Understand designing of microscope and artificial light sources

Understanding optical fiber and its applications

Practice I

Theory: Reflection and refraction of light. Mirror formula, lens maker's formula. Refraction through a prism. Dispersion, light sources: Principle and operations of sodium lamp, mercury lamp and LASER.

Lab:

1. To determine refractive index of the Material of a prism using sodium source.
2. To determine the dispersive power and Cauchy constants of the material of a prism using mercury source.
3. To determine the refractive index of glass slab using travelling microscope.
4. Designing of a compound microscope.

Practice II

Theory: Interference. Young's experiment, conditions for interference, Intensity distribution of fringes, Interference in thin films, Newton's rings.

Diffraction: types of diffraction, Fraunhofer diffraction at a single slit, diffraction at N-parallel slits and plane diffraction grating.

Polarization: Polariser and analyser, optical rotation and Polarimeter

Lab:

1. Determination of wavelength of light by Newton's ring method.
2. Determination of wavelength of LASER source by diffraction grating method
3. Thickness of thin paper by wedge-shaped films
4. Dispersive power and resolving power of a plane diffraction grating.
5. Polarimetry

Practice-III

Theory: Optical properties—scattering, refraction, reflection, transmission & absorption. Introduction, principle of Laser, stimulated and spontaneous emission, Coherence (temporal and spatial) Ruby Laser, Application of Lasers.

Optical Fibres: Introduction, numerical aperture, step index and graded index fibres, attenuation & dispersion mechanism in optical fibers (Qualitative only), application of optical fibres, optical communication (block diagram only)

Lab:

1. Measurement of attenuation and bending losses of an optical fibre.
2. Measurement of numerical aperture of an optical fibre
3. Study of spatial and temporal coherence of LASER
4. Making of a light guide

Course outcome

Students should understand optical phenomena.

Students should learn about different light sources and their use

Students should be able to understand optical fiber principle, operations and its applications.

Text Book:

1. *A Text Book of Optics* by M.N. Avadhanulu, Brij Lal, N. Subrahmanyam, S Chand; 23rd Rev. Edn.

References:

2. *Optics* by Ajoy Ghatak, McGraw Hill Education; 5 edition
3. *Physics-I for engineering degree students* by B.B. Swain and P.K.Jena.
4. *Concepts in Engineering Physics* by I Md. N. Khan.

FCBS0101 ENVIRONMENTAL SCIENCE

<i>Pre-requisite</i>	<i>Course Type</i>	<i>Credits</i>
<i>Nil</i>	<i>Theory</i>	<i>2</i>

Course Objective:

1. *To understand the concept of multi-disciplinary nature of Environmental Science where different aspects are dealt with a holistic approach.*
2. *Students will develop a sense of community responsibility by becoming aware of environmental issues in the larger social context.*
3. *One must be environmentally educated.*

MODULE-I

Environment and its multidisciplinary nature; Need for public awareness; Renewable and non-renewable resources—forest, water, mineral, land, food and energy resources; Structure and function of ecosystems of forest, grass land, desert and aquatic types.

MODULE -II

Biodiversity and its conservation: Biodiversity at global, national and local levels; Threats to biodiversity - Habitat loss; wild life poaching and man - wildlife conflicts; Endangered and endemic species; conservation measures.

Causes, effects and control measures of pollution, air, water and noise pollution; Nuclear hazards; solid-waste management—Causes, effects and control measures; Management of disasters due to natural causes of floods, earthquakes, cyclones and landslides.

MODULE-III

Social issues and the environment; Sustainable environment, Water conservation measures; Rain water harvesting; Resettlement and rehabilitation of people; Climate change and global warming; Acid rain; Ozone layer depletion; water land reclamation; Consumerism and waste products; Features of Environment Protection Act, Air pollution and Control of Pollution Acts; Water Pollution and its Control Act. Effects of Pollution explosion on environment and public health; Need for value education to Protect environment and resources.

Course Outcome:

1. Understand the natural environment and its relationships with human activities.
2. Characterize and analyze human impacts on the environment.
3. Integrate facts, concepts, and methods from multiple disciplines and apply to environmental problems.
4. Design and evaluate strategies, technologies and methods for sustainable management of environmental systems and for the remediation or restoration of degraded environments.

Text Book: Anubhav Kaushik & C.P. Kaushik : Environmental Studies-New age International Publishers.

Reference Books:

1. Benny Joseph : Environmental Studies-Tata Mac Graw Hill
2. E. Bharucha : Text book of Environmental Studies for Under graduate courses– Universities Press. (Book prepared by UGC Committee.

FCBS0102 DIFFERENTIAL EQUATIONS

<i>Pre-requisite</i>	<i>Course Type</i>	<i>Credits</i>
<i>Nil</i>	<i>Theory</i>	<i>3</i>

Course Objectives:

- 1) To understand most of the physical phenomena from Science and Engineering which are modeled by differential equations.
- 2) To find and interpret the solutions of the ODE & PDE appearing in signal systems, dynamical systems, stability theory and a number of applications to scientific and engineering problems.
- 3) To develop the ability to apply differential equations to significant applied and/or theoretical problems.

Course Outcomes: Upon successful completion of this course, the student will be able to:

- 1) Learn fundamental concepts of ODE & PDE theories and where and how such equations arise in applications to scientific and engineering problems.
- 2) Be competent in solving linear/non-linear 1st & higher order ODEs & PDEs using analytical solution methods to obtain their exact solutions.
- 3) Recognize the major classification of ODEs & PDEs and the qualitative differences between the classes of equations.

MODULE-I (12 Hours)

First Order Differential Equations: Separable Equations, Homogeneous & Non-homogeneous Equations, Exact Differential Equations, Integrating Factor, Linear Differential Equations, Bernoulli Equation.

MODULE-II (15 Hours)

Second & Higher Order Linear Differential Equations: Linear Dependence and Independence of Solutions, Wronskian, Constant Coefficient Homogeneous Equations, Cauchy-Euler Equation, Non-homogeneous Equations, Method of Variation of Parameter, Method of Inverse Operator, Legendre Equation.

MODULE-III (15Hrs)

Partial Differential Equation of First Order, Linear and Non-linear Partial Differential Equations, Charpit's Method, Homogeneous and Non-homogeneous Linear Partial Differential Equations with Constant Coefficients, Cauchy Type Differential Equation.

Text Book:

1) *Higher Engineering Mathematics* by B.V. Raman Publisher: TMH
Chapters: 8 (8.1 to 8.10); 9 (9.1 to 9.7), 18 (18.1 to 18.8)

Reference Book:

1) *Advanced Engineering Mathematics* by P.V.O' Neil Publisher: Thomson

FCBS0103 LINEAR ALGEBRA & VECTOR CALCULUS

<i>Pre-requisite</i>	<i>Course Type</i>	<i>Credits</i>
<i>Nil</i>	<i>Theory</i>	<i>3</i>

Course Objectives:

1. To apply concepts of Linear Algebra & Vector Calculus to the problems related to models in work, circulation and flux Problems, hydrodynamics and fluid dynamics, electrical circuits, networking, linear programming, graph theory, computer graphics, cryptography, thermodynamics, construction of curves and surfaces through specified points etc.
2. To solve the system of linear equations appearing in the problems of electrical engineering, mechanical engineering, applied mechanics etc.
3. To apply vectors in higher dimensional space in experimental data, storage and warehousing, electrical circuits, graphical images, mechanical systems and in physics.

Course Outcomes: Upon successful completion of this course, the student will be able to:

1. Use matrix operations to solve systems of linear equations and be able to determine the nature of the solutions.
2. Compute with the characteristic polynomial, eigenvalues, eigenvectors and eigenspaces of a matrix as well as the geometric and the algebraic multiplicities of an eigenvalue and then to diagonalise that matrix.
3. Determine the important quantities associated with scalar and vector fields.

MODULE-I (14 Hours)

Linear Algebra, Basic Concepts, Linear System of Equations, Solution by Gauss Elimination, Conditions of Existence and Uniqueness of Solutions, Rank of a Matrix, Determinants and Cramer's Rule, Linear Dependence and Independence.

MODULE-II (14 Hours)

Eigen Values and Eigen Vectors, Basis, Symmetric, Skew-Symmetric and Orthogonal Matrices, Complex Matrices, Similarity of Matrices, Diagonalization.

MODULE-III (14 Hours)

Vector Differential Calculus: Vector Algebra, Inner Product, Vector Product, Vector & Scalar Functions and Fields, Derivatives, Gradient of a Scalar Field, Directional Derivative, Divergence of a Vector Field, Curl of a Vector Field.

Text Book:

1) *Advanced Engineering Mathematics* by E. Kreyszig Publisher: Johnwiley & Sons Inc-8th Edition
Chapters: 6 (6.1 to 6.6); 7 (7.1, 7.3 to 7.5), 8 (8.1 to 8.4, 8.9 to 8.11)

Reference Books:

- 1) *Advanced Engineering Mathematics* by P.V.O' Neil Publisher: Thomson
- 2) *Mathematical Methods* by Potter & Goldberg ; Publisher : PHI

FCBS0103 INTEGRAL TRANSFORM

<i>Pre-requisite</i>	<i>Course Type</i>	<i>Credits</i>
<i>Nil</i>	<i>Theory</i>	<i>3</i>

Course Objectives: To describe the ideas of Fourier and Laplace Transforms and indicate their applications in the fields such as Signal & System, Digital Signal Processing, Image Processing, Theory of Control Systems, Differential Equations and many others.

1. To use Fourier series for solving boundary value problems appearing in scientific & engineering problems.
2. To get acquainted with the fact that the Laplace transform is related to the Fourier transform, but the Fourier transform expresses a function or signal as a series of modes of vibration (frequencies), whereas the Laplace transform resolves a function into its moments.

Course Outcomes: Upon successful completion of this course, the student will be able to:

1. Obtain Laplace transform of simple functions, functions expressed in graphical form, integrals and derivatives.
2. Solve differential & integral equations with initial conditions using Laplace transform.
3. Compute the Fourier series representation of a periodic function, in both exponential and sine-cosine forms.
4. Evaluate the Fourier transform of a continuous function and be familiar with its basic properties.

MODULE-I (16 Hours)

Laplace Transforms, Transforms of Derivatives and Integrals, Derivatives and Integrals of Transforms, Shifting Properties, Unit Step Function, Dirac's Delta Function, Convolution, Inverse Transforms, Solution to Differential Equation, Integral Equation.

MODULE-II (12 Hours)

Periodic Functions, Trigonometric Series, Fourier Series, Fourier Expansion of Functions of any Period, Even and Odd Functions, Half Range Expansions,

MODULE-III (14Hrs)

Fourier Integrals: Fourier Sine Integral, Fourier cosine Integral. Fourier Transforms: Fourier Sine Transform, Fourier Cosine Transform.

Text Book:

Advanced Engineering Mathematics by E.Kreyszig
Publisher: Johnwiley & Sons Inc-8th Edition
Chapters: 5 (5.1 to 5.6); 10 (10.1 to 10.4, 10.8, 10.9)

Reference Books:

- 1) *Advanced Engineering Mathematics* by P.V.O'Neil .Publisher: Thomson
- 2) *Higher Engineering Mathematics* by B.V.Raman .Publisher: TMH

FCBS0105 COMPLEX ANALYSIS

<i>Pre-requisite</i>	<i>Course Type</i>	<i>Credits</i>
<i>Nil</i>	<i>Theory</i>	3

Course Objectives:

- 1) *To understand the application of Complex Analysis to Two-Dimensional problems in Physics including Hydrodynamics and Thermodynamics and also in Engineering fields such as; Nuclear, Aerospace, Mechanical and Civil engineering, signal processing & communications.*
- 2) *To acquire the skill of contour integration to evaluate complicated real integrals appearing in Engineering problems via residue calculus.*

Course Outcomes: Upon successful completion of this course, the student will be able to:

- 1) *To get equipped with the understanding of the fundamental concepts of functions of a complex variable along with the concepts of analyticity, Cauchy-Riemann relations and harmonic functions.*
- 2) *Evaluate complex contour integrals applying the Cauchy integral theorem, Cauchy integral formula and Residue theorem.*
- 3) *Illustrate the applications of the calculus of residues in the evaluation of real integrals.*

MODULE-I (14 Hours)

Complex Analysis: Analytic Function, Cauchy-Riemann Equations, Laplace Equation, Harmonic Function, Linear Fractional Transformation.

MODULE-II (14 Hours)

Parametric representation , Line Integral in the Complex plane, Cauchy's Integral Theorem, Cauchy's Integral Formula, Derivatives of Analytic Function.

MODULE-III (14Hrs)

Power Series, Taylor's Series, Maclaurin Series, Laurent's Series, Singularities and Zeroes, Residue Theorem, Residue Integration Method, Evaluation of Real Integrals.

Text Book:

1) *Advanced Engineering Mathematics* by E. Kreyszig Publisher: Johnwiley & Sons Inc-8th Edition
Chapters: 12 (12.1 to 12.4 ,12.9) ; 13, 14 (14.2,14.4) & 15.

Reference Books:

- 1) *Advanced Engineering Mathematics* by P.V. O'Neil Publisher: Thomson
- 2) *Fundamentals of Complex Analysis (with Applications to Engineering and Science)* by E.B. Saff & A.D. Snider Publisher: Pearson

FCBS0106 Discrete Mathematics

<i>Pre-requisite</i>	<i>Course Type</i>	<i>Credits</i>
<i>Nil</i>	<i>Theory</i>	<i>3</i>

Course Objectives:

1. To learn a particular set of mathematical facts and to apply their applications in many subjects of Computer Science and Engineering such as Cryptography, Theory of Computation & Data Networking.
2. To understand mathematical reasoning in order to read, comprehend and construct mathematical arguments as well as to solve problems, occurred in the development of programming languages.
3. To work with discrete structures such as graphs to study the structure of the world wide web, to model a computer network and to find the shortest path between two places in a transportation network.

Course Outcomes: Upon successful completion of this course, the student will be able to:

1. Evaluate elementary mathematical arguments and identify fallacious reasoning.
2. Apply the logical structure of proofs and work symbolically with connectives and quantifiers to produce logically valid, correct and clear arguments.
3. Reformulate statements from common language to formal logic. Apply truth tables and the rules of propositional and predicate calculus.
4. Model and solve real-world problems using graphs, both quantitatively and qualitatively.

MODULE-I (12 Hours)

Propositional Logic, Propositional Equivalence, Predicates and Quantifiers, Nested Quantifiers, Rules of Inference, Recurrence Relations, Solving Linear Recurrence Relations.

MODULE-II (16 Hours)

Relations and its properties, Representation of Relations, Closure of Relations, Equivalence Relations and Partitions, Partial Ordering, POSet, Hasse Diagram, Maximal & Minimal elements of a Poset, Supremum & Infimum of a Poset, Lattice, Basic properties of Lattices.

MODULE-III (14Hrs)

Introduction to Graph Theory, Graph terminology, Representation of graphs, Graph Isomorphism, Connectivity, Euler and Hamiltonian Paths, Planar graph, Graph Coloring,

Text Books:

- 1 *Discrete Mathematics and its Applications* by K.H.Rosen Publisher: TMH, Sixth Edition Chapters:1(1.1 to 1.5) ; 6 (6.1, 6.2) ; 7; 8(8.1 to8.5, 8.7, 8.8)
- 2 *Elements of Discrete Mathematics* by C.L.liu & D.P. Mohapatra Publisher: TMH, Third Edition Chapter: 11 (11.1 to 11.4)

Reference Books:

- Discrete and Combinatorial Mathematics* by R.P.Grimaldi Publisher: Pearson
Discrete Mathematics and Applications by Thomas Koshy Publisher: Elsevier
Discrete Mathematical Structures by B. Kolman, R.C. Busby & S. Ross Publisher: PHI

2017 CURRICULUM

COURSES OFFERED BY DEPARTMENT OF HUMANITIES AND MANAGEMENT

BASKET - II

<i>Course Code</i>	<i>Course Title</i>	<i>Course type</i>	<i>Credits</i>	<i>Prerequisite</i>	<i>Department Offering</i>
FCHU1201	Foundations of English Communication	Workshop	2	Nil	Humanities
FCHU1202	Communicative Practice Laboratory -I	Workshop	2	Nil	Humanities
FCHU1203	Business Communication	Workshop	2	Nil	Humanities
FCHU1204	Communicative Practice Laboratory-II	Workshop	2	Nil	Humanities
FCHU1205	Corporate Readiness Laboratory	Workshop	2	Nil	Humanities
FCHU1206	IT Enabled Communication	Workshop	2	Nil	Humanities
FCHU1207	Career Communication	Workshop	2	Nil	Humanities
FCHU1208	Personality Development	Workshop	2	Nil	Humanities
FCHU1209	Seminar and Technical Writing	Workshop	2	Nil	Humanities
FCHU1210	Professional Etiquette	Workshop	2	Nil	Humanities
FCHU1211	Creative Writing	Workshop	2	Nil	Humanities
FCHU1212	English for Competition (GRE/GMAT/TOEFL/IELTS)	Workshop	2	Nil	Humanities
FCHU0210	Life Skills Development (LSD) – I	Practice	2	Nil	Humanities
FCHU0211	Life Skills Development (LSD) – II	Practice	2	Nil	Humanities
FCHU0212	Life Skills Development (LSD) - III	Practice	2	Nil	Humanities
FCMG0101	Economics	Theory	2	Nil	Management
FCMG0102	Accounting & Finance	Theory	2	Nil	Management
FCMG0103	Management Processes and OB	Theory	2	Nil	Management
FCMG0104	Production and Operation Management	Theory	2	Nil	Management
FCMG0105	Marketing Management	Theory	2	Nil	Management
FCMG0108	Introduction to Research	Theory	2	Nil	Management
FCMG0113	Indian Society and Culture	Theory	2	Nil	Management

FCMG1201	Disaster Management	Workshop	2	Nil	Management
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Note: The evaluation for Workshop type subject will be 100% internal by the concerned faculty.

SYLLABUS

FCHU1201 FOUNDATIONS OF ENGLISH COMMUNICATION

<i>Pre - requisites</i>	<i>Course Type</i>	<i>Credits</i>
<i>Nil</i>	<i>Workshop</i>	<i>2</i>

COURSE OBJECTIVES

To develop vocabulary and grammar knowledge

To develop reading comprehension skills

COURSE OUTCOMES

Development of academic and sub-technical vocabulary

Enhancement of basic language skills, i.e., listening, speaking, reading and writing

Development of grammatical competence

Confidence level improvement

This course aims to build the vocabulary, comprehension, and writing skills for effective communication in English language. It will focus on reading, listening to, and writing passages, as a means of Course communications skills.

The essential elements of this course will include:

MODULE-I: READING SKILLS (7hrs.)

Read **one** of the following books:

Animal Farm

Alice in Wonderland

Guide

Malgudi Days

Harry Potter

Amar Chitra Katha

Comprehension Skills: Students will respond to comprehension lessons from the chosen book.

MODULE-II: WRITING SKILLS (7hr.)

Students learn grammar and usage by writing passages, and getting formal feedback on these.

MODULE-III: LISTENING SKILLS (6hrs.)

Students respond to questions based on listening to videos, audio, or speaking assignments of classmates.

MODULE-IV: SPEAKING SKILLS (7hrs.)

Speaking assignments based on chosen book or contemporary topics.

TEXT BOOKS:

Esteras, Santiago Remacha and Fabre, Elena Marco. (2007). *Professional English in Use ICT Student's Book*. Cambridge: Cambridge University Press.

REFERENCES:

Grellet, F. (1981). *Developing Reading Skills*. Cambridge: Cambridge University Press

McCarthy, M. & O'Dell, F. (2008). *Academic Vocabulary in Use*. Cambridge: Cambridge University Press.

Ur Penny, (1992). *Five-Minute Activities: A Resource Book of Short Activities* (Cambridge Handbooks for Language Teachers). Cambridge: CUP

F Klippel. (1984). *Keep Talking*. Cambridge: CUP

EVALUATION SYSTEM (CONTINUOUS INTERNAL ASSESSMENT)

Methods	Convers-ation	Listening Comprehension	Book Review Presentation	Vocab.	Mid-I (Presentation)	Mid-II (Online) Common Errors	Mid-III (Written)	% of Marks 100(Best 5)
Total	20	20	20	20	20	20	20	100

S. No.	Topic	Pedagogy	Details	Instructional Hrs			
				Th	Pract	video	Proj
1	Getting to Know Each Other	Activity Based Learning	Catch the Ball Introductions Ice-breaker Share an interesting fact, stories, questions, memories, embarrassing moments or sometimes relevant to the context. Useful link: http://www.icebreakers.ws/small-group/catch-ball-introductions-icebreaker.html	0	1	0	0
2	Conversation Practice	Pair work using Realia	Formulaic Expressions Doing Things with Words/ Objects Description: Student practice real life situations like using maps, asking for directions, small talk on weather, holidays, parties and eating out.	0	1	1	0
3	Formal and Informal Communication	Degrees of Formality	Worksheet: Ask the students to work in small groups of 2/3. They must read through the phrases in the table, deciding whether each phrase is formal or informal in conversation a conversation situation. When they have finished, review the exercise as a class (answers provided in the worksheet)	0	1	1	0

S. No.	Topic	Pedagogy	Details	Instructional Hrs			
				Th	Pract	video	Proj
4	Shadowing	Pronunciation – intonation, stress, pause	Find an Audio to Listen & Repeat – BBC News, Seminar Talk, Ted Talk etc. https://www.youtube.com/watch?v=GVWFGIyNswI	0	1	1	0
5	Speech Acts	Plain English	Students can 'become' anyone they like for a short time! They will be encouraged to come forward and perform small speech acts and role-plays.	0	1	0	0
6	Ask Me Questions Challenge	Questions & Responses	Individual to respond- the whole class to ask questions. In this session, a student will learn communication management.	0	1	0	0
7	TED Talk Listening	Listening Comprehension	Ice-breaker: Talkathon Assignment: In groups of 4, you are going to create/write 10 questions about the TED Talk	0	1	1	0

			Afterwards, the groups of 4 will split up in new groups of 4 to discuss and compare their questions. <i>Comprehension Test</i>				
8	Ted Talks	Communication & Confidence Body Language	Listen to a Ted Talk & make a presentation on a popular/contemporary topic	0	1	1	0
9	Reading Comprehension Strategies - 1	Pre-reading	Students are encouraged to read any two books in the first semester. [Animal Farm/Old Man and The Sea/ Guide/Malgudi Days/Amar Chitra Katha]	0	1	1	0
10	Reading Comprehension Strategies - 2	Mid - reading	Students respond to comprehension lessons from the chosen books. [Comprehension Passages, Gap filling and Sentence Completion]	0	1	1	0
11	Reading Comprehension Strategies - 3	Post Reading	Students respond to comprehension lessons from the chosen books. [Summarizing/ Narrating/ Enacting/Vocabulary Quiz/]	0	1	0	0
12	Book Review	Writing Short Passages/ Paragraphs	Write a review of your favorite book in at least 250 words. Mention 3 specific learnings and 3 distinct ways in which you plan to incorporate them in your life. To choose from the recommended books.	0	1	0	0
13	News Reading	7 Cs of Communication	Group Activity: Campus/ National News Reading Students read notice boards and visit departments Prepare campus news headlines Present in the class	0	1	0	0

S. No.	Topic	Pedagog	Details	Instructional Hrs			
				Th	Pract	video	Proj
14	Writing to the Point	Word Usage and Sentence Structure Main Idea, Coherence & Cohesion	Each group is seated in a circle. In this activity, the leader of each group cannot see (either blind or blind fold using a handkerchief), but can hear the peer voice. Ask the leader to flip through the pages, and put the finger randomly on fifteen words from the chosen book in five minutes. The other participates copy the words that are closest to the finger. This time bound activity increases the curiosity of the students and engages them in exciting communication and completion of the task. Then, I ask the students to shape the randomly chosen disconnected words into a short poem/story/essay by adding a title to it. <i>Read Out Loud in the Class</i>	0	1	0	0

15	Word Power	Synonyms & Antonyms	App: SPEAK ENGLISH	0	1	1	0
16	Homonyms	Some confusing words Minimizing errors through discussions	Activity: Select the correct option, Use the confusables in sentences to bring out their meaning	0	1	0	0
17	Reading and Writing about visuals	Useful Expressions	Presentation about visuals Task: Selecting information from a visual	0	1	0	0
18	Word Formation	Word structure Word hunt Vocabulary explorations	Group Activity: Students make word clouds	0	1	0	0
19	Vocabulary Building	Descriptive words	Activity : Describe yourself/ your favorite person using 5 descriptive words	0	1	0	0
20	Listen to Popular Songs	Verb tense and aspect of grammar Vocabulary Idioms and expressions	Listen to the song with lyrics Ask questions about the title Gap Filling Exercises	0	1	0	0
21	Vocabulary Development	Word Power	Quiz/ Puzzle	0	1	0	0
22	Grammar	Common Errors	Surprise Quiz && debriefing	0	1	0	0
23	Grammar	Correct Usage	Easy Grammar App-Practice Sets	0	1	0	0
24	English Language Enhancement-I	Tenses	Usage, Question and explanation Fill in the blanks	0	1	0	0
25	English Language Enhancement -II	Active and Passive	I am passive..../I am active activity	0	1	0	0
26	English Language Enhancement-III	Reported Speech	Assignment & debriefing	0	1	0	0
27	English Language Enhancement -IV	Subject-verb agreement	Online Quiz & debriefing	0	1	0	0
28	Learn Grammar with Fun	Conditionals	Activity: The whole class is divided into The Zero Conditional, The First conditional, The Second conditional, and The Conditional to perform the task	0	1	0	0

FCHU1202 COMMUNICATIVE PRACTICE LABORATORY –I

<i>Pre - requisites</i>	<i>Course Type</i>	<i>Credits</i>
<i>Nil</i>	<i>Workshop</i>	<i>2</i>

The language laboratory acts as a platform for learning, practicing and producing language skills through interactive lessons and communicative mode of teaching.

COURSE OBJECTIVES

To expose the students to a variety of self- instructional, learner- friendly modes of language learning.

To enable them to learn better pronunciation through stress on word accent, intonation, and rhythm.

To maintain good linguistic - through accuracy in grammar, pronunciation and vocabulary.

COURSE OUTCOMES

Ability to communicate fluently in different business situation

Effective oral and written communication

Appropriate word usage with correct pronunciation

Clarity of word stress and intonation

A student is required to take up five lab tests of 100 marks- three tests in spoken mode and two tests in written mode.

MODULE-I: FRIENDLY COMMUNICATION (9 HOURS)

Doing Things with Words: To ask for information, help, permission; To instruct, command, request, accept, refuse, prohibit, persuade

Practice of Formulaic Expressions: Greetings, farewells, introductions, thanks, apologies, regrets, good wishes, congratulations, condolences, offers.

Conversation Practice in familiar and unfamiliar situations

(This module will be practiced through conversation activities in pairs & groups)

MODULE-II: GRAMMAR AND VOCABULARY (9 HOURS)

The focus will be on the appropriate usage of language.

Elimination of common errors

Editing passages

Word power A-Z: Easy and quick techniques

Vocabulary building exercises

(Open Source Language Laboratory will be used to take quizzes and practice grammar & vocabulary)

MODULE-III: PHONETICS AND SPOKEN ENGLISH (12 HOURS)

Students will be trained to find out the correct pronunciation of words with the help of a dictionary /software, to enable them to monitor and correct their own pronunciation.

Pronunciation Guidelines: Consonants and Vowels

Pronunciation practice (for accent neutralization), particularly of problem sounds, in isolated words as well as sentences

Speaking Techniques: Using correct stress patterns, developing voice quality

Rhythm and Intonation

(Reading aloud of dialogues, speeches etc. for practice in pronunciation)

(In this module, the learners will use video series from BBC & Sky Pronunciation Suite to improve spoken English)

TEXT BOOKS:

Dwyer, J. (2000). *The Business Communication Handbook*. New Jersey: Prentice Hall.

REFERENCES:

Brown, G & Yule, G. (1983). *Teaching the Spoken Language*. Cambridge: Cambridge University Press.

Brown, H. D. (1994). *Teaching by Principles: An Interactive Approach to Language Pedagogy*. New Jersey: Prentice Hall.

EVALUATION SYSTEM (CONTINUOUS INTERNAL ASSESSMENT)

Methods	Role play	Speech Acts	Grammar Quiz	Story Telling	JAM	Vocabulary-Exercise	Vocabulary-Quiz	% of Marks 100(Best 5)
Total	20	20	20	20	20	20	20	100

SESSION PLAN: COMMUNICATIVE PRACTICE LABORATORY -1**MODULE I: FRIENDLY COMMUNICATION (9 HOURS)**

S. No.	Topic	Pedagogy	Details	Instructional Hrs.			
				Th	Prac	Video	Proj
Lab-1	Ice-Breaking/ Introductory Session	Name Game and Other Ice-breaking Activities	Knowing Each Other http://www.buzzle.com/articles/classroom-icebreaker-activities-for-students.html http://cutmlanguagelab.org/course/view.php?id=3	0	2	0	0
Lab - 2	Conversation Practice-I	Role Plays OSLL (Moodle)	Speech Acts/ Formulaic Expression http://cutmlanguagelab.org/course/view.php?id=3	0	2	0	0
Lab - 3	Conversation Practice-Ii	Small Skits	Small Skits Using Formulaic Expressions http://www.lazybeescripts.co.uk/Scripts/Results.aspx?iSh=5&iSk=1&iMR=11&iXR=15&iPo=2&i17=1&iAS=2&iPS=2 http://cutmlanguagelab.org/course/view.php?id=3	0	2	0	0

MODULE II: GRAMMAR AND VOCABULARY (12 HOURS)

S. No.	Topic	Pedagogy	Details	Instructional Hrs.			
				Th	Prac	Video	Proj
Lab-4	Elimination of Common Grammatical Errors	Quiz OSLL (Moodle)	Emphasis on Tense, Verbs, Modals, Conditionals, Active and Passive Voice, Statements, Questions and Responses, Articles, Preposition & Concord http://cutmlanguagelab.org/course/view.php?id=3 http://www.learnenglishfeelgood.com	0	2	0	0

Lab - 5	Document Makeover	Assignment OSL (Moodle)	Editing passages: Grammatical and Construction errors http://cutmlanguagelab.org/course/view.php?id=3	0	2	0	0
Lab - 6	Vocabulary Building- Word Power	Assignment and Online practice	http://a4esl.org/ http://cutmlanguagelab.org/course/view.php?id3	0	2	0	0
Lab - 7 & 8	Vocabulary Building	Assignment and Online practice	Synonyms, Antonyms, Homophones, One-Word Substitution, Phrasal Verbs http://www.majortests.com/word-focus/vocabulary-tests.php http://www.grammarbank.com/synonyms-antonyms-worksheet.html http://cutmlanguagelab.org/course/view.php?id3	0	2	0	0

MODULE-III: PHONETICS AND SPOKEN ENGLISH (12 HOURS)

S. No.	Topic	Pedagogy	Details	Instructional Hrs.			
				Th	Prac	Video	Proj
Lab -9	Phonetics-I	Online Practice OSL (Moodle)	Phonemic Transcription Using IPA Symbols, Stress Pattern in Words and Phrases http://usefulenglish.ru/phonetics/practice-consonants http://www.agendaweb.org/phonetic.html http://cutmlanguagelab.org/course/view.php?id=3 https://www.youtube.com/watch?v=htmkblboG9Q	0	1	1	0
Lab -10	Phonetics-Ii	Online Practice OSL (Moodle) Sky Pronunciation Suite	Rhythm and Intonation http://www.learning-english-online.net/areas/pronunciation/stress-and-intonation/ http://www.tolearnenglish.com/english_lessons/intonation-exercises http://cutmlanguagelab.org/course/view.php?id=3	0	2	0	0
Lab -11	Event Narration, Story Telling	Assignment	http://gdpi.hitbullseye.com/other-selection-tools-extempore.php http://cutmlanguagelab.org/course/view.php?id=3 http://grammar.about.com/od/developingessays/a/topnarrative07.htm	0	2	0	0

Lab -12	Speaking - Jam, Extempore	Activity Based OSLL (Moodle)	http://orelt.col.org/module/unit/3-practice-public-speaking http://cutmlanguagelab.org/course/view.php?id=3 https://www.youtube.com/watch?v=wV166cH5uQ https://www.youtube.com/watch?v=Mm-4T7qOS4	0	2	0	0
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FCHUI203 BUSINESS COMMUNICATION

<i>Pre - requisites</i>	<i>Course Type</i>	<i>Credits</i>
<i>Nil</i>	<i>Workshop</i>	<i>2</i>

COURSE OBJECTIVES

The course on Business Communication focuses on the basic skills required to be an effective communicator. It aims at imparting the communication skills that are needed in the academic and professional pursuits.

This is directed towards helping the students gain skills in comprehension, group discussions, presentations, interviews, active listening, technical writing and the ability to manage cross-cultural interactions. The focus is on the difficulty experienced by individual students, and the effort to explore a useful strategy for self-improvement. This is achieved through an amalgamation of lecture oriented approach of teaching with the task based skill oriented methodology of learning.

COURSE OUTCOMES

- Understand the differences between general communication and business communication*
- Development of basic language skills, i.e., listening, speaking, reading and writing*
- Effective participation in group discussion and job interviews*

MODULE-I: UNDERSTANDING COMMUNICATION IN BUSINESS (8 hrs.)

The module is a guide to organization communication. It is directed towards enabling students to develop the skills necessary to manage the human resources of their organization.

General Communication and Business Communication

Communication in Organizational Settings: Patterns of Communication in the Business World

– Upward, Downward, Horizontal Grapevine etc, Channels of Communication- Internal and External, Formal and Informal

Introduction to Cross Cultural Communication

Strategies to Overcome Communication Barriers

MODULE-II: READING AND WRITING (10 hrs.)

This unit works on the competency in reading and writing skills through such tasks/activities as reading books, articles, magazines, novels, developing outlines, key expressions, situations, slogan writing and theme building exercises, dialogue writing, interpreting pictures, technical writing.

Importance of Developing Reading Skills

Sub-Skills of Reading: Predicting Content, Skimming & Scanning, Topic sentence and supporting details, Inferential Reading, Guessing the Meaning of Unfamiliar Words, Note Making

Importance of Writing Skills and Principles of Effective Writing

Writing Process: Pre-writing, Drafting and Re-Writing

Paragraph Writing

Summaries and Abstracts

Business Correspondence: Writing Business Letters, E-mail Messages, Memo, Notice, Circulars, Reports, Proposals
 Career Communication: Writing Resume/ CV and Job Application Letter

MODULE-III: LISTENING AND SPEAKING (9 HOURS)

Listening is the mother of all speaking. This unit aims to achieve competence in speaking i.e., the ability to communicate orally in clear, coherent, and persuasive language appropriate to purpose, occasion, and audience. The module focuses on developing this competency which includes acquiring poise and developing control of the language through experience in making presentations to small groups, to large groups, and through the media.

Listening Skills: Listening Process, Hearing and Listening, Types and Barriers, Effective Listening Strategies

Common forms of Oral Communication in the Business World:

Meetings: Organize Meetings, Preparing an Agenda, Chairing a Meeting, Drafting Resolutions, Writing Minutes

Persuasive Speaking: Improving Fluency and Self-Expressions, Articulation, Good Pronunciation, Voice Quality

Making an Oral Presentation: Planning, Preparing and Delivery

Facing an Interview: Preparation, Types of Interview, Do's and Don'ts

Group Discussions: Debate and GD, Types of GD, GD Etiquette

(Treatment: Developing listening and speaking skills through various activities, such as role play activities, practicing short dialogues, JAM, group discussions, debates, speeches, listening to news bulletins, viewing and reviewing documentaries and short films etc.)

TEXT BOOKS:

An Introduction to Professional English and soft skills by B.K Das et al., Cambridge University Press

REFERENCES:

Effective Technical Communication, M. Ashraf Rizvi, TMH Publications.

Business Communication, Krizan. Merrier. Logan. Williams, Thomson

Business Communication Today, Courtland L Bovee, John V Thill & Mukesh Chaturvedi, Pearson Education.

Business communication by Meenakshi Raman and Prakash Singh (Oxford)

Business Communication, Urmila Rai & S.M Rai, Himalaya Publishing House

EVALUATION SYSTEM (CONTINUOUS INTERNAL ASSESSMENT)

Methods	Role Plays (Org. Comm.)	Reading Comprehension & Note-Making	Listening & Individual Presentation	GD	Mid-I (Online Test on Vocabulary)	Mid-II (Written exam on module 2)	Mid-III (Oral Presentation)	% of Marks 100 (Best 5)
Total	20	20	20	20	20	20	20	100

SESSION PLAN: BUSINESS COMMUNICATION

S. No.	Topic	Pedagogy	Details	Instructional Hrs			
				Th	Pract	video	Proj
1	Introduction To Business Communication	Business games Written Assignment	What is Business Communication? General Communication vs. Professional Comm. Das, AIPE & SS,	0	1	0	0
2	General Communication & Business Communication	Audio-visual clips Communication on game-Change your style	Difference in Style Degrees of Formality pp. 6-7 http://christopherhouse.blogspot.in/2012/08/difference-between-business.html	0	1	0	0
3	Communication In Organisational Settings	Small group work Role Plays Quiz	Internal Communication: Formal Communication Network Informal Communication Network External Communication Raman, BC, pp- 13-21 http://keydifferences.com/difference-between-formal-and-informal-communication.html	0	1	0	0
4	Understanding The Importance Of Cross-Cultural Communications	Flip class-Match your points Role Plays	The Global Marketplace The Multicultural Workforce Krizen, BC, Chapter 2 & Bovee, BCT, pp. 63- 65 http://study.com/academy/lesson/cross-cultural-communication-definition-strategies-examples.html	0	1	0	0

S. No.	Topic	Pedagogy	Details	Instructional Hrs			
				Th	Pract	video	Proj
5	Improving Intercultural Sensitivity	Communication Games and activities	Recognise Cultural Differences Overcome Ethnocentrism Study other Cultures Overcome Language Barriers Develop Effective intercultural Skills Bovee, BCT, pp. 66-82	0	1	0	0
6	Over Coming Miscommunication	Workshop (Emphasis on listening skill)	The Information Gap principle Organizational Structure Difference in Status Incorrect Choice of Medium Message Complexity Cultural Differences Psychological Barriers Noise, and barriers http://www.businesscoachphil.com/overcoming-miscommunication-at-work Raman, BC, pp.22-27	0	1	0	0
7	Strategies For Improving	Good Listener Case Studies	Open Feedback, Simple Language, Avoid Overload, Walk the Talk	0	1	0	0

	Organisational Communication	Role plays & presentations	http://debo10199businesscommunication.blogspot.in/2012/02/strategies-for-improving-organizational.html Raman, BC, pp.34-40				
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MODULE II: READING AND WRITING

S. No.	Topic	Pedagogy	Details	Instructional Hrs			
				Th	Pract	video	Proj
8	Importance Of Developing Reading Skills & Reading Strategies	Reading News clips	The Importance of Developing Reading Skills Vocabulary Skills Word Meaning Recognition Guessing the Meaning from Word Structure and Context Guidelines for Improving Reading Skill Types of Reading Tips for Improving Reading Speed Rizvi, ETC, pp. 219- 224 http://www.nclrc.org/essentials/reading/stratread.htm	0	1	0	0
9	The Sub-Skills of Reading	Guessing Game	Understanding the Main Idea and Supporting Details Reading between the Lines: Inferential Reading Understanding the Writer's Point Of View Making Predictions · Guessing the Meanings of Unfamiliar Words · Skimming and Scanning Rizvi, ETC, pp. 228-250 http://literallycommunication.blogspot.in/2013/06/reading-skills-and-its-sub-skills.html	0	1	0	0
10	Note-Making	Topicalizing Schematising Use of Reduction Devices Methods of Sequencing Practice in Note	Mechanics of Note Making Note Writing Techniques Rizvi, ETC, pp.273-289 · http://www2.le.ac.uk/offices/ld/resources/study/notes	0	1	0	0

S. No.	Topic	Pedagogy	Details	Instructional Hrs			
				Th	Pract	video	Proj
11	Importance of Writing Skills	Tasks on small paragraphs Creative writing	Writing Process: Pre-writing, Drafting and Re-writing Idea Mapping Writing and Editing Rai, BC, pp. 182-192 http://smallbusiness.chron.com/importance-writing-skills-business-845.html	0	1	0	0

12	Paragraph Writing	Written Assignment Developing story outline	Unity in writing Topic sentence Chronological order of development Using Connectives Organizing a Paragraph Adequate Development of supporting details Cohesion & Coherence in a Paragraph Rizvi, ETC, pp.337-350 http://www.wikihow.com/Write-a-Paragraph	0	1	0	0
13	Summaries & Abstracts	Written Assignment based on guidelines	Differences between Abstract and Summary Procedure for Writing Abstracts Procedure for writing summary Rizvi, ETC, pp.290-307 http://www.uts.edu.au/current-students/support/helps/self-help-resources/academic-writing/abstract-and-executive-summary	0	1	0	0
14	Writing Business Letter & Proposal	Written Assignment based on guidelines	Purpose & goal Principles of effective letter writing: Courtesy and consideration, Directness and conciseness, Avoid verbosity, Participial endings, Positive and direct statements, Clarity and precision Structure and layout Rizvi, ETC, pp.351-365 & Raman, BC, PP.256-260 http://www.writing-business-letters.com/business-proposal-letter.html	0	1	0	0
15	Memo, Notice, Circulars & Email	Written Assignment based on guidelines	What is a Memo? Email writing format Characteristics of Effective Memo Difference between notice and circular Essentials of notice and notice format Rizvi, ETC, pp.423-436 http://www.umuc.edu/writingcenter/writingresources/effective_memos.cfm http://www.englishtransform.com/2014/04/difference-between-circular-memo-notice.html	0	1	0	0
16	Reports	Written Assignment based on guidelines	Definition and Types Deciding on Format and Length Structure / Parts of Formal Report Topics Covered in a Report Introduction, Body and Closing Krizen, BC, pp 259-303 & Rizvi, ETC, pp. 452-467 http://cgu.edu/pages/852.asp	0	1	0	0

TREATMENT: Tasks/activities as reading books, articles, magazines, novels, developing outlines, key expressions, situations, slogan writing and theme building exercises, dialogue writing, interpreting pictures, technical writing.

MODULE III: LISTENING AND SPEAKING

S. No.	Topic	Pedagogy	Details	Instructional Hrs			
				Th	Pract	video	Proj
17	Listening Skills	Effective Listening Strategies TED Talks: Listening and individual presentation	Listening Process Hearing and Listening Types and Barriers Rizvi, ETC, pp. 59-75 Video : https://www.youtube.com/watch?v=C8zNx_IarUw	0	1	0	0
18	Listening Attentively	News video clips and quizzing	Overall comprehension Extracting Detail information Listening between the lines Note taking Video https://www.youtube.com/watch?v=t2z9mdX1j4A	0	1	0	0
19	Persuasive Speaking	Inspirational audio-video clips for language improvement	Communication module for persuasive meeting Feed back Taking care of non-verbal elements Decoding message Handling noise Raman, BC, pp. 123- 169 & Rizvi, ETC, pp.195 -218 Video: https://www.youtube.com/watch?v=NBObNfR2n_4 Reference: http://www.speaking.pitt.edu/student/public-speaking/persuasive.html	0	1	0	0
20	Oral Presentation	Individual presentation on Events	Improving Fluency and Self-Expressions Articulation Good Pronunciation, Voice Quality Planning & Preparing your Oral Presentation Types of Delivery Guidelines for Delivery: Verbal elements, non-verbal elements, visual elements Practice delivery elements Controlling Nervousness and Stage freight Handling questions responsively narration/JAM Raman, BC, pp. 123- 169 & Rizvi, ETC, pp.195 -218 http://www4.caes.hku.hk/epc/presentation/VIDEO https://www.youtube.com/watch?v=WJIOzFLQ5w4	0	2	0	0
21	Group Discussions	GD Sessions on current/ social issues	Nature of Group Discussion Characteristics of Group Discussion Skills Selection Group Discussions Subject knowledge Oral communication skills Team management	0	2	0	0

			<i>Group Discussion Strategies</i> <i>Role Functions in Group Discussions</i> <i>Rizvi, ETC, pp 165-187</i> https://www.youtube.com/watch?v=ymcMo7JWSu8 http://placement.freshersworld.com/what-is-group-discussion/33122049				
22	<i>Group Discussions</i>	<i>GD Sessions on current/ social issues</i>	<i>Debate and GD</i> <i>Types of GD</i> <i>GD Etiquette</i>		1		
23	<i>Revision</i>	<i>TUTORIAL</i>	<i>Module - I</i>		1		
24	<i>Revision</i>	<i>TUTORIAL</i>	<i>Module - I</i>		1		
25	<i>Revision</i>	<i>TUTORIAL</i>	<i>Module - I</i>		1		

FCHU1204 COMMUNICATIVE PRACTICE LABORATORY –II

<i>Pre - requisites</i>	<i>Course Type</i>	<i>Credits</i>
<i>Nil</i>	<i>Workshop</i>	<i>2</i>

The suggestive assignments in the laboratory are intended as learning activities to facilitate the students in accomplishing the language skills which are needed to succeed in the business world.

COURSE OBJECTIVES

To master Study Skills

To acquire strategic competence to use both spoken & written language to use in a wide range of communication strategies

To acquire Business Performance Skills

COURSE OUTCOMES

The students will be able to

Write effectively for a variety of professional and social settings. They will practice writing as a process of motivated inquiry engaging others writers' ideas as they explore and develop their own. They will demonstrate an ability to revise for content and edit for grammatical and stylistic clarity. And they will develop an awareness and confidence in their own voice as a writer.

Become accomplished, active readers who appreciate ambiguity and complexity, and who can articulate their own interpretations with an awareness and curiosity for other perspectives.

Demonstrate the skills needed to participate in a conversation that builds knowledge collaboratively; listening carefully and respectfully to others' view points; articulating their own ideas in relation to other voices and ideas. Students will be able to prepare, organize and deliver and engaging oral presentation.

A student is required to take up five lab tests of 100 marks- at least two tests in written mode and three tests in spoken mode.

MODULE-I: LISTENING (6 HOURS)

Exercises on Active Listening: The whole group listens to any speech/news broadcast in English and notes down the important points. They listen again to check their points and evaluate themselves. The group then compares points to see how well they have understood the broadcast.

MODULE- II: SPEAKING (8 HOURS)

Situational Dialogues / Role Play: Organization Communication

Oral Presentations- Prepared and Extempore

'Just a minute' Sessions (JAM)

Debates

Mock Meetings

Cracking Job Interviews: Mock Sessions

Group Discussions on current topics

(This module will be practiced through speaking activities like role plays, presentations, and discussions)

MODULE-III: READING (8 HOURS)

Students will be given practice in reading and comprehension 6-8 passages of 100-300 words each, on topics of General as well as professional interest. The texts will be supported by suitable exercises designed to foster comprehension skills and vocabulary enrichment. Students are encouraged to read newspapers, articles, books and novels.

Reading Comprehension Exercises Through Tests, Writing Summary and Presenting, Note Making

Review Presentation (Movie/ Article/ Book)

Vocabulary Building Exercises

(This module encourages extensive use of reading materials)

MODULE-IV: WRITING (8 HOURS)

The Writing Lab content is designed to acquaint the students not only with the techniques of effective writing but also give them an insight into planning and writing documents that produce results.

Short Paragraphs on current general and technical topics

Creative Writing: Idea Generation

Business Letters, Email Messages, Project Writing

Writing Resumes and Cover Letters

(* Students will be required to produce and submit by the end of second semester a 350-500 word project report on a topic of their choice. The project should involve data collection, analysis and reporting. Ten marks (out of 100 marks allocated for Lab Test) will be set apart for the project.)

TEXT BOOK:

An Introduction to Professional English and soft skills by B.K Das et al., Cambridge University Press

REFERENCES:

Effective Business Communication, AshaKaul, Prentice Hall

Professional Communication, ArunaKoneru, TMH

EVALUATION SYSTEM (CONTINUOUS INTERNAL ASSESSMENT)

<i>Methods</i>	<i>Listening Skills</i>	<i>Movie Review</i>	<i>Role Plays</i>	<i>Group Discussion</i>	<i>Mock Interview</i>	<i>JAM</i>	<i>Vocabulary/ Comprehension</i>	<i>% of Marks</i>
Total	20	20	20	20	20	20	20	100(Best 5)

SESSION PLAN: COMMUNICATIVE PRACTICE LABORATORY –II

MODULE I: LISTENING (6 HOURS)

S No.	Topic	Pedagogy	Details	Instructional Hrs			
				Th	Pract	Video	Proj
Lab-1	Introduction and Ice Breakers	Activity - Based	Knowing Each Other, People's Bingo http://cutmlanguagelab.org/course/view.php?id=4	0	2	0	0
Lab - 2	Exercises On Active Listening	Activity Based	Feedback, Note Taking, Summarizing, Paraphrasing and Non-verbal Cues http://cutmlanguagelab.org/course/view.php?id=4 https://www.youtube.com/watch?v=cSohjLYOI2A	0	1	1	0
Lab - 3	Movie Review Presentation	Activity Based	The October Sky/ In Pursuit of Happiness/A Beautiful Mind/ Any Other http://cutmlanguagelab.org/course/view.php?id=4	0	1	1	0

MODULE II: SPEAKING (8 HOURS)

S. No.	Topic	Pedagogy	Details	Instructional Hrs			
				Th	Pract	Video	Pro
Lab-4	Organization Communication	Role play	Business Situations and Mock Meeting http://cutmlanguagelab.org/course/view.php?id=4 http://eduscapes.com/distance/course_activities/simulations.htm https://www.youtube.com/watch?v=3X51J-ZDMmE	0	2	0	0
Lab - 5	Oral Presentations	Activity OSLL (Moodle)	Prepared and Extempore/ Debate / 'Just a Minute' Talk (JAM) http://cutmlanguagelab.org/course/view.php?id=4	0	2	0	0
Lab - 6	Interview /Group Discussion	Mock Interview /Group Discussion OSLL (Moodle)	Frequently Asked Questions (FAQs) Discussion on Current Topics - General, Social, Political, Management, Creative, Education and Sports http://cutmlanguagelab.org/course/view.php?id=4 https://www.youtube.com/watch?v=ymcMo7JWSu8 https://www.youtube.com/watch?v=7gcsZ9H2I6s	0	2	0	0

MODULE-III: READING (8 HOURS)

S. No.	Topic	Pedagogy	Details	Instructional Hrs			
				Th	Pract	Video	Pro
Lab -7	Reading Assignment - I	Assignment , online practice and discussion	Reading abridged texts, relevant topics, and news articles http://cutmlanguagelab.org/course/view.php?id=4	0	2	0	0
Lab -8	Reading Assignment - II		Reading for comprehension and vocabulary http://cutmlanguagelab.org/course/view.php?id=4 http://www.majortests.com/sat/reading-comprehension.php	0	2	0	0

MODULE-IV: WRITING (8 HOURS)

S. No.	Topic	Pedagogy	Details	Instructional Hrs			
				Th	Pract	Video	Pro
Lab -9	Writing Short Paragraphs - General, Current and Technical Topics	Assignment, online practice and discussion	Write, Rewrite, Expand, Correct, Complete, and Improve Paragraphs http://cutmlanguagelab.org/course/view.php?id=4	0	2	0	0
Lab -10	Idea Generation and Creative Writing	Assignment and discussion	Problem solving/decision making, Strategy development, Outline a proposal, Create a timeline Collaboration technique, Expression of creativity, Condensing various thoughts, Put visuals and text together http://cutmlanguagelab.org/course/view.php?id=4	0	2	0	0
Lab -11	Memo Writing & Emails	Assignment and discussion	Adopt the steps of writing process for preparing of memo and emails http://cutmlanguagelab.org/course/view.php?id=4 https://www.youtube.com/watch?v=6zHLHc9CcvQ	0	2	0	0
Lab -12	Preparation Of Business Reports/ Proposals And Presentation	Project Work and discussion	Adopt the steps of writing process for preparing business reports and proposals http://cutmlanguagelab.org/course/view.php?id=4 mails https://www.youtube.com/watch?v=eLKVRDBAMvQ	0	2	0	0

FCHU1205 CORPORATE READINESS LABORATORY

<i>Pre - requisites</i>	<i>Course Type</i>	<i>Credits</i>
<i>Nil</i>	<i>Workshop</i>	<i>2</i>

A real-time project approach in the laboratory is intended to provide a developmentally appropriate ambience, make the students proactive, encourage and motivate as well as develop skills to become a good listener, good communicator and responsible. A student will experience the challenging application process and at the same time prepare for the challenging world. The experience gained from working on projects can help one understand the appropriate and effective use of language skills. It also creates context in which learners engage in purposeful communication.

All communication activities are supported with the help of live projects on general techno-management or local themes which provide exposure to the students and help them to find a suitable job in the industry.

A student is required to take up five laboratory tests of 100 marks.

COURSE OBJECTIVES

- Understand the process of communication*
- View communication from the perspective of each stakeholder*
- Plan and manage communication difficulties*
- Learn exactly how, when and what of communication*

COURSE OUTCOMES

- Understanding the convention of project report*
- Understanding the process of data collection and documentation*
- Preparation and presentation of project report*
- Preparation for various academic and professional needs*

INSTRUCTION AND DELIVERY

Instruction- led facilitation highlights interactions between students and their facilitators, and emphasizes guidance from the facilitator who will track, assess and mentor them.

Students will make a team of four members who will take up real problems and run through the semester trying to solve the problems. The lab program will augment this learning with the right theory.

Participants will use PPTS, flash presentations or high impact presentations, flip charts, blogs, boards with graphical or pictorial representations, with captions and outlines, video display or any other best mode of presentation, post-it notes and group activities to document all processes and methodology.

OUTLINE

LAB1: Introduction to the Lab Program (Session will be driven by the Facilitators)

(Structure, Objective, Methodology, Objective of Choosing Project as a Vehicle to Learn the Course, Process of Carrying out the Project, Announcing the List of Projects)

LAB2: Discussion on Project Approach and Communication (Session will be driven by the Facilitators)

LAB3: Win Your Project: A Presentation by Groups (Session will be driven by the Students)

LAB4: Project Plan Presentation by Groups (Session will be driven by the Students)

LAB5: Review of Weekly Status Reports by the Guide, and Discussions (Session will be driven by the Students)

LAB6: Progress Presentation by Groups, and Feedback by Guide and Co-Guide (Session will be driven by the Students)

LAB7: Review of Documentation File/Dossier, and Feedback by Guide

LAB8: Progress Presentation and Submission of Dossier Containing Documentary Notes

(E.g., compilation of weekly status reports, minutes, photocopies of emails, feedbacks, testimonials, photographs)

LAB 9: Presentation on the Project, Feedback by the Guide and Co-guide

LAB 10: Final Presentation by Groups in front of a Panel and Submission of Project Work

TEXT BOOK:

The Essential Guide to Doing your Research Project by O'LEARY (2011)

REFERENCES:

Logical Framework Analysis, Capacity Building Workshop for Dryland Management, May 3-5, 2000

Professional Presentations by Goodale (2007)

EVALUATION SYSTEM (CONTINUOUS INTERNAL ASSESSMENT)

Methods	Win Your Project	Project Plan Presentation	Weekly Reports	Progress Presentation	Project Presentation	Documentation	Project Report	% of Marks 100 (Best 5)
Total	20	20	20	20	20	20	20	100

S. No.	Topic	Pedagogy	Details	Instructional Hrs				
				Th	Pract	video	Proj	
1	Introduction to the Lab Program	Project-based Learning Discussion Beyond the class Learning	Structure, Objective, Methodology, Objective of Choosing Project as a Vehicle to Learn the Course, Process of Carrying out the Project (Session will be driven by the Facilitators)	0	2	0	0	
2	Announcing the List of Projects		Topics available in OSLL (Moodle) http://cutmlanguagelab.org/	0	1	0	1	
3	Project Approach & Communication		(Session will be driven by the Facilitators) https://www.youtube.com/watch?v=1ybtFwYb7Oc	0	1	0	1	
4	Win Your Project		Rationale for choosing the project topic What makes you say that you deserve the project?/ Why should we give you the project (Session will be driven by the Students)	0	1	0	1	
5	Project Plan		Stakeholder Analysis, Objective Analysis, Situation Analysis, Problem Analysis, Strategy Analysis (Session will be driven by the Students)	0	1	0	1	
6	6Review of Weekly Status		Dossier Verification/Reports by the Guide	0	1	0	1	
7	Review of Progress		Progress Presentation by Groups, and Feedback by Guide and Co-Guide (Session will be driven by the Students)	0	1	0	1	
8	Documentation Review		Presentation with Facilitator Beyond the class Learning	Review of Documentation File/Dossier, and Feedback by Guide	0	1	0	1
9	Progression Presentation and Report Submission		Project-based Learning Presentation and Report Writing	Progress Presentation and Submission of Dossier Containing Documentary Notes (E.g., compilation of weekly status reports, minutes, photocopies of emails, feedbacks, testimonials, photographs)	0	1	0	1

		<i>Beyond the class Learning</i>					
10	<i>Presentation on the Project</i>	<i>Project-based Learning Beyond the class Learning</i>	<i>Presentation on the Project, Feedback by the Guide and Co-guide</i>	0	1	0	1
11	<i>Project Work</i>	<i>Discussion</i>	<i>Performance Analysis</i>	0	0	0	2
12	<i>Communication</i>	<i>Discussion</i>	<i>Performance Analysis</i>	0	2	0	0

FCHU1206 IT ENABLED COMMUNICATION

<i>Pre - requisites</i>	<i>Course Type</i>	<i>Credits</i>
<i>Nil</i>	<i>Workshop</i>	<i>2</i>

COURSE OBJECTIVE AND OUTCOME

Upon completing the syllabus, students should be able to:

- *Speak confidently and fluently, in both formal and informal contexts.*
- *Write clearly, correctly and cogently*
- *Design and have a Home Page/Blog Space, Facebook Page and post comments/reports for collaboration & online presence*
- *Evolve from the role of an 'information provider', through 'motivator' and 'catalyst of change', to 'Change Agent'.*

COURSE OUTLINE

MODULE I: CONCEPTUAL FOUNDATIONS

Pre-Course Assessment

Tell me a bit about yourself: Your background, your major, your professional aspirations ... your likes ... and maybe your favorite movie, and what you like to do in your spare time...

Do you know?

Introduction to IT Enabled Communication

Communication in the New Age Context and Demand for Communication Interventions
(*This module includes pre-course assessments and presentations*)

MODULE II: BLOG DESIGNING & POSTING

Step-by- Step to Writing a Blog: Researching, Brainstorming and Structuring, Writing, Posting, Editing and Accessorizing

Photoshop for Image, Editing and graphic design

(*This module will be driven through methods like self-learning, learning by doing, and workshop*)

MODULE III: TECHNOLOGY AND COMMUNICATION

Tools for Business Correspondence and web-based exercises

Creating and delivering high impact presentations with Slides and other Visuals

Video Documentaries

Video Conferencing Sites, Skype, Team Viewer

(*This module will be facilitated through presentations, use of tools and technology*)

TEXT BOOKS

Shirley Taylor, Model Business Letters (MBL) and Other Business Documents, 5th Edition. Krizen. Merrier.Logan. Williams, Business Communication, and Thomson (BC: Krizen).

M.M. Monippally, *Business Communication Strategies (BCS: MMM)*, TMH, New Delhi, 2001.
 Arthur H. Bell & Dayle M. Smith, *Management Communication (MC: AHB & DMS)*, Wiley Student Edition, 2005

LINKS

http://ctb.ku.edu/en/tablecontents/section_1017.htm

Useful websites for some topics will be linked to the course for improving language proficiency skills of the students.

www.a4esl.org

www.learnenglishfeelgood.com

EVALUATION SYSTEM (CONTINUOUS INTERNAL ASSESSMENT)

Methods	Presenta- tion	Blog Design & Post	Video Documentary	E-mail Writing	Business Letters	Poster/ Template Design	Mid-Sem written Exam	% of Marks 100(Best 5)
Total	20	20	20	20	20	20	20	100

MODULE I: CONCEPTUAL FOUNDATIONS (3HRS)

S. No.	Topic	Pedagogy	Details	Instructional Hrs			
				Th	Pract	video	Proj
1	Pre-Course Assessment [IT Enabled Communication]	Record pre-course assessments on communication management & technology by 'Probing & Doing'	Do you Know?	0	1	0	0
2	Tell me a bit about yourself	Know each other, and create a classroom philoso phy through a game	Your background, your major, your professional aspirations ... your likes ... and maybe your favorite movie, and what you like to do in your spare time...	0	1	0	0
3	Communication in the New Age	Presentation	Context and Demand for Communication Interventions Explore top five social networking sites relevant to technology sector and present in the class, create and maintain online presence on Facebook, Google + or any other	0	1	0	0

MODULE II: BLOG DESIGNING & POSTING

S. No.	Topic	Pedagogy	Details	Instructional Hrs			
				Th	Pract	video	Pro j
4	Step-by- Step to Writing a Blog - 1	Learning to Learn (Self-learning)	Researching	0	1	0	0
5	Step-by- Step to Writing a Blog - 2	Learning to Learn (Self-learning)	Brainstorming & Structuring	0	1	0	0
6	Step-by- Step to Writing a Blog - 3	Learning to Learn (Self-learning)	Writing & Posting	0	1	0	0

7	Step-by- Step to Writing a Blog - 4	Learning to Learn (Self-learning)	Editing & Accessorizing	0	1	0	0
8	Blog	Workshop (Self-learning)	One Day Workshop On Blog Design (CUTM e-content)	0	1	1	0
9	Blog Design	Posting assignments/ weekly reports/share what he/she has learnt (Doing)	Assignment: "Me in a Minute" blog post, email your blog's web address to the facilitators and peer group	0	1	0	0
10	Photoshop - 2	Self- Learning & Peer Learning	Editing and Graphic Design	0	1	1	0
11	Photoshop -3	Photoshop (FOSS) Training	Video tool www.spoken-tutorial.org	0	1	0	0
12	Photoshop	Workshop	One Day Workshop On Blog Design (CUTM e-content)	0	1	1	0

MODULE III: TECHNOLOGY AND COMMUNICATION

S. No.	Topic	Pedagogy	Details	Instructional Hrs			
				Th	Pract	video	Proj
13	Business Correspondence	Document Makeover, Web-based Exercises	Letters & Emails [Write to the point with correctness, conciseness, coherence and completeness]	0	1	0	0
14	Impress Presentation	Training and Practice	Language Laboratory Impress (FOSS)- Presentations (www.spoken-tutorial.org)	0	1	0	0
15	Enhancing presentation through slides and other visuals	Use of media for presenting the visual contents to reinforce the message, and create online presence	Equip the learners with techniques where they feel more confident in front of an audience Assignment [Improve the slides] Slide Share/ Upload on YouTube or Google +	0	1	0	0
16	Delivering High Impact Presentations	Video Recording & Peer Evaluation	Mastering the Art of Delivery, Preparing to Speak, Overcoming Anxiety, Handling Questions Watch-YouTube: Steve Jobs and iPod	0	1	0	0
17	Video Documentaries	Video documentary (Self- Learning)	Each student/group will make a short documentary movie (CSR, Facilities Labs, Student Projects etc.)	0	1	0	0
18	Making of Video Documentary	Workshop	One Day Workshop on Making Video Documentaries	0	1	1	0

19	Documentary Movie	10 min. video presentation by individuals/ groups	Feedback and Analysis	0	1	0	0
20	Video Conferencing	Free conference calls, webcam chat, video conferencing, group calls	Create Account & Practice [Skype, TeamViewer, Mobile]	0	1	0	0
21	Organize and Manage a Video Conference	Use video conference for business meetings Video conference etiquette & tips	Organise, Share & Collaborate	0	1	0	0

FCHU1207 CAREER COMMUNICATION

<i>Pre - requisites</i>	<i>Course Type</i>	<i>Credits</i>
<i>Nil</i>	<i>Workshop</i>	<i>2</i>

OBJECTIVES

- Prepare the graduates to acquire their dream jobs.*
- Build their mindset with right attitude, self-awareness, pro-activeness.*
- Build confidence, and enhance their communication skills to handle all situations.*

OUTCOMES

- Build the confidence of students*
- Trigger the thinking and analyzing ability of the learners to solve problems.*
- Readiness to work on their dream jobs.*

List of Experiments

LAB 1: Introduction to Career Communication

LAB 2: Presentation on Corporate House

Create an awareness and exposure on corporate life and culture.

Learners get exposure to corporate life and culture.

LAB 3: Corporate Quiz

LAB 4: Telephonic Conversation

Learners are equipped with basic knowledge and skill practice for improved telephonic communication.

LAB 5: Email Writing

Learn the characteristics of successful e- mail messages.

Create an effective e-mail message.

LAB 6: Mini Test on Email Writing

LAB 7: Learning Etiquette

Understand what etiquette is & why it's important.

Provide practical techniques and generally-accepted professional and ethical conduct or behaviour that will help create a favourable impression in social and professional life.

Practice proper manners like greeting, saying 'please', 'thank you'.

Appear professional and well groomed.

LAB 8 :Identifying Traits for Professional and Interpersonal Success

Understand the importance of effective interpersonal communication and traits for professional success.

Explore the significance of Active Listening, Problem Solving, Respect, Decision Making, Empathy, Co-operation and Non-verbal communication for professional success.

LAB 9: Job-Application -Cover Letter

Develop the career writing skills of the learners with special emphasis on their interest in specific job positions, their strengths and what values they will bring to the organisation.

LAB 10: Job-Applications – CV

Produce a polished and impressive CV that can be tailored to each specific job application.

Develop the career writing skills of the learners with special emphasis on Statement of Purpose.

Provide with tools to showcase Unique Selling Points for the specified job description.

LAB 11: Participating in Group Discussion (GD)

Mock Interview on basic questions

LAB 12: Facing an Interview

EVALUATION SYSTEM (CONTINUOUS INTERNAL ASSESSMENT)

Methods	Presentation	Corporate Quiz	Telephonic Conversation	Email Writing	CV	GD	Interview	% of Marks 100(Best 5)
Total	20	20	20	20	20	20	20	100

SESSION PLAN: CAREER COMMUNICATION

S. No.	Topic	Pedagogy	Details	Instructional Hrs.			
				Th	Pract	video	Proj
LA B-1	Introduction to Career Communication	Discussion	The Course introduces students to the resources and skills necessary for a successful job or internship search http://cutmlanguagelab.org/course/view.php?id=2	0	2	0	0
LA B-2	Presentation on Corporate House	Team Presentation on OSLL (Moodle)	Create an awareness and exposure on corporate life and culture. Learners get exposure to corporate life and culture. http://cutmlanguagelab.org/course/view.php?id=2 https://www.youtube.com/watch?v=g-_xABU21Yc	0	1	1	0
LAB-3	Corporate Quiz	Quiz OSLL (Moodle)	This Corporate Quiz is an initiative to bring forth all the updates and insights from various industries. Through this quiz , students will be updated with the current happening in the present Corporate world http://cutmlanguagelab.org/course/view.php?id=2	0	2	0	0
LA B-4	Telephonic Conversation	Role play (Pair Work)	Learners are equipped with basic knowledge and skill practice for improved telephonic communication https://www.youtube.com/watch?v=mmXAqMQeOAI https://www.youtube.com/watch?v=6tfFRD0enV0	0	1	1	0
LA B-5	Email Writing	Doing	Learn the characteristics of successful e- mail messages.Create an effective e-mail message. http://cutmlanguagelab.org/course/view.p	0	1	1	0

			hp?id=2https://www.youtube.com/watch?v=mmXAqMQe0AI				
AB -6	Email Writing	Mini Test OSL (Moodle)	(Questions from TCS) http://cutmlanguagelab.org/course/view.php?id=2 https://www.youtube.com/watch?v=LTKb5Fexcuk	0	2	0	0

S. No.	Topic	Pedagog	Details	Instructional Hrs.			
				Th	Pract	video	Proj
LAB-7	Learning Etiquette	Demonstration Video Analysis	Understand what etiquette is & why it's important. Provide practical techniques and generally-accepted professional and ethical conduct or behaviour that will help create a favourable impression in social and professional life. http://cutmlanguagelab.org/course/view.php?id=2 https://www.youtube.com/watch?v=ieYuoQ9sMvA	0	1	1	0
LAB -8	Identifying Traits for Professional and Interpersonal Success	Group Activity Video Analysis	Understand the importance of effective interpersonal communication and traits for professional success. Explore the significance of Active Listening, Problem Solving, Respect, Decision Making, Empathy, Co-operation and Non-verbal communication for professional success. http://cutmlanguagelab.org/course/view.php?id=2	0	1	1	0
LAB -9	Job-Application - Cover Letter	Document Makeover	Develop the career writing skills of the learners with special emphasis on their interest in specific job positions, their strengths and what values they will bring to the organisation. http://cutmlanguagelab.org/course/view.php?id=2 https://www.youtube.com/watch?v=37TbhadX0C8	0	2	0	0

FCHU1208 PERSONALITY DEVELOPMENT

<i>Pre - requisites</i>	<i>Course Type</i>	<i>Credits</i>
<i>Nil</i>	<i>Workshop</i>	<i>2</i>

The laboratory aims at the promotion of the strategies for the personality development of the participants. The rationale behind this endeavor is the recognition of the multifaceted influence of the personality of the participants.

A student is required to take up five laboratory tests of 100 marks.

COURSE OBJECTIVE

Project the force of inner self, assert individuality, influence others and power to success.

COURSE OUTCOME

Learners develop a positive attitude and graceful personality.

LIST OF EXPERIMENTS

Lab 1: Self-Discovery/Self-Analysis

Identifying strengths and weaknesses through games and activities

Lab 2: Impression Management

Formation of impression, first and lasting impression, change: warm-up discussion

Lab 3: Body Language and Communication Style Profile Test

Lab 4 : Working on Attitude: Assertive, Aggressive, Passive

Measure your attitude, case study and role plays

Lab 5: Build Your Skills

Interpersonal Communication and Self

Lab 6: Team Building and Teamwork

Ice-breaker, test your team skills, exercise on stages of formation and effective teams

Lab 6: Explore Your Personality

Lab 7 : Motivation and Success

Ted talks, invited talks and success stories

Lab 8: Time Management

Identifying important time wasters, time management exercises

Lab 10 : Stress Management

Case-based discussions to identify causes of stress, and manage stress

Lab 11: Etiquette and Manners

Test your etiquette and manners, practice good manners

Lab 12 : Personality and Career Choice

Matching your career & personality

TEXT BOOKS:

Basic Managerial Skills for All, 9th Edition, E.H. McGrath, S.J.

Personality Development by Harold R. Wallace & L. Ann Masters, 2006.

REFERENCES:

Personality Development by [John Aurther](#) .Reprint, 2009.

[Personality Development - Transform Yourself](#) by [Rajiv K. Mishra](#), 2004.

[Power of One - Personality and Self-Development](#) by [Dr. Abhishek Mishra](#), 2007.

EVALUATION SYSTEM (CONTINUOUS INTERNAL ASSESSMENT)

Methods	Self-introduction in sales pitch	Debate/ Extempore	Presentation (USP)	Group Activity (Communication)	Public Speaking on Current Topics	Case-based Discussions	Motivation Speech	% of Marks 100 (Best 5)
Total	20	20	20	20	20	20	20	100

SESSION PLAN: PERSONALITY DEVELOPMENT

S. No.	Topic	Pedagogy	Details	Instructional Hrs			
				Th	Pract	video	Proj
1	Self-Discovery/Self-Analysis	Activity Based Learning	Game	0	2	0	0
2	Impression Management	Videos and interactions	19 tips to impress others https://www.buzzfeed.com/carolynkylstra/impress-literally-everyone-you-meet?utm_term=.nbz2MKVQJO#.qywdZLkQXQ	0	1	1	0
3	Body Language and Communication Style Profile Test	Understanding of different postures and gestures through online test	http://www.queendom.com/queendom_tests/transfer	0	1	1	0
4	Working on Assertive, Aggressive, Passive	Role Plays and are Encouraged to watch videos	https://www.youtube.com/watch?v=O6eyUUkpoU8 Role plays	0	1	1	0
5	Build Your Skills	Videos	https://www.youtube.com/watch?v=w97dR3OJB1k http://www.investopedia.com/video/play/interpersonal-skills/	0	1	1	0
6	Team Building and Teamwork	Activity Based Learning	Coin Logo Time Required: 5-10 minutes Begin by asking all participants to empty their pockets, purses, and wallets of any coins they may have and place them on the table in front of them. If someone doesn't have any coins or only has very few, others in the room can share their coins with them. Instruct each person to create their own personal logo using the coins in front of them in just one minute. Other materials they may have on them, such as pens, notebooks, wallets, etc. can also be used in creation of the logo. If there is a particularly large group, people can be broken up into teams of 3-6 people and instructed to create a logo that represents them as a team or the whole room can gather to use the coins to create a logo for the organization/group/department/etc. Each	0	1	1	0

			solitary participant can explain their logo to the group or if the room was split into groups, the leader can have each group discuss what led to the team logo and what it says about them. Not only does this activity promote self and mutual awareness, but it also enables participants to get to know each other on a more personal level. http://www.livestrong.com/article/219775-team-building-exercises-for-small-groups/				
7	Explore Your Personality	videos	https://www.16personalities.com/free-personality-test	0	1	1	0
8	Motivation and Success	videos	https://www.youtube.com/watch?v=ILEg5EZw3iQ https://www.youtube.com/watch?v=g-PNJHhf-ag	0	1	1	0
9	Stress Management	Classroom Exercise	Time Wasters Exercise.pdf	0	1	0	0
10	Etiquette and Manners	videos	https://www.youtube.com/watch?v=55cXVve0lpw for table manners https://www.youtube.com/watch?v=VLqKVfsG-bk for interview etiquette. https://www.youtube.com/watch?v=4-8AlriF908 for manners.	0	1	1	0

S. No.	Topic	Pedagogy	Details	Instructional Hrs			
				Th	Pract	video	Proj
11	Personality and Career Choice	Classroom exercise	rs_self-assessment.pdf	0	1	0	0
12	Time Management	Group Activity	<p>How long is a minute?</p> <p>At the beginning of session ask people to close their eyes for 30 seconds and after that to open it. Nobody can watch the clock and don't measure the time. Ask of participants to open their eyes after what they believe has been 30 seconds. Of course, they all open them at different times. Afterwards, we talk about our understanding of time. Even though everyone has an equal (24 hours a day or 30 seconds for exercise), in fact, we experience it and use it in different ways. Some of us experienced it as a short period, other as a long. This always works as a good opener.</p> <p>2) Cover all the clocks in the room, then ask participants to remove their wrist watches and stand up. Instruct them to sit down when they think 1 minute has elapsed after you shout "Start" to begin the countdown. You will be surprised with the results. Just enjoy the fun that follows this activity</p>	0	1	0	0

FCHU1209 SEMINAR AND TECHNICAL WRITING

<i>Pre - requisites</i>	<i>Course Type</i>	<i>Credits</i>
<i>Nil</i>	<i>Workshop</i>	<i>2</i>

Seminar allows students the opportunity to put all of information together. The students are required to prepare technical reports including oral presentations supported by written technical papers. Seminar is designed to assist students in preparing for their career.

COURSE OBJECTIVES

Understand the requirements and ethics of technical writing in the 21st Century workplace.

Work professionally, individually and in a team to produce effective technical documents incorporating verbal, visual, and multimedia materials as necessary.

Communicate effectively by analyzing audience, organizing documents, writing clearly and precisely with no grammar errors and presenting the document with skillful design.

Locate, evaluate, and incorporate pertinent information.

Write clear, intelligent technical reports

Make seminar presentations

COURSE OUTCOMES

Understand how technical communication is used in the workplace.

Understand and use the principles of design in business and technical communication.

Apply useful descriptive language to your technical documents.

Students will gain experience in preparing a technical report including an oral presentation supported by a written technical paper.

MODULE-I: TECHNICAL COMMUNICATION ESSENTIALS

COURSE OUTCOMES

Describe the writing process most useful in today's technical writing environment.

Analyze an audience and consider appropriate writing situations to meet the audience's needs.

Understand the ethics of the workplace and apply those ethics to their technical and business writing.

OUTLINE: Communicating in the Workplace, Technical Writing Process Today, Readers and Contexts of Use, Ethics in the Technical Workplace

MODULE- II: DOCUMENT DESIGN

COURSE OUTCOMES

Create and use graphics that complement your business and technical communication.

OUTLINE: Designing Documents and Interfaces, Creating and Using Graphics

MODULE-III: TECHNICAL COMMUNICATION STRATEGIES AND RESEARCHED REPORT WRITING

COURSE OUTCOMES

Define terms clearly in technical documents.

Explain instructions and processes clearly.

Write clear proposals for business and technical situations.

Research and manage information.

Write an analytical report.

OUTLINE: Researching and Managing Information, Organizing and Drafting, Technical Definitions, Technical Descriptions, Instructions and Documentation, Proposals, Analytical Reports

MODULE-IV: SEMINAR PRESENTATION

COURSE OUTCOME

Students will not only learn from the experience gained in preparing and presenting their seminar, but will have the opportunity to observe and participate in the seminar given by their classmates.

OUTLINE: Technical Report, Seminar Presentation

(Planning, Preparing, Organizing and Seminar Presentation are the 4 stages of this module)

TEXT BOOK:

Gerson, Sharon J. and Gerson, Steven M. (2007). *Technical Writing Process and Product*. Delhi: Pearson Education.

REFERENCES:

Effective Technical Communication, M. Ashraf Rizvi, TMH Publications.

Business Communication Today, Courtland L Bovee, John V Thill & Mukesh Chaturvedi, Pearson Education.

EVALUATION SYSTEM (CONTINUOUS INTERNAL ASSESSMENT)

Methods	Proposal Writing	Report Writing	Organizing Seminar	Document Formatting	Preparing a Technical Paper	Seminar Presentation-I	Seminar Presentation-II	% of Marks 100 (Best 5)
Total	20	20	20	20	20	20	20	100

SESSION PLAN: SEMINAR AND TECHNICAL WRITING

S. No.	Topic	Pedagogy	Details	Instructional Hrs			
				Th	Pract	video	Proj
1	Introduction to Technical Writing	Activity Based Learning	Writing Genres: Technical versus non-technical writings https://www.youtube.com/watch?v=LTDsgd0ytbE	0	1	0	0
2	Preparing to Write	Doing	Audience Analysis Brainstorming Organizing information Link: https://www.youtube.com/watch?v=wxKJT13EhuM	0	1	0	0
3	Gathering information	Google Search	How do we gather information? Ways, techniques and tools	0	2	0	0
4	Focusing on Writing Skills	Workshop	Brainstorming, Drafting, Editing	0	2	0	0
5	Technical Writing Conventions	Analysis and Discussion	Analysis of different case studies	0	1	0	0
6	Reporting	Learning to Learn Analysis and Discussion	FORMAT: Preliminary pages, Summary, Main section, Conclusion, Recommendations References	0	2	0	0

S. No.	Topic	Pedagogy	Details	Instructional Hrs			
				Th	Pract	video	Proj
7	Using and interpreting Graphics	Group work and Discussion	Matching Games : Texts and graphic types	0	2	0	0
8	Document Formatting	Workshop	Layouts Use of MS Word for Documenting Document templates	0	2	0	0

			APA Format (6th) - Microsoft Word 2010 https://www.youtube.com/watch?v=aWT9zgMPviY				
9	Documentation	Workshop	Documenting Sources: https://www.youtube.com/watch?v=-H2fRG_Rtns	0	2	0	0
10	Introduction to Seminar	Discussion	Seminar : Needs and ways of preparation Video : https://www.youtube.com/watch?v=Rz2II40tQuI	0	1	0	0
11	Questioning Skills	Workshop	Asking and Responding to questions in Seminars TED TALK: https://www.youtube.com/watch?v=PkcHstP6Ht0	0	2	0	0
12	Analysis of various Seminars	Videos and Discussion	Analysis of Seminars: Pros and Cons How to make a seminar effective? https://www.youtube.com/watch?v=x7qPAY9JqE4	0	1	1	0
13	Preparing for a Seminar	Group Work	Grouping Selection of topics	0	1	0	0
14	Collection of Information	Workshop	Primary and secondary sources Preparing sample PPTs	0	2	0	0
15	Seminar Presentation-I	Group Work	Demonstration and Discussion	0	2	0	0
16	Seminar Presentation-II		Demonstration and Discussion	0	2	0	0

FCHU1210 PROFESSIONAL ETIQUETTE

<i>Pre - requisites</i>	<i>Course Type</i>	<i>Credits</i>
<i>Nil</i>	<i>Workshop</i>	<i>2</i>

Etiquette begins with meeting and greeting. Good professional etiquettes indicate that you are a mature responsible, adult who can aptly represent any organization. Etiquettes center upon respect. **COURSE**

OBJECTIVES

- To recognize the importance of proper etiquette at workplace*
- To understand the elements and characteristics of proper etiquette*
- To behave professionally and gain respect*
- To develop an action plan to improve professionalism*

COURSE OUTCOMES

At the end of this course students would be able to learn:

- Professional behavior, standards for appearance, action and attitude in a business environment*
- Handle a variety of social and business situation*
- Different styles of communication based on different situations.*

MODULE- I: MEETING AND GREETING ETIQUETTE, OFFICE ETIQUETTE (7hrs)

- Personal Branding and First Impressions
- Introducing yourself and introducing a guest
- Professionalism at office
- Language styles, tone and attitude

MODULE-II: COMMUNICATION EXCELLENCE (7hrs)

- Techno Etiquette
- Phone Etiquette
- Email Etiquette

Social Media Etiquette
MODULE-III: NETWORKING ETIQUETTE (6hrs)

- Business Card Etiquette
- Names
- Titles
- Net Etiquette
- Proper Introductions

MODULE-IV: BUSINESS ETIQUETTE (7)

- Presentation Etiquette
- Meeting Etiquette
- Dining Etiquette
- Global Etiquette

TEXT BOOK:

The New Etiquette, Real Manners for Real People in Real situations- An A-to-Z Guide by Marjabella Young Stewart, St. Martin Griffin.
Soft Skills, Know Yourself and the World, K.Alex.

REFERENCES:

Do's and Taboos of Hosting International Visitors, Roger E. Axtell, John Wiley & Sons, Inc.
Breaking through Culture Shock: What You Need to Succeed in International Business by Elisabeth Marx.
Dos and Taboos of International Trade by Roger E. Axtell, John Wiley & Sons, Inc.
The Art of Writing Effective E-mails, Jayprakash, Sajitha, Himalayan Publications.
International Communication Management-Individual & Organizational Outcomes by Antonio Ragus, Bookboon, 2010.
Business Communication for Success by Scott Mac Lean, Flat World Knowledge, 2010.
Effective Technical Communication, M. Ashraf Rizvi, TMH Publications.

EVALUATION SYSTEM (CONTINUOUS INTERNAL ASSESSMENT)

Methods	Introducing others, Small Talk	Role Play in formal & informal situations	Presentation	Telephonic interview	Email	Mock Meeting	Quiz on Professional Etiquette	% of Marks 100(Best 5)
Total	20	20	20	20	20	20	20	100

LESSON PLAN: PROFESSIONAL ETIQUETTE

S. No.	Topic	Pedagogy	Details	Instructional Hrs			
				Th	Pract	video	Proj
MODULE 1: MEETING & GREETING ETIQUETTE, OFFICE ETIQUETTE							
1	Personal Introduction	Role play on formal situation with proper introduction	http://smallbusiness.chron.com/first-impressions-business-etiquette-2908.html	0	1	0	0
2	Introducing Others	Knowing each other Fish bowl game	http://www.fasset.org.za/downloads/Office_Etiquette_Material/Handbook_Essential_Office_Etiquette.pdf				
3	Basics of Etiquette	Video clips Small skits	http://www.fasset.org.za/downloads/Office_Etiquette_Material/Handbook_Essential_Office_Etiquette.pdf	0	1	0	0

4	Interpersonal Etiquette	Video clips Activity on using speech acts with appropriate body language Guessing game	http://www.fasset.org.za/downloads/Office_Etiquette_Material/Handbook_Essential_Office_Etiquette.pdf	0	1	0	0
5	Professionalism And Front Office Etiquette	Video Clips Role play on front office management on their dream company Quiz	http://careerplanning.about.com/od/workplacesurvival/a/professionalism.htm http://www.octech.edu/sites/www/Uploads/files/TRIO/Professionalism%20in%20the%20Workplace.pdf	0	1	0	0
6	Professional Conduct	Conversational practice and SWOT Analysis in pair/group task	http://www.fasset.org.za/downloads/Office_Etiquette_Material/Handbook_Essential_Office_Etiquette.pdf	0	1	0	0
7	Professionalism And Front Office Etiquette	Video Clips Role play on front office management on their dream company Quiz	http://careerplanning.about.com/od/workplacesurvival/a/professionalism.htm http://www.octech.edu/sites/www/Uploads/files/TRIO/Professionalism%20in%20the%20Workplace.pdf	0	1	0	0
8	Formal & Informal Attire	Communication Game Quiz	http://www.fasset.org.za/downloads/Office_Etiquette_Material/Handbook_Essential_Office_Etiquette.pdf	0	1	0	0
9	Language Etiquette And Attitude	Enactment in different formal situations with appropriate communication styles	http://www.english.wisc.edu/rfyoung/336/attitudes.pdf https://blog.udemy.com/communication-styles/ http://www.english.wisc.edu/rfyoung/336/attitudes.pdf	0	1	0	0
10	Techno Etiquette	Conversational practice and Small skits	http://theedgeexecutivecoaching.com/articles/etiquette/techno-etiquette/# Question & Answers : http://www.workforce.com/articles/q-a-about-techno-etiquette	0	1	0	0
11	Smart Phone Etiquette	Dialogue Exchange Telephonic Quiz	http://www.talkenglish.com/LessonPracti ce.aspx?ALID=483	0	1	0	0
12	Email Etiquette Social Media Etiquette	Video Clips Written task practice Group work Debate	http://www.businessemail etiquette.com/business-e-mail-etiquette-basics/ http://www.realsimple.com/work-life/work-life-etiquette/manners/social-media-etiquette http://www.moneycrashers.com/social-media-etiquette-tips-personal-business/ Video : https://www.youtube.com/watch?v=RFZwtkoNGrk https://www.youtube.com/watch?v=ootxiibcOWc	0	0	1	0

MODULE II: COMMUNICATION EXCELLENCE (7 HOURS)

S. No.	Topic	Pedagogy	Details	Instructional Hrs			
				Th	Pract	video	Proj
10	Techno Etiquette	Conversational practice and Small skits	http://theedgeexecutivecoaching.com/articles/etiquette/techno-etiquette/# Question & Answers : http://www.workforce.com/articles/q-a-about-techno-etiquette	0	1	0	0
11	Smart Phone Etiquette	Dialogue Exchange Telephonic Quiz	http://www.talkenglish.com/LessonPractice.aspx?ALID=483	0	1	0	0
12	Email Etiquette Social Media Etiquette	Video Clips Written task practice Group work Debate	http://www.businessmailetiquette.com/business-e-mail-etiquette-basics/ http://www.realsimple.com/work-life/work-life-etiquette/manners/social-media-etiquette http://www.moneycrashers.com/social-media-etiquette-tips-personal-business/ Video : https://www.youtube.com/watch?v=RFZwtkoNGrk https://www.youtube.com/watch?v=ootxiibcOWc	0	0	1	0

MODULE-III NETWORKING ETIQUETTE (6HRS)

S. No.	Topic	Pedagogy	Details	Instructional Hrs			
				Th	Pract	video	Proj
13	Netiquette	Written Assignment Drafting Email	http://jillbremer.com/articles/etiquette/techno-etiquette/ http://www.slideshare.net/MarcellineChitolie/techno-etiquette-final-copy	0	1	1	0
14	Business Card Etiquette	Presentations and small group work	http://www.careerealism.com/3-rules-to-smart-business-card-etiquette/	0	1	1	0
15	Forms of Addressing	Written assignment Scrabble and puzzles	http://www.talkenglish.com/LessonPractice.aspx?ALID=483	0	1	1	0

MODULE IV: BUSINESS ETIQUETTE (7 hours)

S. No.	Topic	Pedagogy	Details	Instructional Hrs			
				Th	Pract	video	Proj
16	Presentation Etiquette	Demonstration	http://dianegottsman.com/2013/11/business-etiquette-9-powerful-presentation-tips/ http://dianegottsman.com/2012/07/stand-and-deliver-ten-tips-to-delivering-a-powerful-presentation/	0	1	1	0
17	Meeting Etiquette	Mock Meeting	http://businessculture.org/northern-europe/uk-business-culture/meeting-etiquette/	0	1	1	0

			http://www.fasset.org.za/downloads/Office_Etiquette_Material/Handbook_Essential_Office_Etiquette.pdf				
18	Dinning Etiquette	Activity on-Playing the role of the Host/Hostess, Playing the role of the Guest	Rizvi, ETC, pp.139-164 Soft Skill, Dr.K.Alex-pp-203-219	0	1	1	0

S. No.	Topic	Pedagogy	Details	Instructional Hrs			
				Th	Pract	video	Proj
19	Golden Rules of Global Etiquette	Discussion and Activity	Developing intercultural skill http://www.kwintessential.co.uk/cultural-services/articles/international-business-etiquette.html http://www.kwintessential.co.uk/resources/country-profiles.html http://www.forbes.com/sites/susanadams/2012/06/15/business-etiquette-tips-for-international-travel/ http://www.marcaria.com/international-business-etiquette-customs-and-culture.asp	0	1	1	0
20	Doubt Clearing	One-to-One Interaction	Practice	0	1	0	0
21	Recap	Discussion	Performance Analysis	0	1	0	0

FCHU1211 CREATIVE WRITING

Pre - requisites	Course Type	Credits
Nil	Workshop	2

The aim of the course is to prepare students for careers in a workplace that is information-rich and that increasingly values communication skills and the ability to think creatively and critically. The class time will be devoted to writing workshop, innovation exercises, and the critical appreciation of write-ups. The Creative Writing course will focus on

Reading
Writing Creatively
Presentations

Thus the main objective is to breed a culture of learning where students learn a variety of approaches to creative writing in a cooperative learning environment.

COURSE OBJECTIVES

Develop thinking skills
Acquire basic skills and techniques to develop a suitable practice of creative writing in context
Use a constructive approach to critique his/her own work, as well as work by his/her peers
Organize, prepare and present spoken presentations clearly and expressively

COURSE OUTCOMES

Upon the Completion of the course, a student will
Create Blog/ Online Presence
Submit works for publication
Compose a variety of written responses for different purposes and audiences
Collaborate by sharing ideas, examples and insights, productively and respectfully in informal conversations and discussions.
Students will put into practice the learning into the personal, professional and technical sphere.

MODULE -I: WRITING CREATIVELY (12hrs)

Foundational activities

Introduction to Class Standards
(Workshops, peer conferencing, blogging, reading outside the classroom)
Collaborative Creation of Classroom Philosophy
Basics of Creative Writing

Different forms of expression

Memoirs/Writing the Personal Narratives
Situational Writing/ Writing for the Target Audience
Dialogues, Essay, Poetry Slam
Script Writing
Writing for Blogs
Cooking Up Interview Stories

Writing from visuals

Pictures, Graphs, Images, Diagrams and Designs, Cartoons
Brochures and Newsletters

(This module will be facilitated through creative writing and speaking activities)

MODULE-II: READING AND CRITICAL APPRECIATION (8hrs)

Book

(Independent Study: Two Master Piece)

Article

Movie

(Student Work: Free Choice, Discussion and Oral/ Written Critiquing, Editing/ Revision
Publication/ Sharing, Short Report on Two Authors)

(This module will be facilitated through reading activities and critical appreciation)

MODULE-III: POWER OF LATERAL THINKING TO CREATE NEW IDEAS (7hrs)

General Concepts: Creativity and Lateral Thinking
Using the Technique of Lateral Thinking in Writing
Idea Generation Games and Activities
Six Thinking Hats

(This module will be facilitated through idea generation activities and presentation)

TEXT BOOKS

Creative Writing: A Workbook with Readings- Linda Anderson

Creative Writing- By DevAnjanaNeira

REFERENCES

The Cambridge Companion to Creative Writing by David Morley, Philip Neilsen

Creative Writing- By Adele Ramet

The Creative Writing Mfa Handbook: A Guide for Prospective Graduate Students By Tom Kealey

EVALUATION SYSTEM (CONTINUOUS INTERNAL ASSESSMENT)

Methods	Memoirs	Essay/ Dialogue Writing	Slam Poetry	Script Writing	Writing for Blog	Presentation from Visuals	Cooking up Interview Stories	% of Marks 100(Best 5)
Total	20	20	20	20	20	20	20	100

SESSION PLAN: CREATIVE WRITING
MODULE-1 : WRITING CREATIVELY (12 hours)

S. No.	Topics	Pedagogy	Details	Instructional Hrs			
				Th	Prac t	Vide o	Proj
1	Foundational activities Introduction to Class Standards (Workshops, peer conferencing, blogging, reading outside the classroom)	Conversatio nal practice, Role Plays	https://www.teachingchannel.org/videos/peer-conferencing https://blogging.org/	0	2	0	0
2	Collaborative Creation of Classroom Philosophy	Group tasks	http://writing-speech.dartmouth.edu/teaching/first-year-writing-pedagogies-methods-design/collaborative-learninglearning-peers https://www.earlham.edu/media/894432/creative_writing_rules.pdf	0	2	0	0
		/Practice	https://www.youtube.com/watch?v=syuwXYpV4zA https://classroom.synonym.com/difference-between-memoir-personal-narrative-1729.html https://www.quia.com/files/quia/users/learningcircle/Situational-Writing-Tips https://www.youtube.com/watch?v=PLHkuSpJxPs				
4	Different forms of expression Memoirs/Writing the Personal Narratives Situational Writing/ Writing for the Target Audience	Group work, writing, video links ,	https://www.youtube.com/watch?v=ZA3xt0KkWas https://www.youtube.com/watch?v=zJGX2raiafU https://en.wikipedia.org/wiki/Poetry_slam	0	2	0	0
5	Dialogues, Essay, Poetry Slam	6 Writing for Blogs	https://www.youtube.com/watch?v=ZA3xt0KkWas https://www.youtube.com/watch?v=zJGX2raiafU https://en.wikipedia.org/wiki/Poetry_slam http://www.poetrysoup.com/poems/best/slam				
	Script Writing		http://www.poetrysoup.com/poems/best/slam Writing tasks individual/pa irs				

<https://www.writersstore.com/how-to-write-a-screenplay-a-guide-to-scriptwriting/>

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		Video links Blog writing practice	https://www.youtube.com/watch?v=XZszextv6yE BLOGS :https://www.youtube.com/watch?v=t21sKonfyk				
	Cooking Up Interviews		https://www.themuse.com/advice/6-types-of-stories-you-should-have-on-hand-for-job-interviews 1610270959 https://www.themuse.com/advice/the-interview-technique-you-should-be-using				
8	Writing from visuals Pictures, Graphs, Images, Diagrams and Designs, Cartoons Brochures and Newsletters		https://twp.duke.edu/uploads/assets/Using%20Visual%20Rhetoric%20in%20Academic%20Writing.pdf https://www.youtube.com/watch?v=r6ZVGBQYNXE	0	1	0	0

MODULE-II: READING AND CRITICAL APPRECIATION 8 HOURS)

S. No.	Topics	Pedagogy	Details	Instructional Hrs			
				Th	Pract	Vide o	Proj
9	Book (Independent Study: Two Master Piece)		http://www.howtolearn.com/2012/08/different-reading-techniques-and-when-to-use-them/	0	2	0	0
10	Article writing			0	2	0	0
11	Movie Review (Student Work: Free Choice, Discussion and Oral/ Written Critiquing, Editing/ Revision)			0	1	1	0
12	Publication/ Sharing, Short Report on Two Authors		https://www.elsevier.com/authors/book-authors/science-and-technology-book-publishing/overview-of-the-publishing-process	0	2	0	0

MODULE-III: POWER OF LATERAL THINKING TO CREATE NEW IDEAS (7hrs)

S. No.	Topics	Pedagogy	Details	Instructional Hrs			
				Th	Pract	Vide o	Proj
13	General Concepts: Creativity and Lateral Thinking	Role Plays/ Oral Presentations Practice	www.brainstorming.co.uk/tutorials/definitions.html http://www.trainingcoursematerial.com/free-training-articles/creativity-problem-solving-	0	1	1	0

			decision-making-and-lateral-thinking/defining-lateral-thinking-parallel-thinking-creativity-and-innovation Video : https://www.youtube.com/watch?v=H7PyFNzPSVY				
14	Idea Generation Games and Activities	Pair/group activities	http://study.com/academy/lesson/w-hat-is-idea-generation-definition-process-techniques.html	0	1	1	0
15	Six Thinking Hats	Group task	http://www.debonogroup.com/six_thinking_hats.php	0	1	1	0
16	DOUBT CLEARING			0	1	0	0

FCHU1212 ENGLISH FOR COMPETITION (GRE/GMAT/TOEFL/IELTS)

<i>Pre - requisites</i>	<i>Course Type</i>	<i>Credits</i>
<i>Nil</i>	<i>Workshop</i>	<i>2</i>

COURSE OBJECTIVE

Familiarize the learners with the pattern of the TOEFL/GMAT/IELTS/GRE examination and improve overall English skills to face the competitive exams confidently.

COURSE OUTCOME

Learners understand the pattern of the TOEFL, IELTS and GRE examination and apply test-taking strategies in exams.

A student is required to take up five laboratory tests of 100 marks.

LIST OF EXPERIMENTS

1: TOEFL Listening

Developing Listening Comprehension by taking notes after the short recorded conversations.

2: TOEFL Speaking

Developing test taking strategies to face speaking test of TOEFL exam through role play and Mock Interview.

3: TOEFL Reading

Practicing and improving student's confidence in completing the various sections of reading test in TOEFL examination.

4: TOEFL Writing

Learning and enhancing writing skills required for TOEFL writing test.

5: IELTS Listening

Practicing the listening comprehension of the students and handling questions while listening the recorded conversations.

6: IELTS Speaking

Developing test taking strategies to face speaking test of IELTS examination through role plays and mock interviews.

7: IELTS Writing

Summarizing or explaining information presented in a graph, chart, table or diagram.

8: IELTS Reading

Understanding and interpreting the text in its particular use of language, ideas and style.

9: GRE Reading Comprehension

Taking GRE Reading Comprehension examination with confidence utilizing the methods and strategies.

10: GRE SENTENCE COMPLETION

Developing sentence completion strategies through logical thinking.

11: GRE SENTENCE EQUIVALENCE

Learning and developing strategies to deal with sentence equivalence questions.

12: GRE VOCABULARY

Understanding and using appropriate choice of vocabulary in GRE vocabulary section.

13. GRE Vocabulary & Verbal-Sentence Corrections

14. GMAT Verbal-Critical Reasoning

15. GMAT Verbal- Reading Comprehension

(The entire lab will be facilitated through online quizzes, and practice sets available in language lab)

TEXT BOOKS:

NorthStar Building Skills for the TOEFL iBT, High Intermediate Level (Pearson Education).

NorthStar Building Skills for the TOEFL iBT, Intermediate Level (Pearson Education).

McGraw-Hill's New GRE: 2011-2012 Edition

Princeton Review: Cracking the New GRE 2012

REFERENCES:

Longman Preparation Course for the TOEFL Test – iBT Speaking (Pearson Education).

Longman Preparation Course for the TOEFL Test – iBT Listening (Pearson Education).

Longman Preparation Course for the TOEFL Test – iBT Writing (Pearson Education).

Longman Preparation Course for the TOEFL Test – iBT Reading (Pearson Education).

NorthStar Building Skills for the TOEFL iBT, Advanced Level (Pearson Education).

Achieve IELTS Workbook: Intermediate to Upper Intermediate: English for International Education (Achieve IELTS Intermediate/Upper) (Paperback).

Kaplan New GRE Premier 2011-2012

Barron's New GRE 19th Edition Grade

Manhattan GRE

Gruber's Complete GRE Guide 2012

Nova's GRE Prep Course Grade

ETS's Official Guide to the GRE Revised General Test

Barron's GRE Verbal Workbook

Barron's IELTS with Audio CD: International English Language Testing System (Paperback)

Achieve IELTS Teacher's Book: Intermediate to Upper Intermediate: English for International Education (Achieve IELTS Intermediate/Upper) (Paperback)

Step Up to IELTS Self-study Student's Book [STUDENT EDITION] (Paperback)

IELTS Collected Papers: Research in speaking and writing assessment (Studies in Language Testing) (Paperback)

EVALUATION SYSTEM (CONTINUOUS INTERNAL ASSESSMENT)

Methods	Listening & fill-up blanks, short answers, Multiple-choice	JAM/ Questions & Responses	Vocabulary Quiz, Sentence Completion & Re-order paragraphs	Reading Comprehension	Summarize /Data Comment	Essay Writing	Analytical Writing	% of Marks 100 (Best 5)
Total	20	20	20	20	20	20	20	100

SESSION PLAN: ENGLISH FOR COMPETITION

S. No	Topic	Pedagogy	Details	Instructional Hrs			
				Th	Pract	video	Pro t
.							

1	TOEFL Listening	Listening Activity Based Learning	http://www.examenglish.com/TOEFL/toefl_listening.htm	0	1	1	0
2	TOEFL Speaking	Listening and speaking activity	http://www.examenglish.com/TOEFL/TOEFL_Speaking_part5.htm	0	1	1	0
3	TOEFL Reading & Writing	Reading and Writing Practice	http://www.examenglish.com/TOEFL/TOEFL_reading1.htm (Reading) https://www.englishclub.com/esl-exams/ets-toefl-practice-writing.htm . http://www.time4writing.com/toefl/ (Writing)	0	2	0	0
4	IELTS Listening	Listening Practice	http://takeielts.britishcouncil.org/prepare-your-test/free-ielts-practice-tests/listening-practice-test-1	0	1	1	0
5	IELTS Speaking	Speaking Practice	http://takeielts.britishcouncil.org/prepare-your-test/free-practice-tests/speaking-practice-test-1	0	2	0	0
6	IELTS Writing & Reading	Writing & Reading Practice	http://takeielts.britishcouncil.org/prepare-your-test/free-practice-tests/writing-practice-test-1-ielts-academic http://takeielts.britishcouncil.org/sites/default/files/Writing_practice_test_1_IELTS_Academic_questions.pdf (writing) http://takeielts.britishcouncil.org/prepare-test/practice-tests/reading-practice-test-1-academic (Reading)	0	2	0	0
7	GRE Reading Comprehension	Reading Practice	http://gre.graduateshotline.com/reading_comprehension_practice.html#.V2kJDRITXCM https://www.ets.org/gre/revised_general/prepare/verbal_reasoning/reading_comprehension/sample_questions	0	2	0	0
8	GRE Sentence Completion & Sentence Equivalence	Online practice	http://gre.graduateshotline.com/gre_sentence_completion.pl https://www.ets.org/gre/revised_general/prepare/verbal_reasoning/text_completion/sample_questions http://www.examfocus.com/gre/pt/verbal/sentence-equivalence-1.html	0	2	0	0
9	GRE Vocabulary	Online practice	http://gre.graduateshotline.com/	0	2	0	0
10	GMAT Verbal-Sentence Corrections	Online practice	http://freemattest.net/Questions http://www.majortests.com/gmat/sentence_correction.php	0	2	0	0
11	GMAT Verbal-Critical Reasoning	Online practice	http://www.majortests.com/gmat/critical_reasoning_test01	0	2	0	0
12	GMAT Verbal-Reading Comprehension	Online practice	http://www.majortests.com/gmat/reading_comprehension_test01	0	2	0	0

FCHU0210 LIFE SKILLS DEVELOPMENT-I [English]

<i>Pre - requisites</i>	<i>Course Type</i>	<i>Credits</i>
<i>Nil</i>	<i>Practice</i>	<i>2</i>

OBJECTIVES

To provide ample opportunities for practice

To approach reading comprehension questions and improve your vocabulary

OUTCOME

To qualify competitive exams

MODULE I: (24 HOURS)

S. No.	Topic	Pedagogy	Details	Instructional Hrs			
				Th	Pract	video	Proj
1	Reading Comprehension-1 & 2	Workbook Practice	Passage Reading	0	2	0	0
2	Reading Comprehension-3 & 4	Workbook Practice	Passage Reading	0	2	0	0
3	Reading Comprehension-1, 2 & 3	Workbook Practice	Passage Reading	0	2	0	0
4	Reading Comprehension-4,5 & 6	Workbook Practice	Passage Reading	0	2	0	0
5	Vocabulary(10 New Words)	Workbook Practice	Learning 10 new words	0	2	0	0
6	Vocabulary(15 New Words)	Workbook Practice	Learning 15 new words	0	2	0	0
7	Vocabulary(15 New Words)	Workbook Practice	Learning 15 new words	0	2	0	0
8	Vocabulary(20 New Words)	Workbook Practice & Quiz	Learning 20 new words	0	2	0	0
9	Reading Comprehension-1 & 2	Workbook Practice	Passage Reading	0	2	0	0
10	Reading Comprehension-3 & 4	Workbook Practice	Passage Reading	0	2	0	0
11	Reading Comprehension-5 & 6	Workbook Practice	Passage Reading	0	2	0	0
12	Speaking Skills	ACTIVITY	JAM	0	2	0	0
MODULE II: (24 HOURS)							
1	Vocabulary	Workbook Practice	Learning new words	0	2	0	0
2	Vocabulary	Workbook Practice	Learning new words	0	2	0	0
3	Reading Practice	News Reading	Reading Comprehension	0	2	0	0
4	Reading Comprehension-1 & 2	Workbook Practice	Passage Reading	0	2	0	0
5	Reading Comprehension-3 & 4	Workbook Practice	Passage Reading	0	2	0	0
6	Vocabulary	Workbook Practice	Learning new words	0	2	0	0

7	Vocabulary	Workbook Practice	Learning new words	0	2	0	0
8	Vocabulary	Quiz	Learning new words	0	2	0	0
9	Vocabulary	Workbook Practice	Learning new words	0	2	0	0
10	Speaking Skills	GD & Analysis	General Topics	0	2	0	0
11	Reading Comprehension-1 & 2	Workbook Practice	Passage Reading	0	2	0	0
12	Vocabulary-1	Quiz	Learning new words	0	2	0	0
MODULE-3 (24 HOURS)							
1	Reading Comprehension-1 & 2	Workbook Practice	Passage Reading	0	2	0	0
2	Vocabulary-1	Workbook Practice	Learning new words	0	2	0	0
3	Vocabulary-2	Surprise Quiz	Learning new words	0	2	0	0
4	Vocabulary-2	Workbook Practice	Learning new words	0	2	0	0
5	Vocabulary-3	Workbook Practice	Learning new words	0	2	0	0
6	Vocabulary-3	Asking Each Other	Learning new words	0	2	0	0
7	Vocabulary-4	Quiz	Learning new words	0	2	0	0
8	Reading Comprehension-1 & 2	Workbook Practice	Passage Reading	0	2	0	0
9	Reading Comprehension-3 & 4	Workbook Practice	Passage Reading	0	2	0	0
10	Speaking Practice	Activity Based Learning	Extempore/ Communication Game	0	2	0	0
11	Vocabulary-5	Workbook Practice	Learning new words	0	2	0	0
12	Vocabulary-5	Recap & Analysis	Vocabulary Exercises	0	2	0	0

EVALUATION SYSTEM: INTERNAL ASSESSMENT (50) + EXTERNAL ASSESSMENT (50)

Methods	Online Test-I	Online Test-I	Online Test-I	Attendance	Assignment	% of Marks 50
Total	10	10	10	10	10	100

FCHU0211 LIFE SKILLS DEVELOPMENT-II [APTITUDE]

<i>Pre - requisites</i>	<i>Course Type</i>	<i>Credits</i>
<i>Nil</i>	<i>Practice</i>	<i>2</i>

OBJECTIVE

Aptitude and Reasoning Tests are designed to give an objective assessment of a Candidate's ability in numerical as well as analytical

OUTCOMES

Ability skills will be increased

Improved skills to qualify all competitive exams like Banking Exams, Company-based Exams, Railway Exams, GATE Exams

SESSION PLAN: APTITUDE MODULE I: (24 HOURS)

S. No.	Topic	Pedagogy	Details	Instructional Hrs			
				Th	Pract	video	Proj
1	Number System-01	Workbook Practice	Operation on Numbers, Classification of Numbers, Tests of Divisibility	0	2	0	0
2	Number System-01	Workbook Practice		0	2	0	0
3	Number System-02	Workbook Practice	Unit Digit Calculation, Remainder Calculation,	0	2	0	0
4	Number System-02	Workbook Practice		0	2	0	0
5	Practice Test - 01	Practice Test	Practice Test on Number System http://gradestack.com/blogs/short-quiz-on-number-system-for-ctet-2015/	0	2	0	0
6	Lcm & HCF	Workbook Practice	Basics of LCM & HCF	0	2	0	0
7	Lcm & HCF	Workbook Practice	Basics of LCM & HCF	0	2	0	0
8	Practice Test - 02	Practice Test	Practice Test on LCM & HCF	0	2	0	0
9	Average	Workbook Practice	Basics of Average	0	2	0	0
10	Average	Workbook Practice	Basics of Average	0	2	0	0
11	Practice Test - 03	Practice Test	Practice Test on Average	0	2	0	0
12	Practice Test - 04	Practice Test	Practice Test on Number System, LCM & HCF & Average	0	2	0	0

MODULE II: (24 HOURS)

S. No.	Topic	Pedagogy	Details	Instructional Hrs			
				Th	Pract	video	Proj
1	Percentage	Workbook Practice	Basics of Percentage	0	2	0	0
2	Percentage	Workbook Practice	Basics of Percentage	0	2	0	0
3	Practice Test – 05	Practice Test	Practice Test on Percentage	0	2	0	0
4	Ratio & Proportion	Workbook Practice	Basics of Ratio & Proportion	0	2	0	0
5	Practice Test-06	Practice Test	Practice Test on Ratio & Proportion	0	2	0	0
6	Time & Work	Workbook Practice	Basics of Time & Work, Chain Rule	0	2	0	0
7	Time & Work	Workbook Practice	Basics of Time & Work, Chain Rule	0	2	0	0
8	Practice Test – 07	Practice Test	Practice Test on Time & Work	0	2	0	0
9	Pipes & Cistern	Workbook Practice	Basics of Pipes & Cistern	0	2	0	0
10	Time & Distance, Trains	Workbook Practice	Basics of Time & Distance, Trains	0	2	0	0
11		Workbook Practice	Basics of Time & Distance, Trains	0	2	0	0
12	Practice Test – 08	Practice Test	Practice Test on Time & Distance, Trains	0	2	0	0

MODULE-3 (24 HOURS)

S. No.	Topic	Pedagogy	Details	Instructional Hrs			
				Th	Pract	video	Proj
1	Boats & Streams	Class Task	Basics of Boats & Streams	0	2	0	0
2	Profit & Loss	Class Task	Basics of Profit & Loss	0	2	0	0
3	Profit & Loss	Home Task	Basics of Profit & Loss	0	2	0	0
4	Practice Test - 09	Practice Test	Practice Test on Profit & Loss http://gradestack.com/ssc/quants-quiz-on-profit-and-loss-for-ssc-cgl-2015-exam/	0	2	0	0
5	Practice Test - 10	Practice Test	Practice Test on Boats & Streams	0	2	0	0
6	Practice Test - 11	Practice Test	Practice Test on Average, Percentage, Number System, LCM & HCF, Boats & Streams, Average, Profit & Loss, Trains, Time & Distance www.livetest.in	0	2	0	0
7	Practice Test - 12	Practice Test	Practice Test on Average, Percentage, Number System, LCM & HCF, Boats & Streams, Average, Profit & Loss, Trains, Time & Distance https://www.wiziq.com/tests/aptitude-test	0	2	0	0
8	Practice Test - 13	Practice Test	Practice Test on Average, Percentage, Number System, LCM & HCF, Boats & Streams, Average, Profit & Loss, Trains, Time & Distance	0	2	0	0
9	Practice Test - 14	Practice Test	Practice Test on Average, Percentage, Number System, LCM & HCF, Boats & Streams, Average, Profit & Loss, Trains, Time & Distance	0	2	0	0
10	Practice Test - 15	Practice Test	Practice Test on Average, Percentage, Number System, LCM & HCF, Boats & Streams, Average, Profit & Loss, Trains, Time & Distance	0	2	0	0
11	Practice Test - 16	Practice Test	Practice Test on Average, Percentage, Number System, LCM & HCF, Boats & Streams, Average, Profit & Loss, Trains, Time & Distance http://www.freeonlinetest.in	0	2	0	0
12	Practice Test - 17	Practice Test	Practice Test on Average, Percentage, Number System, LCM & HCF, Boats & Streams,	0	2	0	0

			Average, Profit & Loss, Trains, Time & Distance References for online tests: http://www.careerride.com/Online-practice-test.aspx http://www.freeonlinetest.in http://gradestack.com www.livetest.in https://www.wiziq.com/tests/aptitude-test				
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EVALUATION SYSTEM: INTERNAL ASSESSMENT (50) + EXTERNAL ASSESSMENT (50)

Methods	Online Test-I	Online Test-I	Online Test-I	Attendance	Assignment	% of Marks
Total	10	10	10	10	10	100

FCHU0212 LIFE SKILLS DEVELOPMENT – III [REASONING]

Pre - requisites	Course Type	Credits
Nil	Workshop	2

SESSION PLAN: REASONING MODULE I: (24 HOURS)

S. No.	Topic	Pedagogy	Details	Instructional Hrs			
				Th	Pract	video	Proj
1	Number Series	Workbook Practice	BASICS	0	2	0	0
2	Number Series	Workbook Practice	BASICS	0	2	0	0
3	Practice Test - 01	Practice Test	Practice Test on Number Series http://gradestack.com/ssc/reasoning-quiz-on-number-series-for-ssc-exams-3/	0	2	0	0
4	Letter Series	Class Task	BASICS	0	2	0	0
5	Letter Series	Workbook Practice	BASICS	0	2	0	0
6	Practice Test - 02	Practice Test	Practice Test on Letter Series	0	2	0	0
7	Alpha Numeric Series	Workbook Practice	Basics	0	2	0	0
8	Alpha Numeric Series	Workbook Practice	Basics	0	2	0	0
9	Practice Test - 03	Practice Test	Practice Test on Alpha Numeric Series	0	2	0	0
10	Continuous Pattern Series	Workbook Practice	Basics	0	2	0	0

11	<i>Continuous Pattern Series</i>	<i>Workbook Practice</i>	<i>Basics</i>	0	2	0	0
12	<i>Practice Test - 04</i>	<i>Practice Test</i>	<i>Practice Test on Number Series, Letter Series, Alpha Numeric Series & Continuous Pattern Series</i>	0	2	0	0

MODULE II: (24 HOURS)

S. No.	Topic	Pedagogy	Details	Instructional Hrs			
				Th	Pract	video	Proj
1	<i>Percentage</i>	<i>Workbook Practice</i>	<i>Basics of Percentage</i>	0	2	0	0
2	<i>Percentage</i>	<i>Workbook Practice</i>	<i>Basics of Percentage</i>	0	2	0	0
3	<i>Practice Test - 05</i>	<i>Practice Test</i>	<i>Practice Test on Percentage</i>	0	2	0	0
4	<i>Ratio & Proportion</i>	<i>Workbook Practice</i>	<i>Basics of Ratio & Proportion</i>	0	2	0	0
5	<i>Practice Test-06</i>	<i>Practice Test</i>	<i>Practice Test on Ratio & Proportion</i>	0	2	0	0
6	<i>Time & Work</i>	<i>Workbook Practice</i>	<i>Basics of Time & Work, Chain Rule</i>	0	2	0	0
7	<i>Time & Work</i>	<i>Workbook Practice</i>	<i>Basics of Time & Work, Chain Rule</i>	0	2	0	0
8	<i>Practice Test - 07</i>	<i>Practice Test</i>	<i>Practice Test on Time & Work</i>	0	2	0	0
9	<i>Pipes & Cistern</i>	<i>Workbook Practice</i>	<i>Basics of Pipes & Cistern</i>	0	2	0	0
10	<i>Time & Distance, Trains</i>	<i>Workbook Practice</i>	<i>Basics of Time & Distance, Trains</i>	0	2	0	0
11	<i>Time & Distance, Trains</i>	<i>Workbook Practice</i>	<i>Basics of Time & Distance, Trains</i>	0	2	0	0
12	<i>Practice Test - 08</i>	<i>Practice Test</i>	<i>Practice Test on Time & Distance, Trains</i>	0	2	0	0

MODULE-3 (24 HOURS)

S. No.	Topic	Pedagogy	Details	Instructional Hrs			
				Th	Pract	video	Proj
1	<i>Miscellaneous</i>	<i>Workbook Practice</i>	<i>Basics</i>	0	2	0	0
2	<i>Miscellaneous</i>	<i>Workbook Practice</i>	<i>Basics</i>	0	2	0	0
3	<i>Practice Test - 11</i>	<i>Practice Test</i>	<i>Practice Test on Syllogism, Puzzle, Letter & Number Series, Miscellaneous</i>	0	2	0	0
4	<i>Practice Test - 12</i>	<i>Practice Test</i>	<i>Practice Test on Syllogism, Puzzle, Letter & Number Series, Miscellaneous</i>	0	2	0	0

5	Practice Test - 13	Practice Test	Practice Test on Syllogism,Puzzle,Letter & Number Series,Miscellaneous	0	2	0	0
6	Practice Test - 14	Practice Test	Practice Test on Syllogism,Puzzle,Letter & Number Series, Miscellaneous	0	2	0	0
7	Practice Test - 15	Practice Test	Practice Test on Syllogism, Puzzle,Letter & Number Series ,Miscellaneous	0	2	0	0
8	Practice Test - 16	Practice Test	Practice Test on Syllogism,Puzzle,Letter & Number Series,Miscellaneous	0	2	0	0
9	Practice Test - 17	Practice Test	Practice Test on Syllogism,Puzzle,Letter & Number Series,Miscellaneous	0	2	0	0
10	Practice Test - 18	Practice Test	Practice Test on Syllogism,Puzzle,Letter & Number Series,Miscellaneous	0	2	0	0
11	Practice Test - 19	Practice Test	Practice Test on Syllogism,Puzzle,Letter & Number Series,Miscellaneous	0	2	0	0
12	Practice Test - 20	Practice Test	Practice Test on Syllogism,Puzzle,Letter & Number Series,Miscellaneous http://gradestack.com http://www.freeonlinetest.in www.livetest.in	0	2	0	0

EVALUATION SYSTEM: INTERNAL ASSESSMENT (50) + EXTERNAL ASSESSMENT (50)

Methods	Online Test-I	Online Test-I	Online Test-I	Attendance	Assignment	% of Marks
Total	10	10	10	10	10	100

FCMG0101 ECONOMICS

Pre - requisites	Course Type	Credits
Nil	Theory	2

Course Objective:

In today's dynamic economic environment, effective managerial decision making requires timely and efficient use of information. The basic purpose of this course is to provide students with a basic understanding of the economic principles, methodologies and analytical tools that can be used in business decision making problems. It provides an understanding of the economic environment and its impact on strategy formulation. The course also focuses on the impact of economic policies on managerial decision-making by providing an understanding of fiscal policy, and national and global economic issues affecting business.

The language of science (and all analytical thinking) is mathematics. Since economics is a social science, use of some mathematical tools, basically the constrained and un-constrained optimization

techniques will help in measuring and solving the basic economic problems and thus improves decision-making. It becomes difficult and totally un-practicable to solve business (economic) problems logically and systematically without use of mathematics. The basic objective is to solve problems mathematically and interpret the results economically.

Module-1: Micro Economics

Introduction to economics: Scarcity, Choice and Efficiency, Fundamental issues of what, how and for whom to produce to make the best use of economics. Demand for a commodity: Law of demand, Demand schedule and demand curve, Individual and market demand, Change in demand, Consumer behavior: Analysing law of demand through Marshallian utility analysis, Indifference curve technique and Consumer Surplus.

Elasticity of demand: Price Elasticity of demand: Estimation, Types, Elasticity and revenue, Factors affecting price elasticity of demand. Income elasticity, Cross elasticity, Uses of different concepts of elasticity in business decisions.

Analysis of Supply: Law of Supply, Supply schedule and supply curve, Change in supply, Price elasticity of supply, Equilibrium of demand and supply: Equilibrium with demand and supply curves, Effect of a shift of demand and supply curves.

Production Function: Production function with one variable input, Production function with two variable inputs, optimal combination of inputs, Returns to scale

Cost Theory: Types of costs, Production and cost, Short-run cost functions, Long-run cost functions, Economies of scale and scope, Cost-Volume-profit Analysis

Market: Meaning, types and characteristics of different market structure (Perfect competition, Monopoly, Monopolistic competition and Oligopoly)

Module: 2: Macro Economics

National Income Accounting: Circular flow of Income, National Income Concept, Eight variants of national product aggregates, Measurement (Income, Value Added and Expenditure), Real and Nominal GNP, Difficulties in measuring the national income, Uses of National income statistics, Money and Inflation: Demand for and supply of money. Causes and consequences of Inflation. Commercial and central banking: Role and functions of commercial banks and R.B.I., Monetary Policy and Fiscal policy: Objectives and Instruments, Balance of Payment (BoP): Meaning, BoP Account, Disequilibrium in BoP, Measures to correct disequilibrium in BoP, Foreign Exchange: Floating Exchange Rate and Fixed Exchange Rates

Books & Reference:

1. *Managerial Economics in a Global Economy*, by D. Salvatore, Sixth Edition, OUP, 2008
2. *Managerial Economics*, Truett&Truett, Wiley Publication.
3. *Managerial Economics*, by Petersen Craig H. Cris Lewis and S.K. Jain, Pearson, 2007
4. *Modern Micro Economics*, Koutsoyiannis, (1975), A, Macmillan Press
5. *Managerial Economics*, Mehta, P. L (1999), Sultan Chand & Sons
6. *Principles of Microeconomics*, Mankiw, N. G (2006), Cengage Learning
7. *Macroeconomics*, Mankiw, N. G, (2009), Worth Publishers
8. *Macroeconomics, Theory and Policy*, Dwivedy, D.N (2007), Tata McGraw Hill
9. *Macroeconomics*, D'Souza, E (2008), Pearson Education
10. *Macroeconomic Analysis*, Shapiro, E (2003), Galgotia Publications
11. *Environmental Economics in Theory and Practice – Hankey N, Shogren J F, and White B – 1999 – Macmillan Indian Limited*
12. *Indian Economy*, Mishra &Puri (2011), Himalaya Publishing House

FCMG0102 ACCOUNTING AND FINANCE

<i>Pre - requisites</i>	<i>Course Type</i>	<i>Credits</i>
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<i>Nil</i>	<i>Theory</i>	<i>2</i>
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Course Objective:

- a) To familiarise the students with basic terms of accounting, accounting principles, concepts and convention.
- b) To equip the students with various concepts, tools and techniques of Cost accounting as well as Management accounting essential for managerial decision making process.
- c) To aware students overview of Time Value of Money, Working Capital and Stock Market

Course outcomes:

On the successful completion of this paper the students should be able composed the information about:

- Develop a basic understanding of accounting and financial ratio analysis.
- Students will be able to create, balance and deliver a budget and use budget information for planning and decision purposes.
- Undertake various costing techniques and information for planning and decision-making
- Demonstrate time management by understand various financial funding options for project planning and working capital management of an organizations.
- Know how financial markets as well as the global economy are impacting their organization today and how they will impact their organization into the future.

Module 1:

Basic Accounting Concepts and Conventions, Basic Accounting Equation, Accounting Mechanism: Journals, Ledgers, Trial Balance, Basic Financial Statements: Analysis of Items found in Balance Sheet and Income Statement, Ratio Analysis

Module 2:

Cost Concepts and Cost Terms: Financial Accounting vrs. Cost Accounting, Direct and Indirect Costs, Fixed, Variable and Semi-variable Costs, Standard, Budgeted and Actual Costs, Controllable and Non-controllable costs, Preparation of Cost Sheet, Cost-Volume-Profit Analysis: Concept of Marginal Cost and Contribution, Concept of Break Even Analysis, Applications of Marginal Costing

Module 3:

Time Value of Money: Concept, Simple and Compound Interest, Present Value of a Single Amount, Present Value of an Uneven Series, Future Value of an Annuity, Present Value of an Annuity
Working Capital Management: Meaning and Components of Working Capital, Determinants of Working Capital, Profitability-Risk Trade-off, Types of Working Capital, Importance of Working Capital, Operating Cycle: Concept and Estimation
Stock Market: Types of Capital Issues: Initial Public Offer, Follow-on Public Offer, Rights Issues, Preferential Issues, Red-herring Prospectus, Free Pricing of Issues, Greenshoe Option, Lock-in Period, Safety Net, Listing of Securities on Stock Exchanges

Books Recommended:

1. *Accounting for Management—Ashok Sehgal, Taxxman*
2. *Financial Accounting -- A managerial Perspective, R. Narayanswamy, PHI*
3. *Khan & Jain – Management Accounting, TMH.*
4. *Horngren ,Datar, Foster- Cost Accounting, Pearson.*
5. *Financial Accounting, Jain/Narang/Agrawal, Kalyani.*
6. *Basic Financial Accounting for Management, Shah, Oxford.*
7. *Financial Management by I. M. Pandey*
8. *Financial Management – Theory and Practice by Chandra*
9. *Financial Management – Text and Problems by Khan & Jain*

FCMG0103 MANAGEMENT PROCESSES AND ORGANIZATIONAL BEHAVIOR

<i>Pre - requisites</i>	<i>Course Type</i>	<i>Credits</i>
<i>Nil</i>	<i>Theory</i>	<i>2</i>

Course Objectives:

Management as a subject of study has brought a new paradigm in managing organizations. The young professionals has to learn and reflect the basic principles of management. Along with it the knowledge of Individual and group behaviour and its impact at the workplace is vital. Organizational Behavior (OB) is a field of study that investigates the impact that individuals, groups, and structure have on behavior within an organization. Then it applies that knowledge to make organizations work more effectively. This course will expose students to gain knowledge on the basic principles of management and organization behavior.

Course Introduction

Management as a subject of study has brought a new paradigm in managing organizations. The young professionals has to learn and reflect the basic principles of management. Along with it the knowledge of Individual and group behaviour and its impact at the workplace is vital. Organizational Behavior (OB) is a field of study that investigates the impact that individuals, groups, and structure have on behavior within an organization. Then it applies that knowledge to make organizations work more effectively. This course will expose students to gain knowledge on the basic principles of management and organization behavior.

Course Content

Unit: I

Emergence of Management as a discipline, Principles of management, (Planning, organizing, staffing and controlling) Contributions to management by Luther Gullick , Henri Fayol and Peter F. Drucker and Introduction: Concept and models of OB, Approaches to OB (Systems, Human resource and Contingency)

Unit: II

Individual System: Learning, Perception, Personality and Motivation,

Unit: III

Social System: Group Dynamics and Leadership.

Books Recommended:

1. Robins & Sanghii; Organizational Behavior, Pearson
2. Luthans ,F; Organizational Behavior-TMH
3. Udai Pareek ; Understanding Organizational Behavior, Oxford
4. Prasad,L.M; Organization behavior, S.Chand.
5. K. Aswathappa; Organization behaviour
6. Prasad.L.M ; Principles of Management,

FCMG0104 PRODUCTION AND OPERATION MANAGEMENT

<i>Pre - requisites</i>	<i>Course Type</i>	<i>Credits</i>
<i>Nil</i>	<i>Theory</i>	<i>2</i>

Course Objective:

The course is designed to acquaint the students with decision making in production and operation function of an organization.

Course Outcomes :

- ✓ Acquire a working understanding of the roles/functions of production management in the context of business enterprise.
- ✓ The learner will have a deep knowledge of the fundamental theory and mathematical principles involved in Production and Operation Management.
- ✓ They can use specialized knowledge in Operations Management to solve business processes.
- ✓ They will be capable of applying these principles to solve relevant production or service system problems.

Module 1:

Operations Management- An Introduction : Primary topics in Operations Management, Operations Function and Transformation process . Manufacturing Strategy and Mass customization, Product Development and Service Design , New Product design, Product life cycle, Process design, Process life cycle

Module 2:

Project scheduling Models: Project Network, Critical path Method (CPM), Programme Evaluation Review Technique (PERT).

Scheduling: Objective of Scheduling, Sequencing, Sequencing model: "n" jobs 1 machine, "n" jobs 2 machines.

Module 3:

Inventory Management: Concept of inventory with independent demand: Inventory cost structure, Deterministic inventory model - EOQ models, instantaneous receipt, Inventory model with discounts.

Module 4:

Quality Management: Concept of quality; Quality of design, Conformance & performance; Cost of poor process performance and quality. Statistical Quality Control - Process Control (X-bar, R & P chart, np chart).

Concept of TQM, Just in Time and Lean Production Basic element in JIT, Pull system, Push system

Books Recommended:

- 1) Chase, Jacobs, Aquilano, Agarwal, - "Operations Management", TMH
- 2) Krajewski, Ritzman, Kansal, - "Operations Management", Pearson
- 3) Everette. Adam Jr., Ronald J. Ebert, - "Production and Operations Management", PHI
- 4) Roberta S. Russell & Bernard W. Taylor III, - "Operations Management", Pearson/ PHI
- 5) Aswathappa & Sridhar Bhat, - "Production and Operations Management", HPH
- 6) Gaither, Frazier- Operations Management

FCMG0105 MARKETING MANAGEMENT

<i>Pre - requisites</i>	<i>Course Type</i>	<i>Credits</i>
<i>Nil</i>	<i>Theory</i>	<i>2</i>

Course Objective:

- a) To familiarize the students with the concepts and theories and strategies of marketing.
- b) To focus on the application of these concepts to various marketing contexts
- c) To focus on the emerging areas of marketing

Course outcomes :

- ✓ The students will understand the various marketing approach in today's competitive scenario.
- ✓ The students will learn the application of various marketing tools for solving business problems

The students will acquire and develop the marketing skills to be a successful marketing person

Module 1:

Introduction to marketing; What is marketing?, Importance of marketing function, Process of marketing, Concepts like need, want, value, satisfaction etc, Elementary idea of marketing mix. Understanding Marketing Environment; Factors affecting marketing environment (PESTEL),Porter’s five forces model, Introduction to market research

Module 2:

Segmentation, Targeting & positioning (STP);What is market segmentation?, Criteria for effective segmentation, Targeting selected markets, Targeting strategies, Positioning , Effective positioning strategies, Positioning of brands and repositioning ,introduction to consumer behavior.

Module 3:

Product Management; Classification of products, Product life cycle (PLC), Brand and branding. Pricing; Meaning & objective, steps in setting the price, pricing policies. Promotion; What is promotion, types of promotion, advertising, sales promotion, integrated marketing communication Place; Marketing channels, Channel conflict management, Distribution system. Introduction to services marketing, Emerging concepts like green marketing, e-marketing & social marketing.

Books Recommended:

1. *Marketing Management: A South Asian Perspective- Phillip Kotler, Kevin Lane Keller, Abraham Koshy and MithileshwarJha, 13th Edition Pearson, Education Publication*
2. *Marketing Mangement: Fourth edition- RajanSaxena*
3. *Positioning: The Battle for Your Mind- Al Ries& Jack Trout, Warner Books USA*

FCMG0108 INTRODUCTION TO RESEARCH

<i>Pre - requisites</i>	<i>Course Type</i>	<i>Credits</i>
<i>Nil</i>	<i>Theory</i>	<i>2</i>

Course Objectives:

1. *To introduce the students about research, methods and techniques.*
2. *To understand the process and apply in other areas.*

Course outcome:

1. *Students will be able to understand the process of doing a research.*
2. *Students will be able to write a research report.*

Course Contents:

Module: I Science and Social Science as Knowledge

Common sense view of Science, Seeing is believing?, Visual Experiences, Relevant Facts, Facts precede theory, Observation, Experiment as an adequate basis of Science, Deductive and inductive logic, falsification-A logical view,

Module: II Process of doing Research

Overview: Problem Definition, hypothesis and its function, Types of Research, Literature Review, Research Design, *Sampling:* Census and sample survey, different types of sample design, *Measurement:* Measurement and scaling techniques, *Methods of Data Collections:* Experimentation,

observation, interview, Survey, case study; *Data Analysis and Interpretation*: Qualitative and quantitative data, data presentation, central tendency and dispersion, association, test of significance.

Module: III Report Writing and Presentation

Significance of report writing, different steps in report writing, layout of research report & Types of Report, Presentation, Ethics in Report Writing.

Books Recommended

1. Ranjit Kumar, 2011, *Research Methodology: A Step by Step Guide*, Sage South Asia Publication.

FCMG0113 INDIAN SOCIETY AND CULTURE

<i>Pre - requisites</i>	<i>Course Type</i>	<i>Credits</i>
<i>Nil</i>	<i>Theory</i>	<i>2</i>

Course Objectives:

- a) Develop an understanding social environment
- b) Develop an understanding of cultural environment
- c) Understanding the linkages among social, cultural and business environment

Course outcomes :

- Students would develop an idea about the socio-cultural environment in which they would be working as scientists, researchers and entrepreneurs.
- More specifically, they would get an appreciation of how societal and cultural issues interface with technology and science in the context of overall development of the country.
- Attempt is also made to familiarise students with the science and technology policies that would benefit modern India.

Course Contents:

Module 1: Introduction to Indian Society

Indian Society - Roots of Indian Society , Social Structure – Rural and Urban Contexts, Social Institutions in Indian Society, Caste, Tribe, Dalits and Other Excluded Groups, Power and Conflicts

Module 2: Introduction to Culture in Indian Society

Culture in Ancient, Medieval and Modern India, Languages and Literature in India, Culture Change and its Impact on Indian Society

Module 3: Social Movements

Reformers and Radicals – Rammohan Roy, Syed Ahmed Khan, JotiroPhule, Gopal Krishna Gokhale, BalGangadharTilak, TarabaiShinde, DayanandaSaraswati and Vivekananda Nurturing a Nation – M. K. Gandhi, RabindraNath Tagore, B R Ambedkar, Mohammad Ali Jinnah, EV Ramaswami, Jawaharlal Nehru, RammanoharLohia, Jayaprakash Narayan, Verrier Elwin Peasant, Tribal, Women and Environment movement

Module 4: Social Issues in Modern India

Poverty, Gender Inequality, Disparity and Social Exclusion: SC, ST, Women, Child, Challenged

Module 5: Science, Technology and Society

Science, Technology and Development Linkage, Appropriate Technology, Science and Technology Policy

Books Recommended:

1. *Indian Society and Culture: Continuity and Change* – by N. Hasnain
2. *Social and Cultural History of India* – O.M. Prakash
3. *Makers of Modern India* – RamachandraGuha

FCMG1201 DISASTER MANAGEMENT

<i>Pre - requisites</i>	<i>Course Type</i>	<i>Credits</i>
<i>Nil</i>	<i>Theory</i>	<i>2</i>

CourseStructure
Mechanical Engineering
2017

<i>Code</i>	<i>Subject Title</i>	<i>Type</i>	<i>Credit</i>	<i>Prerequisite</i>
CCME0405	<i>TheoryofMachines</i>	<i>Theory+ Practice</i>	<i>5</i>	<i>NIL</i>
MECC0401	<i>Manufacturing Technology 1</i>	<i>Theory+ Practice</i>	<i>2+1</i>	<i>Workshop Practice</i>
MECC0402	<i>Manufacturing Technology 2</i>	<i>Theory+ Practice</i>	<i>2+2</i>	<i>Nil</i>
MECC0403	<i>Design for Manufacturing</i>	<i>Theory+ Practice</i>	<i>2+2</i>	<i>Workshop Practice</i>
MECC0404	<i>Finite Element Analysis</i>	<i>Theory+ Practice</i>	<i>2+2</i>	<i>Nil</i>
MECC0405	<i>Digital Manufacturing</i>	<i>Theory+ Practice</i>	<i>2+1</i>	<i>Nil</i>
MECC0406	<i>Internal Combustion Engines</i>	<i>Theory+ Practice</i>	<i>1+1</i>	<i>Thermodynamics</i>
MECC0407	<i>Design of Thermal Energy Systems</i>	<i>Theory+ Practice</i>	<i>2+1</i>	<i>Thermodynamics</i>
MECC0408	<i>Renewable EnergySystems</i>	<i>Theory+ Practice</i>	<i>2+1</i>	<i>Nil</i>
MECC0409	<i>Fluid Power</i>	<i>Theory+ Practice</i>	<i>2+1</i>	<i>Nil</i>
MECC0410	<i>Mechanics of Machines</i>	<i>Theory+ Practice</i>	<i>2+1</i>	<i>Nil</i>
MECC0411	<i>Strength of Material</i>	<i>Theory+ Practice</i>	<i>2+1</i>	<i>Engineering Mechanics</i>
MECC0413	<i>Introduction to Hybrid and ElectricVehicles</i>	<i>Theory+ Practice</i>	<i>1+1</i>	<i>Nil</i>
MECC0414	<i>Fluid Mechanics and Heat Transfer</i>	<i>Theory+ Practice</i>	<i>2+1</i>	<i>Basic Fluid Mechanics</i>

<i>Total Credits</i>	45	
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Syllabus

CCME0405 THEORY OF MACHINES

Pre-requisites	Course type	Credits
NIL	Theory+Practice	5

Course Objectives: The overall objective of this course is to learn how to analyze the motion of mechanisms, design mechanisms
Course Outcomes:

1. Distinguish kinematic and kinetic motion.
2. Identify the basic relations between distance, time, velocity, and acceleration.
3. Use graphical and analytic methods to study the motion of various mechanisms.
4. Design basic cam systems

MODULE –I(21Hours)

Mechanisms: Kinematic concept of link, kinematic pair, kinematic chain, Mechanism, binary, ternary and quaternary joints, degree of freedom of planar mechanism, inversions of four bar mechanism, single slider crank mechanism and double slider crank mechanism. (Most of the topics will be through PPT presentation and demonstration)

Motion Analysis: Types of motion, velocity diagram, Instantaneous centre method, Kennedy theorem, relative velocity method, velocities in four bar and slider crank mechanism, Klein's construction. Acceleration diagram of planar mechanism, Coriolis component of acceleration. (The topic is taught through practice)

MODULE –II(21Hours)

Gears: Classification and basic terminology, Fundamental law of gearing, involute tooth profile, Spur gears, other types of gears, standards in tooth forms, length of path of contact and arc of contact, contact ratio, interference in involute gears. (The topics are taught through PPT presentation and demonstration)

Gear trains: Simple, compound, reverted and epi-cyclic gear trains. (The topics are taught through PPT presentation and demonstration)

Steering gear mechanism: Law of correct steering, Davis and Ackermann steering gear mechanism, universal or Hooke's joint.

MODULE –III(25Hours)

Frictional devices: Plate & cone clutches, Brakes and dynamometers, analysis of shoe brake and band brake, study of absorption and transmission dynamometer, Belt and rope drive, slip and creep of belt, maximum power transmitted by belt, introduction to rope and chain drives. (The topic is taught through PPT presentation and demonstration)

CAMS: Various types of cams and followers, nomenclature of cam profile, Displacement, velocity and acceleration of followers. Draw cam profile for various

types of follower motion. (The topic will be through practice mode)

Text Book:

1. Theory of Machines, S.S. Rattan, Tata McGraw Hill.
2. A Textbook of Theory of Machines by R. K. Bansal, Laxmi Publication

Reference Books:

1. Theory of Machines and Mechanisms by Ghosh and Malik
2. Mechanism and Machine Theory by J.S. Rao and R.V. Dukkipati

Module I

S. No.	Topic	Pedagogy	Details	Instructional Hrs			
				Th	Pract	video	Proj
1	Mechanisms: Kinematic concept of link, kinematic pair, kinematic chain, Mechanism, binary, ternary and quaternary joints, degree of freedom of plane mechanism	CRT & PRA		4	2	0	0
2	Inversion of four bar mechanism, single slider crank mechanism and double slider crank mechanism.	CRT, Video		2	0	1	0
3	Motion Analysis: Types of motion, velocity diagram, Instantaneous center method, Kennedy theorem	CRT + PRA		2	2	0	0
4	Relative velocity method, velocities in four bar and slider crank mechanism, Klein's construction	CRT + PRA		2	2	0	0
5	Acceleration diagram of planar mechanism, Coriolis component of acceleration.	CRT + PRA		2	2	0	0

	Subtotal			21		12	8	1	0
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Module-II

S. No.	Topic	Pedagogy	Details	Instructional Hrs			
				Th	Pract	video	Proj
1	Gears: Classification and basic terminology, Fundamental law of gearing, involute tooth profile	CRT & Video Presentation		3	0	1	0
	Spur gears, other types of gears, standards into tooth forms,						

2	length of path of contact and arc of contact, contact ratio, interference in involute gears.	CRT&PRA		3	1	0	0
3	Geartrains: Simple, compound, reverted and epicyclic geartrains	CRT, PRA & Video Presentation		4	2	1	0
4	Steering gear mechanism: Law of correct steering, Davis and Ackermann steering gear mechanism, universal or Hooke's joint.			4	1	1	0
Module-III		Subtotal	21	14	4	3	0
Frictional devices:							
1	Plate & Cone Clutches	CRT&PRA, VIDEO PRESENTATION		4	2	1	0
2	Brakes and dynamometers, analysis of shoe brake and band brake, study of absorption and transmission dynamometer,	CRT&PRA		4	2		
3	Belt and rope drive, slip and creep of belt, maximum power transmitted by a belt, introduction to rope and chain drives	CRT		4	0	0	0
4	CAMS: Various types of cams and followers, nomenclature of cam profile, Displacement, velocity and acceleration of followers. Draw of cam profile for various types of follower motion.	CRT&PRA		2	6	0	0
		Subtotal	25	14	10	1	0

Manufacturing Technology I

SubjectName	Code	Type ofcourse	Credit	Prerequisite
Manufacturing Technology I	MECC0401	Theory+ Practice	2+1(3)	Workshop Practice

1. Objective

<ul style="list-style-type: none"> •To Educate the Students on Principles, Usage and Application of Various Non-chip Forming Manufacturing Technologies. •To Impart Knowledge on Practical Applications of These Technologies Through Actual Experiments and Making of Sample Products.

2. Course Outcomes

<ul style="list-style-type: none"> •Students will have Knowledge and Skills to Understand Actual Manufacturing Processes used in Industry and will be Able to Correlate a Specific Process with the Part/Component being Produced. •Students will be Able to Select the Most Optimum Manufacturing Process for a Specific Product Design and Application.

3. Evaluation Systems

Internal Examination	Component	% of Marks	Method of Assessment
	Midterm Test	20 (ITH)	Written Examination
	Assignment		Report and Presentation
	Experiments	30 (IPR)+20 (EPR)	Lab work & Report
	Project		Report & Presentation
	Quiz		Surprise/Preannounced ones
External Examination		30 (ETH)	Written Examination
Total		100	

Module I (9 Hours)

(Casting Process)

Introduction, Basic Factors Involved in Casting, Patterns (Classifications, Allowances and Considerations), Technology of Mould Making, Principles of Gating Design, Principles of Risers, Core Making Process, Chills and Chaplets, Solidification of Castings, Inspection and Defects in Castings, Post Casting Processing (Cleaning, Finishing & Heat Treatment of Castings).

Module II (11 Hours) (Special Casting)

Special Casting Processes (Permanent Mould Casting, Die Casting, Slush Casting, Centrifugal Casting, Investment Casting, Carbon Dioxide Casting, Stir Casting, Continuous Casting, Shell and Plaster Molding Process, Full Mould Process, Vacuum Sealed Molding Process, Graphite & Ceramic Mould Casting, Semi-solid Metal Casting).

Practice:

1. To Prepare a Green Sand Mould with a Standard Pattern and Study the Tools Used.
2. Furnace Operation & Aluminum Melting to Pour a Casting.

3. Casting Simulation Using Pro CAST.

Module III (5Hours) (Welding Technology)

Physics of Welding, Welding Classification, Applications of Various Welding Processes, Gas Cutting & Brazing Gas Flames, Flux and Filler, Arc Welding: SMAW Principle and Power Source, Types of Electrodes, Functions of Flux Coatings and AWS Classification and Coding.

Module IV (6Hours)

GTAW, GMAW, SAW & Flux-cored Arc Welding, Resistance Welding - Spot and Seam Welding, Flash Butt Welding, Thermit Welding, Friction Welding, Welding Methods like Plasma Arc, Laser Beam, Electron Beam, Ultrasonic, Explosive Welding, Diffusion Bonding, Cladding, Brazing and Soldering.

Module V (9Hours)

Welding Positions, Edge Preparation in Butt & Fillet Welding, Destructive and Non-Destructive Testing of welding, Welding Defects

Practice:

4. Safety Practice and PPE for Welding.
5. Brazing of 20mm MS Pipe Joint.
6. Bead on Plate Varying Current & Voltage for SMAW using E6013.
7. GTAW Torch Assembly and Bead on Aluminum Plate without & with Filler.

Module VI (7Hours) (Metal Forming)

Plastic Deformation and Yield Criteria, Relation between Tensile and Shear stress, Cold and Hot Working, Rolling: Principle and mechanism, Defects, Types of Rolling Mills, Forging: Classification, Open-Die Forging, Impression-Die and Closed-Die Forging, Drop and Press Forging, Forging defects.

Practice:

8. Making a Square Section from 20mm Round MS Bar.

Module VII (9Hours)

Drawing: Methods and Variables, Wire Drawing, Extrusions: Advantages and Disadvantages, Direct, Indirect, Impact and Hydrostatic Extrusion and their Applications, Extrusion of Tubes, Extrusion Defects.

Sheet Metal Work: Bending, Forming and Deep drawing, Shearing, Punching and Blanking - Method and Application.

Practice:

9. Shearing of 2mm MS Sheet and Use of a Progressive Die to Manufacturing a Washer.

6. References

Text Books:

1. Rao, P.N., Manufacturing Technology, Volume 1, 2015, 4th Edition, Tata McGraw Hill Education Private Limited, India.
2. Ghosh, A, Mallik, A.K., Manufacturing Science, 2010, 2nd Edition, East-West Press Private Limited.

Reference Books:

1. Kaushish, J.P., Manufacturing Processes, 2014, 2nd Edition, PHI Learning Private Limited.

2. Sharma, P C, A Text Book of Production Technology (Manufacturing Processes), 2006, 6th Edition, S. Chand & Company Limited.

Online Source: NPTEL

7. Session Plan

Topic coverage and Internal Test	No. of Sessions (in hrs.)	Activity (lecture, tutorial, lab practice, field studies/field-trip, Workshop etc.)	Assignment (Project, assignment, field study, seminar, etc.)	Suggested Reading (Book, Video, Online source, etc.)
Module I				
Basic Factors Involved in Casting.	01	lecture	field study	http://nptel.ac.in/courses/112107144/13 https://www.youtube.com/watch?v=YtksJ12suFM https://www.youtube.com/watch?v=rL3dLQYEYKw 1. Rao, P N, Manufacturing Technology, Volume 1, 2015, 4th Edition, Tata McGraw Hill Education Private Limited, India.
Patterns Classifications Design Allowances, Design Considerations.	01	lecture	field study	http://nptel.ac.in/courses/112107144/15 https://www.youtube.com/watch?v=-g18ycqbLJY https://www.youtube.com/watch?v=Yf-71Y1_FPI https://www.youtube.com/watch?v=khEvhjIh_SM Ref2 Sharma, P C, A Text Book of Production Technology (Manufacturing Processes), 2006, 6 th Edition, S. Chand & Company Limited.
Technology of Mould making.	01	lecture	field study	https://www.youtube.com/watch?v=6ZuxO--vNDU nptel.ac.in/courses/112107215/11 1. Rao, P N, Manufacturing Technology, Volume 1, 2015, 4th Edition, Tata McGraw Hill Education Private Limited, India.
Principles of Gating Design.	01	lecture	field study	https://www.youtube.com/watch?v=CoO_akMDBbo https://www.youtube.com/watch?v=IJF426aMCJA https://www.youtube.com/watch?v=

				CyN6DRjPnxs http://nptel.ac.in/courses/112107144/metalcasting/lecture13&14.htm 1. Rao, P N, Manufacturing Technology, Volume 1, 2015, 4th Edition, TataMcGraw Hill Education Private Limited, India.
Principles of Risers, Problemsolving.	02	lecture	Assignment	https://www.youtube.com/watch?v=2UzsJNikZxY http://nptel.ac.in/courses/112107239/13 http://nptel.ac.in/courses/112107215/25 Ref1. Kaushish, JP, Manufacturing Processes, 2014, 2 nd Edition, PHI Learning Private Limited.
Solidification of castings.	01	lecture		https://www.youtube.com/watch?v=pvmu9Sk2gXk https://www.youtube.com/watch?v=8xVDy8OzeKc https://www.youtube.com/watch?v=wTbcEu8SdAY 2. Ghosh, A, Mallik, A K, Manufacturing Science, 2010, 2 nd Edition, East-West Press Private Limited.
Inspection of Castings.	01	lecture	Assignment	https://mechanicalengineering.com/methods-inspection-finding-out-defects-in-casting/ https://www.youtube.com/watch?v=l8LQShYjsHg
Post Casting Processing.	01	lecture	Assignment	nptel.ac.in/courses/112107084/module13/lecture1/lecture1.pdf nptel.ac.in/courses/112107215/37 https://www.youtube.com/watch?v=xUxSVr_N-zA
Module-II				
Permanent Mould Casting, Die Casting.	01	lecture	Assignment	http://nptel.ac.in/courses/112107078/7 https://www.youtube.com/watch?v=CuRiFL4UZQ0 http://nptel.ac.in/courses/112107219/24 http://nptel.ac.in/courses/112107144/metalcasting/lecture7.htm https://www.youtube.com/watch?v=ps2cWctKLBQ 2. Ghosh, A, Mallik, A K, Manufacturing Science, 2010, 2 nd Edition, East-West Press Private

				Limited.
Slush Casting, Centrifugal Casting, Investment Casting.	01	lecture	Assignment	https://www.youtube.com/watch?v=ps2cWctKLBQ https://www.youtube.com/watch?v=oNZrxFvODtwh https://www.youtube.com/watch?v=U81LJAdzFsY 2. Ghosh, A, Mallik, A K, Manufacturing Science, 2010, 2 nd Edition, East-West Press Private Limited.
Carbon Dioxide Casting, Stir Casting, Continuous Casting.	01	lecture	Assignment	https://pdfs.semanticscholar.org/3937/3d4257ff9cb366a1690ebc3151b692740744.pdf https://www.youtube.com/watch?v=vnNKYYsY4Wc http://nptel.ac.in/courses/112104221/23 https://www.youtube.com/watch?v=ytOUkOdra3E http://nptel.ac.in/courses/113104059/33 https://www.youtube.com/watch?v=6WIA Bd84404
Shell and Plaster Molding Process, Full Mould Process, Vacuum Sealed Molding Process.	01	lecture	Assignment	http://nptel.ac.in/courses/112107078/11 https://www.youtube.com/watch?v=tDYF2Q1r78Q http://nptel.ac.in/courses/112107144/21 http://nptel.ac.in/courses/112107215/15 https://www.youtube.com/watch?v=ZSie37pNqak https://www.youtube.com/watch?v=ZmAkMgl3V3w
Graphite & Ceramic Mould Casting, Semi-solid Metal Casting.	01	lecture	Assignment	www.nptel.ac.in/courses/112101005/downloads/Module 3 Lecture 2 final.pdf http://thelibraryofmanufacturing.com/ceramic_mold_casting.html
Experiment 1	02	Practical		
Experiment 2	02	Practical		
Experiment 3	02	Practical		
Module III				
Physics of Welding, Welding Classification	01	lecture	field study	https://www.youtube.com/watch?v=lzTj9FRyUM0 https://www.youtube.com/watch?v=

Applications of various welding processes.				CCzhT81GrBo https://www.youtube.com/watch?v=AvXoEp53zAYh https://www.youtube.com/watch?v=3nX0oYHnzy0h http://nptel.ac.in/courses/112107144/27 2. Ghosh, A, Mallik, A K, Manufacturing Science, 2010, 2 nd Edition, East-West Press Private Limited.
Gas Cutting & Brazing Gas Flames.	01		field study	https://en.wikipedia.org/wiki/Oxy-fuel_welding_and_cutting https://www.youtube.com/watch?v=3EtEM17C6MI 1. Rao, P N, Manufacturing Technology, Volume 1, 2015, 4th Edition, Tata McGraw Hill Education Private Limited, India.
SMAW Principle and Power Source.	01	lecture	field study	nptel.ac.in/courses/112107090/module4/lecture1/lecture1.pdf http://nptel.ac.in/courses/112107089/14 https://www.youtube.com/watch?v=5hRgwnejWPs https://www.youtube.com/watch?v=yOdXvagHK_M 2. Ghosh, A, Mallik, A K, Manufacturing Science, 2010, 2 nd Edition, East-West Press Private Limited.
Types of Electrodes, Functions of Flux Coatings and AWS Classification and Coding.	02	lecture	field study	http://nptel.ac.in/courses/112107144/welding/lecture5&6.htm
Module-IV				
GTAW, GMAW, SAW & Flux-cored Arc Welding.	02	lecture	field study	http://nptel.ac.in/courses/112107089/16 https://www.youtube.com/watch?v=Vg1UXBHNh6U http://nptel.ac.in/courses/112107089/20 http://nptel.ac.in/courses/112107089/19 https://www.youtube.com/watch?v=TPSQJXqSwTg https://www.weldguru.com/support-files/flux-cored-arc-welding.pdf http://nptel.ac.in/courses/112107078

				/30 https://www.youtube.com/watch?v=Zc3Fu1AVCjc Ref. 1Kaushish,JP,Manufacturing Processes, 2014,2 nd Edition, PHI LearningPrivate Limited.
ResistanceWelding, Spot and Seam weldingFlash Butt Thermitwelding, Friction welding.	02	lecture	field study	https://www.youtube.com/watch?v=Op68bH0bi6I http://www.avio.co.jp/english/products/assem/principle/welding/index.html https://www.youtube.com/watch?v=66-RK0DPXfU https://www.youtube.com/watch?v=pcF7i297aZE https://www.youtube.com/watch?v=bg_fDRr7tUc https://www.youtube.com/watch?v=8LQUlzSwc-k https://www.youtube.com/watch?v=-wNMHFWCJ88 https://www.youtube.com/watch?v=amaHurtwYTc https://www.youtube.com/watch?v=gXp3aRKO4Yc https://www.youtube.com/watch?v=M2zdRBcDZWY https://www.youtube.com/watch?v=-aEuAK8bsQg
Plasma Arc, Laser Beam, Electron Beam, Ultrasonic Explosive Welding, Diffusion bonding.	01	lecture	Assignment	https://www.youtube.com/watch?v=mgaukC25Hqk https://www.youtube.com/watch?v=588EJInHLsc https://www.youtube.com/watch?v=hX2SMbewGwo https://www.youtube.com/watch?v=o4W8nsrvQ6E nptel.ac.in/courses/112107077/35 nptel.ac.in/courses/112107077/module4/lecture3/lecture3.pdf nptel.ac.in/courses/112107213/24 https://www.youtube.com/watch?v=ykf2Zckqcl4 https://www.youtube.com/watch?v=ERrUlzcaqMw
Brazingand Soldering.	01	lecture	Field Study	https://www.youtube.com/watch?v=_mbXkA5FH2U https://www.youtube.com/watch?v=B-vKcEVO4AE https://www.youtube.com/watch?v=0v2SNH_ho08

				Ref.1Kaushish,JP,Manufacturing Processes, 2014, 2 nd Edition, PHI LearningPrivate Limited.
Module-V				
Welding Positions, Edge Preparation in Butt & Fillet Welding.	01	lecture	field study	https://www.youtube.com/watch?v=IWVPbib_HwI https://www.youtube.com/watch?v=I3b6mcCS-1c https://www.youtube.com/watch?v=avyy_iEJKxY https://www.youtube.com/watch?v=0c6PESMOazI 1. Rao, P N, Manufacturing Technology, Volume 1, 2015, 4th Edition, Tata McGraw Hill Education Private Limited, India.
Destructive and NDT Welding Defects, Design considerations in welding.	01	lecture	Assignment	https://www.youtube.com/watch?v=WoHiE5eGaD4 https://www.youtube.com/watch?v=DK1dItnI8mM Ref.1Kaushish,JP,Manufacturing Processes, 2014, 2 nd Edition, PHI LearningPrivate Limited. https://www.youtube.com/watch?v=axaHjrVG-gQ http://nptel.ac.in/courses/112107089/19 http://nptel.ac.in/courses/114105004/37 1. Rao, P N, Manufacturing Technology, Volume 1, 2015, 4th Edition, Tata McGraw Hill Education Private Limited, India.
Automation & Robotics in Welding	01	lecture	Assignment	http://nptel.ac.in/courses/11210708/30 https://www.youtube.com/watch?v=PF8LhtRDeO4
Experiment 4	02	Practice		
Experiment 5				
Experiment 6	02	Practice		
Experiment 7	02	Practice		
Module VI				
Plastic deformation and Yield criteria, Relation between Tensile and Shear stress	01	lecture	Assignment	https://www.youtube.com/watch?v=MdQDS7BwrtA nptel.ac.in/courses/112106153/Module%202/Lecture%204/Module_2_Lecture_4.pdf

Cold and Hot working.				http://nptel.ac.in/courses/112107145/4# https://www.youtube.com/watch?v=dNbVsmVgOnM 1. Ghosh, A, Mallik, A K, Manufacturing Science, 2010, 2 nd Edition, East-West Press Private Limited.
Rolling: principle and mechanism, defects, types of rolling mills.	02	lecture	Assignment	https://www.youtube.com/watch?v=Xf08dgnlwXg https://www.youtube.com/watch?v=ZD8gW_OzkCQ nptel.ac.in/courses/112106153/Module%204/Lecture%205/Module_4_Lecture_5.pdf www.nptel.ac.in/courses/112106153/22
Forging: classification. Analysis of Forging, Drop and Press forging, Forging defects.	02	lecture	Assignment	https://www.youtube.com/watch?v=dFnN1YtomNc http://nptel.ac.in/courses/112107145/5 https://www.youtube.com/watch?v=bgMPuYn2ips Ref. 1 Kaushish, JP, Manufacturing Processes, 2014, 2 nd Edition, PHI Learning Private Limited.
Experiment 8	02	Practice		
Module-VII				
Sheet metal work: Bending, Forming and deep drawing, shearing, Punching and blanking-method and application.	02	lecture	Field Study	https://www.youtube.com/watch?v=8yBZkwR5fuk https://www.youtube.com/watch?v=lqgInojazXA https://www.youtube.com/watch?v=JgNaSll8Obo https://www.youtube.com/watch?v=o5zTUo2t7_w&list=PL4OEy4gx0_rflEo6TXvZMeMptbMfQdYr7 https://www.youtube.com/watch?v=xLxCVuplis http://nptel.ac.in/courses/112106153/29 2. Ghosh, A, Mallik, A K, Manufacturing Science, 2010, 2 nd Edition, East-West Press Private Limited.
Drawing: methods and variables, wire drawing.	02	lecture	Assignment	https://www.youtube.com/watch?v=9RtAis5pnq4 https://www.youtube.com/watch?v=pd4Uk8vk09c nptel.ac.in/courses/112106153/.../Module_8_SheetMetalDrawing-

				Lecture_1.pdf nptel.ac.in/courses/112106153/Module%206/.../Module_6_Drawing-Lecture_2.pdf nptel.ac.in/courses/116102010/28
Extrusions, Direct, Indirect, Impact and Hydrostatic extrusion Applications, Extrusion of Tubes, defects.	01	lecture	Assignment	https://www.youtube.com/watch?v=773oOz38wJM https://www.youtube.com/watch?v=743fHkOvOkA nptel.ac.in/courses/112106153/23 nptel.ac.in/courses/107103012/module4/lec1.pdf 1. Rao, P N, Manufacturing Technology, Volume 1, 2015, 4th Edition, Tata McGraw Hill Education Private Limited, India.
Experiment 9	2	Practice		
Repeat /Test-1	2			
Total	55			

Manufacturing Technology II

Subject Name	Code	Type of Course	T-P-Pr (Credit)	Prerequisite
Manufacturing Technology II	MECC0402	Theory+ Practice	2+2(3)	Nil

1. Objective

<ul style="list-style-type: none"> • To Educate the Students on Principles, Usage and Application of Various Chip Forming Manufacturing Technologies. • To Impart Knowledge on CNC Machining and Programming.

2. Course Outcomes

<ul style="list-style-type: none"> • Students will be Able to Do Process Planning, Develop CNC Part Programs. • Students will have Knowledge and Skills to Operate CNC Machines.
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3. Evaluation Systems

Internal Examination	Component	% of Marks	Method of Assessment
	ITH	30	Written Examination (Best of 2)
	IPR	20	Lab Work & Report
External Examination	ETH	20	Written Examination
	EPR	30	Lab Work
Total		100	

4. Course Outline

Module I (8 Hours) (Conventional Machining)

Mechanics of Metal cutting; Cutting Tool Materials (Principal Tool Materials, Advanced Tool Materials, Indexable Inserts, Tool Coatings); Cutting Fluids and Lubricants (Characteristics, Types, Selection Criteria, Dry and Near-Dry Machining, MQL);

Practice:

1. Measurement of Cutting Tool Temperature using Thermocouple.

Module II (8 Hours)

Theory of Machinability (Tool Life, Cutting Forces, Power Consumption, Surface Roughness, Thermal Aspects).

Mechanism of Cutting on a Lathe, Milling Machine, Shaper, Planer and Slotter;

Practice:

2. Measurement of Cutting Forces using Dynamometer.

Module III (10 Hours)

Drilling (Deep Hole Drilling & Micro Drilling); Boring and Reaming Operations; Principles of Jigs and Fixtures

Practice:

3. Measurement of Surface Roughness using Talysurf.
4. Process Optimization using Minitab and Matlab.

Module IV (10 Hours) (Non-Conventional Machining & Additive Manufacturing)

Non-Conventional Machining Process, Principle and Equipment (Electro-Chemical Machining; Electric Discharge Machining, Laser Beam Machining; Electron Beam Machining; Hot Machining)

Practice:

5. Study of EDM working Principle and Process Parameters.

Module V (9 Hours)

Additive Manufacturing (3D Printing, Rapid Prototyping); Developments in Additive Manufacturing; Classifications of Additive Manufacturing systems

Practice:

6. Component Manufacturing Using 3D Printer.

Module VI (6 Hours) (Computer Aided Manufacturing)

GD&T Concepts (Machining Accuracy; Fundamentals of Measurements; Principles of Tolerancing; Maximum and Minimum Material Requirement)

Module VII (25 Hours)

CAM-Introduction, Types-NC, CNC, DNC, Machining Centers, Adaptive Control, Part Programming G-Codes, M-Codes, Programming & Machining for Simple Components

Practice:

7. Manual Programming Related to Facing, Turning, Drilling, Boring & Pocketing in CNC Machines.
8. Simple Contouring Operation using CNC Milling Machine.

9. 3D Modeling & Product Design with CATIA and SolidWorks (3D Experience)
10. Generation of NC Program and Product Manufacturing by Using MasterCAM Software.
11. Process Planning, Programming, Simulation and Optimization of Machining Processes Using DELMIA.

6. References

Text Books:

1. Rao, P.N., Manufacturing Technology, Volume 2, 2011, 2nd Edition, Tata Mc-Graw Hill Education Private Limited, India.
2. Chattopadhyay, A.B., Machining & Machine Tools, 2012, 1st Edition, Wiley India Private Limited, India.
3. Groover, M.P., Zimmers, E., CAD/CAM: Computer Aided Design & Manufacturing, 2011, 9th Edition, Pearson Education Inc., India.

Reference Books:

1. Shaw, M.C., Metal Cutting Principles, 2011, 2nd Edition, Oxford University Press, India.
2. Bhattacharya, A., Metal Cutting - Theory and Practice, 2015, 8th Edition, New Central Book Agency Private Limited, India.
3. Raghuvanshi, B.S., A Course in Workshop Technology, Volume 2, 2009, 10th Edition, Dhanpat Rai & Co., India.

Online Source: NPTEL

7. Session Plan

Topic coverage and Internal Test	No. of Sessions (in hrs.)	Activity (lecture, tutorial, lab practice, field studies/field-trip, Workshop etc.)	Assignment (project, assignment, field study, seminar, etc.)	Suggested Reading (Book, Video, Online source, etc.)
Module I				
Mechanics of Metal cutting	1	Lecture, lab practice	Assignment	https://www.youtube.com/channel/UCCqGTvGZgWw8mFX5KYTHCkw NPTEL: http://nptel.ac.in/courses/112105127/ Raghuvanshi, B.S., A Course in Workshop Technology, Volume 2, 2009, 10 th Edition, Dhanpat Rai & Co., India.
Cutting Tools - Types, Materials	1	Lecture, lab practice	Assignment	NPTEL: http://nptel.ac.in/courses/112105127/ Chattopadhyay, A.B., Machining & Machine Tools, 2012, 1 st Edition, Wiley India Private Limited, India.
Cutting Fluids and	2	practice	Assignment	NPTEL:

Lubricants (Characteristics, Types, Selection Criteria, Dry and near-dry Machining, MQL)				http://nptel.ac.in/courses/112105127/ https://www.youtube.com/watch?v=81Fdif5e85c nptel.ac.in/courses/112104225/21 Rao,PN, Manufacturing Technology, Volume2,2011,2ndEdition, TataMc- Graw HillEducation Private Limited, India.
Experiment1.	4	Practice		
Module II				
Theory of Machinability (Tool Life, Cutting Forces, Power Consumption, Surface Roughness, ThermalAspects).	2	practice	Assignment	NPTEL: http://nptel.ac.in/courses/112105127/ https://www.youtube.com/watch?v=OnGXJA7oX https://www.youtube.com/watch?v=x4FeoETWk Chattopadhyay,AB, Machining &Machine Tools, 2012, 1st Edition, Wiley India Private Limited, India. Bhattacharya,A, MetalCutting-Theory and Practice,2015, 8th Edition,NewCentral BookAgencyPrivate Limited,India.
Mechanism of cutting onLathe, Milling Machine, Shaper, Planerand Slotter;	2	Lecture	Field Study	
Experiment2	4	Practice		https://www.youtube.com/watch?v=jqRCFwV29hY Chattopadhyay,AB, Machining &Machine Tools, 2012, 1st Edition, Wiley India Private Limited, India. Shaw,MC,MetalCuttingPrinciples,2011, 2nd Edition, Oxford UniversityPress, India.
Module III				
PrinciplesofJigs and Fixtures	1	Practice	Assignment	https://www.youtube.com/watch?v=7yzvno4AvKw nptel.ac.in/courses/112105127/pdf/LM-33.pdf
Drilling(Dep hole drilling& Micro drilling), Boringand reaming Operations	1	Practice	Assignment	https://www.youtube.com/watch?v=p_LgK0Ffg20 https://www.youtube.com/watch?v=XXpOwsD0fWM
Experiment3	4	Practice		https://www.youtube.com/watch?v=hz5rX4QxbNQ https://www.youtube.com/watch?v=dzhh82H2Nuk
Experiment4	4	Practice		

Module IV				
Non-traditional Machining fundamentals- ECM, EDM, LBM and EBM.	6	Practice	Assignment	https://www.youtube.com/watch?v=KXFpTb9cBpY https://www.youtube.com/watch?v=Hc6mfNWT8oQ http://nptel.ac.in/courses/112105126/41 http://nptel.ac.in/courses/112107078/23 https://www.youtube.com/watch?v=mgaukC25Hqk https://www.youtube.com/watch?v=ptEmX9O4nDw
Experiment7.	4	Practice		
Module V				
Additive Manufacturing (3DPrinting, Rapid Prototyping)	3	Lecture	Assignment	http://nptel.ac.in/courses/112104204/47 http://nptel.ac.in/courses/112107078/37 https://www.youtube.com/watch?v=cwguTQEKdOY https://www.youtube.com/watch?v=NkC8TNts4B4
Developments in Additive Manufacturing; Classifications of Additive Manufacturing systems.	2	Lecture	Assignment	https://www.ntnu.no/documents/10401/.../92ff1f88-c0cb-4b28-b605-21c354301281
Experiment8.	4	Practice		
Module VI				
GD&T Concepts (Machining Accuracy; Fundamentals of Measurements; Principles of Tolerancing; Maximum and Minimum Material Requirement)	6	Practice	Assignment	www.pages.drexel.edu/~rcc34/Files/Teaching/MEM201%20L6-Tolerance_RC.pdf https://www.youtube.com/watch?v=-qz8_sbhwY https://www.gdandtbasics.com/gdt-symbols/ https://www.youtube.com/watch?v=M0bVXXmXXdI
Module VII				
Types- NC, CNC, DNC, Machining Centers, Adaptive Control	2	Lecture	Assignment	https://www.youtube.com/watch?v=KXFpTb9cBpY https://www.youtube.com/watch?v=gG0IHYSIQsU Groover, M P, Zimmers, E, CAD/CAM: Computer Aided Design & Manufacturing,

				2011, 9th Edition, Pearson Education Inc., India.
Part Programming–G Codes, M-Codes	3	practice		Groover, M P, Zimmers, E, CAD/CAM: Computer Aided Design & Manufacturing, 2011, 9th Edition, Pearson Education Inc., India.
Experiment9.	4	Practice		
Experiment10.	4	Practice		
Experiment11.	4	Practice		
Experiment12.	4	Practice		
Experiment13.	4	Practice		
Total(hrs)	77			

Design for Manufacturing

SubjectName	Code	Type ofcourse	T-P-Pr (Credit)	Prerequisite
Design for Manufacturing	MECC0403	Theory+ Practice	2+2(4)	Workshop Practice

1. Objective

- To provide the students detailed understanding of primary manufacturing processes and product design from concept-to-mass production.
- To impart knowledge on use and application of software to solve design engineering problems in metal casting, forging and sheet metal forming processes.

2. Course outcomes

- Students will be able to select appropriate manufacturing technology and process to produce a product effectively with quality and optimized production cost.
- Students will have skills and knowledge to use software like CATIA, Novaflow and SolidCV, ProCAST, Flow-3D Cast, DEFORM-3D and PAM-STAMP2G.

3. Evaluation Systems

Internal Examination	Component	% of Marks	Method of Assessment
	Internal Class Test	20	Written Examination
	Internal Practice	20+10	Written Examination+ Learning Record
External Examination	External Theory+ EPR	30+20	Written Examination + Lab. Work & Record
Total		100	

4. Course Outline

Module I(8 Hrs)

Introduction to Design: Problem and Solutions, What is Good Design? Design as Model-making, Design, Creativity, Innovation and Invention. The History of DFM/A, Why Companies Are using DFM/A, The

Boothroyd Dewhurst Design for Manual Assembly Method, Product Complexity, Product Variants, Reusable/Modularity/Standard Design, Product Costs, Quality, Regulatory & Safety Requirements, Aesthetic and Ergonomic Considerations in Design, Design for Maintenance.

Module II (8Hrs)

Design for Manufacture: Assembly, Shipping, Maintenance, Design Efficiency, Materials Selection, Manufacturing Considerations in Design: Role of Processing in Design, Types of Manufacturing Processes, Design for Manufacturability, Design for Castings, Forgings, Sheet Metal Forming, Design for Machining, Powder Metallurgy, Welding, Heat Treatment, Assembly, Corrosion Resistance, Designing with Plastic Processing.

Module III (6Hrs)

Economics of Manufacturing, Product Target Cost Evaluation: Categories of Costs, Methods of Developing Cost Estimates, Cost Indexes, Cost Capacity Factors, Estimating Plant Cost, Design to Cost, Manufacturing Costs, Value Analysis in Costing.

Module IV (8Hrs)

Metal Casting Design: Design for Castability; Introduction to Casting, Types of Casting, Mathematical Modelling of Liquefying the Material, Viscosity and Fluidity Parameter included as Flow Equation, Casting Microstructure and Defects, Casting Design Process; Sprue, Gate, Runner Design according to Flow Equations, Analysis Prediction for Metal Casting, Liquid Phase Fraction, Shrinkage Prediction, Calculating Feeder, Secondary Dendrite Arm Spacing (SDAS).

Module V (15Hrs)

Simulation of Casting Process; STL Part Design Generation from CAD Package, Simulation of Solidification, Calculation of Riser, Design of Gating and Simulation of Mold Filling, Simulation of Riser and Gating System. Components: Die Casting Design and Simulation of Casting of Engine Block using Aluminum Alloy Specifically Al-Si-Cu-Mg-Fe Alloy. Simulation of Casting for Shell Housing.

Practice:

1. Casting Design & Analysis using CATIA, Novaflow and Solid CV, ProCAST, Flow-3D Cast.

Module VI (15 Hrs)

Forging Design: Design Aspect of Forging and their Significance. Procedure of Working out of Forging Drawing and Technology for Open and Close Die Forgings. Developing the Forging Drawing of Some Jobs. Factors Affecting the Metal Flow in Closed Dies. Forgeability, Friction and Lubrication, Die Temperature, Size and Shape Factor, Flash and Gutter. Designing Performing, Finisher, Trimming and Punching Dies; Selection of Forging Equipments; Die Wear, Die Materials, Forging Defects, Heat Treatments of Dies and Forgings.

Practice:

2. Forging Design & Flow Simulation using CATIA and DEFORM-3D.

Module VII (15Hrs) (Sheet Metal Forming)

Sheet Metal: Design for Formability; Formability of Sheet Metal, Press for Sheet Metal Process, Die & Punch, High Energy Rate Forming Process, Extrusion Process and Bulk Deformation Process. Blank Holder Force Estimation, Incremental Forming Analysis Residual Stress Vs Blanking Force Analysis and Optimization, Hot Stamping Process.

Analysis Prediction: Differential heating and Differential Cooling in Hot Forming Process, Map of Meso Patch on the component, Force Required for Product Shape. Components: B-pillar Trim, Bonnet, Suspension Rocker Arms, Roof Liner, Body Side Outer.

Practice:

3. SheetMetalToolDesign inCAD.
4. UseofCATIAand PAM-STAMP2G

6. Reference

TextBooks:

1. Boothroyd,G,Dewhurst,P,Knight,AW,ProductDesignForManufacture&Assembly,2011,3rd Edition, CRCPress, NW.
2. Chitale, AK, ProductDesign &Manufacturing, 2013,6thEdition, PHIpublication, India.

Reference Books:

1. Bralla, J G, Design for Manufacturability Handbook, 2001, 2nd Edition, Tata McGraw-Hill Companies, Inc.
2. Ulrich,KT,Eppinger,SD,ProductDesign&Development,2016,5thedition,TataMcGraw-Hill Companies, Inc.

7.SessionPlan

Topiccoverage and InternalTest	No. of Sessions (in hrs.)	Activity (lecture, tutorial,lab practice,field studies/field-trip, Workshop etc.)	Assignment (Project, assignment, field study, seminar, etc.)	Suggested Reading (Book, Video, Online source, etc.)
Module I				
Introduction to Design, Problemand Solutions, Whatis Good Design?	02	Lecture		1. http://nptel.ac.in/courses/112101005/ 2. Boothroyd, G, Dewhurst, P, Knight,AW, Product Design ForManufacture &Assembly, 2011, 3 rd Edition, CRCPress, NW.
Design asModel-making, Design, Creativity, Innovation and Invention.The HistoryofDFM/A, WhyCompaniesAre usingDFM/A	02	Lecture		1. Boothroyd,G,Dewhurst,P, Knight, A W, Product DesignForManufacture& Assembly, 2011, 3 rd Edition, CRCPress, NW.

TheBoothroyd DewhurstDesign for ManualAssembly Method,	02	Lecture		1. Boothroyd, G, Dewhurst, P, Knight,AW, Product Design ForManufacture &Assembly, 2011, 3 rd Edition, CRCPress, NW
ProductComplexity, ProductVariants, Reusable/ Modularity/Standard Design, ProductCosts, Quality, Regulatory& SafetyRequirements, Design for Maintenance	02	Lecture		1. Boothroyd,G,Dewhurst,P, Knight, A W, Product DesignForManufacture& Assembly, 2011, 3 rd Edition, CRCPress, NW.
Module II				
Design for Manufacture, Assembly, Shipping, Maintenance, Design Efficiency	02	Lecture		1. http://nptel.ac.in/courses/112101005/20 2. Boothroyd, G, Dewhurst, P, Knight,AW, Product Design ForManufacture &Assembly, 2011, 3 rd Edition, CRCPress, NW.
Materials Selection, Manufacturing Considerationsin Design:Role of Processingin Design, Typesof Manufacturing Processes, Economics of Manufacturing	02	Lecture		1. http://nptel.ac.in/courses/112101005/4 2. Boothroyd, G, Dewhurst, P, Knight,AW, Product Design ForManufacture &Assembly, 2011, 3 rd Edition, CRCPress, NW.
Design for Castings, Forgings, SheetMetal Forming, Design for Machining	02	Lecture		1. Chitale, AK, Product Design &Manufacturing, 2013, 6 th Edition, PHI publication, India. 2. http://nptel.ac.in/downloads/112101005/

Powder Metallurgy, Welding, Heat Treatment, Assembly, Corrosion Resistance,	02	Lecture		<ol style="list-style-type: none"> 1. http://nptel.ac.in/downloads/112101005/ 2. Ulrich,KT,Eppinger,SD, Product Design & Development, 2016, 5th edition, Tata McGraw-Hill Companies, Inc.
Module III				
Product Target Cost Evaluation: Categories of Costs, Methods of Developing Cost Estimates, Cost Indexes, Cost Capacity Factors,	03	Lecture		<ol style="list-style-type: none"> 1. http://www.nptel.ac.in/courses/110101010/downloads/mod3/Module%20III-Lec1.pdf 2. Boothroyd,G,Dewhurst,P, Knight, A W, Product Design For Manufacture & Assembly, 2011, 3rd Edition, CRC Press, NW.
Estimating Plant Cost, Design to Cost, Manufacturing Costs, Value Analysis in Costing.	03	Lecture		<ol style="list-style-type: none"> 3. http://www.nptel.ac.in/courses/110101010/downloads/mod3/Module%20III-Lec1.pdf 4. Boothroyd,G,Dewhurst,P, Knight, A W, Product Design For Manufacture & Assembly, 2011, 3rd Edition, CRC Press, NW.
Module IV				
Design for Castability; Introduction to Casting, Types of Casting	02	Lecture		<ol style="list-style-type: none"> 1. efoundry.iitb.ac.in/TechnicalPapers/1999/1999Sourcecon_DesignForCasting.pdf 2. nptel.ac.in/courses/112101005/12 3. Chitale, A K, Product Design & Manufacturing, 2013, 6th Edition, PHI publication, India.
Mathematical Modelling of Liquefying the Material, Viscosity and Fluidity Parameter included as Flow	03	Lecture		<ol style="list-style-type: none"> 1. Chitale, AK, Product Design & Manufacturing, 2013, 6th Edition, PHI publication, India.

Equation				
Casting Design Process; Sprue, Gate, Runner Design according to Flow Equations, Simulation of Casting Process	03	Lecture		<ol style="list-style-type: none"> 1. Ulrich, K. T., Eppinger, S. D., Product Design & Development, 2016, 5th edition, Tata McGraw-Hill Companies, Inc. 2. Chitale, A. K., Product Design & Manufacturing, 2013, 6th Edition, PHI publication, India.
Module V				
Simulation of Casting Process; STL Part Design Generation from CAD Package, Simulation of Solidification	03	Practice		
Calculation of Riser, Design of Gating and Simulation of Mold Filling, Simulation of Riser and Gating System.	03	Practice		<ol style="list-style-type: none"> 1. Chitale, A. K., Product Design & Manufacturing, 2013, 6th Edition, PHI publication, India.
Analysis Prediction: Liquid Phase Fraction, Shrinkage Prediction, Calculating Feeder, Secondary Dendrite Arm Spacing (SDAS).	03	Practice		
Components: Die Casting Design and Simulation of Casting of Engine Block using Aluminium Alloy Specifically Al-Si-Cu-Mg-Fe Alloy.	03	Practice		
Simulation of Casting for Shell Housing. Casting Design & Analysis using CATIA, Novaflow and Solid CV, ProCAST,	03	Practice		

Flow-3D Cast				
Module VI				
Forging Design: Design Aspect of Forging and their Significance. Procedure of Working out of Forging Drawing and Technology for Open and Close Die Forgings.	03	Practice		1. Chitale, A K, Product Design & Manufacturing, 2013, 6 th Edition, PHI publication, India.
Developing the Forging Drawing of Some Jobs. Factors Affecting the Metal Flow in Closed Dies. Forgeability, Friction and Lubrication	03	Practice		1.
Die Temperature, Size and Shape Factor, Flash and Gutter. Designing Performing, Finisher, Trimming and Punching Dies; Selection of Forging Equipments; Die Wear, Die Materials, Forging Defects	03	Practice		1. nptel.ac.in/courses/107103012/module4/lec7.pdf 2. Chitale, A K, Product Design & Manufacturing, 2013, 6 th Edition, PHI publication, India.
Heat Treatments of Dies and Forgings.	03	Lecture		
Forging Design & Flow Simulation using CATIA and DEFORM-3D	03	Practice		
Module VII				
Sheet Metal: Design for Formability; Formability of Sheet Metal, Press for Sheet Metal Process	02	Lecture		1. web.mit.edu/2.810/www/files/lectures/2015.../lec6-sheet-metal-forming-2015.pdf 2. nptel.ac.in/courses/112107144/4

				3. Boothroyd,G,Dewhurst,P, Knight, A W, Product DesignForManufacture& Assembly, 2011, 3 rd Edition, CRCPress, NW.
Die &Punch, High EnergyRate Forming Process, Extrusion Processand Bulk Deformation Process.	02	Lecture		1. http://nptel.ac.in/courses/112101005/downloads/Module_3_Lecture_5_final.pdf 2. Chitale, AK, Product Design &Manufacturing, 2013, 6 th Edition, PHI publication, India.
Blank Holder Force Estimation, Incremental Forming Analysis Residual Stress vs Blanking Force Analysis and Optimization, Hot StampingProcess. `	02	Lecture		1. Bralla, J G, Design for Manufacturability Handbook, 2001, 2nd Edition, Tata McGraw-Hill Companies, Inc. 2. Boothroyd,G,Dewhurst,P, Knight, A W, Product DesignForManufacture& Assembly, 2011, 3 rd Edition, CRCPress, NW.
Analysis Prediction: Differentialheating and Differential Coolingin Hot FormingProcess,Map ofMeso Patchon the component, Force RequiredforProduct Shape	02	Lecture		
Components: B-pillar Trim, Bonnet, Suspension Rocker Arms, Roof Liner, BodySideOuter.	01	Lecture		
SheetMetalTool Design in CAD	03	Practice		

Use of CATIA and PAM-STAMP 2G	03	Practice		
Total	75hrs			

Finite Element Analysis

Subject Name	Code	Type of course	T-P-Pr (Credit)	Prerequisite
Finite Element Analysis	MECC0404	Theory+Practice	2+2(4)	Nil

1. Course Objective

<ul style="list-style-type: none"> To Educate the Students on Fundamental Principles of Finite Element Analysis. To Impart Knowledge on Use and Application of Software for Analysis, Interpretation of Results through Hands-on Practices/Exercises.

2. Course Outcome

<ul style="list-style-type: none"> Students will be Able to Deploy Practical and Industrial Approach using FEA towards Solving Engineering Problems.

3. Evaluation Systems

Internal Examination	Component	% of Marks	Method of Assessment
	ITH/Cass Test	20	Best of two Written Exam
	IPR	30	Lab Work & Report
External Examination	EPR	20	Lab Work & Report
	ETH	30	External Exam
Total		100	

4. Course Outline

Module I (5 Hours)

Overview to Finite Element Analysis: History of FEA; Introduction to types of FEA Analysis, Role of Computer, General Procedure of Finite Element Method, Advantages and Applications of FEA, Principle of Convergence, Review of Matrix Algebra and Gaussian Elimination.

Module II (9 Hours)

One Dimensional Analysis: Coordinates Systems, Field Variable, Shape Functions, Element Stiffness Matrix and Load Vector, Assembly, Global Equations, Imposition of Boundary Conditions.

Overview to Pre-Processing (About Meshing, Types of Meshing: 1-D, 2-D, 3-D, Special Elements, Meshing Quality Criteria, Material Properties, and Boundary Conditions)

Module III (12 Hours)

Pre-Processing: CAD Geometry Preparation; Meshing and Quality Check; Material Assignment & Boundary Conditions.

Analysis of Bar, Spring, Truss and Beam Elements.

Module IV (15 Hours)

Introduction Types of Analysis & Detail: Linear Static Analysis; Non-Linear Analysis; Dynamic Analysis

Module V (7 Hours)

Thermal Analysis; Computational Fluid Dynamics; Fatigue Analysis; Crash Analysis; NVH Analysis.

Module VI (12 Hours)

Structural Analysis of a Pressure Vessel; Thermal Analysis of a Pressure Vessel; Dynamic Analysis of a Scooter Frame.

Module VII (15 Hours)

Post Processing, Result Interpretation and Testing & Field Data Acquisition.

Solving: Post-Processing, Result Interpretation.

5. Reference

Text Books:

1. Practical Finite Element Analysis, Nitin S. Ghokhale, Published by Finite to Infinite, Pune.
2. ANSYS Workbench: A Tutorial Approach, Sham Tickoo, CADCIM Technologies

Reference Books:

1. Applied Finite Element Analysis, Larry J. Segerlind, John Wiley and Sons, Inc.
2. Finite Element Analysis: Theory and Application with ANSYS, Saeed Moaveni, Prentice Hall, Inc.

7. Session Plan

Topic coverage and Internal Test	No. of Sessions (in hrs.)	Activity (lecture, tutorial, lab practice, field studies/field -trip, Workshop etc.)	Assignment (Project, assignment, field study, seminar, etc.)	Suggested Reading (Book, Video, Online source, etc.)
Module I				
Overview to Finite Element Analysis	02	lecture	field study	Ghokhale S. Practical Finite Element Analysis Published by Finite to Infinite-Pune.
History of FEA	01	lecture	field study	Ghokhale S. Practical Finite Element Analysis Published by Finite to Infinite-Pune
Introduction to types of FEA Analysis, Role of Computer, General Procedure of Finite	02	lecture	Assignment	Ghokhale S. Practical Finite Element Analysis Published by Finite to Infinite-Pune

Element Method, Advantages and Applications of FEA, Principle of Convergence, Review of Matrix Algebra and Gaussian Elimination				
Module II				
One Dimensional Analysis: Coordinates Systems, Field Variable, Shape Functions, Element Stiffness Matrix and Load Vector, Assembly, Global Equations, Imposition of Boundary Conditions.	03	lecture	Assignment	Ghokhale S. Practical Finite Element Analysis Published by Finiteto Infinite-Pune
Overview to Pre-Processing: About Meshing, Types of Meshing: 1-D, 2-D, 3-D, Special Elements, Meshing Quality Criteria, Material Properties, Boundary Conditions	06	lecture	Assignment	Ghokhale S. Practical Finite Element Analysis Published by Finiteto Infinite-Pune
Module III				
Lab/Practical Session: Pre-Processing: CAD Geometry Preparation, Meshing & Quality Check, Material Assignment & Boundary	12	Practice	Assignment	Ghokhale S. Practical Finite Element Analysis Published by Finiteto Infinite-Pune
Module IV				
Introduction Types of Analysis & Detail: Linear Static Analysis, Non-Linear Analysis, Dynamic Analysis	7	lecture	Assignment	Ghokhale S. Practical Finite Element Analysis Published by Finiteto Infinite-Pune
Lab/Practical Session: Analysis of Industry FEA Exercises on: Linear Static Analysis, Dynamic Analysis, Report	8	Practice	Assignment	Ghokhale S. Practical Finite Element Analysis Published by Finiteto Infinite-Pune
Module V				
Thermal Analysis, Computational Fluid Dynamics, Fatigue Analysis, Crash Analysis, NVH Analysis	7	lecture	Assignment	Ghokhale S. Practical Finite Element Analysis Published by Finiteto Infinite-Pune
Module VI				
Lab/Practical Session:	12	Practice	Assignment	Ghokhale S. Practical Finite

Solver:SolvingFEA problem				Element Analysis Published by Finiteto Infinite-Pune
Module VII				
PostProcessing,Result Interpretation,Testing& Field Data Acquisition	3	lecture	Assignment	Ghokhale S. Practical Finite Element Analysis Published by Finiteto Infinite-Pune
Lab/PracticalSession: Solving: Post-Processing, Result Interpretation	12	Practice	Assignment	Ghokhale S. Practical Finite Element Analysis Published by Finiteto Infinite-Pune
TotalHours	75			

Digital Manufacturing

SubjectName	Code	Type ofcourse	T-P-Pr (Credit)	Prerequisite
DigitalManufacturing	MECC0405	Theory+ Practice	2+1(3)	Nil

1. Objective

- Toeducatethestudents onentirestagesofproductlifecycle beginningfromconceptstage, design, testing, validation, manufacturing, servicingetc.
- Toeducatethestudents on Industry4.0 standards.

2. Course Outcomes

- StudentswillbeabletousemodernsoftwarelikeDELMIA-Quest(DassaultSystem)and Camtesia to conceptualiseand create3Dfactorylayouts andoptimise resourceplanning.
- Students willbeable todosimulation ofmanufacturingprocessesusingsoftwaretools.

3. Evaluation Systems

InternalExamination	Component	%ofMarks	Method ofAssessment
	InternalTheory	20	Written Examination
	InternalPractice	20+10	Reportand Presentation
External Examination	ExternalTheory	30	Written Examination
	ExternalPractice	20	Reportand Presentation
Total		100	

4. CourseOutline

Module 1 (3hours)

Introduction toProductDevelopment: ProductDesign concept – System&Sub-systems, Design Validation,Prototyping,Facility&ProcessPlanning,ToolingDevelopment,Manufacturing,Quality, Serviceability.

New Product Introduction (NPI): Concept, Simultaneous Engineering, Cost Engineering – Value AnalysisValue Engineering(VAVE),TearDown &BenchMarking.

Module 2 (6hours)

Digital Manufacturing: Overview, Industry challenges, End to End solution for various industry, Benefits,IndustryCasestudies,IntroductionofIndustry4.0,Convention&EmergingTechnological Solution.

Product Life Cycle (PLM): Overview, Life Cycle Stages, BOM & CAD Management, Change Management, Technological Solution.

Module 3 (6 hours)

Industry 4.0: 4th Industrial Revolution & its Pillars, Overview of Digitization & Simulation, The Industrial Internet of Things, Augmented Reality, 3D-Printing-Additive Manufacturing, Autonomous Robots, Cyber Security, Big Data Analysis, Cloud Server & Data, Horizontal & Vertical systems Integration, C-Flex, Flexible Manufacturing System (FMS)

Module 4 (15 Hours)

Process Planning: Overview, Capacity Planning, Process/Operations, Process Planning, Assembly & Job shop planning, Cycle Time, Standard Man Hour (SMH), Time Analysis–MOST Maynard Operation Sequence Technique (MOST) Technique, Balancing, Shop floor Process and Quality Documentation (PFD, PFMEA, CP)

Digital Twin: Introduction of Facility/Layout Planning, Digital Factory with Plant Facilities & resources, Assembly/Di-assembly, Tool, Process Manufacturability Simulation, Ergonomics Analysis, Visibility & Reachability Simulation, Robotics Simulation, Virtual Commissioning, E-Learning / 3D Work Instruction,

Module 5 (11 Hours)

Material/Factory Flow Simulation: Lab Session using DELMIA-Quest (Dassault Systeme) & Camtasia, Discrete Event Simulation, Factory Layout and Alternate Material Handling Systems, Factory Flow & Logistics Simulation, Virtual Factories in 3D Environment and Analyses, Bottleneck Identification and Corrective Actions, Labor Requirements or Resource Requirements, Throughput of the Production System, Productivity and Utilizations.

Lean Manufacturing: Introduction: Overview of a pre-built Model, Modeling Methodology, Running a Model, Creating Reports and Charts.

Module 6 (11 Hours)

Material Handling Systems: Modeling Labor, Modeling Conveyor Systems, Creating Pallets, Modeling AGV, Modeling Power and Free Systems, Getting Started: Setting the Startup Options, Creating the Library, Creating Basic Simulation Mode.

Animation & Kinematics: Building Basic CAD, Positioning Way Points, Building Kinematics Device, Assigning Resource Kinematics, Creating & Playing a Script, Adding a Grab and Release.

Module 7 (10 Hours)

Shifts and Schedules: Creating Shifts, Setting Schedules, Handling Interrupts, Handling Failures, Preview of Advanced Usage: Creating CRANES, Creating Reports, Debugging, Data Interface Methodology (in or out excel), Using Simulation Control Language (SCL), Using Batch Control Language (BCL), Report & Video Creation.

6. Text Books:

1. Zhou, Z, Fundamentals of Digital Manufacturing Science, 2011, Springer Series in Advanced Manufacturing.
2. Jain, RK, Production Technology, 17th Edition, 2009, Khanna Publishers.

Reference Books:

1. Kalpakjian, S., Schmid, S.R., Manufacturing Engineering & Technology, 4th Edition, 2013, Pearson Education.
2. Chitale, A.K., Gupta, R.C., Product Design & Manufacturing, 6th Edition, 2013, PHI Learning Private Limited.

Online Source: NPTEL, YouTube

Note: Use of Approved Statistical Table Permitted in the Examination.

7. Session Plan

Sl. No	Topic coverage and Internal Test	No. of Sessions (in hrs.)	Activity (lecture, tutorial, lab practice, field studies/field-trip, Workshop etc.)	Assignment (Project, field study, seminar, etc.)	Suggested Reading (Book, Video, Online source, etc.)
Module-I					
1	Introduction to Product Development: Product Design concept – System & Sub systems, Design Validation, Prototyping, Facility & Process Planning, Tooling Development, Manufacturing, Quality, Serviceability.	2	Lecture & Lab practice	Project	https://www.youtube.com/watch?v=G3s4aPgcniw Chitale, A.K., Gupta, R.C., Product Design & Manufacturing, 6 th Edition, 2013, PHI Learning Private Limited.
2	New Product Introduction (NPI): Concept, Simultaneous Engineering, Cost Engineering – Value Analysis Value Engineering (VAVE), Tear Down & Bench Marking.	1	Lecture & Lab practice	Project	https://www.youtube.com/watch?v=G3s4aPgcniw https://www.youtube.com/watch?v=TT6tVH6cDMM https://www.youtube.com/watch?v=ia7sQuiHVY Chitale, A.K., Gupta, R.C., Product Design & Manufacturing, 6 th Edition, 2013, PHI Learning Private Limited.
Module-II					
3	Digital Manufacturing: Overview, Industry challenges, End to End solution for various industry, Benefits, Industry Case studies, Introduction of Industry 4.0, Convention & Emerging Technological Solution.	3	Lecture & Lab practice	Project	https://www.youtube.com/watch?v=HPRURtORnis Zhou, Z., Fundamentals of Digital Manufacturing Science, 2011, Springer Series in Advanced Manufacturing.
4	Product Life Cycle (PLM): Overview, Life Cycle	3	Lecture & Lab	Project	https://www.youtube.com/watch?v=_26E6QR_hmU

	Stages, BOM & CAD Management, Change Management, Technological Solution.		practice		https://www.youtube.com/watch?v=kVereJE1ZI
Module-III					
6	Industry 4.0: 4th Industrial Revolution & its Pillars, Overview of Digitization & Simulation, The Industrial Internet of Things, Augmented Reality , 3D-Printing-Additive Manufacturing, Autonomous Robots, Cyber Security, Big Data Analysis, Cloud Server & Data, Horizontal & Vertical systems Integration, C-Flex, Flexible Manufacturing System (FMS)	6	Lecture & Lab practice	Project	https://www.youtube.com/watch?v=h9t06cyC7Es https://www.youtube.com/watch?v=pj8ApxsymB4 https://www.youtube.com/watch?v=G0EJmBoLq-g https://www.youtube.com/watch?v=r9wrgtz7Qx4 https://www.youtube.com/watch?v=WYnOGAvQEgk https://www.youtube.com/watch?v=6IRvZcRgEbs
Module-IV					
7	Process Planning: Overview, Capacity Planning, Process/Operations, Process Planning, Assembly & Job shop planning, Cycle Time, Standard Man Hour (SMH), Time Analysis – MOST Maynard Operation Sequence Technique (MOST) Technique, Balancing, Shop floor Process and Quality Documentation (PFD, PFMEA, CP)	7	Lab Practice	Project	https://www.youtube.com/watch?v=8MeHL0j-oKE https://www.youtube.com/watch?v=TPkxWAJvPw https://www.youtube.com/watch?v=m-ni_0no-JE https://www.youtube.com/watch?v=SiJXVdfCCiA
8	Digital Twin: Introduction of Facility/Layout Planning, Digital Factory with Plant Facilities & resources, Assembly/Di-assembly, Tool, Process Manufacturability Simulation, Ergonomics Analysis, Visibility & Reachability Simulation, Robotics Simulation, Virtual Commissioning, E-Learning / 3D Work Instruction.	8	Lecture & Lab practice	Project	https://www.youtube.com/watch?v=r2GRLxAsEs https://www.youtube.com/watch?v=SK9fxHw-Nxk https://www.youtube.com/watch?v=UZs-cCsMqaI https://www.youtube.com/watch?v=l_ePLMV7NnA https://www.youtube.com/watch?v=11ttgmRJFOk
Module-V					

9	Material/Factory Flow Simulation: Lab Session using DELMIA-Quest (Dassault Systeme) & Camtesia, Discrete Event Simulation, Factory Layout and Alternate Material Handling Systems, Factory Flow & Logistics Simulation, Virtual Factories in 3D Environment and Analyses, Bottleneck Identification and Corrective Actions, Labor Requirements or Resource Requirements, Throughput of the Production System, Productivity and Utilizations.	6	Lecture & Lab practice	Project	https://www.youtube.com/watch?v=zGQP6sURiLQ https://www.youtube.com/watch?v=kBby1Cdc44M https://www.youtube.com/watch?v=wfxlzV2mlc
10	Lean Manufacturing: Introduction: Overview of a pre-built Model, Modeling Methodology, Running a Model, Creating Reports and Charts.	5	Lecture & Lab practice	Project	https://www.youtube.com/watch?v=iFydS5Hq1SY
Module-VI					
11	Material Handling Systems: Modeling Labor, Modeling Conveyor Systems, Creating Pallets, Modeling AGV, Modeling Power and Free Systems, Getting Started: Setting the Startup Options, Creating the Library, Creating Basic Simulation Mode.	5	Lecture & Lab practice	Project	https://www.youtube.com/watch?v=PusvVnC_4Uc https://www.youtube.com/watch?v=nFu4FFgbMY4 https://www.youtube.com/watch?v=1RGlRH3FDoU
12	Animation & Kinematics: Building Basic CAD, Positioning Way Points, Building Kinematics Device, Assigning Resource Kinematics, Creating & Playing a Script, Adding a Grab and Release.	6	Lecture & Lab practice	Project	https://www.youtube.com/watch?v=ysjqH3iKv4k
Module-VII					
13	Shifts and Schedules: Creating Shifts, Setting Schedules, Handling Interrupts, Handling Failures, Preview of Advanced Usage: Creating	10	Lecture & Lab practice	Project	https://www.youtube.com/watch?v=wVICveldyyM https://www.youtube.com/watch?v=6WIF7m9vD4U https://www.youtube.com/watch?v=V1TJ6b6_EjM

	CRANES, Creating Reports, Debugging, Data Interface Methodology (in or out excel), Using Simulation Control Language (SCL), Using Batch Control Language (BCL), Report & Video Creation.				
	Total Hours	62			

Internal Combustion Engines

Subject Name	Code	Type of Course	Credit	Prerequisite
Internal Combustion Engines	MECC0406	Theory+Practices	1+1(2)	Thermodynamics

1. Objective

- ✓ To educate the students on operating principles, technology behind internal combustion engines.
- ✓ To educate the students on construction and various sub-systems of internal combustion engines.

2. Course Outcomes

- ✓ Students will be able to test internal combustion engines for various performance parameters using engine test rigs.
- ✓ Students will be able to carry out emission tests using various types of fuels commonly used in internal combustion engines.

3. Evaluation Systems

Examination	Theory	Marks	Method of Assessment
	Internal	20	Written examination
Practice	External	30	Written examination+L.R+Assignment
	Practice	Marks	Method of Assessment
Internal	30	Experiment+L.R+VIVA	
External	20	Experiment+L.R+VIVA	
Total		100	

4. Course outline

Module I (16 Hours)

Performance Parameters and Characteristics: Introduction, Engine Power, Engine Efficiency, Engine Performance Characteristics, Variables Affecting Performance Characteristics, Methods of Improving Engine Performance, Heat Balance.

Practice:

1. Study of Two/Four Stroke Petrol/Diesel Engine.
2. Port and Valve Timing Diagram of Two and Four-Stroke Petrol/Diesel Engines.

3. Load Test on Petrol Engine.
4. Load Test on Diesel Engine
5. Morse Test on Multi-Cylinder Petrol/Diesel Engine
6. Heat Balance Study of Petrol/Diesel Engine

Module II (8 Hours)

Fuel: Fuels of SI and CI Engine, Properties, Potential and Advantages of Alternative Liquid and Gaseous Fuels for SI and CI Engines.

Practice:

7. Preparation of Alternate Liquid Fuel.
8. Determination of Octane Number and Cetane Number of Fuel
9. Determination of Kinematic Viscosity, Density of Bio-Diesel and Bio-Ethanol

Module III (5 Hours)

Mechanical Injection Systems: Functional Requirements of an Injection System, Classification of Injection Systems, Fuel Feed Pump, Injection Pump, Injection Pump, Governor, Fuel Injector, Nozzle.

Practice

10. Study of Mechanical Injection System

Module IV (3 Hours)

Electronic Injection Systems: Multi-Point Fuel Injection (MPFI) System, ECU, Injection Timing, Group Gasoline Injection System.

Practice:

11. Study of Electronic Injection System

Module V (3 Hours)

Ignition: Energy Requirement for Ignition, Battery Ignition Systems, Modern Ignition Systems, Firing Order.

Practice:

12. Study of Battery Ignition System of IC Engine

Module VI (4 Hours)

Combustion: Stages of Combustion in SI and CI Engines, Flame Propagation and Ignition Delay, Abnormal Combustion, Phenomena of Knock in SI & CI Engines, Detonation, Diesel Knock & Methods to Control Diesel Knock. SI & CI Engine Combustion Chambers.

Module VII (08 Hours)

Cooling & Lubricating Systems: Air Cooling & Water Cooling Systems, Properties of Lubricants and Different Types of Lubricating System.

Engine Emission and Control: Mechanism of Pollutant Formation and its Harmful Effects. Methods of Measuring Pollutants and Control of Engine Emission.

Practice:

13. Comparative Study of Emissions from Engines using Fossil Fuel and Alternative Fuel.

14. Measuring Exhaust Emissions of an Engine by using Gas Analyzer.

6. Reference

Text Books:

1. Internal Combustion Engines, V. Ganeshan, TMH, 3rd Edition
2. A Textbook of Internal Combustion Engine, R.K. Rajput, LP, 2nd Edition

Reference Books:

1. A Course in IC Engines, V.M. Domkundwar, Dhanpat Rai and Sons

7. Session Plan

Topic coverage and Internal Test	No. of Sessions (in hrs.)	Activity (lecture, tutorial, lab practice, field studies/field-trip, Workshop)	Assignment (project, assignment, field study, seminar, etc.)	Suggested Reading (Book, Video, Online source, etc.)
Module I Introduction, Engine Power, Engine Efficiency, Engine Performance Characteristics, Variables Affecting Performance Characteristics, Methods of Improving Engine Performance, Heat Balance.	16 (theo-4, practice-12)	lecturer+ lab Practice	Assignment with problem solving	Internal Combustion Engines, V. Ganeshan, TMH, 3 rd Edition A Textbook of Internal Combustion Engine, R. K. Rajput, LP, 2 nd Edition https://www.youtube.com/watch?v=PgvD9mx9Doo
Module II Fuel of SI and CI Engine, Properties, Potential and Advantages of Alternative Liquid and Gaseous Fuels for SI and CI Engines.	8 (theo-2, practice-6)	lecturer+ lab Practice	Assignment	Internal Combustion Engines, V. Ganeshan, TMH, 3 rd Edition A Textbook of Internal Combustion Engine, R. K. Rajput, LP, 2 nd Edition
Module III Functional Requirements of an Injection System, Classification of Injection Systems, Fuel Feed Pump, Injection Pump, Injection Pump, Governor, Fuel Injector, Nozzle.	5 (theo-3, practice-2)	lecturer+ lab Practice	Assignment	Internal Combustion Engines, V. Ganeshan, TMH, 3 rd Edition A Textbook of Internal Combustion Engine, R. K. Rajput, LP, 2 nd Edition https://www.youtube.com/watch?v=P5-yxENaLDU&t=49s
Module IV Multi-Point Fuel Injection (MPFI) System, ECU, Injection Timing, Group	3 (theory-1, practice-2)	lecturer+ lab Practice	Assignment	Internal Combustion Engines, V. Ganeshan, TMH, 3 rd Edition A Textbook of Internal Combustion Engine, R. K.

Gasoline Injection System.				Rajput, LP, 2 nd Edition
Module V Energy Requirement for Ignition, Battery Ignition Systems, Modern Ignition Systems, Firing Order.	3(theory-1, practice-2)	lecturer+ lab Practice	Assignment	Internal Combustion Engines, V. Ganeshan, TMH, 3rd Edition A Textbook of Internal Combustion Engine, R. K. Rajput, LP, 2 nd Edition
Module VI Stages of Combustion In SI and CI Engines, Flame Propagation and Ignition Delay, Abnormal Combustion, Phenomena of Knock In SI & CI Engines, Detonation, Diesel Knock & Methods to Control Diesel Knock. SI & CI Engine Combustion Chambers.	4(theory-4 hour)	lecturer	Assignment	Internal Combustion Engines, V. Ganeshan, TMH, 3rd Edition A Textbook of Internal Combustion Engine, R. K. Rajput, LP, 2 nd Edition https://www.youtube.com/watch?v=ZxkLgv8c3OE
Module 7 Air Cooling & Water Cooling Systems, Properties of Lubricants and Different Types of Lubricating System	2(theory-2 hour)	lecture	Assignment	Internal Combustion Engines, V. Ganeshan, TMH, 3rd Edition
Mechanism of Pollutant Formation and Its Harmful Effects. Methods of Measuring Pollutants and Control of Engine Emission.	6(theory-2, practice-4)	lecturer+ lab Practice	Assignment	Internal Combustion Engines, V. Ganeshan, TMH, 3rd Edition A Textbook of Internal Combustion Engine, R. K. Rajput, LP, 2 nd Edition

Design of Thermal Energy Systems

Subject Name	Code	Type of course	T-P-Pr (Credit)	Prerequisite
Design of Thermal Energy Systems	MECC0407	Theory+ Practice	2+1(3)	Thermodynamics

1. Objective

- To educate the students on principles, technology and applications of various thermal energy systems as used in industry.
- To impart technical knowledge and skills on design of various thermal energy systems

2. Course Outcomes

- Students will be able to identify and select, design and implement appropriate thermal energy system corresponding to specific need.
- Students will be able to take up testing, maintenance of thermal energy systems with minimum

additionalinput.

3. Evaluation Systems

Internal Examination	Component	% of Marks	Method of Assessment
	Midterm Test	20 (ITH)	Written examination
	Assignment		Report and Presentation
	Experiments	30 (IPR)+20 (EPR)	Lab work, report
	Project		Report and presentation
	Quiz		Surprise/preannounced ones
External Examination		30	Written examination
Total		100	

4. Course outline

Module I (12 Hours)

Heat Exchangers: Classification and Thermal Design of Heat Exchangers, Overall Heat Transfer Coefficient, Fouling Factor or Dirt Factor, Temperature Profiles in Heat Exchangers, LMTD Correction Factor, Pressure Drop in Heat Exchanger, Correlation for Tube Side Pressure Drop, Correlation for Shell Side Pressure Drop, Heat Transfer Effectiveness and Number of Transfer Units, Calculation and Designing of the Heat Exchanger, Double-Pipe Heat Exchanger.

Practice:

1. Determination of Overall Heat Transfer Coefficient of Concentric Tube Heat Exchanger
2. Determination of Effectiveness and Efficiency of Cross Flow Heat Exchanger
3. Determination of Overall Heat Transfer Coefficient of Shell and Tube Heat Exchanger

Module II (6 Hours)

Vapor Power Cycles: Introduction, Power Cycles, Carnot Vapor Cycle and its Limitations, Rankine Cycle, Means of Increasing Rankine Cycle Efficiency, Reheat Cycle, Regenerative Feed Heating Cycle, Binary Vapor Cycle, Gas-Vapor Coupled Cycles, Cogeneration.

Module III (6 Hours)

Air Refrigeration System: Introduction, Unit of Refrigeration, Coefficient of Performance, Refrigerants, Characteristics of Different Refrigerants, Ozone Depletion Potentials, Green House Potential Refrigerants, Use of Non-Polluting Refrigerants, Reversed Carnot Cycle, Bell Coleman Air Refrigerator

Module IV (12 Hours)

Vapor Compression System: Analysis of Theoretical Vapor Compression Cycle, Representation of Cycle on T-S and P-H Diagram, Simple Saturation Cycle, Sub-Cooled Cycle and Super-Heated Cycle, Effect of Suction and Discharge Pressure on Performance.

Practice:

4. Determination of C.O.P of Vapor Compression Refrigeration System
5. Determination of C.O.P and Capacity of an Ice Plant
6. Leak Detection and Charging of Refrigerants in a Domestic Refrigerator
7. Handson Practice on Soldering and Brazing

Module V (4 Hours)

Vapor Absorption System: Simple Ammonia Absorption System, Improved Absorption System, Electrolux Refrigerator, Lithium-Bromide Absorption Refrigeration System.

Module VI (10 Hours)

Air Conditioning: Factors Affecting the Air Quality, Dry Bulb Temperature, Wet Bulb Temperature, Relative Humidity, Dew Point Temperature, Specific Humidity, Absolute Humidity, Specific Enthalpy, Pressure, Ventilation, Study on Psychrometric Chart,

Practice:

8. Calculation of C.O.P. Of Air Conditioning System
9. Performance Test of Window Type Air Conditioner
10. To Carry Out Cooling Process of Fresh Air and Find Out Relevant Parameter of Air
11. To Carry Out Heating Process of Fresh Air and Find Out Relevant Parameter of Air

Module VII (10 Hours)

Heating and Cooling Load Calculation: Building Heat and Cooling Load Calculation, Air Distribution System, Calculation for Duct Size, Water and Air Cooled Chillers, Cooling Towers.

Practice:

12. Determination of Efficiency of Cooling Tower
13. Calculation of Cooling Load of a Confined Space

6. Reference**Text Books:**

1. J P Holman and Souvik Bhattacharyya, Heat Transfer, McGraw-Hill Education (India) Private Limited; 10th Edition; 2011.
2. Refrigeration and Air Conditioning by C.P Arora, McGraw Hill
3. Engineering Thermodynamics, P.K. Nag, Tata McGraw Hill Companies

Reference Books:

1. Wilbert F. Stoecker and J.W. Jones, Refrigeration and Air Conditioning, 2nd Edition, (ISBN: 9780070665910) McGraw-Hill Higher Education
2. Thermodynamics: An Engineering Approach, Y.A Cengel, M. A Boles, Tata McGraw Hill Companies.

7. Session Plan

Topic coverage and Internal Test	No. of Sessions (in hrs.)	Activity (lecture, tutorial, lab practice, field studies/field-trip, Workshop etc.)	Assignment (project, assignment, field study, seminar, etc.)	Suggested Reading (Book, Video, Online source, etc.)
Module I (12 Hours)				
Heat Exchangers: Classification and thermal design of heat exchangers, Overall heat transfer coefficient, Fouling factor or dirt factor, Temperature profiles in heat exchangers, LMTD correction factor, Pressure drop in heat exchanger, Correlation for tube side pressure drop, Correlation for shell side pressure drop, Heat transfer	12 (Th-6, Pr-6)	Lecture + Lab Practice	Assignment, Project	J P Holman and Souvik Bhattacharyya, Heat Transfer, McGraw-Hill Education (India) Private Limited; 10th Edition; 2011. https://www.youtube.com/watch?v=-AdmxCJIWBk https://www.youtube.com/watch?v=eraQJ3Z9Mb8 https://www.youtube.com/watch?v=o0UJDQfwPaM

effectiveness and number of transfer units, Calculation and designing of the heat exchanger, Double-pipe heat exchanger				
Module II (6 Hours)				
Vapor Power Cycles: Introduction, power cycles, Carnot vapor cycle and its limitations, Rankine cycle, Means of increasing Rankine cycle efficiency, Reheat cycle, Regenerative feed heating cycle, Binary vapor cycle, Gas-vapor coupled cycles, Cogeneration	6 (Th-6)	Lecture	Assignment	Engineering Thermodynamics, P.K. Nag, Tata McGraw Hill Companies Thermodynamics: An Engineering Approach, Y.A Cengel, M. A Boles, Tata McGraw Hill Companies. https://www.youtube.com/watch?v=ouWOhk1INjo https://www.youtube.com/watch?v=ZJtobHMiXyQ https://www.youtube.com/watch?v=HtXjbA3h3wQ
Module III (6 Hours)				
Air Refrigeration System: Introduction, unit of refrigeration, coefficient of performance, refrigerants, characteristics of different refrigerants, ozone depletion potentials, green house potential refrigerants, use of non-polluting refrigerants, reversed Carnot cycle, Bell Coleman air refrigerator, problem illustration and solution.	6 (Th-6)	Lecture	Assignment	Refrigeration and Air Conditioning by C.P Arora, McGraw Hill https://www.youtube.com/watch?v=a17i7yHvCns
Module IV (12 Hours)				
Vapor Compression System: Analysis of theoretical vapor compression cycle, representation of cycle on T-S and p-h diagram, simple saturation cycle, sub-cooled cycle and super-	12 (Th-4, Pr-8)	Lecture + Lab Practice	Assignment	Refrigeration and Air Conditioning by C.P Arora, McGraw Hill https://www.youtube.com/watch?v=cobFAMZDS0o

heated cycle, effect of suction and discharge pressure on performance				
Module V (4Hours)				
Vapor Absorption System: Simple ammonia absorption system, improved absorption system, electrolux refrigerator, lithium-bromide absorption refrigeration system	4 (Th-4)	Lecture	Assignment	Refrigeration and Air Conditioning by C.P Arora, McGraw Hill https://www.youtube.com/watch?v=Ll8Ku-mFQxE https://www.youtube.com/watch?v=TFxbHp8uIyQ
Module VI (10 Hours)				
Air Conditioning: Factors affecting the air quality, dry bulb temperature, wet bulb temperature, relative humidity, dew point temperature, specific humidity, absolute humidity, specific enthalpy, pressure, ventilation, study on psychometric chart	10 (Th-3, Pr-7)	Lecture + Lab Practice	Assignment	Refrigeration and Air Conditioning by C.P Arora, McGraw Hill Wilbert F. Stoecker and J.W. Jones, Refrigeration and Air Conditioning, 2nd Edition, (ISBN:9780070665910) McGraw-Hill Higher Education https://www.youtube.com/watch?v=fqvo7bSr6t8 https://www.youtube.com/watch?v=YrDZ9u2_GAQ
Module VII (10Hours)				
Heating and Cooling Load Calculation: Building heat and cooling load calculation, air distribution system, calculation for duct size, water and air cooled chillers, cooling towers.	10 (Th-4, Pr-6)	Lecture + Lab Practice	Assignment	Refrigeration and Air Conditioning by C.P Arora, McGraw Hill Wilbert F. Stoecker and J.W. Jones, Refrigeration and Air Conditioning, 2nd Edition, (ISBN:9780070665910) McGraw-Hill Higher Education https://www.youtube.com/watch?v=jygiuS-9ubU https://www.youtube.com/watch?v=1cvFIBLo4u0

Total(hrs)	60			
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Renewable Energy Systems

SubjectName	Code	Type ofcourse	Credit	Prerequisite
Renewable EnergySystems	MECC0408	Theory&Practice	2+1(3)	Nil

1. Objective

1. To expose the students about energy demand and supply situation in India.
2. To expose students about Renewable energy systems in use.

2. Course outcomes

- To have a knowledge of energy scene in India.
- To acquire the skill of analyzing and designing renewable energy systems.

3. Evaluation Systems

Internal Examination	Component	% of Marks	Method of Assessment
	Midterm Test	20 (ITH)	Written examination
	Assignment		Report and Presentation
	Experiments	30 (IPR)+20 (EPR)	Lab work, report
External Examination		50	Written examination
Total		100	

4. Course outline

Module I (8 Hrs)

Energy Demand and Supply Situation in India: Sectorial energy demands in India, Different Energy sources in India, Systems view of energy, Institutions and policies affecting energy systems.

Solar Energy: Basic Principle of solar energy and its conversion to thermal and electrical energy.

Module II (10 Hrs)

Photovoltaic system: Principle of Photovoltaic effect, Types and Application: Domestic and Industrial, Photovoltaic system and its Components, PV system and its Design, PV system Installation and Testing.

Practice:

1. Photo-Voltaic Power Output Vs Tilt Angle, Ambient Temperature and Shade.
2. Solar PV System Installation and Performance test.

Module III (9 Hrs)

Solar Thermal System: Types of Collector and its Application, Design of different types of Collectors, Testing and Installation of Solar Thermal System.

Practice:

3. Thermal Analysis of Solar Flat Plate Collector Using ANSYS.
4. Performance Test of a Solar Dryer.

Module IV (4 Hrs)

Wind Energy: Basic Principle of Wind Energy Conversion, Wind Data and Energy Estimation, Wind Energy Sources and Potential, Wind Power Systems: System components, Types of Turbine, Turbine Rating, Choice of Generators,

Module V (8Hrs)

Variable speed operation, maximum power operation, control systems, Application of Wind energy in different sectors, system design features, testing and installation of Wind systems.

Practice:

5. Simulation for Wind Turbine Generator with DC Motor in Solar/Wind Energy Mobile Workstation.

Module VI (8Hrs)

Bio Energy: Basic Principle of Biomass Generation and Conversion, Sources and Potential of Bio-Gas, Application of Bio-Gas in different Sectors.

Practice:

6. Performance Testing of Bio gas Plant.

Module VII (9Hrs)

Types of Conversion: Thermal, Thermochemical Process, and Fermentation: Aerobic and Anaerobic digestion, Design and Construction details of Main Digester, Testing and installation of Bio-Gas Plant.

Practice:

7. Energy Analysis of Different Biomass Products.

6. References

Text Books:

1. Non-conventional Energy sources by Rai G.D, 2nd edition (1999) Khanna Publishers, New Delhi.
2. Renewable Energy Sources and Emerging Technologies by Kothari, D.P., Singal, K.C. and Ranjan, Prentice hall, New Delhi, 2nd Edition, 2008.

Reference Books:

1. Solar Energy by Sukhatme, S.P., 2nd Edition, TMH, 2003.
2. Solar Photovoltaic – Fundamentals, Technologies and Applications by CS Solanki, 3rd Edition 2015.
3. Online Source: NPTEL, You tube

7. Session Plan

Topic coverage and Internal Test	No. of Sessions (in hrs.)	Activity (lecture, tutorial, lab practice, field studies/field-trip, Workshop etc.)	Assignment (Project, assignment, field study, seminar, etc.)	Suggested Reading (Book, Video, Online source, etc.)
Module I(8Hrs)				
Energy Demand and Supply Situation in India energy demands in India	2	Lecturer		1. Renewable Energy Sources and Emerging Technologies by Kothari, D.P., Singal, K.C. and Ranjan, Prentice hall, New Delhi, 2nd edition, 2008.
Energy sources in India	1	Lecturer		1. Renewable Energy Sources and Emerging Technologies by Kothari, D.P., Singal, K.C. and Ranjan, Prentice hall, New Delhi, 2nd Edition, 2008.
Systems view of energy.	2	Lecturer		1. Renewable Energy Sources and Emerging Technologies by Kothari, D.P., Singal, K.C. and Ranjan, Prentice hall, New Delhi, 2 nd Edition, 2008.
Institutions and policies affecting energy systems	1	Lecturer	Assignment	1. Renewable Energy Sources and Emerging Technologies by Kothari, D.P., Singal, K.C. and Ranjan, Prentice hall, New Delhi, 2nd Edition, 2008.
Solar Energy Basic Principle of solar energy and its conversion to thermal and electrical energy.	2	Lecturer		2. Solar Photovoltaic – Fundamentals, Technologies and Applications by CS Solanki, 3rd Edition 2015.
Module II(10Hrs)				
Photovoltaic system: Principle of Photovoltaic effect, Types and application: domestic and industrial	1	Lecturer		2. Solar Photovoltaic – Fundamentals, Technologies and Applications by CS Solanki, 3rd Edition 2015. https://www.youtube.com/watch?v=Rq5Nzv_6v98
Photovoltaic system	1	Lecturer	Field study	2. Solar Photovoltaic –

and its components				Fundamentals, Technologies and Applications by CS Solanki, 3rdEdition2015. https://www.youtube.com/watch?v=f1QSPBTJs5I
PVsystemand itdesign	4(Theory -1hour, Practice-3 hours)	Lecturer+ Lab Practice	Assignment	2 Solar Photovoltaic – Fundamentals, Technologies and Applications by CS Solanki, 3rdEdition2015. https://www.youtube.com/watch?v=q7hW9XQLf6g
PVsysteminstallation and testing	4(Theory -1 hour, Practice-2 hours)	Lecturer+ Lab Practice	Field study	2 Solar Photovoltaic – Fundamentals, Technologies and Applications by CS Solanki, 3rdEdition2015. https://www.youtube.com/watch?v=Q5X6sMScwvM https://www.youtube.com/watch?v=ffm_sR_xdRkY
Module-III(9 Hrs)				
Solarthermalsystem: TypesofCollectorand itsapplication	1	Lecturer		1. Non-conventional Energy sources by Rai G.D, 2nd edition (1999) Khanna Publishers, New Delhi.
Design ofdifferent typesofcollectors	4(Theory -1 hour, Practice 2 hours)	Lecturer+ Lab Practice	Assignment	1. Non-conventional Energy sources by Rai G.D, 2nd edition (1999) Khanna Publishers, New Delhi. https://www.youtube.com/watch?v=wwl0QAQCJyc
Testingand installation ofsolar thermalsystem	4(Theory -1hour, Practice-3 hours)	Lecturer+ Lab Practice	Field study	1. Non-conventional Energy sources by Rai G.D, 2nd edition (1999) Khanna Publishers, New Delhi.
Module-IV(4Hrs)				
Wind Energy: Basic Principleof Wind Energy Conversion, Wind DataandEnergy Estimation, wind energy sourcesand potential	2	Lecturer		1. Non-conventional Energy sources by Rai G.D, 2nd edition (1999) Khanna Publishers, New Delhi.
Windpowersystems: systemcomponents, TypesofTurbine, Turbine rating. Choice ofgenerators	2	Lecturer		1. Non-conventionalEnergy sourcesbyRaiG.D, 2nd edition(1999)Khanna Publishers, New Delhi. https://www.youtube.com/wat

				ch?v=LNXtm7aHvWc https://www.youtube.com/watch?v=DILJwsFl3w
Module-V(8Hrs)				
Variables speed operation, maximum power operation, maximum power operation, control systems, Application of Wind energy in different sectors	2	Lecturer	Assignment	1 Non-conventional Energy sources by Rai G.D, 2nd edition (1999) Khanna Publishers, New Delhi.
System design features, testing and installation of Wind systems.	6 (Theory - 2 hour, Practice - 4 hours)	(Lecturer + Lab Practice)	Assignment	1 Non-conventional Energy sources by Rai G.D, 2nd edition (1999) Khanna Publishers, New Delhi.
Module-VI(8hrs)				
Bio Energy Basic Principle of Biomass Generation and Conversion	1	Lecturer		1. Non-conventional Energy sources by Rai G.D, 2nd edition (1999) Khanna Publishers, New Delhi.
Sources and potential of Bio-Gas	1	Lecturer		1. Non-conventional Energy sources by Rai G.D, 2nd edition (1999) Khanna Publishers, New Delhi.
Application of Bio-Gas in different sectors	1	Lecturer		1. Non-conventional Energy sources by Rai G.D, 2nd edition (1999) Khanna Publishers, New Delhi.
Testing and installation of Bio-Gas Plant	5 (Theory - 1 hour, Practice - 4 hour)	Lecturer + Lab Practice	Field study	1. Non-conventional Energy sources by Rai G.D, 2nd edition (1999) Khanna Publishers, New Delhi. https://www.youtube.com/watch?v=PmBx5Zo8KZo
Module-VII(9 hrs)				
Types of Conversion: Thermal, Thermochemical Process	1	Lecturer	Assignment	1. Non-conventional Energy sources by Rai G.D, 2nd edition (1999) Khanna Publishers, New Delhi.
Fermentation: Aerobic and Anaerobic digestion	2	Lecturer		1. Non-conventional Energy sources by Rai G.D, 2nd edition (1999) Khanna Publishers, New Delhi.
Design and Construction details of Main Digester	6 (Theory - 2 hour, Practice - 4 hour)	(Lecturer + lab Practice)	Field study	1. Non-conventional Energy sources by Rai G.D, 2nd edition (1999) Khanna Publishers, New Delhi. https://www.youtube.com/watch?v=PmBx5Zo8KZo

Fluid Power

Subject Name	Code	Type of Course	T-P-Pr (Credit)	Prerequisite
Fluid Power	MECC0409	Theory+ Practice	2+1(3)	NIL

1. Objective

- To impart knowledge to students on principles and technology behind use of fluid power.
- To educate the students on application of fluid power in various industrial applications and devices.

2. Course Outcomes

- Students will be able to identify various elements used in fluid power systems and will be able to deliver fluid power circuit diagrams.
- Students will be able to design and test various control circuits using Fluidsim software.

3. Evaluation Systems

Internal Examination	Component	% of Marks	Method of Assessment
	Midterm Test	20 (ITH)	Written examination
	Assignment		Report and Presentation
	Experiments	30 (IPR) + 20(EPR)	Lab work, report
	Project		Report and presentation
	Quiz		Surprise/preannounced ones
External Examination		30	Written examination
Total		100	

4. Course Outline

Module I (5 Hours)

Hydraulic Turbines: Force of Jet on Stationary and Moving Plates (Flat and Curved), Expressions for Torque and Work Done. Classification, Definitions of Heads and Efficiencies.

Pelton Wheel - Construction and Working Principle, Work Done and Hydraulic Efficiency, Design Aspects.

Module II (10 Hours)

Reaction Turbines: Components, Working Principle, Work Done and Efficiency, Draft Tube, Specific Speed, Cavitation, Governing Mechanism, Selection of Turbines.

Practice:

1. Impact of Jets on Vanes
2. Performance Test on Pelton Wheel
3. Performance Test on Francis Turbine

4. Performance Test on Kaplan Turbine

Module III (12 Hours)

Reciprocating Compressors: Construction and Working, Multistage Conditions for Minimum Work, Intercooling, Efficiency and Control of Air Compressors

Rotary Compressors: Introduction, Classification, Roots Blower, Vane Type, Screw Compressor, Scroll Compressor

Axial Flow Compressors: Construction of an Axial Flow Compressor, Aerofoil Blading, Lift and Drag, Performance Characteristics

Practice:

5. Determination of volumetric Efficiency of Reciprocating Air Compressor.
6. To Determine the Efficiency of Rotary Air Compressor.
7. To Determine the Efficiency of Centrifugal Air Compressor.

Module IV (5 Hours)

Basic Hydraulic and Pneumatic: Types, Construction, Working and Applications of (i) Pressure Control Valves, (ii) Directional Control Valves, (iii) Flow Control Valves, (iv) Proportional Control Valve (Proportional Pressure Relief Valve, Proportional Pressure Reducing Valve, Proportional Direction Valve).

Module V (15 Hours)

Hydraulic Pumps: General Assembly Sketch, Main Parts, Working Principle, Applications and Comparison of Following Pumps: External, Internal Gear Pumps & Ge-Rotor (Generator Rotor), Lobe, Screw, Vane Piston, Centrifugal Pump, Reciprocating Pump.

Actuators: Classification, Construction, Working and Applications.

Practice:

8. To Design Different Circuit by Using Different Valves & Actuators with Different Conditions.
9. Performance Test on Single Stage Centrifugal Pump
10. Performance Test on Reciprocating Pump
11. Testing Different Circuits on Fluid-Sim Software.
12. Testing Different Circuit on Pneumatic Kit.

Module VI (5 Hours)

Sensors and Relay: Measuring Devices and Dynamic Characteristics, Active and Passive Sensors and Transducers, Relay, Classifications and Working Principle.

Motion Sensors: Resistive Strain Gauge, LVDT, RVDT, Capacitive, Piezo, Seismic Pickups, Vibrometers and Accelerometers.

Module VII (8 Hours)

Optical Sensors: Lasers, Photo-Detectors and Optical Fiber As Sensors

Electro Pneumatic and Hydraulics: Servo Control Valves: Mechanical Hydraulic Servo Valve, Electro Hydraulic Servo Valve, Single Stage, Two Stage Flapper Type, Jet Pipe Type.

Practice:

13. Design Different Circuit by Using Different Valves & Actuators with Different Conditions.
14. Testing Different Circuits on Fluid-Sim Software.

6. Reference

Text Book:

1. Oil Hydraulic Systems by S.R. Majumdar, Tata McGraw-Hill Publication
2. Fluid Mechanics and Hydraulic Machines, R.K. Bansal, Laxmi Publications

Reference Book:

1. Hydraulic and Pneumatics, A Technician's & Engineer's Guide by Andrew Parr Jaico Publishing House.
2. Festo Manuals

7. Session Plan

Topic coverage and Internal Test	No. of Sessions (in hrs.)	Activity (lecture, tutorial, lab practice, field studies/field-trip, Workshop etc.)	Assignment (project, assignment, field study, seminar, etc.)	Suggested Reading (Book, Video, Online source, etc.)
Module I				
Force of Jet on Stationary and Moving Plates (Flat and Curved), Expressions for Torque and Work Done. Classification, Definitions of Heads and Efficiencies. Pelton Wheel-Construction and Working Principle, Work Done and Hydraulic Efficiency, Design Aspects.	5	lecture + lab practice	Assignment with problem solving	R.K. Bansal, Fluid Mechanics and Hydraulic Machines, Laxmi Publications
Practice				
1. Impact of Jets on Vanes 2. Performance Test on Pelton Wheel	4			
Module II				

Reaction Turbines: Components, Working Principle, Work Done and Efficiency, Draft Tube, Specific Speed, Cavitation, Governing Mechanism, Selection of Turbines.	2	lecture + lab practice	Assignment with problem solving	R.K. Bansal, Fluid Mechanics and Hydraulic Machines, Laxmi Publications
Practice				
3. Performance Test on Francis Turbine	4			
4. Performance Test on Kaplan Turbine				
Module III				
Reciprocating Compressors: Construction and Working, Multistage Conditions for Minimum Work, Intercooling, Efficiency and Control of Air Compressors	2	lecture + lab practice	Assignment with problem solving	R.K. Bansal, Fluid Mechanics and Hydraulic Machines, Laxmi Publications
Rotary Compressors: Introduction, Classification, Roots Blower, Vane Type, Screw Compressor, Scroll Compressor	2	lecture + lab practice	Assignment with problem solving	R.K. Bansal, Fluid Mechanics and Hydraulic Machines, Laxmi Publications
Axial Flow Compressors: Construction of an Axial Flow Compressor, Aerofoil Blading, Lift and Drag, Performance Characteristics	2	lecture + lab practice	Assignment with problem solving	R.K. Bansal, Fluid Mechanics and Hydraulic Machines, Laxmi Publications
Practice:				
5. Determination of volumetric Efficiency of Reciprocating Air Compressor.	6			
6. To Determine the Efficiency of Rotary Air Compressor.				
7. To Determine the Efficiency of Centrifugal Air Compressor.				
Module IV				
Basic Hydraulic and Pneumatic: Types, Construction, Working and Applications of (i) Pressure	5	lecture + lab practice	Assignment with problem solving	Oil Hydraulic Systems by S.R. Majumdar, Tata Mcgraw-Hill Publication

Control Valves. (ii) Directional Control Valves, (iii) Flow Control Valves. (iv) Proportional Control Valve(Proportional Pressure Relief Valve, Proportional Pressure Reducing Valve, Proportional Direction Valve).				
Module V				
Hydraulic Pumps: General Assembly Sketch, Main Parts, Working Principle, Applications and Comparison of Following Pumps: External, Internal Gear Pumps & Ge-Rotor (Generator Rotor). Lobe, Screw, Vane Piston, Centrifugal Pump, Reciprocating Pump. Actuators -Classification, Construction, Working and Applications.	9	lecture + lab practice	Assignment with problem solving	Oil Hydraulic Systems by S.R. Majumdar, Tata Mcgraw-Hill Publication Festo manuals
Practice				
8. To Design Different Circuit by Using Different Valves & Actuators with Different Conditions. 9. Performance Test on Single Stage Centrifugal Pump 10. Performance Test on Reciprocating Pump 11. Testing Different Circuits on Fluid-Sim Software. 12. Testing Different Circuit on Pneumatic Kit.	6			
Module VI				
Sensors and Relay: Measuring Devices and Dynamic Characteristics, Active and Passive Sensors and Transducers, Relay, Classifications and Working	5	lecture + lab practice	Assignment with problem solving	1. Oil Hydraulic Systems by S.R. Majumdar, Tata Mcgraw-Hill Publication 2. Festo manuals

Principle. Motion Sensors: Resistive Strain Gauge, LVDT, RVDT, Capacitive, Piezo, Seismic Pickups, Vibrometers and Accelerometers.				
Module VII				
Optical Sensors: Lasers. Photo-Detectors and Optical Fiber As Sensors Electro pneumatic and Hydraulics: Servo Control Valves: - Mechanical Hydraulic Servo Valve, Electro Hydraulic Servo Valve, Single Stage, Two Stage Flapper Type, Jet Pipe Type.	4	lecture + lab practice	Assignment with problem solving	1. Oil Hydraulic Systems by S.R. Majumdar, Tata Mcgraw-Hill Publication 2. Festo manuals
Practice				
13. Design Different Circuit by Using Different Valves & Actuators with Different Conditions. 14. Testing Different Circuits on Fluid-Sim Software.	4			
TOTAL	60			

Mechanics of Machines

Subject Name	Code	Type of course	Credit	Prerequisite
Mechanics of Machines	MECC0410	Theory+ Practice	2+1(3)	Nil

1. Objective

- ✓ To educate the student on basic theories, concepts and methods used for study and analysis of commonly used mechanisms in various applications.
- ✓ To educate the students on some of the widely used mechanical power transmission elements.

2. Course Outcomes

- Students will have knowledge and skills to analyse, design and develop mechanisms suited to specific applications.
- Students will have knowledge and skills to study and understand working of complex mechanisms and machines enabling them to safely operate and maintain such installations.

3. Evaluation Systems

Internal Examination	Component	% of Marks	Method of Assessment
	Midterm Test	20 (ITH)	Written examination
	Assignment		Report and Presentation
	Experiments	30 (IPR)+20 (EPR)	Lab work, report
	Project		Report and presentation
	Quiz		Surprise/preannounced ones
External Examination		30	Written examination
Total		100	

4. Course Outline

Module I (09 Hours)

Planar Mechanisms: Kinematic Link, Pair, Chain and Mechanism; Types of Links and Joints, Degree of Freedom; Grashof's Law for four bar Mechanism, Inversions of four bar Mechanism, Single Slider Crank Mechanism and Double Slider Crank Mechanism.

Practice :

- Position Analysis of Grashof and non-Grashof four bar Mechanism
- Position Analysis of Slider Crank Mechanism, Scotch Yoke Mechanism and Elliptical Trammel

Module II (14 Hours)

Motion Analysis: Instantaneous Centre of Rotation, Number and Types of Instantaneous Centres, Kennedy Theorem, Relative Velocity Method, Velocities in Four Bar and Slider Crank Mechanism, Crank and Slotted Lever Mechanism, Angular Velocity Ratio Theorem, Acceleration Diagram of Single Slider-Crank Mechanism, Coriolis Component of Acceleration.

Practice:

- Instantaneous Center Method to Find Velocity of Various Mechanisms
- Klein's Construction for Determination of Velocity and Acceleration of Reciprocating Parts
- Velocity Analysis of Grashof and Non-Grashof Four Bar Mechanism
- Velocity Analysis of Slider Crank Mechanism and Scotch Yoke Mechanism
- Acceleration Analysis of Slider Crank Mechanism

Module III (09 Hours)

Gears: Classification and Basic Terminology, Fundamental Law of Gearing, Standard forms of Tooth, Length of Path of Contact and Arc of Contact, Contact Ratio, Interference in Involute Gears.

Gear trains: Simple, Compound, Reverted and Epi-Cyclic Gear Trains.

Practice:

- Study of Operations of Various Gear Trains in Automobiles

Module IV (07 Hours)

CAM: Various Types of Cams and Followers; Displacement, Velocity and Acceleration Diagrams for Different Follower Motions; Nomenclature of Cam Profile.

Practice:

9. Construction of Cam Profile for Various Follower Motions

Module V (05 Hours)

Inertia forces in reciprocating parts: Velocity and Acceleration of a Piston, Angular Velocity and Angular Acceleration of Connecting Rod, Engine Force Analysis, Dynamically Equivalent System.

Module VI (08 Hours)

Gyroscope: Gyroscopic Couple, Gyroscopic Effect on Naval Ships and Aeroplanes, Stability of Two-wheeler Vehicles.

Practice :

10. Determine Gyroscopic Couple on Motorized Gyroscope

Balancing: Static and Dynamic Balancing, Balancing of Several Masses Revolving in the Same Plane and Different Planes, Balancing of Reciprocating Mass, Partial Primary Balancing, Partial Balancing of Locomotives.

Practice:

11. Balancing of Several Masses Revolving in the Same and Different Planes

Module VII (08 Hours)

Vibration: Basic Concepts and Types of Vibration, Methods of Vibration Analysis, Free Undamped Longitudinal, Transverse and Torsional Vibrations, Damped Free Vibrations, Logarithmic Decrement, Forced Vibration with Harmonic Excitation, Vibration Isolation and Transmissibility.

Practice:

12. Determination of Critical or Whirling Speed of Shaft
13. Simple and Compound Pendulum

Text Book:

1. Theory of Machines, S.S. Rattan, Tata McGraw-Hill.
2. Theory of Machines, R.K. Bansal, Laxmi Publication

Reference Books:

1. Theory of Machines, Sadhu Singh, Khanna Publishers
2. Design of Machinery, Robert L. Norton, McGraw-Hill

7. Session Plan

Topic coverage and Internal Test	No. of Sessions (in hrs.)	Activity (lecture, tutorial, lab practice, field studies/field-trip, Workshop etc.)	Assignment (project, assignment, field study, seminar, etc.)	Suggested Reading (Book, Video, Online source, etc.)
MODULE -I				

Kinematic link, pair, chain and mechanism; types of links and joints, degree of freedom; Grashof's law for four bar mechanism	3	Lecture	Assignment	http://mm-nitk.vlabs.ac.in/index.html#
Inversions of four bar mechanism	2	Lecture	Assignment	
Single slider crank mechanism and double slider crank mechanism.	4	Lecture	Assignment	http://mm-nitk.vlabs.ac.in/index.html#
MODULE II				
Instantaneous centre of rotation, number and types of instantaneous centres, Kennedy theorem, relative velocity method	3	Lecture	Assignment	
Velocities in four bar, slider crank mechanism, crank and slotted lever mechanism	2+2	Lecture	Assignment	http://mm-nitk.vlabs.ac.in/index.html# http://mm-nitk.vlabs.ac.in/index.html#
Angular velocity ratio theorem	1	Lecture	Assignment	
Acceleration diagram of single slider-crank mechanism	2+2	Lecture + Practice	Assignment	http://mm-nitk.vlabs.ac.in/index.html#
Coriolis component of acceleration.	2	Lecture	Assignment	
MODULE - III				
Classification and basic terminology, fundamental law of gearing	2	Lecture	Assignment	https://www.youtube.com/watch?v=Z1f29M4o3jI
Standard forms of tooth, length of path of contact and arc of contact, contact ratio, interference in involute gears.	3	Lecture	Assignment	
Simple, compound, reverted and epi-cyclic gear trains.	2+2	Lecture + Practice	assignment	
MODULE IV				
CAM: Various types of cams and followers	1	Lecture	Assignment	https://www.youtube.com/watch?v=YbjmphKVVpA
Displacement, velocity and acceleration diagrams for different follower motions; nomenclature of cam profile	2+2+2	Lecture + Practice	assignment	
MODULE - V				
Velocity and acceleration of a piston, angular velocity and	3	Lecture	Assignment	

angular acceleration of connecting rod				
Engine force analysis, dynamically equivalent system	2	Lecture	Assignment	
MODULE- VI				
Gyroscope: Gyroscopic couple, gyroscopic effect on naval ships	1+2	Lecture + Practice	Assignment	
Gyroscopic effect on aeroplanes, stability of two-wheeler vehicles.	1	Lecture	Assignment	https://www.youtube.com/watch?v=ZsaVIW1BFUQ
Balancing: Static and dynamic balancing, balancing of several masses revolving in the same plane	1+1	Lecture + Practice	Assignment	
Balancing of several masses revolving in different planes	1	Lecture	Assignment	https://www.youtube.com/watch?v=_CwACU8Zfug
Balancing of reciprocating mass, partial primary balancing	1	Lecture	Assignment	https://www.youtube.com/watch?v=Eg9AwoxvwlQ
MODULE -VII				
Vibration: Basic concepts and types of vibration, methods of vibration analysis, free undamped longitudinal, transverse and torsional vibrations	2+2	Lecture + Practice	Assignment	https://www.youtube.com/watch?v=qV65LJ6LpI4
Damped free vibrations, logarithmic decrement	2	Lecture	Assignment	https://www.youtube.com/watch?v=Zp9g0Xbv7G4
Forced vibration with harmonic excitation, vibration isolation and transmissibility	2	Lecture	Assignment	https://www.youtube.com/watch?v=cGFjNhGwUY
Total(hrs)	60			

Strength of Material

Subject Name	Code	Type of course	T-P-Pr (Credit)	Prerequisite
Strength of Material	MECC0411	Theory+ Practice	2+1(3)	Engineering Mechanics

1. Objective

- To educate the students on basic theories behind mechanics of solids.
- To educate the students on using ANSYS for analysis of various mechanical structures and load transmitting elements.

2. Course Outcomes

- Students will have knowledge and practical engineering skills in analysis of mechanical strength of structures and load transmission elements and will be able to design them based on input data.
- Students will be able to deploy ANSYS to develop mechanical design solutions.

3. Evaluation Systems

Internal Examination	Component	% of Marks	Method of Assessment
	Midterm Test	20 (ITH)	Written Examination
	Assignment		Report and Presentation
	Experiments	30 (IPR)+20 (EPR)	Lab Work, Report
	Project		Report and Presentation
	Quiz		Surprise/Preannounced Ones
External Examination		30	Written Examination
Total		100	

4. Course Outline

Module I (10 Hrs): Analysis of Beams

Shear and Bending Moment in Beams: Types of Beams and Loads, Concept of Shear Force, Bending Moment and Sign Conventions, Relation Between Load, Shear Force and Bending Moment, Procedure for Drawing Shear Force and Bending Moment Diagrams, Point of Contra Flexure.

- Simulation (Using ANSYS): Evaluate Shear Force and Bending Moment
- Simulation (Using ANSYS): Beam Analysis with Point Load, UDL, UVL and Moment

MODULE II (08 Hrs):

Stresses in Beams: Simple or Pure Bending, Flexure Formula, Section Modulus, Neutral Axis, Determination Bending Stresses, Shear Stress Distribution for Different Sections.

- Simulation (Using ANSYS): To Analyze The Bending Stress of a Cantilevered and Simply Supported Beam

MODULE III (07 Hrs):

Deflection of Beams: Equation of Elastic Curve, Direct Integration Method, Strain Energy Method, Castigliano's Theorem

- Stress & Deflection Analysis of Mechanical Component (Using ANSYS)
- Double Shear Test and Deflection Test Using UTM

Module IV: (08 Hrs) Analysis of Column and Shaft

Column Analysis: Failure of a Column, End Conditions, Euler's Critical Load for Long Columns, Rankine's Empirical Formula, Effective Length and Slenderness Ratio, Eccentric Loading and Secant Formula.

- Simulation (Using ANSYS): Buckling Analysis of a Square Column, I-Beam and RCC Beam

Module V: Torsion (08 Hrs): Torsion Formula, Design of Shafts, Power Transmitted by Shafts, Composite Shafts, Combined Bending and Torsion, Closed-Coiled Helical Springs, Spring Connected in Series and Parallel.

- Simulation (Using ANSYS): Static and Dynamic Analysis of Shaft

8. Simulation (Using ANSYS): Spring Structural Analysis
9. Simulation (Using ANSYS): Stress Analysis of Suspension System
10. Stiffness Test of a Helical Spring

Module VI (08 Hrs.)

Theories of Failure: Failure Under Biaxial Loading, Rankine's Theory, Guest's or Tresca's Theory, Von Mises Theory, Graphical Representation of Failure, Safety Factors, Prevention of Failure in Design Stage, Diagnosis of Failure In Post-Manufacturing Stage.

11. Simulation: Spur Gear Fatigue Analysis in ANSYS
12. Simulation: Chair Structural Analysis in ANSYS
13. Simulation (Using ANSYS): Bicycle Frame Structural Analysis

Module VII (11 Hrs.)

Fatigue: Failure Under Cyclic Loading, Endurance Limit, S-N Curve, Stress Concentration, Goodman and Soderberg Criteria.

14. Fatigue Failure Analysis (Using ANSYS)
15. Fatigue Analysis of a Plate with Hole (Using ANSYS)
16. Fatigue Analysis (Using ANSYS) of Crankshaft of Two Wheeler

Fracture: Types of Failure, Brittle and Ductile Fracture, Basic Modes of Fracture, Griffith's Analysis, Energy Release Rate, Elastic Stress at the Tip of a Sharp Crack, Crack Growth and Stress Intensity Factor, Critical SIF, Fracture Toughness Testing.

Software Requirement: ANSYS

5. Reference

Text Books:

1. Strength of Materials, S.S. Rattan, Tata Mc-Graw Hill Publication.
2. Advanced Mechanics of Materials, A.P. Boresi and R.J. Schmidt, Wiley India

Reference Books:

1. Elements of Fracture mechanics, Prashant Kumar, McGraw Hill Education (India)
2. Engineering Mechanics of Solids, Egor P. Popov, Pearson publication

Online Source: YouTube, NPTEL

6. Session Plan

Topic coverage and Internal Test	No. of Sessions (in hrs.)	Activity (lecture, tutorial, lab practice, field studies/field-trip, Workshop etc.)	Assignment (project, assignment, field study, seminar, etc.)	Suggested Reading (Book, Video, Online source, etc.)
Module-I				
Shear And Bending	2			1. Strength of materials by S.S. Rattan, Tata Mc-

Moment In Beams: Types of Beams and Loads, Concept of Shear force, Bending moment and Sign Conventions				Graw Hill Publication
Relation Between Load, Shear force and Bending moment, Procedure for Drawing Shear force and Bending moment Diagrams, Point of Contra Flexure.	4			1. Strength of materials by S.S. Rattan, Tata Mc-Graw Hill Publication
Simulation (Using ANSYS): Evaluate Shear Force and Bending Moment Simulation (Using ANSYS): Beam Analysis with Point Load, UDL, UVL and Moment	4	Lab practice		
MODULE II				
Stresses in beams: Simple or Pure Bending, Flexure Formula, Section Modulus, Neutral Axis, Determination Bending Stresses, Shear Stress Distribution for Different Sections.	6			1. Strength of materials by S.S. Rattan, Tata Mc-Graw Hill Publication 2. https://www.youtube.com/watch?v=ekKQvGna0ig
Simulation (Using ANSYS): To Analyze The Bending Stress of a Cantilevered and Simply Supported Beam	2	Lab practice		
Module-III				
Deflection of beams: Equation	3			1. Strength of materials by S.S. Rattan, Tata Mc-Graw Hill Publication

of Elastic Curve, Direct Integration Method, Strain Energy Method, Castigliano's Theorem				
Stress&Deflection Analysis of Mechanical Component(Using ANSYS) DoubleShear Test andDeflection Test UsingUTM	4	Lab practice		
Module-IV				
Column analysis: Failure of a Column, End Conditions, Euler's CriticalLoad for Long Columns, Rankine's Empirical Formula, Effective Length and Slenderness Ratio, Eccentric Loading and SecantFormula.	4			1.Strength ofmaterialsbyS.S. Rattan,TataMc-Graw HillPublication
Simulation(Using ANSYS):Buckling Analysis of a Square Column, I-Beam and RCC Beam	4	Lab practice		
Module-V				
Torsion: Torsion Formula,Design of Shafts, Power Transmitted by Shafts, Composite Shafts, Combined Bending and Torsion, Closed-Coiled Helical	4			1.Strength ofmaterialsbyS.S. Rattan,TataMc-Graw HillPublication 2. https://www.youtube.com/watch?v=rJ2e4DximL0 3. https://www.youtube.com/watch?v=xI-NqAKZ_60

Springs, Spring Connected in Series and Parallel.				
Simulation(Using ANSYS): Spring Structural Analysis. Stiffness Test of a Helical Spring.	4	Lab practice		
Module-VI				
Theories of failure: Failure Under Biaxial Loading, Rankine's Theory, Guest's or Tresca's Theory, Von Mises Theory, Graphical Representation of Failure, Safety Factors, Prevention of Failure in Design Stage, Diagnosis of Failure In Post-Manufacturing Stage.	4			1. Strength of materials by S.S. Rattan, Tata McGraw Hill Publication 2. https://www.youtube.com/watch?v=2SGqcLZISQ0 3. https://www.youtube.com/watch?v=p-CUK_pEfR4 4. https://www.youtube.com/watch?v=hETp6TDi7-k
Simulation: Spur Gear Fatigue Analysis in Ansys. Simulation(Using ANSYS): Bicycle Frame Structural Analysis	4	Lab practice		
Module-VII				
Fatigue: Failure Under Cyclic Loading, Endurance Limit. S-N Curve, Stress Concentration, Goodman and Soderberg Criteria.	2			1. Strength of materials by S.S. Rattan, Tata McGraw Hill Publication 2. Advanced mechanics of materials by A.P. Boresi and R.J. Schmidt, Wiley India

Fatigue Analysis of a Plate With Hole(Using ANSYS). Fatigue Analysis(Using ANSYS)of Crankshaftof Two Wheeler	4	Lab practice		
Fracture: Types of Failure,Brittle and Ductile Fracture, Basic Modesof Fracture. Griffith's Analysis, Energy Release Rate, Elastic Stress at the Tipofa Sharp Crack, Crack Growth and Stress Intensity Factor, Critical SIF, Fracture Toughness Testing.	2			1.Advanced mechanics ofmaterials byA.P. Boresi and R.J. Schmidt, WilleyIndia 2. https://www.youtube.com/watch?v=jJMSvgcZaGA 3. https://www.youtube.com/watch?v=ESj-l62l74E
Tensile Test, CompressionTest\	3	Lab practice		
Total (hrs)	60			

Design of Transmission Systems

Subject Name	Code	Type of course	T-P-Pr (Credit)	Prerequisite
Design of Transmission Systems	MECC0412	Theory+ Practice	2+1(3)	Mechanics of Solids

1. Objective

- To familiarize the various mechanical power transmission elements and systems as used in industry.
- To enable the students to design basic transmission elements using prior theoretical knowledge.

2. Course outcomes

- To convert basic input data into engineering design and drawing using CATIA and ANSYS.

3. Evaluation Systems

Internal Examination	Component	%ofMarks	MethodofAssessment
	MidtermTest	20 (ITH)	Written examination
	Assignment		Reportand Presentation
	Experiments	30(IPR)+20 (EPR)	Lab work, report
	Quiz		Surprise/preannounced ones
External Examination		30	Written examination
Total		100	

4. Courseoutline

Module I(20 hrs) (BasicPowerTransmission Elements)

DesignofShaftCoupling: KeysandSplines; StrengthofaSunkKey; RigidandFlexibleCoupling, Hooke’sJointand ConstantVelocityJoint.

Practice:

- 1.Design ofFlange CouplingusingCATIA
- 2.Design ofHooke’sJointusingCATIA

DesignofBelt,Ropeand ChainDrives: Flat,V-BeltandRopeBelts; Slip andCreepofBelt; Velocity RatioofBeltDrives;CentrifugalandInitialTension;Maximum PowerTransmission ThroughaBelt Drive, PowerTransmittingChains.

Practice:

3. Design ofFlatbeltpulleyusingCATIA
4. Design ofV-beltpulleyusingCATIA

DesignofGears: SelectionofMaterials;ForceAnalysis,BeamStrengthofGearTooth,GearTooth Failure.

Practice:

5. Computeraided spurgear design and analysis usingCATIAand ANSYS
6. Computeraided helicalgear design and analysis usingCATIAand ANSYS

Module II(14Hrs) Power Transmission Mechanisms

Clutch: Friction, Centrifugal, Vacuumand Free WheelClutch, Construction andWorkingPrinciple

Fluid Couplingand Torque Converter: Basic Concepts, Construction and WorkingPrinciple

Brakes: SingleandDoubleShoeBrake, InternalExpandingBrake, BandBrake, ElectromagneticBrakes, ConceptofRegenerative Braking.

Module III (18Hrs) Applications, MechanicalPower MeasurementandControl

Applications:

- ✓ GearBox Used in Automobiles, MachineTool, etc
- ✓ Conveyorwith the Application ofBeltDrives
- ✓ UseofTorque ConverterinAutomaticTransmission
- ✓ Electric Overhead Cranes and Goods/PassengerLiftsUsingRope Drives
- ✓ BallScrewMechanisms Used in CNCMachines
- ✓ UseofRigid and FlexibleCouplings in Pumps and Compressors
- ✓ Disc type and Drum types Brakes used in Automobiles
- ✓ PowerTransmission using Cardan Shaft in Rolling Mills and Conveyors

MechanicalPowerMeasurementand Control:

Basic MechanicalControlSystems: TypesofControlSystems, Openand Closed Loop, Feedback, Need andBasicWorkingPrinciple ofGovernorand Flywheel, Variable FrequencyDrive (VFD).

Dynamometers: Power Measuring Instruments Such as Rope Brake, Hydraulic and Eddy Current Dynamometers.

Practice:

7. Measurement of Torque and Power Using Rope Brake Dynamometer

6. Reference

Text Book:

1. Design of Machine Elements by V.B. Bhandari, Tata McGraw-Hill
2. Mechanical Power Transmission by William J. Patton, Prentice Hall

Reference Books:

1. Shigley's Mechanical Engineering Design by Richard G. Budynas and J.K. Nisbett, McGraw-Hill
2. Design Data Handbook by S. Md. Jalaludeen, Anuradha Publications

7. Session Plan

Topic coverage and Internal Test	No. of Sessions (in hrs.)	Activity (lecture, tutorial, lab practice, field studies/field-trip, Workshop etc.)	Assignment (project, assignment, field study, seminar, etc.)	Suggested Reading (Book, Video, Online source, etc.)
Keys and Splines: Strength of a Sunk Key;	1	Lecturer+ Video	Assignment	Design of Machine Elements by V.B. Bhandari, Tata McGraw-Hill https://www.youtube.com/watch?v=S8Qmy4fGnnE
Rigid and Flexible Coupling	1	Lecture + video	Assignment	Design of Machine Elements by V.B. Bhandari, Tata McGraw-Hill https://www.youtube.com/watch?v=CwiaS075YzQ https://www.youtube.com/watch?v=9jdc0CzMjCo
Hooke's Joint and Constant Velocity Joint.	1	Lecture + video	Assignment	Design of Machine Elements by V.B. Bhandari, Tata McGraw-Hill https://www.youtube.com/watch?v=EJL9qHhQing https://www.youtube.com/watch?v=LCMZz6YhbOQ
Design of Flange Coupling using CATIA	2	Lab Practice		Design of Machine Elements by V.B. Bhandari, Tata McGraw-Hill https://www.youtube.com/wat

				ch?v=bshE5AavL7U
Design of Hooke's Joint Using CATIA	2	Lab Practice		https://www.youtube.com/watch?v=0PPGOJ2u-IQ
Flat Belt, V-Belt and Rope Belts;;,	1	Lecture + video	Assignment	Design of Machine Elements by V.B. Bhandari, Tata McGraw-Hill https://www.youtube.com/watch?v=0mb_XMGja_c https://www.youtube.com/watch?v=i7niMZ22izc
Slip and Creep of Belt; Velocity Ratio of Belt Drives	1	Lecturer	Assignment	Design of Machine Elements by V.B. Bhandari, Tata McGraw-Hill
Centrifugal and Initial Tension; Maximum Power Transmission Through a Belt Drive	1	Lecturer	Assignment	Design of Machine Elements by V.B. Bhandari, Tata McGraw-Hill
Power Transmitting Chains.	1	Lecturer	Assignment	Design of Machine Elements by V.B. Bhandari, Tata McGraw-Hill https://www.youtube.com/watch?v=4PsJkXO70Xc
Design of Flat Belt Pulley using CATIA	2	Lab Practice		https://www.youtube.com/watch?v=M_5mb-VqKKI
Design & Analysis of V-Belt Pulley using CATIA	2	Lab Practice		https://www.youtube.com/watch?v=p3YAdqpPxxI
Design of Gears: Selection of Materials; Force Analysis, Beam Strength of Gear Tooth, Gear Tooth Failure.	1	Lecture + video	Assignment	Design of Machine Elements by V.B. Bhandari, Tata McGraw-Hill https://www.youtube.com/watch?v=P4rNX0gCm3E https://www.youtube.com/watch?v=bH3v2bGvLyM https://www.youtube.com/watch?v=ihGFUAAwj7g
Computer Aided Spur Gear Design and Analysis using CATIA and ANSYS	2	Lab Practice		https://www.youtube.com/watch?v=vPq3KuqPERs https://www.youtube.com/watch?v=h2ZFUiZDsw

Computer Aided Worm Gear Design and Analysis using CATIA and ANSYS	2	Lab Practice		https://www.youtube.com/watch?v=VIqyulx0nDk https://www.youtube.com/watch?v=RLjxmaxDN5w
Clutch: Friction, Centrifugal, Vacuum And FreeWheel Clutch, Construction And Working Principle	4	Lecturer+ Video	Assignment	Design of Machine Elements by V.B. Bhandari, Tata McGraw-Hill https://www.youtube.com/watch?v=devo3kdSPQY https://www.youtube.com/watch?v=pqF-aBtTBnY&t=108s
Fluid Coupling And Torque Converter: Basic Concepts, Construction And Working Principle	5	Lecture + video		Mechanical Power Transmission by William J. Patton, Prentice Hall https://www.youtube.com/watch?v=11Q4g-oOLr8 https://www.youtube.com/watch?v=z5G2zQ_3xTc&t
Brakes: Single and Double Shoe Brake, Internal Expanding Brake, Band Brake, Electromagnetic Brakes, Concept Of Regenerative Braking	5	Lecture + video	Assignment	Design of Machine Elements by V.B. Bhandari, Tata McGraw-Hill https://www.youtube.com/watch?v=CoCmQnQOZ0k https://www.youtube.com/watch?v=vTUTTPy_zJs&t=110s https://www.youtube.com/watch?v=CzEBVdZevOs&t=45s
Applications, Mechanical Power Measurement and Control	14	video + Field studies		https://www.youtube.com/watch?v=QPrNiclydiE https://www.youtube.com/watch?v=wOm7NKdiexY https://www.youtube.com/watch?v=0mb_XMGja_c&t=258s https://www.youtube.com/watch?v=11Q4g-oOLr8 https://www.youtube.com/watch?v=z5G2zQ_3xTc&t=38s https://www.youtube.com/watch?v=P_1MuAhO6kY https://www.youtube.com/watch?v=LviUp94t65Q https://www.youtube.com/watch?v=K3i-Ecb698g https://www.youtube.com/watch?v=JOVNFoKHjIY https://www.youtube.com/watch?v=HewKs2kZIMI https://www.youtube.com/watch

				ch?v=jkmAaBJ0A6Y https://www.youtube.com/watch?v= Tc7HvIGOH4 https://www.youtube.com/watch?v=MAuVDB-G-HQ&t=110s https://www.youtube.com/watch?v=FJJqiKpnPjo https://www.youtube.com/watch?v=B2thGLC5cRs
Basic Mechanical Control Systems: Types of Control Systems, Open and Closed Loop, Feedback, Need and Basic Working Principle of Governor and Flywheel, Variable Frequency Drive (VFD).	2	Lecture		Mechanical Power Transmission by William J. Patton, Prentice Hall
Dynamometers: Power Measuring Instruments such as Rope Brake, Hydraulic and Eddy Current Dynamometers	1	Lecturer+ Video	Assignment	Design of Machine Elements by V.B. Bhandari, Tata McGraw-Hill https://www.youtube.com/watch?v=Kq81cwrogio https://www.youtube.com/watch?v=uwZGtFRtGoU https://www.youtube.com/watch?v=te6dm20B-zA
Measurement of Torque and Power Using Rope Brake Dynamometer	1	Lab Practice		https://www.youtube.com/watch?v=iamxq4Jsimo
Total(hrs)	52			

Introduction to Hybrid and Electric Vehicles

Subject Name	Code	Type of Course	T-P-Pr (Credit)	Prerequisite
Introduction to Hybrid and Electric Vehicles	MECC0413	Theory+ Practice	1+1(2)	Nil

1. Objective

<ul style="list-style-type: none"> ✓ To educate the students on principles, technology, usage and application of fully electric and hybrid vehicles. ✓ To educate the students on energy source, power flow and drive train technologies used in electrical

and hybrid vehicles as on date.

2. Course Outcomes

- Students will be able to identify and understand the electrical circuits and will be able to test the performance of these vehicles.
- Students will be able to carry out maintenance activities of these vehicles.

3. Evaluation Systems

Internal Examination	Component	% of marks	Methods of assessment
	Internal Test	10	Written examination
	Assignment	5	Report
	Learning Record	5	Report
	Experiments	30	Lab work
External Examination	External Theory	30	Written examination
	External Practice	20	Lab work
Total		100	

4. Course outline

Module I (4 Hours)

Introduction to Hybrid Vehicles: History of Hybrid Vehicles, Social and Environmental Importance, Working Principle of Hybrid Vehicles.

Module II (8 Hours)

Hybrid Drive-Trains: Basic Concept of Hybrid Traction, Types of Drive Train in Hybrid Vehicles, Power Flow Control in Hybrid Drive-Train Topologies, Fuel Analysis ((Density, Viscosity, Calorific Value, Flash & Fire Point), Fuel Efficiency

Practice:

- Determination of Calorific Value of a Fuel by using Bomb Calorimeter
- Determination of Flash Point and Fire Point of a Given Fuel
- Determination of Viscosity of a Given Fuel

Module III (8 Hours)

Introduction to Electric Vehicles: Reasons for Electric Vehicle Development, Advantages and Disadvantages of Electric Vehicle, Main Components of Electric Vehicles (Battery, Motor, Controller, DC to DC Converter), Working of Main Components.

Practice:

- Practice in Controller Connection Used in Electric Vehicle
- Practice Wiring and Harnessing in Battery Electric Vehicle

Module IV (7 Hours)

Energy Storage:

Energy Storage Requirements in Electric Vehicles, Battery Monitoring and Charging Control, Combination of Batteries, Sizing of Battery Cell, Principles of Operation of Fuel Cell, Regenerative Braking System.

Practice:

6. Maintenance of Lead Acid Batteries

7. Sizing of Battery Cell

Module V (5Hours)

Electric Drive-Trains: Basic Concept of Electric Traction, Introduction to Various Electric Drive-Train Topologies, Power Flow Control in Electric Drive-Train Topologies.

Module VI (6Hours)

Electric Propulsion Unit: Introduction to Electric Components Used in Hybrid and Electric Vehicles, DCMotor, Control of DCMotor Drives, BLDC (Brushless DC) Motor

Practice:

8. Performance Characteristics of a Shunt and Series DCMotor

9. Disassemble Different Parts of BLDC Motor

Module VII (7Hours)

Types of Motors and Drives: Induction Motor and Drives, Permanent Magnet Synchronous Motor Drives, Switched Reluctance Motor Drives.

Practice:

10. Load Test on Three Phase Induction Motor

11. Speed Control of DC Shunt Motor by Armature and Field Control

12. Permanent Magnet Motor Drives, Their Control

6. Reference

Text Books:

1. Electric and Hybrid Vehicles: Design Fundamentals, Iqbal Hussein, CRC Press, 2003.

2. Modern Electric Vehicle Technology, C.C. Chan and K.T. Chau, Oxford Science Publications.

Reference Books:

1. Internal Combustion Engines, V. Ganesan, Tata McGraw Hill.

2. Principles of Electrical Machines, V.K. Mehta and Rohit Mehta, S. Chand.

Online Source: <http://nptel.iitm.ac.in>

7. Session Plan

Topic coverage and Internal Test	No. of Sessions (in hrs.)	Activity (lecture, tutorial, lab practice, field studies/field-trip, Workshop etc.)	Assignment (project, assignment, field study, seminar, etc.)	Suggested Reading (Book, Video, Online source, etc.)
Module I (4 Hours)				
Introduction to	4 (Th-4)	Lecture	Assignment,	Electric and Hybrid Vehicles:

Hybrid Vehicles: History of hybrid vehicles, Social and environmental importance, Working principle of hybrid vehicles.			Seminar	Design Fundamentals, Iqbal Hussein, CRC Press, 2003 https://www.youtube.com/watch?v=pMTPUjfiQQw http://nptel.iitm.ac.in
Module II(8Hours)				
Hybrid Drive-Trains: Basic concept of hybridtraction,Types of drive train in hybrid vehicles, Powerflowcontrolin hybrid drive-train topologies, Fuel analysis ((Density, Viscosity, Calorific Value, Flash &Fire point), Fuefficiency	8(Th-4, Pr-4)	Lecture + Lab Practice	Assignment	Electric and Hybrid Vehicles: Design Fundamentals, Iqbal Hussein, CRC Press, 2003 V. Ganesan, Internal Combustion Engines, Tata McGraw Hill https://www.youtube.com/watch?v=axzTZZKm3mc http://nptel.iitm.ac.in
Module III (8Hours)				
Introduction to Electric Vehicles: Reasons for electric vehicle development, Advantages and disadvantages of electricvehicle,Main components of electric vehicles (Battery, Motor, Controller,DCtoDC converter), Working ofmain components	8(Th-4,Pr-4)	Lecture + Lab Practice	Assignment	Electric and Hybrid Vehicles: Design Fundamentals, Iqbal Hussein, CRC Press, 2003 Modern Electric Vehicle Technology, C.C. Chan and K.T. Chau, Oxford Science Publications https://www.youtube.com/watch?v=ytVyj10p0BI http://nptel.iitm.ac.in
Module IV(7Hours)				
EnergyStorage: Energy storage requirements in electric vehicles, Battery monitoring and charging control, Combination of batteries. Sizing of batterycell,Principles of operation of Fuel cell, Regenerative brakingsystem	7(Th-3, Pr-4)	Lecture + Lab Practice	Assignment	Electric and Hybrid Vehicles: Design Fundamentals, Iqbal Hussein, CRC Press, 2003 Modern Electric Vehicle Technology, C.C. Chan and K.T. Chau, Oxford Science Publications https://www.youtube.com/watch?v=N10IPLUxNWM https://www.youtube.com/watch?v=uLrCFStQQUU https://www.youtube.com/watch?v=2SQ2SYhVaaE http://nptel.iitm.ac.in
Module V (5Hours)				

Electric Drive-Trains: Basic concept of electric traction, Introduction to various electric drive-train topologies, Powerflow control in electric drive-train topologies.	5(Th-5)	Lecture	Assignment	Electric and Hybrid Vehicles: Design Fundamentals, Iqbal Hussein, CRC Press, 2003 https://www.youtube.com/watch?v=0DqPmACIeKA https://www.youtube.com/watch?v=gK6UUY3nTko http://nptel.iitm.ac.in
Module VI (6Hours)				
Electric Propulsion Unit: Introduction to electric components used in hybrid and electric vehicles, DC Motor, Control of DC Motor drives, BLDC (Brushless DC) Motor	6 (Th-3, Pr-3)	Lecture + Lab Practice	Assignment	Electric and Hybrid Vehicles: Design Fundamentals, Iqbal Hussein, CRC Press, 2003 V.K. Mehta and Rohit Mehta, Principles of Electrical Machines, S. Chand https://www.youtube.com/watch?v=jAGTEAtPEzY https://www.youtube.com/watch?v=bCEiOnuODa https://www.youtube.com/watch?v=LtJoJBUSE28 https://www.youtube.com/watch?v=VkJDXxZlHs&list=PLMH080Gkmb0ZNVz4hVSolj7JrUf56wPN https://www.youtube.com/watch?v=dAW8e3N9xDE http://nptel.iitm.ac.in
Module VII (7Hours)				
Types of Motors and Drives: Induction motor and drives, Permanent magnet synchronous motor drives, Switched reluctance motor drives	7 (Th-3, Pr-4)	Lab Practice	Assignment	V.K. Mehta and Rohit Mehta, Principles of Electrical Machines, S. Chand
Total (hrs)	45			

Fluid Mechanics and Heat Transfer

Subject Name	Code	Type of Course	Credit	Prerequisite
Fluid Mechanics and Heat Transfer	MECC0414	Theory + Practice	2+1(3)	Basic Fluid Mechanics

1. Objective

- ✓ To Educate the Students on Basic Theories behind Fluid Mechanics and Heat Transfer as Used in Engineering Practices.
- ✓ To Educate the Students on use of Experimental methods to Determine Various Engineering Parameters used in Fluid Mechanics and Heat Transfer Applications.

2. Course Outcomes

- ✓ Students will be able to Analyze and Design various Equipment used in Industry using Principles of Fluid Mechanics and Heat Transfer.

3. Evaluation Systems

Internal Examination	Component	% of marks	Method of assessment
	Midterm Test	20 (ITH)	Written Examination
	Assignment		Report and Presentation
	Experiments	30 (IPR) + 20 (EPR)	Lab work, report
	Project		Report and presentation
	Quiz		Surprise/preannounced ones
External Examination		30	Written examination
Total		100	

4. Course Outline

Module I (8 Hrs)

Forces on Submerged Bodies: Causes for Drag and Lift, Drag and Lift Coefficients, Drag on a Sphere and a Cylinder, Terminal velocity of a Body, Stoke's Law, Development of Lift and Drag on a Stationary and Rotating Cylinder, Magnus Effect, Stagnation Points, Introduction to Airfoil Theory.

Practice:

1. Determination of Viscosity of a Liquid by using Stoke's Law.

Module II (8 Hrs)

Incompressible flow: Navier-stokes equation (without derivation), Exact solutions of Navier-stokes equation, Poiseuille flow, Couette flow, Movement of Piston in a Dashpot.

Practice:

2. To Determine Velocity of a Point Within a Flow through the Pipe Line by Close Circuit Prandtl Tube Apparatus.
3. To Demonstrate Laminar and Turbulent Flow through Closed Conduit and to Find Out Reynolds Number by Reynolds Apparatus.
4. To Determine the Frictional Losses in the Pipe by Pipe Friction Apparatus.

Module III (5 Hours)

Compressible flow: Basic equations of Compressible Fluid Flow: Continuity Equation and General Energy Equation, Velocity of Pressure Wave in a Fluid, Subsonic, Sonic and Supersonic Flow, Mach Number, Wave Propagation in a Compressible Fluid, Stagnation Properties.

Module IV (13 Hours)

Conduction: Fourier's Law of Conduction, General Heat Conduction Equation in Different Coordinate Systems (No Derivation), One Dimensional Steady State Conduction in Plane Wall, Composite Wall, Composite Cylinders and Composite Spheres with Convective Atmosphere, Electrical Analogy, Conduction with Heat Generation, Overall Heat Transfer Coefficients, Critical Thickness of Insulation, Heat Transfer from Extended Surfaces, Effectiveness and Efficiency, Unsteady State Heat Conduction, Lumped Heat Capacity System and Lumped Capacitance Method.

Practice:

5. Determination of Overall Heat Transfer Coefficient of Composite Slab.
6. Determination of Thermal Conductivity of Liquid.
7. Experiment on Transient Heat Conduction Apparatus.
8. Efficiency and Effectiveness of Pin Fins.

Module V (10 Hours)

Convection: Hydrodynamic and Thermal Boundary Layer, Principles and Governing Equations, Forced Convection: External Flow Over a Flat Plate, Cylinder, Sphere and Non-Circular Ducts, Use of Empirical Relations, Internal Flow Through Pipe, Annular Spaces and Non-Circular Conduits, Natural Convection: Vertical, Horizontal, Inclined Surfaces.

Practice:

9. Determination of Heat Transfer Coefficient in Forced Convection.
10. Determination of Heat Transfer Coefficient in Natural Convection.

Module VI (5 Hours)

Heat Transfer with Phase Change: Film Wise and Drop Wise Condensation, Boiling Heat Transfer, Regimes of Boiling.

Practice:

11. Determination of Critical Heat Flux during Boiling Heat Transfer.
12. Determination of Heat Transfer in Drop and Film Wise Condensation.

Module VII (7 Hours)

Radiation: Electromagnetic Spectrum, Black Body Emission, Emissive Power, Laws of Radiation, Nature of Black and Grey Bodies, Concepts, Radiation Shape Factor, Thermal Resistance and Electrical Analogy, Radiation Heat Transfer Between Two Surfaces, Reradiating Surface, Radiation Shield.

Practice:

13. Determination of Surface Emissivity.
14. Verification of Stefan Boltzmann's Law.

6. Reference

Text Books:

1. Fundamentals of Heat and Mass Transfer by R.C. Sachdeva, 2nd Edition.

2. FluidMechanicsbyR.K.Bansaland Hydraulic Machines, LaxmiPublications.

ReferenceBooks:

1. HeatTransferby R.K. Rajput, LaxmiPublication.
2. Hydraulics &FluidMechanicsbyP.N. Modiand S.N.Seth, Rajsons Publications.
3. *OnlineSource:* www.nptel.ac.in, You tube video.

7. SessionPlan

Topiccoverage andInternal Test	No. of Sessions(in hrs.)	Activity (lecture, tutorial, lab practice, field studies/field-trip, Workshop etc.)	Assignme nt (project, assignme nt, field study, seminar, etc.)	Suggested Reading (Book, Video, Online source, etc.)
Module-1 (8 Hrs)				
Forceson SubmergedBodies: CausesforDragand Lift,Drag andLiftCoefficients,Dragon a Sphereand aCylinder	2	Lecturer	Assignme ntwith problem solving	1.FluidMechanicsbyR.K. Bansal and Hydraulic Machines, Laxmi Publications. https://www.youtube.com/watch?v=5ltjFEei3AI
Terminalvelocity ofaBody, Stroke’s Law,Development of Lift and Drag on a Stationary and RotatingCylinder	2+2	Lecturer + Lab Practice	Assignme ntwith problem solving	1.FluidMechanicsbyR.K. Bansal and Hydraulic Machines, Laxmi Publications. https://www.youtube.com/watch?v=hUP5igTjvuc https://www.youtube.com/watch?v=AcsrBCEJz-Y https://www.youtube.com/watch?v=mQwlmXtRu5k
Magnus Effect, Stagnation Points,Introduction toAirfoil Theory.	2	Lecturer	Assignme ntwith problem solving	1.FluidMechanicsbyR.K. Bansal and Hydraulic Machines, Laxmi Publications. https://www.youtube.com/watch?v=AJl8EvLp1G0
Module II(8 Hrs)				

Incompressible flow: Navier-stokes equation (without derivation)	1+2	Lecturer + Lab Practice	Assignment with problem solving	2. Hydraulics & Fluid Mechanics by P.N. Modi and S.N. Seth Rajsons Publications., https://www.youtube.com/watch?v=JH3I-NliCkM
Exact solutions of Navier-stokes equation	1	Lecturer + Lab Practice	Assignment with problem solving	2. Hydraulics & Fluid Mechanics by P.N. Modi and S.N. Seth, Rajsons Publications.
Poiseuille flow	2	Lab Practice	Assignment with problem solving	3. Hydraulics & Fluid Mechanics by P.N. Modi and S.N. Seth Rajsons Publications. https://www.youtube.com/watch?v=A8f0YfkXwds https://www.youtube.com/watch?v=fTEGOMWIKZ0
Couette flow, Movement of Piston in a Dashpot.	2	Lab Practice	Assignment with problem solving	3. Hydraulics & Fluid Mechanics by P.N. Modi and S.N. Seth, Rajsons Publications. https://www.youtube.com/watch?v=PQTRdX6-4kQ
Module III (5 Hrs)				
Compressible flow: Basic equations of Compressible Fluid Flow: Continuity Equation and General Energy Equation	2	Lecturer	Assignment with problem solving	1. Fluid Mechanics by R.K. Bansal and Hydraulic Machines, Laxmi Publications. https://www.youtube.com/watch?v=4EADzHBJtE
Velocity of Pressure Wave in a Fluid, Subsonic, Sonic and Supersonic Flow	2	Lecturer	Assignment with problem solving	1. Fluid Mechanics by R.K. Bansal and Hydraulic Machines, Laxmi Publications.
Mach Number, Wave Propagation in a Compressible Fluid, Stagnation Properties.	1	Lecturer	Assignment with problem solving	1. Fluid Mechanics by R.K. Bansal and Hydraulic Machines, Laxmi Publications.

Module IV(13 Hrs)				
Fourier's Law of Conduction, General Heat Conduction Equation in Different Coordinate Systems (No Derivation)	1	Lecturer	Assignment with problem solving	<p>1. Heat and Mass Transfer, R.K. Rajput, Laxmi Publications.</p> <p>2. Fundamentals of Heat and Mass Transfer, by R.C. Sachdeva, 2nd Edition.</p> <p>https://www.youtube.com/watch?v=gcY6832h_Nw</p> <p>https://www.youtube.com/watch?v=bA3EzToAWOE</p> <p>https://www.youtube.com/watch?v=pRnURDgfByE</p> <p>https://www.youtube.com/watch?v=Atnjo7dD_bA</p> <p>http://nptel.ac.in/courses/112108149/pdf/M1/Student_Slides_M1.pdf</p> <p>https://www.youtube.com/watch?v=VO_3WW6ZcWw</p> <p>https://www.youtube.com/watch?v=zFkJy_VocCk</p>
One Dimensional Steady State Conduction in Plane Wall	1	Lecturer	Assignment with problem solving	<p>1. Heat and Mass Transfer, R.K. Rajput, Laxmi Publications.</p> <p>2. Fundamentals of Heat and Mass Transfer, by R.C. Sachdeva, 2nd Edition.</p> <p>http://nptel.ac.in/courses/112108149/pdf/M2/Student_Slides_M2.pdf</p> <p>https://www.youtube.com/watch?v=HbzUeBCmjNQ</p> <p>https://www.youtube.com/watch?v=mhWPR3xNPRE</p> <p>https://www.youtube.com/watch?v=zM86XDUsMmA</p> <p>https://www.youtube.com/watch?v=40A4p0HrWik</p>
Composite wall, Composite Cylinders and Composite Spheres with Convective Atmosphere	1	Lecturer	Assignment with problem solving	<p>1. Heat and Mass Transfer, R.K. Rajput, Laxmi Publications.</p> <p>2. Fundamentals of Heat</p>

				and Mass Transfer, by R.C. Sachdeva, 2nd Edition. http://nptel.ac.in/courses/112108149/pdf/M2/Student_Slides_M2.pdf
Electrical Analogy, Conduction with Heat Generation	1	Lecturer	Assignment with problem solving	1. Heat and Mass Transfer, R.K. Rajput, Laxmi Publications. 2. Fundamentals of Heat and Mass Transfer, by R.C. Sachdeva, 2nd Edition.
Overall Heat Transfer Coefficients,	2	Lab Practice	Assignment with problem solving	1. Heat and Mass Transfer, R.K. Rajput, Laxmi Publications. 2. Fundamentals of Heat and Mass Transfer, by R.C. Sachdeva, 2nd Edition.
Critical Thickness of Insulation,	1	Lecturer	Assignment with problem solving	1. Heat and Mass Transfer, R.K. Rajput, Laxmi Publications. 2. Fundamentals of Heat and Mass Transfer, by R.C. Sachdeva, 2nd Edition.
Heat transfer from Extended Surfaces,	1	Lecturer	Assignment with problem solving	1. Heat and Mass Transfer, R.K. Rajput, Laxmi Publications. 2. Fundamentals of Heat and Mass Transfer, by R.C. Sachdeva, 2nd Edition. https://www.youtube.com/watch?v=rKcTidz-1P4 https://www.youtube.com/watch?v=DTXpnhTOI20http://nptel.ac.in/courses/112108149/pdf/M3/Student_Slides_M3.pdf
Effectiveness and Efficiency	2	Lab Practice	Assignment with problem solving	1. Heat and Mass Transfer, R.K. Rajput, Laxmi Publications. 2. Fundamentals of Heat and Mass Transfer, by R.C. Sachdeva, 2nd Edition.
Unsteady State Heat Conduction	2	Lab Practice	Assignment with	1. Heat and Mass Transfer, R.K. Rajput, Laxmi

			problem solving	Publications. 2. Fundamentals of Heat and Mass Transfer, by R.C. Sachdeva, 2nd Edition. https://www.youtube.com/watch?v=Di8G5iPDPEQ https://www.youtube.com/watch?v=seNR8waoBgE
Lumped heat Capacity System and Lumped Capacitance Method.	1	Lecturer	Assignment with problem solving	1. Heat and Mass Transfer, R.K. Rajput, Laxmi Publications. 2. Fundamentals of Heat and Mass Transfer, by R.C. Sachdeva, 2nd Edition.
Module V (10 Hrs)				
Convection: Hydrodynamic and Thermal Boundary Layer, Principles and Governing Equations	2	Lecturer	Assignment with problem solving	1. Heat and Mass Transfer, R.K. Rajput, Laxmi Publications. 2. Fundamentals of Heat and Mass Transfer, by R.C. Sachdeva, 2nd Edition. http://nptel.ac.in/courses/112108149/pdf/M6/Student_Slides_M6.pdf
Forced Convection: External flow over a Flat plate, Cylinder, Sphere and non-circular Ducts, use of Empirical Relations	2+2	Lecturer+ Lab Practice	Assignment with problem solving	1. Heat and Mass Transfer, R.K. Rajput, Laxmi Publications. 2. Fundamentals of Heat and Mass Transfer, by R.C. Sachdeva, 2nd Edition.
Internal flow through pipe, Annular spaces and non-Circular Conduits, Natural Convection: Vertical, Horizontal, Inclined Surfaces	2+2	Lecturer+ Lab Practice		1. Heat and Mass Transfer, R.K. Rajput, Laxmi Publications. 2. Fundamentals of Heat and Mass Transfer, by R.C. Sachdeva, 2nd Edition.
Module VI (5 Hrs)				
Heat transfer with phase change: - Film Wise and Drop Wise Condensation	1+2	Lecturer+ Lab Practice		1. Heat and Mass Transfer, R.K. Rajput, Laxmi Publications. 2. Fundamentals of Heat and Mass Transfer, by R.C. Sachdeva, 2nd Edition.

Boiling Heat transfer, Regimes of Boiling.	2	Lab Practice		<p>1. Heat and Mass Transfer, R.K. Rajput, Laxmi Publications.</p> <p>http://nptel.ac.in/courses/112108149/pdf/M8/Student_Slides_M8.pdf</p> <p>https://www.youtube.com/watch?v=NaSMTsscEao</p> <p>https://www.youtube.com/watch?v=N1yZwRcQSZw</p>
Module VII (7 Hrs)				
Radiation: Electromagnetic spectrum, blackbody emission, emissive power, laws of radiation, nature of black and grey bodies, concepts	1+2	Lecturer+ Lab Practice		<p>1. Heat and Mass Transfer, R.K. Rajput, Laxmi Publications.</p> <p>2. Fundamentals of Heat and Mass Transfer, by R.C. Sachdeva, 2nd Edition.</p> <p>https://www.youtube.com/watch?v=5GoZZKcNZiQ</p> <p>https://www.youtube.com/watch?v=tZliZyoYT80</p> <p>http://nptel.ac.in/courses/112108149/pdf/M9/Student_Slides_M9.pdf</p>
Radiation Shape Factor, Thermal Resistance and Electrical Analogy	1+2	Lecturer+ Lab Practice		<p>1. Heat and Mass Transfer, R.K. Rajput, Laxmi Publications.</p> <p>2. Fundamentals of Heat and Mass Transfer, by R.C. Sachdeva, 2nd Edition.</p> <p>https://www.youtube.com/watch?v=TiOpUAI_9mk</p> <p>https://www.youtube.com/watch?v=szEOmHKjzhs</p>
Radiation Heat Transfer between two Surfaces, reradiating Surface, Radiation Shield	1	Lecturer		<p>1. Heat and Mass Transfer, R.K. Rajput, Laxmi Publications.</p> <p>2. Fundamentals of Heat and Mass Transfer, by R.C. Sachdeva, 2nd Edition.</p>

The following colour represents the syllabus revision, skill, employability and entrepreneurship.

Green : Skill

Pink : Employability

Sky : Entrepreneurship

Course Structure
Mechanical Engineering
2017

<i>Code</i>	<i>Subject Title</i>	<i>Type</i>	<i>Credit</i>	<i>Prerequisite</i>
CCME0405	<i>Theory of Machines</i>	<i>Theory+ Practice</i>	5	NIL
MECC0401	<i>Manufacturing Technology 1</i>	<i>Theory+ Practice</i>	2+1	<i>Workshop Practice</i>
MECC0402	<i>Manufacturing Technology 2</i>	<i>Theory+ Practice</i>	2+2	Nil
MECC0403	<i>Design for Manufacturing</i>	<i>Theory+ Practice</i>	2+2	<i>Workshop Practice</i>
MECC0404	<i>Finite Element Analysis</i>	<i>Theory+ Practice</i>	2+2	Nil
MECC0405	<i>Digital Manufacturing</i>	<i>Theory+ Practice</i>	2+1	Nil
MECC0406	<i>Internal Combustion Engines</i>	<i>Theory+ Practice</i>	1+1	<i>Thermodynamics</i>
MECC0407	<i>Design of Thermal Energy Systems</i>	<i>Theory+ Practice</i>	2+1	<i>Thermodynamics</i>
MECC0408	<i>Renewable Energy Systems</i>	<i>Theory+ Practice</i>	2+1	Nil
MECC0409	<i>Fluid Power</i>	<i>Theory+ Practice</i>	2+1	Nil
MECC0410	<i>Mechanics of Machines</i>	<i>Theory+ Practice</i>	2+1	Nil
MECC0411	<i>Strength of Material</i>	<i>Theory+ Practice</i>	2+1	<i>Engineering Mechanics</i>
MECC0413	<i>Introduction to Hybrid and Electric Vehicles</i>	<i>Theory+ Practice</i>	1+1	Nil
MECC0414	<i>Fluid Mechanics and Heat Transfer</i>	<i>Theory+ Practice</i>	2+1	<i>Basic Fluid Mechanics</i>
Total Credits			45	

Syllabus

CCME0405 THEORY OF MACHINES

Pre-requisites	Course type	Credits
NIL	Theory+Practice	5

Course Objectives: The overall objective of this course is to learn how to analyze the motion of mechanisms, design mechanisms
Course Outcomes:

1. Distinguish kinematic and kinetic motion.
2. Identify the basic relations between distance, time, velocity, and acceleration.
3. Use graphical and analytic methods to study the motion of various mechanisms.
4. Design basic cam systems

MODULE –I(21Hours)

Mechanisms: Kinematic concept of link, kinematic pair, kinematic chain, Mechanism, binary, ternary and quaternary joints, degree of freedom of planar mechanism, inversions of four bar mechanism, single slider crank mechanism and double slider crank mechanism. (Most of the topics will be through PPT presentation and demonstration)

Motion Analysis: Types of motion, velocity diagram, Instantaneous centre method, Kennedy theorem, relative velocity method, velocities in four bar and slider crank mechanism, Klein's construction. Acceleration diagram of planar mechanism, Coriolis component of acceleration. (The topic is taught through practice)

MODULE –II(21Hours)

Gears: Classification and basic terminology, Fundamental law of gearing, involute tooth profile, Spur gears, other types of gears, standards in tooth forms, length of path of contact and arc of contact, contact ratio, interference in involute gears. (The topics are taught through PPT presentation and demonstration)

Gear trains: Simple, compound, reverted and epicyclic gear trains. (The topics are taught through PPT presentation and demonstration)

Steering gear mechanism: Law of correct steering, Davis and Ackermann steering gear mechanism, universal or Hooke's joint.

MODULE –III(25Hours)

Frictional devices: Plate & cone clutches, Brakes and dynamometers, analysis of shoe brake and band brake, study of absorption and transmission dynamometer, Belt and rope drive, slip and creep of belt, maximum power transmitted by belt, introduction to rope and chain drives. (The topic is taught through PPT presentation and demonstration)

CAMS: Various types of cams and followers, nomenclature of cam profile, Displacement, velocity and acceleration of followers. Draw cam profile for various

types of follower motion. (The topic will be through practice mode)

Text Book:

1. Theory of Machines, S.S. Rattan, Tata McGraw Hill.
2. A Textbook of Theory of Machines by R. K. Bansal, Laxmi Publication

Reference Books:

1. Theory of Machines and Mechanisms by Ghosh and Malik
2. Mechanism and Machine Theory by J.S. Rao and R.V. Dukkipati

Module I

S. No.	Topic	Pedagogy	Details	Instructional Hrs			
				Th	Pract	video	Proj
1	Mechanisms: Kinematic concept of link, kinematic pair, kinematic chain, Mechanism, binary, ternary and quaternary joints, degree of freedom of plane mechanism	CRT & PRA		4	2	0	0
2	Inversion of four bar mechanism, single slider crank mechanism and double slider crank mechanism.	CRT, Video		2	0	1	0
3	Motion Analysis: Types of motion, velocity diagram, Instantaneous center method, Kennedy theorem	CRT + PRA		2	2	0	0
4	Relative velocity method, velocities in four bar and slider crank mechanism, Klein's construction	CRT + PRA		2	2	0	0
5	Acceleration diagram of planar mechanism, Coriolis component of acceleration.	CRT + PRA		2	2	0	0

	Subtotal			21		12	8	1	0
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Module-II

S. No.	Topic	Pedagogy	Details	Instructional Hrs			
				Th	Pract	video	Proj
1	Gears: Classification and basic terminology, Fundamental law of gearing, involute tooth profile	CRT & Video Presentation		3	0	1	0
	Spur gears, other types of gears, standards into tooth forms,						

2	length of path of contact and arc of contact, contact ratio, interference in involute gears.	CRT&PRA		3	1	0	0
3	Geartrains: Simple, compound, reverted and epicyclic geartrains	CRT, PRA & Video Presentation		4	2	1	0
4	Steering gear mechanism: Law of correct steering, Davis and Ackermann steering gear mechanism, universal or Hooke's joint.			4	1	1	0
Module-III		Subtotal	21	14	4	3	0
Frictional devices:							
1	Plate & Cone Clutches	CRT&PRA, VIDEO PRESENTATION		4	2	1	0
2	Brakes and dynamometers, analysis of shoe brake and band brake, study of absorption and transmission dynamometer,	CRT&PRA		4	2		
3	Belt and rope drive, slip and creep of belt, maximum power transmitted by a belt, introduction to rope and chain drives	CRT		4	0	0	0
4	CAMS: Various types of cams and followers, nomenclature of cam profile, Displacement, velocity and acceleration of followers. Draw of cam profile for various types of follower motion.	CRT&PRA		2	6	0	0
		Subtotal	25	14	10	1	0

Manufacturing Technology I

SubjectName	Code	Type ofcourse	Credit	Prerequisite
Manufacturing Technology I	MECC0401	Theory+ Practice	2+1(3)	Workshop Practice

1. Objective

<ul style="list-style-type: none"> •To Educate the Students on Principles, Usage and Application of Various Non-chip Forming Manufacturing Technologies. •To Impart Knowledge on Practical Applications of These Technologies Through Actual Experiments and Making of Sample Products.

2. Course Outcomes

<ul style="list-style-type: none"> •Students will have Knowledge and Skills to Understand Actual Manufacturing Processes used in Industry and will be Able to Correlate a Specific Process with the Part/Component being Produced. •Students will be Able to Select the Most Optimum Manufacturing Process for a Specific Product Design and Application.

3. Evaluation Systems

Internal Examination	Component	% of Marks	Method of Assessment
	Midterm Test	20 (ITH)	Written Examination
	Assignment		Report and Presentation
	Experiments	30 (IPR)+20 (EPR)	Lab work & Report
	Project		Report & Presentation
	Quiz		Surprise/Preannounced ones
External Examination		30 (ETH)	Written Examination
Total		100	

Module I (9 Hours)

(Casting Process)

Introduction, Basic Factors Involved in Casting, Patterns (Classifications, Allowances and Considerations), Technology of Mould Making, Principles of Gating Design, Principles of Risers, Core Making Process, Chills and Chaplets, Solidification of Castings, Inspection and Defects in Castings, Post Casting Processing (Cleaning, Finishing & Heat Treatment of Castings).

Module II (11 Hours) (Special Casting)

Special Casting Processes (Permanent Mould Casting, Die Casting, Slush Casting, Centrifugal Casting, Investment Casting, Carbon Dioxide Casting, Stir Casting, Continuous Casting, Shell and Plaster Molding Process, Full Mould Process, Vacuum Sealed Molding Process, Graphite & Ceramic Mould Casting, Semi-solid Metal Casting).

Practice:

1. To Prepare a Green Sand Mould with a Standard Pattern and Study the Tools Used.
2. Furnace Operation & Aluminum Melting to Pour a Casting.

3. Casting Simulation Using Pro CAST.

Module III (5Hours) (Welding Technology)

Physics of Welding, Welding Classification, Applications of Various Welding Processes, Gas Cutting & Brazing Gas Flames, Flux and Filler, Arc Welding: SMAW Principle and Power Source, Types of Electrodes, Functions of Flux Coatings and AWS Classification and Coding.

Module IV (6Hours)

GTAW, GMAW, SAW & Flux-cored Arc Welding, Resistance Welding - Spot and Seam Welding, Flash Butt Welding, Thermit Welding, Friction Welding, Welding Methods like Plasma Arc, Laser Beam, Electron Beam, Ultrasonic, Explosive Welding, Diffusion Bonding, Cladding, Brazing and Soldering.

Module V (9Hours)

Welding Positions, Edge Preparation in Butt & Fillet Welding, Destructive and Non-Destructive Testing of welding, Welding Defects

Practice:

4. Safety Practice and PPE for Welding.
5. Brazing of 20mm MS Pipe Joint.
6. Bead on Plate Varying Current & Voltage for SMAW using E6013.
7. GTAW Torch Assembly and Bead on Aluminum Plate without & with Filler.

Module VI (7Hours) (Metal Forming)

Plastic Deformation and Yield Criteria, Relation between Tensile and Shear stress, Cold and Hot Working, Rolling: Principle and mechanism, Defects, Types of Rolling Mills, Forging: Classification, Open-Die Forging, Impression-Die and Closed-Die Forging, Drop and Press Forging, Forging defects.

Practice:

8. Making a Square Section from 20mm Round MS Bar.

Module VII (9Hours)

Drawing: Methods and Variables, Wire Drawing, Extrusions: Advantages and Disadvantages, Direct, Indirect, Impact and Hydrostatic Extrusion and their Applications, Extrusion of Tubes, Extrusion Defects.

Sheet Metal Work: Bending, Forming and Deep drawing, Shearing, Punching and Blanking - Method and Application.

Practice:

9. Shearing of 2mm MS Sheet and Use of a Progressive Die to Manufacturing a Washer.

6. References

Text Books:

1. Rao, P.N., Manufacturing Technology, Volume 1, 2015, 4th Edition, Tata McGraw Hill Education Private Limited, India.
2. Ghosh, A, Mallik, A.K., Manufacturing Science, 2010, 2nd Edition, East-West Press Private Limited.

Reference Books:

1. Kaushish, J.P., Manufacturing Processes, 2014, 2nd Edition, PHI Learning Private Limited.

2. Sharma, P C, A Text Book of Production Technology (Manufacturing Processes), 2006, 6th Edition, S. Chand & Company Limited.

Online Source: NPTEL

7. Session Plan

Topic coverage and Internal Test	No. of Sessions (in hrs.)	Activity (lecture, tutorial, lab practice, field studies/field-trip, Workshop etc.)	Assignment (Project, assignment, field study, seminar, etc.)	Suggested Reading (Book, Video, Online source, etc.)
Module I				
Basic Factors Involved in Casting.	01	lecture	field study	http://nptel.ac.in/courses/112107144/13 https://www.youtube.com/watch?v=YtksJ12suFM https://www.youtube.com/watch?v=rL3dLQYEYKw 1. Rao, P N, Manufacturing Technology, Volume 1, 2015, 4th Edition, Tata McGraw Hill Education Private Limited, India.
Patterns Classifications Design Allowances, Design Considerations.	01	lecture	field study	http://nptel.ac.in/courses/112107144/15 https://www.youtube.com/watch?v=-g18ycqbLJY https://www.youtube.com/watch?v=Yf-71Y1_FPI https://www.youtube.com/watch?v=khEvhjIh_SM Ref2 Sharma, P C, A Text Book of Production Technology (Manufacturing Processes), 2006, 6 th Edition, S. Chand & Company Limited.
Technology of Mould making.	01	lecture	field study	https://www.youtube.com/watch?v=6ZuxO--vNDU nptel.ac.in/courses/112107215/11 1. Rao, P N, Manufacturing Technology, Volume 1, 2015, 4th Edition, Tata McGraw Hill Education Private Limited, India.
Principles of Gating Design.	01	lecture	field study	https://www.youtube.com/watch?v=CoO_akMDBbo https://www.youtube.com/watch?v=IJF426aMCJA https://www.youtube.com/watch?v=

				CyN6DRjPnxs http://nptel.ac.in/courses/112107144/metalcasting/lecture13&14.htm 1. Rao, P N, Manufacturing Technology, Volume 1, 2015, 4th Edition, TataMcGraw Hill Education Private Limited, India.
Principles of Risers, Problems solving.	02	lecture	Assignment	https://www.youtube.com/watch?v=2UzsJNikZxY http://nptel.ac.in/courses/112107239/13 http://nptel.ac.in/courses/112107215/25 Ref1. Kaushish, JP, Manufacturing Processes, 2014, 2 nd Edition, PHI Learning Private Limited.
Solidification of castings.	01	lecture		https://www.youtube.com/watch?v=pvmu9Sk2gXk https://www.youtube.com/watch?v=8xVDy8OzeKc https://www.youtube.com/watch?v=wTbcEu8SdAY 2. Ghosh, A, Mallik, A K, Manufacturing Science, 2010, 2 nd Edition, East-West Press Private Limited.
Inspection of Castings.	01	lecture	Assignment	https://mechanicalengineering.com/methods-inspection-finding-out-defects-in-casting/ https://www.youtube.com/watch?v=l8LQShYjsHg
Post Casting Processing.	01	lecture	Assignment	nptel.ac.in/courses/112107084/module13/lecture1/lecture1.pdf nptel.ac.in/courses/112107215/37 https://www.youtube.com/watch?v=xUxSVr_N-zA
Module-II				
Permanent Mould Casting, Die Casting.	01	lecture	Assignment	http://nptel.ac.in/courses/112107078/7 https://www.youtube.com/watch?v=CuRiFL4UZQ0 http://nptel.ac.in/courses/112107219/24 http://nptel.ac.in/courses/112107144/metalcasting/lecture7.htm https://www.youtube.com/watch?v=ps2cWctKLBQ 2. Ghosh, A, Mallik, A K, Manufacturing Science, 2010, 2 nd Edition, East-West Press Private

				Limited.
Slush Casting, Centrifugal Casting, InvestmentCasting.	01	lecture	Assignment	https://www.youtube.com/watch?v=ps2cWctKLBQ https://www.youtube.com/watch?v=oNZrxFvODtwh https://www.youtube.com/watch?v=U81LJAdzFsY 2. Ghosh, A,Mallik, A K, ManufacturingScience,2010, 2 nd Edition, East-WestPressPrivate Limited.
Carbon Dioxide Casting, StirCasting, Continuous Casting.	01	lecture	Assignment	https://pdfs.semanticscholar.org/3937/3d4257ff9cb366a1690ebc3151b692740744.pdf https://www.youtube.com/watch?v=vnNKYYsY4Wc http://nptel.ac.in/courses/112104221/23 https://www.youtube.com/watch?v=ytOUkOdra3E http://nptel.ac.in/courses/113104059/33 https://www.youtube.com/watch?v=6WIA Bd84404
Shelland Plaster MoldingProcess, Full Mould Process, VacuumSealed MoldingProcess.	01	lecture	Assignment	http://nptel.ac.in/courses/112107078/11 https://www.youtube.com/watch?v=tDYF2Q1r78Q http://nptel.ac.in/courses/112107144/21 http://nptel.ac.in/courses/112107215/15 https://www.youtube.com/watch?v=ZSie37pNqak https://www.youtube.com/watch?v=ZmAkMgl3V3w
Graphite & Ceramic Mould Casting, Semi- solid MetalCasting.	01	lecture	Assignment	www.nptel.ac.in/courses/112101005/downloads/Module 3 Lecture 2 final.pdf http://thelibraryofmanufacturing.com/ceramic_mold_casting.html
Experiment1	02	Practical		
Experiment2	02	Practical		
Experiment3	02	Practical		
Module III				
Physics of Welding, Welding Classification	01	lecture	field study	https://www.youtube.com/watch?v=lzTj9FRyUM0 https://www.youtube.com/watch?v=

Applications of various welding processes.				CCzhT81GrBo https://www.youtube.com/watch?v=AvXoEp53zAYh https://www.youtube.com/watch?v=3nX0oYHnzy0h http://nptel.ac.in/courses/112107144/27 2. Ghosh, A, Mallik, A K, Manufacturing Science, 2010, 2 nd Edition, East-West Press Private Limited.
Gas Cutting & Brazing Gas Flames.	01		field study	https://en.wikipedia.org/wiki/Oxy-fuel_welding_and_cutting https://www.youtube.com/watch?v=3EtEM17C6MI 1. Rao, P N, Manufacturing Technology, Volume 1, 2015, 4th Edition, Tata McGraw Hill Education Private Limited, India.
SMAW Principle and Power Source.	01	lecture	field study	nptel.ac.in/courses/112107090/module4/lecture1/lecture1.pdf http://nptel.ac.in/courses/112107089/14 https://www.youtube.com/watch?v=5hRgwnejWPs https://www.youtube.com/watch?v=yOdXvagHK_M 2. Ghosh, A, Mallik, A K, Manufacturing Science, 2010, 2 nd Edition, East-West Press Private Limited.
Types of Electrodes, Functions of Flux Coatings and AWS Classification and Coding.	02	lecture	field study	http://nptel.ac.in/courses/112107144/welding/lecture5&6.htm
Module-IV				
GTAW, GMAW, SAW & Flux-cored Arc Welding.	02	lecture	field study	http://nptel.ac.in/courses/112107089/16 https://www.youtube.com/watch?v=Vg1UXBHNh6U http://nptel.ac.in/courses/112107089/20 http://nptel.ac.in/courses/112107089/19 https://www.youtube.com/watch?v=TPSQJXqSwTg https://www.weldguru.com/support-files/flux-cored-arc-welding.pdf http://nptel.ac.in/courses/112107078

				/30 https://www.youtube.com/watch?v=Zc3Fu1AVCjc Ref. 1Kaushish,JP,Manufacturing Processes, 2014,2 nd Edition, PHI LearningPrivate Limited.
ResistanceWelding, Spot and Seam weldingFlash Butt Thermitwelding, Friction welding.	02	lecture	field study	https://www.youtube.com/watch?v=Op68bH0bi6I http://www.avio.co.jp/english/products/assem/principle/welding/index.html https://www.youtube.com/watch?v=66-RK0DPXfU https://www.youtube.com/watch?v=pcF7i297aZE https://www.youtube.com/watch?v=bg_fDRr7tUc https://www.youtube.com/watch?v=8LQUlzSwc-k https://www.youtube.com/watch?v=-wNMHFWCJ88 https://www.youtube.com/watch?v=amaHurtwYTc https://www.youtube.com/watch?v=gXp3aRKO4Yc https://www.youtube.com/watch?v=M2zdRBcDZWY https://www.youtube.com/watch?v=-aEuAK8bsQg
Plasma Arc, Laser Beam, Electron Beam, Ultrasonic Explosive Welding, Diffusion bonding.	01	lecture	Assignment	https://www.youtube.com/watch?v=mgaukC25Hqk https://www.youtube.com/watch?v=588EJInHLsc https://www.youtube.com/watch?v=hX2SMbewGwo https://www.youtube.com/watch?v=o4W8nsrvQ6E nptel.ac.in/courses/112107077/35 nptel.ac.in/courses/112107077/module4/lecture3/lecture3.pdf nptel.ac.in/courses/112107213/24 https://www.youtube.com/watch?v=ykf2Zckqcl4 https://www.youtube.com/watch?v=ERrUlzcaqMw
Brazingand Soldering.	01	lecture	Field Study	https://www.youtube.com/watch?v=_mbXkA5FH2U https://www.youtube.com/watch?v=B-vKcEVO4AE https://www.youtube.com/watch?v=0v2SNH_ho08

				Ref.1Kaushish,JP,Manufacturing Processes, 2014, 2 nd Edition, PHI LearningPrivate Limited.
Module-V				
WeldingPositions, Edge Preparationin Butt&Fillet Welding.	01	lecture	field study	https://www.youtube.com/watch?v=IWVPbib_HwI https://www.youtube.com/watch?v=I3b6mcCS-1c https://www.youtube.com/watch?v=avyy_iEJKxY https://www.youtube.com/watch?v=0c6PESMOazI 1. Rao,P N, Manufacturing Technology, Volume 1, 2015, 4th Edition, Tata McGraw Hill Education Private Limited,India.
Destructive and NDT WeldingDefects, Design considerations in welding.	01	lecture	Assignment	https://www.youtube.com/watch?v=WoHiE5eGaD4 https://www.youtube.com/watch?v=DK1dItnI8mM Ref.1Kaushish,JP,Manufacturing Processes, 2014, 2 nd Edition, PHI LearningPrivate Limited. https://www.youtube.com/watch?v=axaHjrVG-gQ http://nptel.ac.in/courses/112107089 http://nptel.ac.in/courses/114105004 /37 1. Rao, P N, Manufacturing Technology, Volume 1, 2015, 4th Edition,TataMcGraw Hill Education Private Limited,India.
Automation & Roboticsin Welding	01	lecture	Assignment	http://nptel.ac.in/courses/11210708/30 https://www.youtube.com/watch?v=PF8LhtRDeO4
Experiment4 Experiment5	02	Practice		
Experiment6	02	Practice		
Experiment7	02	Practice		
ModuleVI				
Plastic deformation and Yield criteria, Relationbetween Tensileand Shear stress	01	lecture	Assignment	https://www.youtube.com/watch?v=MdQDS7BwrtA nptel.ac.in/courses/112106153/Module%202/Lecture%204/Module_2_Lecture_4.pdf

Cold and Hot working.				http://nptel.ac.in/courses/112107145/4# https://www.youtube.com/watch?v=dNbVsmVgOnM 1. Ghosh, A, Mallik, A K, Manufacturing Science, 2010, 2 nd Edition, East-West Press Private Limited.
Rolling: principle and mechanism, defects, types of rolling mills.	02	lecture	Assignment	https://www.youtube.com/watch?v=Xf08dgnlwXg https://www.youtube.com/watch?v=ZD8gW_OzkCQ nptel.ac.in/courses/112106153/Module%204/Lecture%205/Module_4_Lecture_5.pdf www.nptel.ac.in/courses/112106153/22
Forging: classification. Analysis of Forging, Drop and Press forging, Forging defects.	02	lecture	Assignment	https://www.youtube.com/watch?v=dFnN1YtomNc http://nptel.ac.in/courses/112107145/5 https://www.youtube.com/watch?v=bgMPuYn2ips Ref. 1 Kaushish, JP, Manufacturing Processes, 2014, 2 nd Edition, PHI Learning Private Limited.
Experiment 8	02	Practice		
Module-VII				
Sheet metal work: Bending, Forming and deep drawing, shearing, Punching and blanking-method and application.	02	lecture	Field Study	https://www.youtube.com/watch?v=8yBZkwR5fuk https://www.youtube.com/watch?v=lqgInojazXA https://www.youtube.com/watch?v=JgNaSll8Obo https://www.youtube.com/watch?v=o5zTUo2t7_w&list=PL4OEy4gx0_rflEo6TXvZMeMptbMfQdYr7 https://www.youtube.com/watch?v=xLxCVuplis http://nptel.ac.in/courses/112106153/29 2. Ghosh, A, Mallik, A K, Manufacturing Science, 2010, 2 nd Edition, East-West Press Private Limited.
Drawing: methods and variables, wire drawing.	02	lecture	Assignment	https://www.youtube.com/watch?v=9RtAis5pnq4 https://www.youtube.com/watch?v=pd4Uk8vk09c nptel.ac.in/courses/112106153/.../Module_8_SheetMetalDrawing-

				Lecture_1.pdf nptel.ac.in/courses/112106153/Module%206/.../Module_6_Drawing-Lecture_2.pdf nptel.ac.in/courses/116102010/28
Extrusions, Direct, Indirect, Impact and Hydrostatic extrusion Applications, Extrusion of Tubes, defects.	01	lecture	Assignment	https://www.youtube.com/watch?v=773oOz38wJM https://www.youtube.com/watch?v=743fHkOvOkA nptel.ac.in/courses/112106153/23 nptel.ac.in/courses/107103012/module4/lec1.pdf 1. Rao, P N, Manufacturing Technology, Volume 1, 2015, 4th Edition, Tata McGraw Hill Education Private Limited, India.
Experiment 9	2	Practice		
Repeat /Test-1	2			
Total	55			

Manufacturing Technology II

Subject Name	Code	Type of Course	T-P-Pr (Credit)	Prerequisite
Manufacturing Technology II	MECC0402	Theory+ Practice	2+2(3)	Nil

1. Objective

<ul style="list-style-type: none"> • To Educate the Students on Principles, Usage and Application of Various Chip Forming Manufacturing Technologies. • To Impart Knowledge on CNC Machining and Programming.

2. Course Outcomes

<ul style="list-style-type: none"> • Students will be Able to Do Process Planning, Develop CNC Part Programs. • Students will have Knowledge and Skills to Operate CNC Machines.
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3. Evaluation Systems

Internal Examination	Component	% of Marks	Method of Assessment
	ITH	30	Written Examination (Best of 2)
	IPR	20	Lab Work & Report
External Examination	ETH	20	Written Examination
	EPR	30	Lab Work
Total		100	

4. Course Outline

Module I (8 Hours) (Conventional Machining)

Mechanics of Metal cutting; Cutting Tool Materials (Principal Tool Materials, Advanced Tool Materials, Indexable Inserts, Tool Coatings); Cutting Fluids and Lubricants (Characteristics, Types, Selection Criteria, Dry and Near-Dry Machining, MQL);

Practice:

1. Measurement of Cutting Tool Temperature using Thermocouple.

Module II (8 Hours)

Theory of Machinability (Tool Life, Cutting Forces, Power Consumption, Surface Roughness, Thermal Aspects).

Mechanism of Cutting on a Lathe, Milling Machine, Shaper, Planer and Slotter;

Practice:

2. Measurement of Cutting Forces using Dynamometer.

Module III (10 Hours)

Drilling (Deep Hole Drilling & Micro Drilling); Boring and Reaming Operations; Principles of Jigs and Fixtures

Practice:

3. Measurement of Surface Roughness using Talysurf.
4. Process Optimization using Minitab and Matlab.

Module IV (10 Hours) (Non-Conventional Machining & Additive Manufacturing)

Non-Conventional Machining Process, Principle and Equipment (Electro-Chemical Machining; Electric Discharge Machining, Laser Beam Machining; Electron Beam Machining; Hot Machining)

Practice:

5. Study of EDM working Principle and Process Parameters.

Module V (9 Hours)

Additive Manufacturing (3D Printing, Rapid Prototyping); Developments in Additive Manufacturing; Classifications of Additive Manufacturing systems

Practice:

6. Component Manufacturing Using 3D Printer.

Module VI (6 Hours) (Computer Aided Manufacturing)

GD&T Concepts (Machining Accuracy; Fundamentals of Measurements; Principles of Tolerancing; Maximum and Minimum Material Requirement)

Module VII (25 Hours)

CAM-Introduction, Types-NC, CNC, DNC, Machining Centers, Adaptive Control, Part Programming G-Codes, M-Codes, Programming & Machining for Simple Components

Practice:

7. Manual Programming Related to Facing, Turning, Drilling, Boring & Pocketing in CNC Machines.
8. Simple Contouring Operation using CNC Milling Machine.

9. 3D Modeling & Product Design with CATIA and SolidWorks (3D Experience)
10. Generation of NC Program and Product Manufacturing by Using MasterCAM Software.
11. Process Planning, Programming, Simulation and Optimization of Machining Processes Using DELMIA.

6. References

Text Books:

1. Rao, P.N., Manufacturing Technology, Volume 2, 2011, 2nd Edition, Tata Mc-Graw Hill Education Private Limited, India.
2. Chattopadhyay, A.B., Machining & Machine Tools, 2012, 1st Edition, Wiley India Private Limited, India.
3. Groover, M.P., Zimmers, E., CAD/CAM: Computer Aided Design & Manufacturing, 2011, 9th Edition, Pearson Education Inc., India.

Reference Books:

1. Shaw, M.C., Metal Cutting Principles, 2011, 2nd Edition, Oxford University Press, India.
2. Bhattacharya, A., Metal Cutting - Theory and Practice, 2015, 8th Edition, New Central Book Agency Private Limited, India.
3. Raghuvanshi, B.S., A Course in Workshop Technology, Volume 2, 2009, 10th Edition, Dhanpat Rai & Co., India.

Online Source: NPTEL

7. Session Plan

Topic coverage and Internal Test	No. of Sessions (in hrs.)	Activity (lecture, tutorial, lab practice, field studies/field-trip, Workshop etc.)	Assignment (project, assignment, field study, seminar, etc.)	Suggested Reading (Book, Video, Online source, etc.)
Module I				
Mechanics of Metalcutting	1	Lecture, lab practice	Assignment	https://www.youtube.com/channel/UCCqGTvGZgWw8mFX5KYTHCkw NPTEL: http://nptel.ac.in/courses/112105127/ Raghuvanshi, B.S., A Course in Workshop Technology, Volume 2, 2009, 10 th Edition, Dhanpat Rai & Co., India.
Cutting Tools - Types, Materials	1	Lecture, lab practice	Assignment	NPTEL: http://nptel.ac.in/courses/112105127/ Chattopadhyay, A.B., Machining & Machine Tools, 2012, 1 st Edition, Wiley India Private Limited, India.
Cutting Fluids and	2	practice	Assignment	NPTEL:

Lubricants (Characteristics, Types, Selection Criteria, Dry and near-dry Machining, MQL)				http://nptel.ac.in/courses/112105127/ https://www.youtube.com/watch?v=81Fdif5e85c nptel.ac.in/courses/112104225/21 Rao,PN, Manufacturing Technology, Volume2,2011,2ndEdition, TataMc- Graw HillEducation Private Limited, India.
Experiment1.	4	Practice		
Module II				
Theory of Machinability (Tool Life, Cutting Forces, Power Consumption, Surface Roughness, ThermalAspects).	2	practice	Assignment	NPTTEL: http://nptel.ac.in/courses/112105127/ https://www.youtube.com/watch?v=OnGXJA7oX https://www.youtube.com/watch?v=x4FeoETWk Chattopadhyay,AB, Machining &Machine Tools, 2012, 1st Edition, Wiley India Private Limited, India. Bhattacharya,A, MetalCutting-Theory and Practice,2015, 8th Edition,NewCentral BookAgencyPrivate Limited,India.
Mechanism of cutting onLathe, Milling Machine, Shaper, Planerand Slotter;	2	Lecture	Field Study	
Experiment2	4	Practice		https://www.youtube.com/watch?v=jqRCFwV29hY Chattopadhyay,AB, Machining &Machine Tools, 2012, 1st Edition, Wiley India Private Limited, India. Shaw,MC,MetalCuttingPrinciples,2011, 2nd Edition, Oxford UniversityPress, India.
Module III				
PrinciplesofJigs and Fixtures	1	Practice	Assignment	https://www.youtube.com/watch?v=7yzvno4AvKw nptel.ac.in/courses/112105127/pdf/LM-33.pdf
Drilling(Deep hole drilling& Micro drilling), Boringand reaming Operations	1	Practice	Assignment	https://www.youtube.com/watch?v=p_LgK0Ffg20 https://www.youtube.com/watch?v=XXpOwsD0fWM
Experiment3	4	Practice		https://www.youtube.com/watch?v=hz5rX4QxbNQ https://www.youtube.com/watch?v=dzhh82H2Nuk
Experiment4	4	Practice		

Module IV				
Non-traditional Machining fundamentals- ECM, EDM, LBM and EBM.	6	Practice	Assignment	https://www.youtube.com/watch?v=KXFpTb9cBpY https://www.youtube.com/watch?v=Hc6mfNWT8oQ http://nptel.ac.in/courses/112105126/41 http://nptel.ac.in/courses/112107078/23 https://www.youtube.com/watch?v=mgaukC25Hqk https://www.youtube.com/watch?v=ptEmX9O4nDw
Experiment7.	4	Practice		
Module V				
Additive Manufacturing (3DPrinting, Rapid Prototyping)	3	Lecture	Assignment	http://nptel.ac.in/courses/112104204/47 http://nptel.ac.in/courses/112107078/37 https://www.youtube.com/watch?v=cwguTQEKdOY https://www.youtube.com/watch?v=NkC8TNts4B4
Developments in Additive Manufacturing; Classifications of Additive Manufacturing systems.	2	Lecture	Assignment	https://www.ntnu.no/documents/10401/.../92ff1f88-c0cb-4b28-b605-21c354301281
Experiment8.	4	Practice		
Module VI				
GD&T Concepts (Machining Accuracy; Fundamentals of Measurements; Principles of Tolerancing; Maximum and Minimum Material Requirement)	6	Practice	Assignment	www.pages.drexel.edu/~rcc34/Files/Teaching/MEM201%20L6-Tolerance_RC.pdf https://www.youtube.com/watch?v=-qz8_sbhwY https://www.gdandtbasics.com/gdt-symbols/ https://www.youtube.com/watch?v=M0bVXXmXXdI
Module VII				
Types- NC, CNC, DNC, Machining Centers, Adaptive Control	2	Lecture	Assignment	https://www.youtube.com/watch?v=KXFpTb9cBpY https://www.youtube.com/watch?v=gG0IHYSIQsU Groover, M P, Zimmers, E, CAD/CAM: Computer Aided Design & Manufacturing,

				2011, 9th Edition, Pearson Education Inc., India.
Part Programming–G Codes, M-Codes	3	practice		Groover, M P, Zimmers, E, CAD/CAM: Computer Aided Design & Manufacturing, 2011, 9th Edition, Pearson Education Inc., India.
Experiment9.	4	Practice		
Experiment10.	4	Practice		
Experiment11.	4	Practice		
Experiment12.	4	Practice		
Experiment13.	4	Practice		
Total(hrs)	77			

Design for Manufacturing

SubjectName	Code	Type ofcourse	T-P-Pr (Credit)	Prerequisite
Design for Manufacturing	MECC0403	Theory+ Practice	2+2(4)	Workshop Practice

1. Objective

- To provide the students detailed understanding of primary manufacturing processes and product design from concept-to-mass production.
- To impart knowledge on use and application of software to solve design engineering problems in metal casting, forging and sheet metal forming processes.

2. Course outcomes

- Students will be able to select appropriate manufacturing technology and process to produce a product effectively with quality and optimized production cost.
- Students will have skills and knowledge to use software like CATIA, Novaflow and SolidCV, ProCAST, Flow-3D Cast, DEFORM-3D and PAM-STAMP2G.

3. Evaluation Systems

Internal Examination	Component	% of Marks	Method of Assessment
	Internal Class Test	20	Written Examination
	Internal Practice	20+10	Written Examination+ Learning Record
External Examination	External Theory+ EPR	30+20	Written Examination + Lab. Work & Record
Total		100	

4. Course Outline

Module I(8 Hrs)

Introduction to Design: Problem and Solutions, What is Good Design? Design as Model-making, Design, Creativity, Innovation and Invention. The History of DFM/A, Why Companies Are using DFM/A, The

Boothroyd Dewhurst Design for Manual Assembly Method, Product Complexity, Product Variants, Reusable/Modularity/Standard Design, Product Costs, Quality, Regulatory & Safety Requirements, Aesthetic and Ergonomic Considerations in Design, Design for Maintenance.

Module II (8Hrs)

Design for Manufacture: Assembly, Shipping, Maintenance, Design Efficiency, Materials Selection, Manufacturing Considerations in Design: Role of Processing in Design, Types of Manufacturing Processes, Design for Manufacturability, Design for Castings, Forgings, Sheet Metal Forming, Design for Machining, Powder Metallurgy, Welding, Heat Treatment, Assembly, Corrosion Resistance, Designing with Plastic Processing.

Module III (6Hrs)

Economics of Manufacturing, Product Target Cost Evaluation: Categories of Costs, Methods of Developing Cost Estimates, Cost Indexes, Cost Capacity Factors, Estimating Plant Cost, Design to Cost, Manufacturing Costs, Value Analysis in Costing.

Module IV (8Hrs)

Metal Casting Design: Design for Castability; Introduction to Casting, Types of Casting, Mathematical Modelling of Liquefying the Material, Viscosity and Fluidity Parameter included as Flow Equation, Casting Microstructure and Defects, Casting Design Process; Sprue, Gate, Runner Design according to Flow Equations, Analysis Prediction for Metal Casting, Liquid Phase Fraction, Shrinkage Prediction, Calculating Feeder, Secondary Dendrite Arm Spacing (SDAS).

Module V (15Hrs)

Simulation of Casting Process; STL Part Design Generation from CAD Package, Simulation of Solidification, Calculation of Riser, Design of Gating and Simulation of Mold Filling, Simulation of Riser and Gating System. Components: Die Casting Design and Simulation of Casting of Engine Block using Aluminum Alloy Specifically Al-Si-Cu-Mg-Fe Alloy. Simulation of Casting for Shell Housing.

Practice:

1. Casting Design & Analysis using CATIA, Novaflow and Solid CV, ProCAST, Flow-3D Cast.

Module VI (15 Hrs)

Forging Design: Design Aspect of Forging and their Significance. Procedure of Working out of Forging Drawing and Technology for Open and Close Die Forgings. Developing the Forging Drawing of Some Jobs. Factors Affecting the Metal Flow in Closed Dies. Forgeability, Friction and Lubrication, Die Temperature, Size and Shape Factor, Flash and Gutter. Designing Performing, Finisher, Trimming and Punching Dies; Selection of Forging Equipments; Die Wear, Die Materials, Forging Defects, Heat Treatments of Dies and Forgings.

Practice:

2. Forging Design & Flow Simulation using CATIA and DEFORM-3D.

Module VII (15Hrs) (Sheet Metal Forming) -

Sheet Metal: Design for Formability; Formability of Sheet Metal, Press for Sheet Metal Process, Die & Punch, High Energy Rate Forming Process, Extrusion Process and Bulk Deformation Process. Blank Holder Force Estimation, Incremental Forming Analysis Residual Stress Vs Blanking Force Analysis and Optimization, Hot Stamping Process.

Analysis Prediction: Differential heating and Differential Cooling in Hot Forming Process, Map of Meso Patch on the component, Force Required for Product Shape. Components: B-pillar Trim, Bonnet, Suspension Rocker Arms, Roof Liner, Body Side Outer.

Practice:

3. SheetMetalToolDesign inCAD.
4. UseofCATIAand PAM-STAMP2G

6. Reference

TextBooks:

1. Boothroyd,G,Dewhurst,P,Knight,AW,ProductDesignForManufacture&Assembly,2011,3rd Edition, CRCPress, NW.
2. Chitale, AK, ProductDesign &Manufacturing, 2013,6thEdition, PHIpublication, India.

Reference Books:

1. Bralla, J G, Design for Manufacturability Handbook, 2001, 2nd Edition, Tata McGraw-Hill Companies, Inc.
2. Ulrich,KT,Eppinger,SD,ProductDesign&Development,2016,5thedition,TataMcGraw-Hill Companies, Inc.

7.SessionPlan

Topiccoverage and InternalTest	No. of Sessions (in hrs.)	Activity (lecture, tutorial,lab practice,field studies/field-trip, Workshop etc.)	Assignment (Project, assignment, field study, seminar, etc.)	Suggested Reading (Book, Video, Online source, etc.)
Module I				
Introduction to Design, Problemand Solutions, Whatis Good Design?	02	Lecture		1. http://nptel.ac.in/courses/112101005/ 2. Boothroyd, G, Dewhurst, P, Knight,AW, Product Design ForManufacture &Assembly, 2011, 3 rd Edition, CRCPress, NW.
Design asModel-making, Design, Creativity, Innovation and Invention.The HistoryofDFM/A, WhyCompaniesAre usingDFM/A	02	Lecture		1. Boothroyd,G,Dewhurst,P, Knight, A W, Product DesignForManufacture& Assembly, 2011, 3 rd Edition, CRCPress, NW.

TheBoothroyd DewhurstDesign for ManualAssembly Method,	02	Lecture		1. Boothroyd, G, Dewhurst, P, Knight,AW, Product Design ForManufacture &Assembly, 2011, 3 rd Edition, CRCPress, NW
ProductComplexity, ProductVariants, Reusable/ Modularity/Standard Design, ProductCosts, Quality, Regulatory& SafetyRequirements, Design for Maintenance	02	Lecture		1. Boothroyd,G,Dewhurst,P, Knight, A W, Product DesignForManufacture& Assembly, 2011, 3 rd Edition, CRCPress, NW.
Module II				
Design for Manufacture, Assembly, Shipping, Maintenance, Design Efficiency	02	Lecture		1. http://nptel.ac.in/courses/112101005/20 2. Boothroyd, G, Dewhurst, P, Knight,AW, Product Design ForManufacture &Assembly, 2011, 3 rd Edition, CRCPress, NW.
Materials Selection, Manufacturing Considerationsin Design:Role of Processingin Design, Typesof Manufacturing Processes, Economics of Manufacturing	02	Lecture		1. http://nptel.ac.in/courses/112101005/4 2. Boothroyd, G, Dewhurst, P, Knight,AW, Product Design ForManufacture &Assembly, 2011, 3 rd Edition, CRCPress, NW.
Design for Castings, Forgings, SheetMetal Forming, Design for Machining	02	Lecture		1. Chitale, AK, Product Design &Manufacturing, 2013, 6 th Edition, PHI publication, India. 2. http://nptel.ac.in/downloads/112101005/

Powder Metallurgy, Welding, Heat Treatment, Assembly, Corrosion Resistance,	02	Lecture		<ol style="list-style-type: none"> 1. http://nptel.ac.in/downloads/112101005/ 2. Ulrich,KT,Eppinger,SD, Product Design & Development, 2016, 5th edition, Tata McGraw-Hill Companies, Inc.
Module III				
Product Target Cost Evaluation: Categories of Costs, Methods of Developing Cost Estimates, Cost Indexes, Cost Capacity Factors,	03	Lecture		<ol style="list-style-type: none"> 1. http://www.nptel.ac.in/courses/110101010/downloads/mod3/Module%20III-Lec1.pdf 2. Boothroyd,G,Dewhurst,P, Knight, A W, Product Design For Manufacture & Assembly, 2011, 3rd Edition, CRC Press, NW.
Estimating Plant Cost, Design to Cost, Manufacturing Costs, Value Analysis in Costing.	03	Lecture		<ol style="list-style-type: none"> 3. http://www.nptel.ac.in/courses/110101010/downloads/mod3/Module%20III-Lec1.pdf 4. Boothroyd,G,Dewhurst,P, Knight, A W, Product Design For Manufacture & Assembly, 2011, 3rd Edition, CRC Press, NW.
Module IV				
Design for Castability; Introduction to Casting, Types of Casting	02	Lecture		<ol style="list-style-type: none"> 1. efoundry.iitb.ac.in/TechnicalPapers/1999/1999Sourcecon_DesignForCasting.pdf 2. nptel.ac.in/courses/112101005/12 3. Chitale, A K, Product Design & Manufacturing, 2013, 6th Edition, PHI publication, India.
Mathematical Modelling of Liquefying the Material, Viscosity and Fluidity Parameter included as Flow	03	Lecture		<ol style="list-style-type: none"> 1. Chitale, AK, Product Design & Manufacturing, 2013, 6th Edition, PHI publication, India.

Equation				
Casting Design Process; Sprue, Gate, Runner Design according to Flow Equations, Simulation of Casting Process	03	Lecture		<ol style="list-style-type: none"> 1. Ulrich, K. T., Eppinger, S. D., Product Design & Development, 2016, 5th edition, Tata McGraw-Hill Companies, Inc. 2. Chitale, A. K., Product Design & Manufacturing, 2013, 6th Edition, PHI publication, India.
Module V				
Simulation of Casting Process; STL Part Design Generation from CAD Package, Simulation of Solidification	03	Practice		
Calculation of Riser, Design of Gating and Simulation of Mold Filling, Simulation of Riser and Gating System.	03	Practice		<ol style="list-style-type: none"> 1. Chitale, A. K., Product Design & Manufacturing, 2013, 6th Edition, PHI publication, India.
Analysis Prediction: Liquid Phase Fraction, Shrinkage Prediction, Calculating Feeder, Secondary Dendrite Arm Spacing (SDAS).	03	Practice		
Components: Die Casting Design and Simulation of Casting of Engine Block using Aluminium Alloy Specifically Al-Si-Cu-Mg-Fe Alloy.	03	Practice		
Simulation of Casting for Shell Housing. Casting Design & Analysis using CATIA, Novaflow and Solid CV, ProCAST,	03	Practice		

Flow-3D Cast				
Module VI				
Forging Design: Design Aspect of Forging and their Significance. Procedure of Working out of Forging Drawing and Technology for Open and Close Die Forgings.	03	Practice		1. Chitale, A K, Product Design & Manufacturing, 2013, 6 th Edition, PHI publication, India.
Developing the Forging Drawing of Some Jobs. Factors Affecting the Metal Flow in Closed Dies. Forgeability, Friction and Lubrication	03	Practice		1.
Die Temperature, Size and Shape Factor, Flash and Gutter. Designing Performing, Finisher, Trimming and Punching Dies; Selection of Forging Equipments; Die Wear, Die Materials, Forging Defects	03	Practice		1. nptel.ac.in/courses/107103012/module4/lec7.pdf 2. Chitale, A K, Product Design & Manufacturing, 2013, 6 th Edition, PHI publication, India.
Heat Treatments of Dies and Forgings.	03	Lecture		
Forging Design & Flow Simulation using CATIA and DEFORM-3D	03	Practice		
Module VII				
Sheet Metal: Design for Formability; Formability of Sheet Metal, Press for Sheet Metal Process	02	Lecture		1. web.mit.edu/2.810/www/files/lectures/2015.../lec6-sheet-metal-forming-2015.pdf 2. nptel.ac.in/courses/112107144/4

				3. Boothroyd,G,Dewhurst,P, Knight, A W, Product DesignForManufacture& Assembly, 2011, 3 rd Edition, CRCPress, NW.
Die &Punch, High EnergyRate Forming Process, Extrusion Processand Bulk Deformation Process.	02	Lecture		1. http://nptel.ac.in/courses/112101005/downloads/Module_3_Lecture_5_final.pdf 2. Chitale, AK, Product Design &Manufacturing, 2013, 6 th Edition, PHI publication, India.
Blank Holder Force Estimation, Incremental Forming Analysis Residual Stress vs Blanking Force Analysis and Optimization, Hot StampingProcess. `	02	Lecture		1. Bralla, J G, Design for Manufacturability Handbook, 2001, 2nd Edition, Tata McGraw-Hill Companies, Inc. 2. Boothroyd,G,Dewhurst,P, Knight, A W, Product DesignForManufacture& Assembly, 2011, 3 rd Edition, CRCPress, NW.
Analysis Prediction: Differentialheating and Differential Coolingin Hot FormingProcess,Map ofMeso Patchon the component, Force RequiredforProduct Shape	02	Lecture		
Components: B-pillar Trim, Bonnet, Suspension Rocker Arms, Roof Liner, BodySideOuter.	01	Lecture		
SheetMetalTool Design in CAD	03	Practice		

Use of CATIA and PAM-STAMP 2G	03	Practice		
Total	75hrs			

Finite Element Analysis

Subject Name	Code	Type of course	T-P-Pr (Credit)	Prerequisite
Finite Element Analysis	MECC0404	Theory+Practice	2+2(4)	Nil

1. Course Objective

<ul style="list-style-type: none"> To Educate the Students on Fundamental Principles of Finite Element Analysis. To Impart Knowledge on Use and Application of Software for Analysis, Interpretation of Results through Hands-on Practices/Exercises.

2. Course Outcome

<ul style="list-style-type: none"> Students will be Able to Deploy Practical and Industrial Approach using FEA towards Solving Engineering Problems.

3. Evaluation Systems

Internal Examination	Component	% of Marks	Method of Assessment
	ITH/Cass Test	20	Best of two Written Exam
	IPR	30	Lab Work & Report
External Examination	EPR	20	Lab Work & Report
	ETH	30	External Exam
Total		100	

4. Course Outline

Module I (5 Hours)

Overview to Finite Element Analysis: History of FEA; Introduction to types of FEA Analysis, Role of Computer, General Procedure of Finite Element Method, Advantages and Applications of FEA, Principle of Convergence, Review of Matrix Algebra and Gaussian Elimination.

Module II (9 Hours)

One Dimensional Analysis: Coordinates Systems, Field Variable, Shape Functions, Element Stiffness Matrix and Load Vector, Assembly, Global Equations, Imposition of Boundary Conditions.

Overview to Pre-Processing (About Meshing, Types of Meshing: 1-D, 2-D, 3-D, Special Elements, Meshing Quality Criteria, Material Properties, and Boundary Conditions)

Module III (12 Hours)

Pre-Processing: CAD Geometry Preparation; Meshing and Quality Check; Material Assignment & Boundary Conditions.

Analysis of Bar, Spring, Truss and Beam Elements.

Module IV (15 Hours)

Introduction Types of Analysis & Detail: Linear Static Analysis; Non-Linear Analysis; Dynamic Analysis

Module V (7 Hours)

Thermal Analysis; Computational Fluid Dynamics; Fatigue Analysis; Crash Analysis; NVH Analysis.

Module VI (12 Hours)

Structural Analysis of a Pressure Vessel; Thermal Analysis of a Pressure Vessel; Dynamic Analysis of a Scooter Frame.

Module VII (15 Hours)

Post Processing, Result Interpretation and Testing & Field Data Acquisition.

Solving: Post-Processing, Result Interpretation.

5. Reference

Text Books:

1. Practical Finite Element Analysis, Nitin S. Ghokhale, Published by Finito Infinite, Pune.
2. ANSYS Workbench: A Tutorial Approach, Sham Tickoo, CADCIM Technologies

Reference Books:

1. Applied Finite Element Analysis, Larry J. Segerlind, John Wiley and Sons, Inc.
2. Finite Element Analysis: Theory and Application with ANSYS, Saeed Moaveni, Prentice Hall, Inc.

7. Session Plan

Topic coverage and Internal Test	No. of Sessions (in hrs.)	Activity (lecture, tutorial, lab practice, field studies/field -trip, Workshop etc.)	Assignment (Project, assignment, field study, seminar, etc.)	Suggested Reading (Book, Video, Online source, etc.)
Module I				
Overview to Finite Element Analysis	02	lecture	field study	Ghokhale S. Practical Finite Element Analysis Published by Finito Infinite-Pune.
History of FEA	01	lecture	field study	Ghokhale S. Practical Finite Element Analysis Published by Finito Infinite-Pune
Introduction to types of FEA Analysis, Role of Computer, General Procedure of Finite	02	lecture	Assignment	Ghokhale S. Practical Finite Element Analysis Published by Finito Infinite-Pune

Element Method, Advantages and Applications of FEA, Principle of Convergence, Review of Matrix Algebra and Gaussian Elimination				
Module II				
One Dimensional Analysis: Coordinates Systems, Field Variable, Shape Functions, Element Stiffness Matrix and Load Vector, Assembly, Global Equations, Imposition of Boundary Conditions.	03	lecture	Assignment	Ghokhale S. Practical Finite Element Analysis Published by Finiteto Infinite-Pune
Overview to Pre-Processing: About Meshing, Types of Meshing: 1-D, 2-D, 3-D, Special Elements, Meshing Quality Criteria, Material Properties, Boundary Conditions	06	lecture	Assignment	Ghokhale S. Practical Finite Element Analysis Published by Finiteto Infinite-Pune
Module III				
Lab/Practical Session: Pre-Processing: CAD Geometry Preparation, Meshing & Quality Check, Material Assignment & Boundary	12	Practice	Assignment	Ghokhale S. Practical Finite Element Analysis Published by Finiteto Infinite-Pune
Module IV				
Introduction Types of Analysis & Detail: Linear Static Analysis, Non-Linear Analysis, Dynamic Analysis	7	lecture	Assignment	Ghokhale S. Practical Finite Element Analysis Published by Finiteto Infinite-Pune
Lab/Practical Session: Analysis of Industry FEA Exercises on: Linear Static Analysis, Dynamic Analysis, Report	8	Practice	Assignment	Ghokhale S. Practical Finite Element Analysis Published by Finiteto Infinite-Pune
Module V				
Thermal Analysis, Computational Fluid Dynamics, Fatigue Analysis, Crash Analysis, NVH Analysis	7	lecture	Assignment	Ghokhale S. Practical Finite Element Analysis Published by Finiteto Infinite-Pune
Module VI				
Lab/Practical Session:	12	Practice	Assignment	Ghokhale S. Practical Finite

Solver:SolvingFEA problem				Element Analysis Published by Finiteto Infinite-Pune
Module VII				
PostProcessing,Result Interpretation,Testing& Field Data Acquisition	3	lecture	Assignment	Ghokhale S. Practical Finite Element Analysis Published by Finiteto Infinite-Pune
Lab/PracticalSession: Solving: Post-Processing, Result Interpretation	12	Practice	Assignment	Ghokhale S. Practical Finite Element Analysis Published by Finiteto Infinite-Pune
TotalHours	75			

Digital Manufacturing

SubjectName	Code	Type ofcourse	T-P-Pr (Credit)	Prerequisite
DigitalManufacturing	MECC0405	Theory+ Practice	2+1(3)	Nil

1. Objective

- Toeducatethestudents onentirestagesofproductlifecycle beginningfromconceptstage, design, testing, validation, manufacturing, servicingetc.
- Toeducatethestudents on Industry4.0 standards.

2. Course Outcomes

- StudentswillbeabletousemodernsoftwarelikeDELMIA-Quest(DassaultSystem)and Camtesia to conceptualiseand create3Dfactorylayouts andoptimise resourceplanning.
- Students willbeable todosimulation ofmanufacturingprocessesusingsoftwaretools.

3. Evaluation Systems

InternalExamination	Component	%ofMarks	Method ofAssessment
	InternalTheory	20	Written Examination
	InternalPractice	20+10	Reportand Presentation
External Examination	ExternalTheory	30	Written Examination
	ExternalPractice	20	Reportand Presentation
Total		100	

4. CourseOutline

Module 1 (3hours)

Introduction toProductDevelopment: ProductDesign concept – System&Sub-systems, Design Validation,Prototyping,Facility&ProcessPlanning,ToolingDevelopment,Manufacturing,Quality, Serviceability.

New Product Introduction (NPI): Concept, Simultaneous Engineering, Cost Engineering – Value AnalysisValue Engineering(VAVE),TearDown &BenchMarking.

Module 2 (6hours)

Digital Manufacturing: Overview, Industry challenges, End to End solution for various industry, Benefits,IndustryCasestudies,IntroductionofIndustry4.0,Convention&EmergingTechnological Solution.

Product Life Cycle (PLM): Overview, Life Cycle Stages, BOM & CAD Management, Change Management, Technological Solution.

Module 3 (6 hours)

Industry 4.0: 4th Industrial Revolution & its Pillars, Overview of Digitization & Simulation, The Industrial Internet of Things, Augmented Reality, 3D-Printing-Additive Manufacturing, Autonomous Robots, Cyber Security, Big Data Analysis, Cloud Server & Data, Horizontal & Vertical systems Integration, C-Flex, Flexible Manufacturing System (FMS)

Module 4 (15 Hours)

Process Planning: Overview, Capacity Planning, Process/Operations, Process Planning, Assembly & Job shop planning, Cycle Time, Standard Man Hour (SMH), Time Analysis–MOST Maynard Operation Sequence Technique (MOST) Technique, Balancing, Shop floor Process and Quality Documentation (PFD, PFMEA, CP)

Digital Twin: Introduction of Facility/Layout Planning, Digital Factory with Plant Facilities & resources, Assembly/Di-assembly, Tool, Process Manufacturability Simulation, Ergonomics Analysis, Visibility & Reachability Simulation, Robotics Simulation, Virtual Commissioning, E-Learning / 3D Work Instruction,

Module 5 (11 Hours)

Material/Factory Flow Simulation: Lab Session using DELMIA-Quest (Dassault Systeme) & Camtasia, Discrete Event Simulation, Factory Layout and Alternate Material Handling Systems, Factory Flow & Logistics Simulation, Virtual Factories in 3D Environment and Analyses, Bottleneck Identification and Corrective Actions, Labor Requirements or Resource Requirements, Throughput of the Production System, Productivity and Utilizations.

Lean Manufacturing: Introduction: Overview of a pre-built Model, Modeling Methodology, Running a Model, Creating Reports and Charts.

Module 6 (11 Hours)

Material Handling Systems: Modeling Labor, Modeling Conveyor Systems, Creating Pallets, Modeling AGV, Modeling Power and Free Systems, Getting Started: Setting the Startup Options, Creating the Library, Creating Basic Simulation Mode.

Animation & Kinematics: Building Basic CAD, Positioning Way Points, Building Kinematics Device, Assigning Resource Kinematics, Creating & Playing a Script, Adding a Grab and Release.

Module 7 (10 Hours)

Shifts and Schedules: Creating Shifts, Setting Schedules, Handling Interrupts, Handling Failures, Preview of Advanced Usage: Creating CRANES, Creating Reports, Debugging, Data Interface Methodology (in or out excel), Using Simulation Control Language (SCL), Using Batch Control Language (BCL), Report & Video Creation.

6. Text Books:

1. Zhou, Z, Fundamentals of Digital Manufacturing Science, 2011, Springer Series in Advanced Manufacturing.
2. Jain, RK, Production Technology, 17th Edition, 2009, Khanna Publishers.

Reference Books:

1. Kalpakjian, S., Schmid, S.R., Manufacturing Engineering & Technology, 4th Edition, 2013, Pearson Education.
2. Chitale, A.K., Gupta, R.C., Product Design & Manufacturing, 6th Edition, 2013, PHI Learning Private Limited.

Online Source: NPTEL, YouTube

Note: Use of Approved Statistical Table Permitted in the Examination.

7. Session Plan

Sl. No	Topic coverage and Internal Test	No. of Sessions (in hrs.)	Activity (lecture, tutorial, lab practice, field studies/field-trip, Workshop etc.)	Assignment (Project, field study, seminar, etc.)	Suggested Reading (Book, Video, Online source, etc.)
Module-I					
1	Introduction to Product Development: Product Design concept – System & Sub systems, Design Validation, Prototyping, Facility & Process Planning, Tooling Development, Manufacturing, Quality, Serviceability.	2	Lecture & Lab practice	Project	https://www.youtube.com/watch?v=G3s4aPgcniw Chitale, A.K., Gupta, R.C., Product Design & Manufacturing, 6 th Edition, 2013, PHI Learning Private Limited.
2	New Product Introduction (NPI): Concept, Simultaneous Engineering, Cost Engineering – Value Analysis Value Engineering (VAVE), Tear Down & Bench Marking.	1	Lecture & Lab practice	Project	https://www.youtube.com/watch?v=G3s4aPgcniw https://www.youtube.com/watch?v=TT6tVH6cDMM https://www.youtube.com/watch?v=ia7sQuiHVY Chitale, A.K., Gupta, R.C., Product Design & Manufacturing, 6 th Edition, 2013, PHI Learning Private Limited.
Module-II					
3	Digital Manufacturing: Overview, Industry challenges, End to End solution for various industry, Benefits, Industry Case studies, Introduction of Industry 4.0, Convention & Emerging Technological Solution.	3	Lecture & Lab practice	Project	https://www.youtube.com/watch?v=HPRURtORnis Zhou, Z., Fundamentals of Digital Manufacturing Science, 2011, Springer Series in Advanced Manufacturing.
4	Product Life Cycle (PLM): Overview, Life Cycle	3	Lecture & Lab	Project	https://www.youtube.com/watch?v=_26E6QR_hmU

	Stages, BOM & CAD Management, Change Management, Technological Solution.		practice		https://www.youtube.com/watch?v=kVereJE1ZI
Module-III					
6	Industry 4.0: 4th Industrial Revolution & its Pillars, Overview of Digitization & Simulation, The Industrial Internet of Things, Augmented Reality, 3D-Printing-Additive Manufacturing, Autonomous Robots, Cyber Security, Big Data Analysis, Cloud Server & Data, Horizontal & Vertical systems Integration, C-Flex, Flexible Manufacturing System (FMS)	6	Lecture & Lab practice	Project	https://www.youtube.com/watch?v=h9t06cyC7Es https://www.youtube.com/watch?v=pj8ApxsymB4 https://www.youtube.com/watch?v=G0EJmBoLq-g https://www.youtube.com/watch?v=r9wrgtz7Qx4 https://www.youtube.com/watch?v=WYnOGAvQEgk https://www.youtube.com/watch?v=6IRvZcRgEbs
Module-IV					
7	Process Planning: Overview, Capacity Planning, Process/Operations, Process Planning, Assembly & Job shop planning, Cycle Time, Standard Man Hour (SMH), Time Analysis – MOST Maynard Operation Sequence Technique (MOST) Technique, Balancing, Shop floor Process and Quality Documentation (PFD, PFMEA, CP)	7	Lab Practice	Project	https://www.youtube.com/watch?v=8MeHL0j-oKE https://www.youtube.com/watch?v=TPkxWAJvPw https://www.youtube.com/watch?v=m-ni_0no-JE https://www.youtube.com/watch?v=SiJXVdfCCiA
8	Digital Twin: Introduction of Facility/Layout Planning, Digital Factory with Plant Facilities & resources, Assembly/Di-assembly, Tool, Process Manufacturability Simulation, Ergonomics Analysis, Visibility & Reachability Simulation, Robotics Simulation, Virtual Commissioning, E-Learning / 3D Work Instruction.	8	Lecture & Lab practice	Project	https://www.youtube.com/watch?v=r2GRLxAsEs https://www.youtube.com/watch?v=SK9fxHw-Nxk https://www.youtube.com/watch?v=UZs-cCsMqaI https://www.youtube.com/watch?v=l_ePLMV7NnA https://www.youtube.com/watch?v=11ttgmRJFOk
Module-V					

9	Material/Factory Flow Simulation: Lab Session using DELMIA-Quest (Dassault Systeme) & Camtesia, Discrete Event Simulation, Factory Layout and Alternate Material Handling Systems, Factory Flow & Logistics Simulation, Virtual Factories in 3D Environment and Analyses, Bottleneck Identification and Corrective Actions, Labor Requirements or Resource Requirements, Throughput of the Production System, Productivity and Utilizations.	6	Lecture & Lab practice	Project	https://www.youtube.com/watch?v=zGQP6sURiLQ https://www.youtube.com/watch?v=kBby1Cdc44M https://www.youtube.com/watch?v=wfxlzV2mlc
10	Lean Manufacturing: Introduction: Overview of a pre-built Model, Modeling Methodology, Running a Model, Creating Reports and Charts.	5	Lecture & Lab practice	Project	https://www.youtube.com/watch?v=iFydS5Hq1SY
Module-VI					
11	Material Handling Systems: Modeling Labor, Modeling Conveyor Systems, Creating Pallets, Modeling AGV, Modeling Power and Free Systems, Getting Started: Setting the Startup Options, Creating the Library, Creating Basic Simulation Mode.	5	Lecture & Lab practice	Project	https://www.youtube.com/watch?v=PusvVnC_4Uc https://www.youtube.com/watch?v=nFu4FFgbMY4 https://www.youtube.com/watch?v=1RGlRH3FDoU
12	Animation & Kinematics: Building Basic CAD, Positioning Way Points, Building Kinematics Device, Assigning Resource Kinematics, Creating & Playing a Script, Adding a Grab and Release.	6	Lecture & Lab practice	Project	https://www.youtube.com/watch?v=ysjqH3iKv4k
Module-VII					
13	Shifts and Schedules: Creating Shifts, Setting Schedules, Handling Interrupts, Handling Failures, Preview of Advanced Usage: Creating	10	Lecture & Lab practice	Project	https://www.youtube.com/watch?v=wVICveldyyM https://www.youtube.com/watch?v=6WIF7m9vD4U https://www.youtube.com/watch?v=V1TJ6b6_EjM

	CRANES, Creating Reports, Debugging, Data Interface Methodology (in or out excel), Using Simulation Control Language (SCL), Using Batch Control Language (BCL), Report & Video Creation.				
	Total Hours	62			

Internal Combustion Engines

Subject Name	Code	Type of Course	Credit	Prerequisite
Internal Combustion Engines	MECC0406	Theory+Practices	1+1(2)	Thermodynamics

1. Objective

- ✓ To educate the students on operating principles, technology behind internal combustion engines.
- ✓ To educate the students on construction and various sub-systems of internal combustion engines.

2. Course Outcomes

- ✓ Students will be able to test internal combustion engines for various performance parameters using engine test rigs.
- ✓ Students will be able to carry out emission tests using various types of fuels commonly used in internal combustion engines.

3. Evaluation Systems

Examination	Theory	Marks	Method of Assessment
	Internal	20	Written examination
External	30	Written examination+L.R+Assignment	
Practice	Internal	Marks	Method of Assessment
	Internal	30	Experiment+L.R+VIVA
External	20	Experiment+L.R+VIVA	
Total		100	

4. Course outline

Module I (16 Hours)

Performance Parameters and Characteristics: Introduction, Engine Power, Engine Efficiency, Engine Performance Characteristics, Variables Affecting Performance Characteristics, Methods of Improving Engine Performance, Heat Balance.

Practice:

1. Study of Two/Four Stroke Petrol/Diesel Engine.
2. Port and Valve Timing Diagram of Two and Four-Stroke Petrol/Diesel Engines.

3. Load Test on Petrol Engine.
4. Load Test on Diesel Engine
5. Morse Test on Multi-Cylinder Petrol/Diesel Engine
6. Heat Balance Study of Petrol/Diesel Engine

Module II (8 Hours)

Fuel: Fuels of SI and CI Engine, Properties, Potential and Advantages of Alternative Liquid and Gaseous Fuels for SI and CI Engines.

Practice:

7. Preparation of Alternate Liquid Fuel.
8. Determination of Octane Number and Cetane Number of Fuel
9. Determination of Kinematic Viscosity, Density of Bio-Diesel and Bio-Ethanol

Module III (5 Hours)

Mechanical Injection Systems: Functional Requirements of an Injection System, Classification of Injection Systems, Fuel Feed Pump, Injection Pump, Injection Pump, Governor, Fuel Injector, Nozzle.

Practice

10. Study of Mechanical Injection System

Module IV (3 Hours)

Electronic Injection Systems: Multi-Point Fuel Injection (MPFI) System, ECU, Injection Timing, Group Gasoline Injection System.

Practice:

11. Study of Electronic Injection System

Module V (3 Hours)

Ignition: Energy Requirement for Ignition, Battery Ignition Systems, Modern Ignition Systems, Firing Order.

Practice:

12. Study of Battery Ignition System of IC Engine

Module VI (4 Hours)

Combustion: Stages of Combustion in SI and CI Engines, Flame Propagation and Ignition Delay, Abnormal Combustion, Phenomena of Knock in SI & CI Engines, Detonation, Diesel Knock & Methods to Control Diesel Knock. SI & CI Engine Combustion Chambers.

Module VII (08 Hours)

Cooling & Lubricating Systems: Air Cooling & Water Cooling Systems, Properties of Lubricants and Different Types of Lubricating System.

Engine Emission and Control: Mechanism of Pollutant Formation and its Harmful Effects. Methods of Measuring Pollutants and Control of Engine Emission.

Practice:

13. Comparative Study of Emissions from Engines using Fossil Fuel and Alternative Fuel.

14. Measuring Exhaust Emissions of an Engine by using Gas Analyzer.

6. Reference

Text Books:

1. Internal Combustion Engines, V. Ganeshan, TMH, 3rd Edition
2. A Textbook of Internal Combustion Engine, R.K. Rajput, LP, 2nd Edition

Reference Books:

1. A Course in IC Engines, V.M. Domkundwar, Dhanpat Rai and Sons

7. Session Plan

Topic coverage and Internal Test	No. of Sessions (in hrs.)	Activity (lecture, tutorial, lab practice, field studies/field-trip, Workshop)	Assignment (project, assignment, field study, seminar, etc.)	Suggested Reading (Book, Video, Online source, etc.)
Module I Introduction, Engine Power, Engine Efficiency, Engine Performance Characteristics, Variables Affecting Performance Characteristics, Methods of Improving Engine Performance, Heat Balance.	16 (theo-4, practice-12)	lecturer+ lab Practice	Assignment with problem solving	Internal Combustion Engines, V. Ganeshan, TMH, 3 rd Edition A Textbook of Internal Combustion Engine, R. K. Rajput, LP, 2 nd Edition https://www.youtube.com/watch?v=PgvD9mx9Doo
Module II Fuel of SI and CI Engine, Properties, Potential and Advantages of Alternative Liquid and Gaseous Fuels for SI and CI Engines.	8 (theo-2, practice-6)	lecturer+ lab Practice	Assignment	Internal Combustion Engines, V. Ganeshan, TMH, 3 rd Edition A Textbook of Internal Combustion Engine, R. K. Rajput, LP, 2 nd Edition
Module III Functional Requirements of an Injection System, Classification of Injection Systems, Fuel Feed Pump, Injection Pump, Injection Pump, Governor, Fuel Injector, Nozzle.	5 (theo-3, practice-2)	lecturer+ lab Practice	Assignment	Internal Combustion Engines, V. Ganeshan, TMH, 3 rd Edition A Textbook of Internal Combustion Engine, R. K. Rajput, LP, 2 nd Edition https://www.youtube.com/watch?v=P5-yxENaLDU&t=49s
Module IV Multi-Point Fuel Injection (MPFI) System, ECU, Injection Timing, Group	3 (theory-1, practice-2)	lecturer+ lab Practice	Assignment	Internal Combustion Engines, V. Ganeshan, TMH, 3 rd Edition A Textbook of Internal Combustion Engine, R. K.

Gasoline Injection System.				Rajput, LP, 2 nd Edition
Module V Energy Requirement for Ignition, Battery Ignition Systems, Modern Ignition Systems, Firing Order.	3(theory-1, practice-2)	lecturer+ lab Practice	Assignment	Internal Combustion Engines, V. Ganeshan, TMH, 3rd Edition A Textbook of Internal Combustion Engine, R. K. Rajput, LP, 2 nd Edition
Module VI Stages of Combustion In SI and CI Engines, Flame Propagation and Ignition Delay, Abnormal Combustion, Phenomena of Knock In SI & CI Engines, Detonation, Diesel Knock & Methods to Control Diesel Knock. SI & CI Engine Combustion Chambers.	4(theory-4 hour)	lecturer	Assignment	Internal Combustion Engines, V. Ganeshan, TMH, 3rd Edition A Textbook of Internal Combustion Engine, R. K. Rajput, LP, 2 nd Edition https://www.youtube.com/watch?v=ZxkLgv8c3OE
Module 7 Air Cooling & Water Cooling Systems, Properties of Lubricants and Different Types of Lubricating System	2(theory-2 hour)	lecture	Assignment	Internal Combustion Engines, V. Ganeshan, TMH, 3rd Edition
Mechanism of Pollutant Formation and Its Harmful Effects. Methods of Measuring Pollutants and Control of Engine Emission.	6(theory-2, practice-4)	lecturer+ lab Practice	Assignment	Internal Combustion Engines, V. Ganeshan, TMH, 3rd Edition A Textbook of Internal Combustion Engine, R. K. Rajput, LP, 2 nd Edition

Design of Thermal Energy Systems

Subject Name	Code	Type of course	T-P-Pr (Credit)	Prerequisite
Design of Thermal Energy Systems	MECC0407	Theory+ Practice	2+1(3)	Thermodynamics

1. Objective

- To educate the students on principles, technology and applications of various thermal energy systems as used in industry.
- To impart technical knowledge and skills on design of various thermal energy systems

2. Course Outcomes

- Students will be able to identify and select, design and implement appropriate thermal energy system corresponding to specific need.
- Students will be able to take up testing, maintenance of thermal energy systems with minimum

additional input.

3. Evaluation Systems

Internal Examination	Component	% of Marks	Method of Assessment
	Midterm Test	20 (ITH)	Written examination
	Assignment		Report and Presentation
	Experiments	30 (IPR)+20 (EPR)	Lab work, report
	Project		Report and presentation
	Quiz		Surprise/preannounced ones
External Examination		30	Written examination
Total		100	

4. Course outline

Module I (12 Hours)

Heat Exchangers: Classification and Thermal Design of Heat Exchangers, Overall Heat Transfer Coefficient, Fouling Factor or Dirt Factor, Temperature Profiles in Heat Exchangers, LMTD Correction Factor, Pressure Drop in Heat Exchanger, Correlation for Tube Side Pressure Drop, Correlation for Shell Side Pressure Drop, Heat Transfer Effectiveness and Number of Transfer Units, Calculation and Designing of the Heat Exchanger, Double-Pipe Heat Exchanger.

Practice:

1. Determination of Overall Heat Transfer Coefficient of Concentric Tube Heat Exchanger
2. Determination of Effectiveness and Efficiency of Cross Flow Heat Exchanger
3. Determination of Overall Heat Transfer Coefficient of Shell and Tube Heat Exchanger

Module II (6 Hours)

Vapor Power Cycles: Introduction, Power Cycles, Carnot Vapor Cycle and its Limitations, Rankine Cycle, Means of Increasing Rankine Cycle Efficiency, Reheat Cycle, Regenerative Feed Heating Cycle, Binary Vapor Cycle, Gas-Vapor Coupled Cycles, Cogeneration.

Module III (6 Hours)

Air Refrigeration System: Introduction, Unit of Refrigeration, Coefficient of Performance, Refrigerants, Characteristics of Different Refrigerants, Ozone Depletion Potentials, Green House Potential Refrigerants, Use of Non-Polluting Refrigerants, Reversed Carnot Cycle, Bell Coleman Air Refrigerator

Module IV (12 Hours)

Vapor Compression System: Analysis of Theoretical Vapor Compression Cycle, Representation of Cycle on T-S and P-H Diagram, Simple Saturation Cycle, Sub-Cooled Cycle and Super-Heated Cycle, Effect of Suction and Discharge Pressure on Performance.

Practice:

4. Determination of C.O. P of Vapor Compression Refrigeration System
5. Determination of C.O. P and Capacity of an Ice Plant
6. Leak Detection and Charging of Refrigerants in a Domestic Refrigerator
7. Handson Practice on Soldering and Brazing

Module V (4 Hours)

Vapor Absorption System: Simple Ammonia Absorption System, Improved Absorption System, Electrolux Refrigerator, Lithium-Bromide Absorption Refrigeration System.

Module VI (10 Hours)

Air Conditioning: Factors Affecting the Air Quality, Dry Bulb Temperature, Wet Bulb Temperature, Relative Humidity, Dew Point Temperature, Specific Humidity, Absolute Humidity, Specific Enthalpy, Pressure, Ventilation, Study on Psychrometric Chart,

Practice:

8. Calculation of C.O.P. Of Air Conditioning System
9. Performance Test of Window Type Air Conditioner
10. To Carry Out Cooling Process of Fresh Air and Find Out Relevant Parameter of Air
11. To Carry Out Heating Process of Fresh Air and Find Out Relevant Parameter of Air

Module VII(10Hours)

Heating and Cooling Load Calculation: Building Heat and Cooling Load Calculation, Air Distribution System, Calculation for Duct Size, Water and Air Cooled Chillers, Cooling Towers.

Practice:

12. Determination of Efficiency of Cooling Tower
13. Calculation of Cooling Load of a Confined Space

6. Reference**Text Books:**

1. J P Holman and Souvik Bhattacharyya, Heat Transfer, McGraw-Hill Education (India) Private Limited; 10th Edition; 2011.
2. Refrigeration and Air Conditioning by C.P Arora, McGraw Hill
3. Engineering Thermodynamics, P.K. Nag, Tata McGraw Hill Companies

Reference Books:

1. Wilbert F. Stoecker and J.W. Jones, Refrigeration and Air Conditioning, 2nd Edition, (ISBN: 9780070665910) McGraw-Hill Higher Education
2. Thermodynamics: An Engineering Approach, Y.A Cengel, M. A Boles, Tata McGraw Hill Companies.

7. Session Plan

Topic coverage and Internal Test	No. of Sessions (in hrs.)	Activity (lecture, tutorial, lab practice, field studies/field-trip, Workshop etc.)	Assignment (project, assignment, field study, seminar, etc.)	Suggested Reading (Book, Video, Online source, etc.)
Module I(12Hours)				
Heat Exchangers: Classification and thermal design of heat exchangers, Overall heat transfer coefficient, Fouling factor or dirt factor, Temperature profiles in heat exchangers, LMTD correction factor, Pressure drop in heat exchanger, Correlation for tube side pressure drop, Correlation for shell side pressure drop, Heat transfer	12 (Th-6, Pr-6)	Lecture + Lab Practice	Assignment, Project	J P Holman and Souvik Bhattacharyya, Heat Transfer, McGraw-Hill Education (India) Private Limited; 10th Edition; 2011. https://www.youtube.com/watch?v=-AdmxCJIWBk https://www.youtube.com/watch?v=eraQJ3Z9Mb8 https://www.youtube.com/watch?v=o0UJDQfwPaM

effectiveness and number of transfer units, Calculation and designing of the heat exchanger, Double-pipe heat exchanger				
Module II (6 Hours)				
Vapor Power Cycles: Introduction, power cycles, Carnot vapor cycle and its limitations, Rankine cycle, Means of increasing Rankine cycle efficiency, Reheat cycle, Regenerative feed heating cycle, Binary vapor cycle, Gas-vapor coupled cycles, Cogeneration	6 (Th-6)	Lecture	Assignment	Engineering Thermodynamics, P.K. Nag, Tata McGraw Hill Companies Thermodynamics: An Engineering Approach, Y.A Cengel, M. A Boles, Tata McGraw Hill Companies. https://www.youtube.com/watch?v=ouWOhk1INjo https://www.youtube.com/watch?v=ZJtobHMiXyQ https://www.youtube.com/watch?v=HtXjbA3h3wQ
Module III (6 Hours)				
Air Refrigeration System: Introduction, unit of refrigeration, coefficient of performance, refrigerants, characteristics of different refrigerants, ozone depletion potentials, green house potential refrigerants, use of non-polluting refrigerants, reversed Carnot cycle, Bell Coleman air refrigerator, problem illustration and solution.	6 (Th-6)	Lecture	Assignment	Refrigeration and Air Conditioning by C.P Arora, McGraw Hill https://www.youtube.com/watch?v=a17i7yHvCns
Module IV (12 Hours)				
Vapor Compression System: Analysis of theoretical vapor compression cycle, representation of cycle on T-S and p-h diagram, simple saturation cycle, sub-cooled cycle and super-	12 (Th-4, Pr-8)	Lecture + Lab Practice	Assignment	Refrigeration and Air Conditioning by C.P Arora, McGraw Hill https://www.youtube.com/watch?v=cobFAMZDS0o

heated cycle, effect of suction and discharge pressure on performance				
Module V (4Hours)				
Vapor Absorption System: Simple ammonia absorption system, improved absorption system, electrolux refrigerator, lithium-bromide absorption refrigeration system	4 (Th-4)	Lecture	Assignment	Refrigeration and Air Conditioning by C.P Arora, McGraw Hill https://www.youtube.com/watch?v=L18Ku-mFQxE https://www.youtube.com/watch?v=TFxbHp8uIyQ
Module VI (10 Hours)				
Air Conditioning: Factors affecting the air quality, dry bulb temperature, wet bulb temperature, relative humidity, dew point temperature, specific humidity, absolute humidity, specific enthalpy, pressure, ventilation, study on psychometric chart	10 (Th-3, Pr-7)	Lecture + Lab Practice	Assignment	Refrigeration and Air Conditioning by C.P Arora, McGraw Hill Wilbert F. Stoecker and J.W. Jones, Refrigeration and Air Conditioning, 2nd Edition, (ISBN:9780070665910) McGraw-Hill Higher Education https://www.youtube.com/watch?v=fqvo7bSr6t8 https://www.youtube.com/watch?v=YrDZ9u2_GAQ
Module VII (10Hours)				
Heating and Cooling Load Calculation: Building heat and cooling load calculation, air distribution system, calculation for duct size, water and air cooled chillers, cooling towers.	10 (Th-4, Pr-6)	Lecture + Lab Practice	Assignment	Refrigeration and Air Conditioning by C.P Arora, McGraw Hill Wilbert F. Stoecker and J.W. Jones, Refrigeration and Air Conditioning, 2nd Edition, (ISBN:9780070665910) McGraw-Hill Higher Education https://www.youtube.com/watch?v=jygiuS-9ubU https://www.youtube.com/watch?v=1cvFIBLo4u0

Total(hrs)	60			
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Renewable Energy Systems

SubjectName	Code	Type ofcourse	Credit	Prerequisite
Renewable EnergySystems	MECC0408	Theory&Practice	2+1(3)	Nil

1. Objective

1. To expose the students about energy demand and supply situation in India.
2. To expose students about Renewable energy systems in use.

2. Course outcomes

- To have a knowledge of energy scene in India.
- To acquire the skill of analyzing and designing renewable energy systems.

3. Evaluation Systems

Internal Examination	Component	% of Marks	Method of Assessment
	Midterm Test	20 (ITH)	Written examination
	Assignment		Report and Presentation
	Experiments	30 (IPR)+20 (EPR)	Lab work, report
External Examination		50	Written examination
Total		100	

4. Course outline

Module I (8 Hrs)

Energy Demand and Supply Situation in India: Sectorial energy demands in India, Different Energy sources in India, Systems view of energy, Institutions and policies affecting energy systems.

Solar Energy: Basic Principle of solar energy and its conversion to thermal and electrical energy.

Module II (10 Hrs)

Photovoltaic system: Principle of Photovoltaic effect, Types and Application: Domestic and Industrial, Photovoltaic system and its Components, PV system and its Design, PV system Installation and Testing.

Practice:

1. Photo-Voltaic Power Output Vs Tilt Angle, Ambient Temperature and Shade.
2. Solar PV System Installation and Performance test.

Module III (9 Hrs)

Solar Thermal System: Types of Collector and its Application, Design of different types of Collectors, Testing and Installation of Solar Thermal System.

Practice:

3. Thermal Analysis of Solar Flat Plate Collector Using ANSYS.
4. Performance Test of a Solar Dryer.

Module IV (4 Hrs)

Wind Energy: Basic Principle of Wind Energy Conversion, Wind Data and Energy Estimation, Wind Energy Sources and Potential, Wind Power Systems: System components, Types of Turbine, Turbine Rating, Choice of Generators,

Module V (8Hrs)

Variable speed operation, maximum power operation, control systems, Application of Wind energy in different sectors, system design features, testing and installation of Wind systems.

Practice:

5. Simulation for Wind Turbine Generator with DC Motor in Solar/Wind Energy Mobile Workstation.

Module VI (8Hrs)

Bio Energy: Basic Principle of Biomass Generation and Conversion, Sources and Potential of Bio-Gas, Application of Bio-Gas in different Sectors.

Practice:

6. Performance Testing of Bio gas Plant.

Module VII (9Hrs)

Types of Conversion: Thermal, Thermochemical Process, and Fermentation: Aerobic and Anaerobic digestion, Design and Construction details of Main Digester, Testing and installation of Bio-Gas Plant.

Practice:

7. Energy Analysis of Different Biomass Products.

6. References

Text Books:

1. Non-conventional Energy sources by Rai G.D, 2nd edition (1999) Khanna Publishers, New Delhi.
2. Renewable Energy Sources and Emerging Technologies by Kothari, D.P., Singal, K.C. and Ranjan, Prentice hall, New Delhi, 2nd Edition, 2008.

Reference Books:

1. Solar Energy by Sukhatme, S.P., 2nd Edition, TMH, 2003.
2. Solar Photovoltaic – Fundamentals, Technologies and Applications by CS Solanki, 3rd Edition 2015.
3. Online Source: NPTEL, You tube

7. Session Plan

Topic coverage and Internal Test	No. of Sessions (in hrs.)	Activity (lecture, tutorial, lab practice, field studies/field-trip, Workshop etc.)	Assignment (Project, assignment, field study, seminar, etc.)	Suggested Reading (Book, Video, Online source, etc.)
Module I(8Hrs)				
Energy Demand and Supply Situation in India energy demands in India	2	Lecturer		1. Renewable Energy Sources and Emerging Technologies by Kothari, D.P., Singal, K.C. and Ranjan, Prentice hall, New Delhi, 2nd edition, 2008.
Energy sources in India	1	Lecturer		1. Renewable Energy Sources and Emerging Technologies by Kothari, D.P., Singal, K.C. and Ranjan, Prentice hall, New Delhi, 2nd Edition, 2008.
Systems view of energy.	2	Lecturer		1. Renewable Energy Sources and Emerging Technologies by Kothari, D.P., Singal, K.C. and Ranjan, Prentice hall, New Delhi, 2 nd Edition, 2008.
Institutions and policies affecting energy systems	1	Lecturer	Assignment	1. Renewable Energy Sources and Emerging Technologies by Kothari, D.P., Singal, K.C. and Ranjan, Prentice hall, New Delhi, 2nd Edition, 2008.
Solar Energy Basic Principle of solar energy and its conversion to thermal and electrical energy.	2	Lecturer		2. Solar Photovoltaic – Fundamentals, Technologies and Applications by CS Solanki, 3rd Edition 2015.
Module II(10Hrs)				
Photovoltaic system: Principle of Photovoltaic effect, Types and application: domestic and industrial	1	Lecturer		2. Solar Photovoltaic – Fundamentals, Technologies and Applications by CS Solanki, 3rd Edition 2015. https://www.youtube.com/watch?v=Rq5Nzv_6v98
Photovoltaic system	1	Lecturer	Field study	2. Solar Photovoltaic –

and its components				Fundamentals, Technologies and Applications by CS Solanki, 3rdEdition2015. https://www.youtube.com/watch?v=f1QSPBTJs5I
PVsystemand itdesign	4(Theory -1hour, Practice-3 hours)	Lecturer+ Lab Practice	Assignment	2 Solar Photovoltaic – Fundamentals, Technologies and Applications by CS Solanki, 3rdEdition2015. https://www.youtube.com/watch?v=q7hW9XQLf6g
PVsysteminstallation and testing	4(Theory -1 hour, Practice-2 hours)	Lecturer+ Lab Practice	Field study	2 Solar Photovoltaic – Fundamentals, Technologies and Applications by CS Solanki, 3rdEdition2015. https://www.youtube.com/watch?v=Q5X6sMScwvM https://www.youtube.com/watch?v=ffm_sR_xdRkY
Module-III(9 Hrs)				
Solarthermalsystem: TypesofCollectorand itsapplication	1	Lecturer		1. Non-conventional Energy sources by Rai G.D, 2nd edition (1999) Khanna Publishers, New Delhi.
Design ofdifferent typesofcollectors	4(Theory -1 hour, Practice 2 hours)	Lecturer+ Lab Practice	Assignment	1. Non-conventional Energy sources by Rai G.D, 2nd edition (1999) Khanna Publishers, New Delhi. https://www.youtube.com/watch?v=wwl0QAQCJyc
Testingand installation ofsolar thermalsystem	4(Theory -1hour, Practice-3 hours)	Lecturer+ Lab Practice	Field study	1. Non-conventional Energy sources by Rai G.D, 2nd edition (1999) Khanna Publishers, New Delhi.
Module-IV(4Hrs)				
Wind Energy: Basic Principleof Wind Energy Conversion, Wind DataandEnergy Estimation, wind energy sourcesand potential	2	Lecturer		1. Non-conventional Energy sources by Rai G.D, 2nd edition (1999) Khanna Publishers, New Delhi.
Windpowersystems: systemcomponents, TypesofTurbine, Turbine rating. Choice ofgenerators	2	Lecturer		1. Non-conventionalEnergy sourcesbyRaiG.D, 2nd edition(1999)Khanna Publishers, New Delhi. https://www.youtube.com/wat

				ch?v=LNXtm7aHvWc https://www.youtube.com/watch?v=DILJwsFl3w
Module-V(8Hrs)				
Variables speed operation, maximum power operation, maximum power operation, control systems, Application of Wind energy in different sectors	2	Lecturer	Assignment	1 Non-conventional Energy sources by Rai G.D, 2nd edition (1999) Khanna Publishers, New Delhi.
System design features, testing and installation of Wind systems.	6 (Theory - 2 hour, Practice - 4 hours)	(Lecturer + Lab Practice)	Assignment	1 Non-conventional Energy sources by Rai G.D, 2nd edition (1999) Khanna Publishers, New Delhi.
Module-VI(8hrs)				
Bio Energy Basic Principle of Biomass Generation and Conversion	1	Lecturer		1. Non-conventional Energy sources by Rai G.D, 2nd edition (1999) Khanna Publishers, New Delhi.
Sources and potential of Bio-Gas	1	Lecturer		1. Non-conventional Energy sources by Rai G.D, 2nd edition (1999) Khanna Publishers, New Delhi.
Application of Bio-Gas in different sectors	1	Lecturer		1. Non-conventional Energy sources by Rai G.D, 2nd edition (1999) Khanna Publishers, New Delhi.
Testing and installation of Bio-Gas Plant	5 (Theory - 1 hour, Practice - 4 hour)	Lecturer + Lab Practice	Field study	1. Non-conventional Energy sources by Rai G.D, 2nd edition (1999) Khanna Publishers, New Delhi. https://www.youtube.com/watch?v=PmBx5Zo8KZo
Module-VII(9 hrs)				
Types of Conversion: Thermal, Thermochemical Process	1	Lecturer	Assignment	1. Non-conventional Energy sources by Rai G.D, 2nd edition (1999) Khanna Publishers, New Delhi.
Fermentation: Aerobic and Anaerobic digestion	2	Lecturer		1. Non-conventional Energy sources by Rai G.D, 2nd edition (1999) Khanna Publishers, New Delhi.
Design and Construction details of Main Digester	6 (Theory - 2 hour, Practice - 4 hour)	(Lecturer + lab Practice)	Field study	1. Non-conventional Energy sources by Rai G.D, 2nd edition (1999) Khanna Publishers, New Delhi. https://www.youtube.com/watch?v=PmBx5Zo8KZo

Fluid Power

Subject Name	Code	Type of Course	T-P-Pr (Credit)	Prerequisite
Fluid Power	MECC0409	Theory+ Practice	2+1(3)	NIL

1. Objective

- To impart knowledge to students on principles and technology behind use of fluid power.
- To educate the students on application of fluid power in various industrial applications and devices.

2. Course Outcomes

- Students will be able to identify various elements used in fluid power systems and will be able to deliver fluid power circuit diagrams.
- Students will be able to design and test various control circuits using Fluidsim software.

3. Evaluation Systems

Internal Examination	Component	% of Marks	Method of Assessment
	Midterm Test	20 (ITH)	Written examination
	Assignment		Report and Presentation
	Experiments	30 (IPR) + 20(EPR)	Lab work, report
	Project		Report and presentation
	Quiz		Surprise/preannounced ones
External Examination		30	Written examination
Total		100	

4. Course Outline

Module I (5 Hours)

Hydraulic Turbines: Force of Jet on Stationary and Moving Plates (Flat and Curved), Expressions for Torque and Work Done. Classification, Definitions of Heads and Efficiencies.

Pelton Wheel - Construction and Working Principle, Work Done and Hydraulic Efficiency, Design Aspects.

Module II (10 Hours)

Reaction Turbines: Components, Working Principle, Work Done and Efficiency, Draft Tube, Specific Speed, Cavitation, Governing Mechanism, Selection of Turbines.

Practice:

1. Impact of Jets on Vanes
2. Performance Test on Pelton Wheel
3. Performance Test on Francis Turbine

4. Performance Test on Kaplan Turbine

Module III (12 Hours)

Reciprocating Compressors: Construction and Working, Multistage Conditions for Minimum Work, Intercooling, Efficiency and Control of Air Compressors

Rotary Compressors: Introduction, Classification, Roots Blower, Vane Type, Screw Compressor, Scroll Compressor

Axial Flow Compressors: Construction of an Axial Flow Compressor, Aerofoil Blading, Lift and Drag, Performance Characteristics

Practice:

5. Determination of volumetric Efficiency of Reciprocating Air Compressor.
6. To Determine the Efficiency of Rotary Air Compressor.
7. To Determine the Efficiency of Centrifugal Air Compressor.

Module IV (5 Hours)

Basic Hydraulic and Pneumatic: Types, Construction, Working and Applications of (i) Pressure Control Valves, (ii) Directional Control Valves, (iii) Flow Control Valves, (iv) Proportional Control Valve (Proportional Pressure Relief Valve, Proportional Pressure Reducing Valve, Proportional Direction Valve).

Module V (15 Hours)

Hydraulic Pumps: General Assembly Sketch, Main Parts, Working Principle, Applications and Comparison of Following Pumps: External, Internal Gear Pumps & Ge-Rotor (Generator Rotor), Lobe, Screw, Vane Piston, Centrifugal Pump, Reciprocating Pump.

Actuators-Classification, Construction, Working and Applications.

Practice:

8. To Design Different Circuit by Using Different Valves & Actuators with Different Conditions.
9. Performance Test on Single Stage Centrifugal Pump
10. Performance Test on Reciprocating Pump
11. Testing Different Circuits on Fluid-Sim Software.
12. Testing Different Circuit on Pneumatic Kit.

Module VI (5 Hours)

Sensors and Relay: Measuring Devices and Dynamic Characteristics, Active and Passive Sensors and Transducers, Relay, Classifications and Working Principle.

Motion Sensors: Resistive Strain Gauge, LVDT, RVDT, Capacitive, Piezo, Seismic Pickups, Vibrometers and Accelerometers.

Module VII (8 Hours)

Optical Sensors: Lasers, Photo-Detectors and Optical Fiber As Sensors

Electro Pneumatic and Hydraulics: Servo Control Valves: Mechanical Hydraulic Servo Valve, Electro Hydraulic Servo Valve, Single Stage, Two Stage Flapper Type, Jet Pipe Type.

Practice:

13. Design Different Circuit by Using Different Valves & Actuators with Different Conditions.
14. Testing Different Circuits on Fluid-Sim Software.

6. Reference

Text Book:

1. Oil Hydraulic Systems by S.R. Majumdar, Tata McGraw-Hill Publication
2. Fluid Mechanics and Hydraulic Machines, R.K. Bansal, Laxmi Publications

Reference Book:

1. Hydraulic and Pneumatics, A Technician's & Engineer's Guide by Andrew Parr Jaico Publishing House.
2. Festo Manuals

7. Session Plan

Topic coverage and Internal Test	No. of Sessions (in hrs.)	Activity (lecture, tutorial, lab practice, field studies/field-trip, Workshop etc.)	Assignment (project, assignment, field study, seminar, etc.)	Suggested Reading (Book, Video, Online source, etc.)
Module I				
Force of Jet on Stationary and Moving Plates (Flat and Curved), Expressions for Torque and Work Done. Classification, Definitions of Heads and Efficiencies. Pelton Wheel-Construction and Working Principle, Work Done and Hydraulic Efficiency, Design Aspects.	5	lecture + lab practice	Assignment with problem solving	R.K. Bansal, Fluid Mechanics and Hydraulic Machines, Laxmi Publications
Practice				
1. Impact of Jets on Vanes 2. Performance Test on Pelton Wheel	4			
Module II				

Reaction Turbines: Components, Working Principle, Work Done and Efficiency, Draft Tube, Specific Speed, Cavitation, Governing Mechanism, Selection of Turbines.	2	lecture + lab practice	Assignment with problem solving	R.K. Bansal, Fluid Mechanics and Hydraulic Machines, Laxmi Publications
Practice				
3. Performance Test on Francis Turbine	4			
4. Performance Test on Kaplan Turbine				
Module III				
Reciprocating Compressors: Construction and Working, Multistage Conditions for Minimum Work, Intercooling, Efficiency and Control of Air Compressors	2	lecture + lab practice	Assignment with problem solving	R.K. Bansal, Fluid Mechanics and Hydraulic Machines, Laxmi Publications
Rotary Compressors: Introduction, Classification, Roots Blower, Vane Type, Screw Compressor, Scroll Compressor	2	lecture + lab practice	Assignment with problem solving	R.K. Bansal, Fluid Mechanics and Hydraulic Machines, Laxmi Publications
Axial Flow Compressors: Construction of an Axial Flow Compressor, Aerofoil Blading, Lift and Drag, Performance Characteristics	2	lecture + lab practice	Assignment with problem solving	R.K. Bansal, Fluid Mechanics and Hydraulic Machines, Laxmi Publications
Practice:				
5. Determination of volumetric Efficiency of Reciprocating Air Compressor.	6			
6. To Determine the Efficiency of Rotary Air Compressor.				
7. To Determine the Efficiency of Centrifugal Air Compressor.				
Module IV				
Basic Hydraulic and Pneumatic: Types, Construction, Working and Applications of (i) Pressure	5	lecture + lab practice	Assignment with problem solving	Oil Hydraulic Systems by S.R. Majumdar, Tata Mcgraw-Hill Publication

Control Valves. (ii) Directional Control Valves, (iii) Flow Control Valves. (iv) Proportional Control Valve(Proportional Pressure Relief Valve, Proportional Pressure Reducing Valve, Proportional Direction Valve).				
Module V				
Hydraulic Pumps: General Assembly Sketch, Main Parts, Working Principle, Applications and Comparison of Following Pumps: External, Internal Gear Pumps & Ge-Rotor (Generator Rotor). Lobe, Screw, Vane Piston, Centrifugal Pump, Reciprocating Pump. Actuators -Classification, Construction, Working and Applications.	9	lecture + lab practice	Assignment with problem solving	Oil Hydraulic Systems by S.R. Majumdar, Tata Mcgraw-Hill Publication Festo manuals
Practice				
8. To Design Different Circuit by Using Different Valves & Actuators with Different Conditions. 9. Performance Test on Single Stage Centrifugal Pump 10. Performance Test on Reciprocating Pump 11. Testing Different Circuits on Fluid-Sim Software. 12. Testing Different Circuit on Pneumatic Kit.	6			
Module VI				
Sensors and Relay: Measuring Devices and Dynamic Characteristics, Active and Passive Sensors and Transducers, Relay, Classifications and Working	5	lecture + lab practice	Assignment with problem solving	1. Oil Hydraulic Systems by S.R. Majumdar, Tata Mcgraw-Hill Publication 2. Festo manuals

Principle. Motion Sensors: Resistive Strain Gauge, LVDT, RVDT, Capacitive, Piezo, Seismic Pickups, Vibrometers and Accelerometers.				
Module VII				
Optical Sensors: Lasers. Photo-Detectors and Optical Fiber As Sensors Electro pneumatic and Hydraulics: Servo Control Valves: - Mechanical Hydraulic Servo Valve, Electro Hydraulic Servo Valve, Single Stage, Two Stage Flapper Type, Jet Pipe Type.	4	lecture + lab practice	Assignment with problem solving	1. Oil Hydraulic Systems by S.R. Majumdar, Tata Mcgraw-Hill Publication 2. Festo manuals
Practice				
13. Design Different Circuit by Using Different Valves & Actuators with Different Conditions. 14. Testing Different Circuits on Fluid-Sim Software.	4			
TOTAL	60			

Mechanics of Machines

Subject Name	Code	Type of course	Credit	Prerequisite
Mechanics of Machines	MECC0410	Theory+ Practice	2+1(3)	Nil

1. Objective

<ul style="list-style-type: none"> ✓ To educate the student on basic theories, concepts and methods used for study and analysis of commonly used mechanisms in various applications. ✓ To educate the students on some of the widely used mechanical power transmission elements.

2. Course Outcomes

- Students will have knowledge and skills to analyse, design and develop mechanisms suited to specific applications.
- Students will have knowledge and skills to study and understand working of complex mechanisms and machines enabling them to safely operate and maintain such installations.

3. Evaluation Systems

Internal Examination	Component	% of Marks	Method of Assessment
	Midterm Test	20 (ITH)	Written examination
	Assignment		Report and Presentation
	Experiments	30 (IPR)+20 (EPR)	Lab work, report
	Project		Report and presentation
	Quiz		Surprise/preannounced ones
External Examination		30	Written examination
Total		100	

4. Course Outline

Module I (09 Hours)

Planar Mechanisms: Kinematic Link, Pair, Chain and Mechanism; Types of Links and Joints, Degree of Freedom; Grashof's Law for four bar Mechanism, Inversions of four bar Mechanism, Single Slider Crank Mechanism and Double Slider Crank Mechanism.

Practice :

- Position Analysis of Grashof and non-Grashof four bar Mechanism
- Position Analysis of Slider Crank Mechanism, Scotch Yoke Mechanism and Elliptical Trammel

Module II (14 Hours)

Motion Analysis: Instantaneous Centre of Rotation, Number and Types of Instantaneous Centres, Kennedy Theorem, Relative Velocity Method, Velocities in Four Bar and Slider Crank Mechanism, Crank and Slotted Lever Mechanism, Angular Velocity Ratio Theorem, Acceleration Diagram of Single Slider-Crank Mechanism, Coriolis Component of Acceleration.

Practice:

- Instantaneous Center Method to Find Velocity of Various Mechanisms
- Klein's Construction for Determination of Velocity and Acceleration of Reciprocating Parts
- Velocity Analysis of Grashof and Non-Grashof Four Bar Mechanism
- Velocity Analysis of Slider Crank Mechanism and Scotch Yoke Mechanism
- Acceleration Analysis of Slider Crank Mechanism

Module III (09 Hours)

Gears: Classification and Basic Terminology, Fundamental Law of Gearing, Standard forms of Tooth, Length of Path of Contact and Arc of Contact, Contact Ratio, Interference in Involute Gears.

Gear trains: Simple, Compound, Reverted and Epi-Cyclic Gear Trains.

Practice:

- Study of Operations of Various Gear Trains in Automobiles

Module IV (07 Hours)

CAM: Various Types of Cams and Followers; Displacement, Velocity and Acceleration Diagrams for Different Follower Motions; Nomenclature of Cam Profile.

Practice:

9. Construction of Cam Profile for Various Follower Motions

Module V (05 Hours)

Inertia forces in reciprocating parts: Velocity and Acceleration of a Piston, Angular Velocity and Angular Acceleration of Connecting Rod, Engine Force Analysis, Dynamically Equivalent System.

Module VI (08 Hours)

Gyroscope: Gyroscopic Couple, Gyroscopic Effect on Naval Ships and Aeroplanes, Stability of Two-wheeler Vehicles.

Practice :

10. Determine Gyroscopic Couple on Motorized Gyroscope

Balancing: Static and Dynamic Balancing, Balancing of Several Masses Revolving in the Same Plane and Different Planes, Balancing of Reciprocating Mass, Partial Primary Balancing, Partial Balancing of Locomotives.

Practice:

11. Balancing of Several Masses Revolving in the Same and Different Planes

Module VII (08 Hours)

Vibration: Basic Concepts and Types of Vibration, Methods of Vibration Analysis, Free Undamped Longitudinal, Transverse and Torsional Vibrations, Damped Free Vibrations, Logarithmic Decrement, Forced Vibration with Harmonic Excitation, Vibration Isolation and Transmissibility.

Practice:

12. Determination of Critical or Whirling Speed of Shaft
13. Simple and Compound Pendulum

Text Book:

1. Theory of Machines, S.S. Rattan, Tata McGraw-Hill.
2. Theory of Machines, R.K. Bansal, Laxmi Publication

Reference Books:

1. Theory of Machines, Sadhu Singh, Khanna Publishers
2. Design of Machinery, Robert L. Norton, McGraw-Hill

7. Session Plan

Topic coverage and Internal Test	No. of Sessions (in hrs.)	Activity (lecture, tutorial, lab practice, field studies/field-trip, Workshop etc.)	Assignment (project, assignment, field study, seminar, etc.)	Suggested Reading (Book, Video, Online source, etc.)
MODULE -I				

Kinematic link, pair, chain and mechanism; types of links and joints, degree of freedom; Grashof's law for four bar mechanism	3	Lecture	Assignment	http://mm-nitk.vlabs.ac.in/index.html#
Inversions of four bar mechanism	2	Lecture	Assignment	
Single slider crank mechanism and double slider crank mechanism.	4	Lecture	Assignment	http://mm-nitk.vlabs.ac.in/index.html#
MODULE II				
Instantaneous centre of rotation, number and types of instantaneous centres, Kennedy theorem, relative velocity method	3	Lecture	Assignment	
Velocities in four bar, slider crank mechanism, crank and slotted lever mechanism	2+2	Lecture	Assignment	http://mm-nitk.vlabs.ac.in/index.html# http://mm-nitk.vlabs.ac.in/index.html#
Angular velocity ratio theorem	1	Lecture	Assignment	
Acceleration diagram of single slider-crank mechanism	2+2	Lecture + Practice	Assignment	http://mm-nitk.vlabs.ac.in/index.html#
Coriolis component of acceleration.	2	Lecture	Assignment	
MODULE - III				
Classification and basic terminology, fundamental law of gearing	2	Lecture	Assignment	https://www.youtube.com/watch?v=Z1f29M4o3jI
Standard forms of tooth, length of path of contact and arc of contact, contact ratio, interference in involute gears.	3	Lecture	Assignment	
Simple, compound, reverted and epi-cyclic gear trains.	2+2	Lecture + Practice	assignment	
MODULE IV				
CAM: Various types of cams and followers	1	Lecture	Assignment	https://www.youtube.com/watch?v=YbjmphKVVpA
Displacement, velocity and acceleration diagrams for different follower motions; nomenclature of cam profile	2+2+2	Lecture + Practice	assignment	
MODULE - V				
Velocity and acceleration of a piston, angular velocity and	3	Lecture	Assignment	

angular acceleration of connecting rod				
Engine force analysis, dynamically equivalent system	2	Lecture	Assignment	
MODULE- VI				
Gyroscope: Gyroscopic couple, gyroscopic effect on naval ships	1+2	Lecture + Practice	Assignment	
Gyroscopic effect on aeroplanes, stability of two-wheeler vehicles.	1	Lecture	Assignment	https://www.youtube.com/watch?v=ZsaVIW1BFUQ
Balancing: Static and dynamic balancing, balancing of several masses revolving in the same plane	1+1	Lecture + Practice	Assignment	
Balancing of several masses revolving in different planes	1	Lecture	Assignment	https://www.youtube.com/watch?v=_CwACU8Zfug
Balancing of reciprocating mass, partial primary balancing	1	Lecture	Assignment	https://www.youtube.com/watch?v=Eg9AwoxvwlQ
MODULE -VII				
Vibration: Basic concepts and types of vibration, methods of vibration analysis, free undamped longitudinal, transverse and torsional vibrations	2+2	Lecture + Practice	Assignment	https://www.youtube.com/watch?v=qV65LJ6LpI4
Damped free vibrations, logarithmic decrement	2	Lecture	Assignment	https://www.youtube.com/watch?v=Zp9g0Xbv7G4
Forced vibration with harmonic excitation, vibration isolation and transmissibility	2	Lecture	Assignment	https://www.youtube.com/watch?v=cGFjNhGwUY
Total(hrs)	60			

Strength of Material

Subject Name	Code	Type of course	T-P-Pr (Credit)	Prerequisite
Strength of Material	MECC0411	Theory+ Practice	2+1(3)	Engineering Mechanics

1. Objective

- To educate the students on basic theories behind mechanics of solids.
- To educate the students on using ANSYS for analysis of various mechanical structures and load transmitting elements.

2. Course Outcomes

- Students will have knowledge and practical engineering skills in analysis of mechanical strength of structures and load transmission elements and will be able to design them based on input data.
- Students will be able to deploy ANSYS to develop mechanical design solutions.

3. Evaluation Systems

Internal Examination	Component	% of Marks	Method of Assessment
	Midterm Test	20 (ITH)	Written Examination
	Assignment		Report and Presentation
	Experiments	30 (IPR)+20 (EPR)	Lab Work, Report
	Project		Report and Presentation
	Quiz		Surprise/Preannounced Ones
External Examination		30	Written Examination
Total		100	

4. Course Outline

Module I (10 Hrs): Analysis of Beams

Shear and Bending Moment in Beams: Types of Beams and Loads, Concept of Shear Force, Bending Moment and Sign Conventions, Relation Between Load, Shear Force and Bending Moment, Procedure for Drawing Shear Force and Bending Moment Diagrams, Point of Contra Flexure.

- Simulation (Using ANSYS): Evaluate Shear Force and Bending Moment
- Simulation (Using ANSYS): Beam Analysis with Point Load, UDL, UVL and Moment

MODULE II (08 Hrs):

Stresses in Beams: Simple or Pure Bending, Flexure Formula, Section Modulus, Neutral Axis, Determination Bending Stresses, Shear Stress Distribution for Different Sections.

- Simulation (Using ANSYS): To Analyze The Bending Stress of a Cantilevered and Simply Supported Beam

MODULE III (07 Hrs):

Deflection of Beams: Equation of Elastic Curve, Direct Integration Method, Strain Energy Method, Castigliano's Theorem

- Stress & Deflection Analysis of Mechanical Component (Using ANSYS)
- Double Shear Test and Deflection Test Using UTM

Module IV: (08 Hrs) Analysis of Column and Shaft

Column Analysis: Failure of a Column, End Conditions, Euler's Critical Load for Long Columns, Rankine's Empirical Formula, Effective Length and Slenderness Ratio, Eccentric Loading and Secant Formula.

- Simulation (Using ANSYS): Buckling Analysis of a Square Column, I-Beam and RCC Beam

Module V: Torsion (08 Hrs): Torsion Formula, Design of Shafts, Power Transmitted by Shafts, Composite Shafts, Combined Bending and Torsion, Closed-Coiled Helical Springs, Spring Connected in Series and Parallel.

- Simulation (Using ANSYS): Static and Dynamic Analysis of Shaft

8. Simulation (Using ANSYS): Spring Structural Analysis
9. Simulation (Using ANSYS): Stress Analysis of Suspension System
10. Stiffness Test of a Helical Spring

Module VI (08 Hrs.)

Theories of Failure: Failure Under Biaxial Loading, Rankine's Theory, Guest's or Tresca's Theory, Von Mises Theory, Graphical Representation of Failure, Safety Factors, Prevention of Failure in Design Stage, Diagnosis of Failure In Post-Manufacturing Stage.

11. Simulation: Spur Gear Fatigue Analysis in ANSYS
12. Simulation: Chair Structural Analysis in ANSYS
13. Simulation (Using ANSYS): Bicycle Frame Structural Analysis

Module VII (11 Hrs.)

Fatigue: Failure Under Cyclic Loading, Endurance Limit, S-N Curve, Stress Concentration, Goodman and Soderberg Criteria.

14. Fatigue Failure Analysis (Using ANSYS)
15. Fatigue Analysis of a Plate with Hole (Using ANSYS)
16. Fatigue Analysis (Using ANSYS) of Crankshaft of Two Wheeler

Fracture: Types of Failure, Brittle and Ductile Fracture, Basic Modes of Fracture, Griffith's Analysis, Energy Release Rate, Elastic Stress at the Tip of a Sharp Crack, Crack Growth and Stress Intensity Factor, Critical SIF, Fracture Toughness Testing.

Software Requirement: ANSYS

5. Reference

Text Books:

1. Strength of Materials, S.S. Rattan, Tata Mc-Graw Hill Publication.
2. Advanced Mechanics of Materials, A.P. Boresi and R.J. Schmidt, Wiley India

Reference Books:

1. Elements of Fracture mechanics, Prashant Kumar, McGraw Hill Education (India)
2. Engineering Mechanics of Solids, Egor P. Popov, Pearson publication

Online Source: YouTube, NPTEL

6. Session Plan

Topic coverage and Internal Test	No. of Sessions (in hrs.)	Activity (lecture, tutorial, lab practice, field studies/field-trip, Workshop etc.)	Assignment (project, assignment, field study, seminar, etc.)	Suggested Reading (Book, Video, Online source, etc.)
Module-I				
Shear And Bending	2			1. Strength of materials by S.S. Rattan, Tata Mc-

Moment In Beams: Types of Beams and Loads, Concept of Shear force, Bending moment and Sign Conventions				Graw Hill Publication
Relation Between Load, Shear force and Bending moment, Procedure for Drawing Shear force and Bending moment Diagrams, Point of Contra Flexure.	4			1. Strength of materials by S.S. Rattan, Tata Mc-Graw Hill Publication
Simulation (Using ANSYS): Evaluate Shear Force and Bending Moment Simulation (Using ANSYS): Beam Analysis with Point Load, UDL, UVL and Moment	4	Lab practice		
MODULE II				
Stresses in beams: Simple or Pure Bending, Flexure Formula, Section Modulus, Neutral Axis, Determination Bending Stresses, Shear Stress Distribution for Different Sections.	6			1. Strength of materials by S.S. Rattan, Tata Mc-Graw Hill Publication 2. https://www.youtube.com/watch?v=ekKQvGna0ig
Simulation (Using ANSYS): To Analyze The Bending Stress of a Cantilevered and Simply Supported Beam	2	Lab practice		
Module-III				
Deflection of beams: Equation	3			1. Strength of materials by S.S. Rattan, Tata Mc-Graw Hill Publication

of Elastic Curve, Direct Integration Method, Strain Energy Method, Castigliano's Theorem				
Stress&Deflection Analysis of Mechanical Component(Using ANSYS) DoubleShear Test andDeflection Test UsingUTM	4	Lab practice		
Module-IV				
Column analysis: Failure of a Column, End Conditions, Euler's CriticalLoad for Long Columns, Rankine's Empirical Formula, Effective Length and Slenderness Ratio, Eccentric Loading and SecantFormula.	4			1.Strength ofmaterialsbyS.S. Rattan,TataMc-Graw HillPublication
Simulation(Using ANSYS):Buckling Analysis of a Square Column, I-Beam and RCC Beam	4	Lab practice		
Module-V				
Torsion: Torsion Formula,Design of Shafts, Power Transmitted by Shafts, Composite Shafts, Combined Bending and Torsion, Closed-Coiled Helical	4			1.Strength ofmaterialsbyS.S. Rattan,TataMc-Graw HillPublication 2. https://www.youtube.com/watch?v=rJ2e4DximL0 3. https://www.youtube.com/watch?v=xI-NqAKZ_60

Springs, Spring Connected in Series and Parallel.				
Simulation(Using ANSYS): Spring Structural Analysis. Stiffness Test of a Helical Spring.	4	Lab practice		
Module-VI				
Theories of failure: Failure Under Biaxial Loading, Rankine's Theory, Guest's or Tresca's Theory, Von Mises Theory, Graphical Representation of Failure, Safety Factors, Prevention of Failure in Design Stage, Diagnosis of Failure In Post-Manufacturing Stage.	4			1. Strength of materials by S.S. Rattan, Tata McGraw Hill Publication 2. https://www.youtube.com/watch?v=2SGqcLZISQ0 3. https://www.youtube.com/watch?v=p-CUK_pEfR4 4. https://www.youtube.com/watch?v=hETp6TDi7-k
Simulation: Spur Gear Fatigue Analysis in Ansys. Simulation(Using ANSYS): Bicycle Frame Structural Analysis	4	Lab practice		
Module-VII				
Fatigue: Failure Under Cyclic Loading, Endurance Limit. S-N Curve, Stress Concentration, Goodman and Soderberg Criteria.	2			1. Strength of materials by S.S. Rattan, Tata McGraw Hill Publication 2. Advanced mechanics of materials by A.P. Boresi and R.J. Schmidt, Wiley India

Fatigue Analysis of a Plate With Hole(Using ANSYS). Fatigue Analysis(Using ANSYS)of Crankshaftof Two Wheeler	4	Lab practice		
Fracture: Types of Failure,Brittle and Ductile Fracture, Basic Modesof Fracture. Griffith's Analysis, Energy Release Rate, Elastic Stress at the Tipofa Sharp Crack, Crack Growth and Stress Intensity Factor, Critical SIF, Fracture Toughness Testing.	2			1.Advanced mechanics ofmaterials byA.P. Boresi and R.J. Schmidt, WilleyIndia 2. https://www.youtube.com/watch?v=jJMSvgcZaGA 3. https://www.youtube.com/watch?v=ESj-l62l74E
Tensile Test, CompressionTest\	3	Lab practice		
Total (hrs)	60			

Design of Transmission Systems

Subject Name	Code	Type of course	T-P-Pr (Credit)	Prerequisite
Design of Transmission Systems	MECC0412	Theory+ Practice	2+1(3)	Mechanics of Solids

1. Objective

- To familiarize the various mechanical power transmission elements and systems as used in industry.
- To enable the students to design basic transmission elements using prior theoretical knowledge.

2. Course outcomes

- To convert basic input data into engineering design and drawing using CATIA and ANSYS.

3. Evaluation Systems

Internal Examination	Component	% of Marks	Method of Assessment
	Midterm Test	20 (ITH)	Written examination
	Assignment		Report and Presentation
	Experiments	30 (IPR)+20 (EPR)	Lab work, report
	Quiz		Surprise/preannounced ones
External Examination		30	Written examination
Total		100	

4. Course outline

Module I (20 hrs) (Basic Power Transmission Elements)

Design of Shaft Coupling: Keys and Splines; Strength of a Sunk Key; Rigid and Flexible Coupling, Hooke's Joint and Constant Velocity Joint.

Practice:

1. Design of Flange Coupling using CATIA
2. Design of Hooke's Joint using CATIA

Design of Belt, Rope and Chain Drives: Flat, V-Belt and Rope Belts; Slip and Creep of Belt; Velocity Ratio of Belt Drives; Centrifugal and Initial Tension; Maximum Power Transmission Through a Belt Drive, Power Transmitting Chains.

Practice:

3. Design of Flat belt pulley using CATIA
4. Design of V-belt pulley using CATIA

Design of Gears: Selection of Materials; Force Analysis, Beam Strength of Gear Tooth, Gear Tooth Failure.

Practice:

5. Computer aided spur gear design and analysis using CATIA and ANSYS
6. Computer aided helical gear design and analysis using CATIA and ANSYS

Module II (14 Hrs) Power Transmission Mechanisms

Clutch: Friction, Centrifugal, Vacuum and Free Wheel Clutch, Construction and Working Principle

Fluid Coupling and Torque Converter: Basic Concepts, Construction and Working Principle

Brakes: Single and Double Shoe Brake, Internal Expanding Brake, Band Brake, Electromagnetic Brakes, Concept of Regenerative Braking.

Module III (18 Hrs) Applications, Mechanical Power Measurement and Control

Applications:

- ✓ Gear Box Used in Automobiles, Machine Tool, etc
- ✓ Conveyor with the Application of Belt Drives
- ✓ Use of Torque Converter in Automatic Transmission
- ✓ Electric Overhead Cranes and Goods/Passenger Lifts Using Rope Drives
- ✓ Ball Screw Mechanisms Used in CNC Machines
- ✓ Use of Rigid and Flexible Couplings in Pumps and Compressors
- ✓ Disc type and Drum type Brakes used in Automobiles
- ✓ Power Transmission using Cardan Shaft in Rolling Mills and Conveyors

Mechanical Power Measurement and Control:

Basic Mechanical Control Systems: Types of Control Systems, Open and Closed Loop, Feedback, Need and Basic Working Principle of Governor and Flywheel, Variable Frequency Drive (VFD).

Dynamometers: Power Measuring Instruments Such as Rope Brake, Hydraulic and Eddy Current Dynamometers.

Practice:

7. Measurement of Torque and Power Using Rope Brake Dynamometer

6. Reference

Text Book:

1. Design of Machine Elements by V.B. Bhandari, Tata McGraw-Hill
2. Mechanical Power Transmission by William J. Patton, Prentice Hall

Reference Books:

1. Shigley's Mechanical Engineering Design by Richard G. Budynas and J.K. Nisbett, McGraw-Hill
2. Design Data Handbook by S. Md. Jalaludeen, Anuradha Publications

7. Session Plan

Topic coverage and Internal Test	No. of Sessions (in hrs.)	Activity (lecture, tutorial, lab practice, field studies/field-trip, Workshop etc.)	Assignment (project, assignment, field study, seminar, etc.)	Suggested Reading (Book, Video, Online source, etc.)
Keys and Splines: Strength of a Sunk Key;	1	Lecturer+ Video	Assignment	Design of Machine Elements by V.B. Bhandari, Tata McGraw-Hill https://www.youtube.com/watch?v=S8Qmy4fGnnE
Rigid and Flexible Coupling	1	Lecture + video	Assignment	Design of Machine Elements by V.B. Bhandari, Tata McGraw-Hill https://www.youtube.com/watch?v=CwiaS075YzQ https://www.youtube.com/watch?v=9jdc0CzMjCo
Hooke's Joint and Constant Velocity Joint.	1	Lecture + video	Assignment	Design of Machine Elements by V.B. Bhandari, Tata McGraw-Hill https://www.youtube.com/watch?v=EJL9qHhQing https://www.youtube.com/watch?v=LCMZz6YhbOQ
Design of Flange Coupling using CATIA	2	Lab Practice		Design of Machine Elements by V.B. Bhandari, Tata McGraw-Hill https://www.youtube.com/wat

				ch?v=bshE5AavL7U
Design of Hooke's Joint Using CATIA	2	Lab Practice		https://www.youtube.com/watch?v=0PPGOJ2u-IQ
Flat Belt, V-Belt and Rope Belts;;,	1	Lecture + video	Assignment	Design of Machine Elements by V.B. Bhandari, Tata McGraw-Hill https://www.youtube.com/watch?v=0mb_XMGja_c https://www.youtube.com/watch?v=i7niMZ22izc
Slip and Creep of Belt; Velocity Ratio of Belt Drives	1	Lecturer	Assignment	Design of Machine Elements by V.B. Bhandari, Tata McGraw-Hill
Centrifugal and Initial Tension; Maximum Power Transmission Through a Belt Drive	1	Lecturer	Assignment	Design of Machine Elements by V.B. Bhandari, Tata McGraw-Hill
Power Transmitting Chains.	1	Lecturer	Assignment	Design of Machine Elements by V.B. Bhandari, Tata McGraw-Hill https://www.youtube.com/watch?v=4PsJkXO70Xc
Design of Flat Belt Pulley using CATIA	2	Lab Practice		https://www.youtube.com/watch?v=M_5mb-VqKKI
Design & Analysis of V-Belt Pulley using CATIA	2	Lab Practice		https://www.youtube.com/watch?v=p3YAdqpPxxI
Design of Gears: Selection of Materials; Force Analysis, Beam Strength of Gear Tooth, Gear Tooth Failure.	1	Lecture + video	Assignment	Design of Machine Elements by V.B. Bhandari, Tata McGraw-Hill https://www.youtube.com/watch?v=P4rNX0gCm3E https://www.youtube.com/watch?v=bH3v2bGvLyM https://www.youtube.com/watch?v=ihGFUAAwj7g
Computer Aided Spur Gear Design and Analysis using CATIA and ANSYS	2	Lab Practice		https://www.youtube.com/watch?v=vPq3KuqPERs https://www.youtube.com/watch?v=h2ZFUiZDsw

Computer Aided Worm Gear Design and Analysis using CATIA and ANSYS	2	Lab Practice		https://www.youtube.com/watch?v=VIqyulx0nDk https://www.youtube.com/watch?v=RLjxmaxDN5w
Clutch: Friction, Centrifugal, Vacuum And FreeWheel Clutch, Construction And Working Principle	4	Lecturer+ Video	Assignment	Design of Machine Elements by V.B. Bhandari, Tata McGraw-Hill https://www.youtube.com/watch?v=devo3kdSPQY https://www.youtube.com/watch?v=pqF-aBtTBnY&t=108s
Fluid Coupling And Torque Converter: Basic Concepts, Construction And Working Principle	5	Lecture + video		Mechanical Power Transmission by William J. Patton, Prentice Hall https://www.youtube.com/watch?v=11Q4g-oOLr8 https://www.youtube.com/watch?v=z5G2zQ_3xTc&t
Brakes: Single and Double Shoe Brake, Internal Expanding Brake, Band Brake, Electromagnetic Brakes, Concept Of Regenerative Braking	5	Lecture + video	Assignment	Design of Machine Elements by V.B. Bhandari, Tata McGraw-Hill https://www.youtube.com/watch?v=CoCmOnQOZ0k https://www.youtube.com/watch?v=vTUTTPy_zJs&t=110s https://www.youtube.com/watch?v=CzEBVdZevOs&t=45s
Applications, Mechanical Power Measurement and Control	14	video + Field studies		https://www.youtube.com/watch?v=QPrNiclydiE https://www.youtube.com/watch?v=wOm7NKdiexY https://www.youtube.com/watch?v=0mb_XMGja_c&t=258s https://www.youtube.com/watch?v=11Q4g-oOLr8 https://www.youtube.com/watch?v=z5G2zQ_3xTc&t=38s https://www.youtube.com/watch?v=P_1MuAhO6kY https://www.youtube.com/watch?v=LviUp94t65Q https://www.youtube.com/watch?v=K3i-Ecb698g https://www.youtube.com/watch?v=JOVNFoKHjIY https://www.youtube.com/watch?v=HewKs2kZIMI https://www.youtube.com/watch

				ch?v=jkmAaBJ0A6Y https://www.youtube.com/watch?v= Tc7HvIGOH4 https://www.youtube.com/watch?v=MAuVDB-G-HQ&t=110s https://www.youtube.com/watch?v=FJJqiKpnPjo https://www.youtube.com/watch?v=B2thGLC5cRs
Basic Mechanical Control Systems: Types of Control Systems, Open and Closed Loop, Feedback, Need and Basic Working Principle of Governor and Flywheel, Variable Frequency Drive (VFD).	2	Lecture		Mechanical Power Transmission by William J. Patton, Prentice Hall
Dynamometers: Power Measuring Instruments such as Rope Brake, Hydraulic and Eddy Current Dynamometers	1	Lecturer+ Video	Assignment	Design of Machine Elements by V.B. Bhandari, Tata McGraw-Hill https://www.youtube.com/watch?v=Kq81cwrogio https://www.youtube.com/watch?v=uwZGtFRtGoU https://www.youtube.com/watch?v=te6dm20B-zA
Measurement of Torque and Power Using Rope Brake Dynamometer	1	Lab Practice		https://www.youtube.com/watch?v=iamxq4Jsimo
Total(hrs)	52			

Introduction to Hybrid and Electric Vehicles

Subject Name	Code	Type of Course	T-P-Pr (Credit)	Prerequisite
Introduction to Hybrid and Electric Vehicles	MECC0413	Theory+ Practice	1+1(2)	Nil

1. Objective

<ul style="list-style-type: none"> ✓ To educate the students on principles, technology, usage and application of fully electric and hybrid vehicles. ✓ To educate the students on energy source, power flow and drive train technologies used in electrical

and hybrid vehicles as on date.

2. Course Outcomes

- Students will be able to identify and understand the electrical circuits and will be able to test the performance of these vehicles.
- Students will be able to carry out maintenance activities of these vehicles.

3. Evaluation Systems

Internal Examination	Component	% of marks	Methods of assessment
	Internal Test	10	Written examination
	Assignment	5	Report
	Learning Record	5	Report
	Experiments	30	Lab work
External Examination	External Theory	30	Written examination
	External Practice	20	Lab work
Total		100	

4. Course outline

Module I (4 Hours)

Introduction to Hybrid Vehicles: History of Hybrid Vehicles, Social and Environmental Importance, Working Principle of Hybrid Vehicles.

Module II (8 Hours)

Hybrid Drive-Trains: Basic Concept of Hybrid Traction, Types of Drive Train in Hybrid Vehicles, Power Flow Control in Hybrid Drive-Train Topologies, Fuel Analysis ((Density, Viscosity, Calorific Value, Flash & Fire Point), Fuel Efficiency

Practice:

1. Determination of Calorific Value of a Fuel by using Bomb Calorimeter
2. Determination of Flash Point and Fire Point of a Given Fuel
3. Determination of Viscosity of a Given Fuel

Module III (8 Hours)

Introduction to Electric Vehicles: Reasons for Electric Vehicle Development, Advantages and Disadvantages of Electric Vehicle, Main Components of Electric Vehicles (Battery, Motor, Controller, DC to DC Converter), Working of Main Components.

Practice:

4. Practice in Controller Connection Used in Electric Vehicle
5. Practice Wiring and Harnessing in Battery Electric Vehicle

Module IV (7 Hours)

Energy Storage:

Energy Storage Requirements in Electric Vehicles, Battery Monitoring and Charging Control, Combination of Batteries, Sizing of Battery Cell, Principles of Operation of Fuel Cell, Regenerative Braking System.

Practice:

6. Maintenance of Lead Acid Batteries

7. Sizing of Battery Cell

Module V (5Hours)

Electric Drive-Trains: Basic Concept of Electric Traction, Introduction to Various Electric Drive-Train Topologies, Power Flow Control in Electric Drive-Train Topologies.

Module VI (6Hours)

Electric Propulsion Unit: Introduction to Electric Components Used in Hybrid and Electric Vehicles, DCMotor, Control of DCMotor Drives, BLDC (Brushless DC) Motor

Practice:

8. Performance Characteristics of a Shunt and Series DCMotor

9. Disassemble Different Parts of BLDC Motor

Module VII (7Hours)

Types of Motors and Drives: Induction Motor and Drives, Permanent Magnet Synchronous Motor Drives, Switched Reluctance Motor Drives.

Practice:

10. Load Test on Three Phase Induction Motor

11. Speed Control of DC Shunt Motor by Armature and Field Control

12. Permanent Magnet Motor Drives, Their Control

6. Reference

Text Books:

1. Electric and Hybrid Vehicles: Design Fundamentals, Iqbal Hussein, CRC Press, 2003.

2. Modern Electric Vehicle Technology, C.C. Chan and K.T. Chau, Oxford Science Publications.

Reference Books:

1. Internal Combustion Engines, V. Ganesan, Tata McGraw Hill.

2. Principles of Electrical Machines, V.K. Mehta and Rohit Mehta, S. Chand.

Online Source: <http://nptel.iitm.ac.in>

7. Session Plan

Topic coverage and Internal Test	No. of Sessions (in hrs.)	Activity (lecture, tutorial, lab practice, field studies/field-trip, Workshop etc.)	Assignment (project, assignment, field study, seminar, etc.)	Suggested Reading (Book, Video, Online source, etc.)
Module I (4 Hours)				
Introduction to	4 (Th-4)	Lecture	Assignment,	Electric and Hybrid Vehicles:

Hybrid Vehicles: History of hybrid vehicles, Social and environmental importance, Working principle of hybrid vehicles.			Seminar	Design Fundamentals, Iqbal Hussein, CRC Press, 2003 https://www.youtube.com/watch?v=pMTPUjfiQQw http://nptel.iitm.ac.in
Module II(8Hours)				
Hybrid Drive-Trains: Basic concept of hybrid traction, Types of drive train in hybrid vehicles, Power flow control in hybrid drive-train topologies, Fuel analysis ((Density, Viscosity, Calorific Value, Flash & Fire point), Fuel efficiency	8(Th-4, Pr-4)	Lecture + Lab Practice	Assignment	Electric and Hybrid Vehicles: Design Fundamentals, Iqbal Hussein, CRC Press, 2003 V. Ganesan, Internal Combustion Engines, Tata McGraw Hill https://www.youtube.com/watch?v=axzTZZKm3mc http://nptel.iitm.ac.in
Module III (8Hours)				
Introduction to Electric Vehicles: Reasons for electric vehicle development, Advantages and disadvantages of electric vehicle, Main components of electric vehicles (Battery, Motor, Controller, DC to DC converter), Working of main components	8(Th-4, Pr-4)	Lecture + Lab Practice	Assignment	Electric and Hybrid Vehicles: Design Fundamentals, Iqbal Hussein, CRC Press, 2003 Modern Electric Vehicle Technology, C.C. Chan and K.T. Chau, Oxford Science Publications https://www.youtube.com/watch?v=ytVyj10p0BI http://nptel.iitm.ac.in
Module IV(7Hours)				
Energy Storage: Energy storage requirements in electric vehicles, Battery monitoring and charging control, Combination of batteries. Sizing of battery cell, Principles of operation of Fuel cell, Regenerative braking system	7(Th-3, Pr-4)	Lecture + Lab Practice	Assignment	Electric and Hybrid Vehicles: Design Fundamentals, Iqbal Hussein, CRC Press, 2003 Modern Electric Vehicle Technology, C.C. Chan and K.T. Chau, Oxford Science Publications https://www.youtube.com/watch?v=N10IPLUxNWM https://www.youtube.com/watch?v=uLrCFStQQUU https://www.youtube.com/watch?v=2SQ2SYhVaaE http://nptel.iitm.ac.in
Module V (5Hours)				

Electric Drive-Trains: Basic concept of electric traction, Introduction to various electric drive-train topologies, Powerflow control in electric drive-train topologies.	5(Th-5)	Lecture	Assignment	Electric and Hybrid Vehicles: Design Fundamentals, Iqbal Hussein, CRC Press, 2003 https://www.youtube.com/watch?v=0DqPmACIeKA https://www.youtube.com/watch?v=gK6UUY3nTko http://nptel.iitm.ac.in
Module VI (6Hours)				
Electric Propulsion Unit: Introduction to electric components used in hybrid and electric vehicles, DC Motor, Control of DC Motor drives, BLDC (Brushless DC) Motor	6 (Th-3, Pr-3)	Lecture + Lab Practice	Assignment	Electric and Hybrid Vehicles: Design Fundamentals, Iqbal Hussein, CRC Press, 2003 V.K. Mehta and Rohit Mehta, Principles of Electrical Machines, S. Chand https://www.youtube.com/watch?v=jAGTEAtPEzY https://www.youtube.com/watch?v=bCEiOnuODa https://www.youtube.com/watch?v=LtJoJBUSE28 https://www.youtube.com/watch?v=Vk2jDXxZlhs&list=PLMH0_80Gkb0ZNVz4hVsolj7JrUf56wPN https://www.youtube.com/watch?v=dAW8e3N9xDE http://nptel.iitm.ac.in
Module VII (7Hours)				
Types of Motors and Drives: Induction motor and drives, Permanent magnet synchronous motor drives, Switched reluctance motor drives	7 (Th-3, Pr-4)	Lab Practice	Assignment	V.K. Mehta and Rohit Mehta, Principles of Electrical Machines, S. Chand
Total (hrs)	45			

Fluid Mechanics and Heat Transfer

Subject Name	Code	Type of Course	Credit	Prerequisite
Fluid Mechanics and Heat Transfer	MECC0414	Theory+ Practice	2+1(3)	Basic Fluid Mechanics

1. Objective

- ✓ To Educate the Students on Basic Theories behind Fluid Mechanics and Heat Transfer as Used in Engineering Practices.
- ✓ To Educate the Students on use of Experimental methods to Determine Various Engineering Parameters used in Fluid Mechanics and Heat Transfer Applications.

2. Course Outcomes

- ✓ Students will be able to Analyze and Design various Equipment used in Industry using Principles of Fluid Mechanics and Heat Transfer.

3. Evaluation Systems

Internal Examination	Component	% of marks	Method of assessment
	Midterm Test	20 (ITH)	Written Examination
	Assignment		Report and Presentation
	Experiments	30 (IPR) + 20 (EPR)	Lab work, report
	Project		Report and presentation
	Quiz		Surprise/preannounced ones
External Examination		30	Written examination
Total		100	

4. Course Outline

Module I (8 Hrs)

Forces on Submerged Bodies: Causes for Drag and Lift, Drag and Lift Coefficients, Drag on a Sphere and a Cylinder, Terminal velocity of a Body, Stoke's Law, Development of Lift and Drag on a Stationary and Rotating Cylinder, Magnus Effect, Stagnation Points, Introduction to Airfoil Theory.

Practice:

1. Determination of Viscosity of a Liquid by using Stoke's Law.

Module II (8 Hrs)

Incompressible flow: Navier-stokes equation (without derivation), Exact solutions of Navier-stokes equation, Poiseuille flow, Couette flow, Movement of Piston in a Dashpot.

Practice:

2. To Determine Velocity of a Point Within a Flow through the Pipe Line by Close Circuit Prandtl Tube Apparatus.
3. To Demonstrate Laminar and Turbulent Flow through Closed Conduit and to Find Out Reynolds Number by Reynolds Apparatus.
4. To Determine the Frictional Losses in the Pipe by Pipe Friction Apparatus.

Module III (5 Hours)

Compressible flow: Basic equations of Compressible Fluid Flow: Continuity Equation and General Energy Equation, Velocity of Pressure Wave in a Fluid, Subsonic, Sonic and Supersonic Flow, Mach Number, Wave Propagation in a Compressible Fluid, Stagnation Properties.

Module IV (13 Hours)

Conduction: Fourier's Law of Conduction, General Heat Conduction Equation in Different Coordinate Systems (No Derivation), One Dimensional Steady State Conduction in Plane Wall, Composite Wall, Composite Cylinders and Composite Spheres with Convective Atmosphere, Electrical Analogy, Conduction with Heat Generation, Overall Heat Transfer Coefficients, Critical Thickness of Insulation, Heat Transfer from Extended Surfaces, Effectiveness and Efficiency, Unsteady State Heat Conduction, Lumped Heat Capacity System and Lumped Capacitance Method.

Practice:

5. Determination of Overall Heat Transfer Coefficient of Composite Slab.
6. Determination of Thermal Conductivity of Liquid.
7. Experiment on Transient Heat Conduction Apparatus.
8. Efficiency and Effectiveness of Pin Fins.

Module V (10 Hours)

Convection: Hydrodynamic and Thermal Boundary Layer, Principles and Governing Equations, Forced Convection: External Flow Over a Flat Plate, Cylinder, Sphere and Non-Circular Ducts, Use of Empirical Relations, Internal Flow Through Pipe, Annular Spaces and Non-Circular Conduits, Natural Convection: Vertical, Horizontal, Inclined Surfaces.

Practice:

9. Determination of Heat Transfer Coefficient in Forced Convection.
10. Determination of Heat Transfer Coefficient in Natural Convection.

Module VI (5 Hours)

Heat Transfer with Phase Change: Film Wise and Drop Wise Condensation, Boiling Heat Transfer, Regimes of Boiling.

Practice:

11. Determination of Critical Heat Flux during Boiling Heat Transfer.
12. Determination of Heat Transfer in Drop and Film Wise Condensation.

Module VII (7 Hours)

Radiation: Electromagnetic Spectrum, Black Body Emission, Emissive Power, Laws of Radiation, Nature of Black and Grey Bodies, Concepts, Radiation Shape Factor, Thermal Resistance and Electrical Analogy, Radiation Heat Transfer Between Two Surfaces, Reradiating Surface, Radiation Shield.

Practice:

13. Determination of Surface Emissivity.
14. Verification of Stefan Boltzmann's Law.

6. Reference

Text Books:

1. Fundamentals of Heat and Mass Transfer by R.C. Sachdeva, 2nd Edition.

2. FluidMechanicsbyR.K.Bansaland Hydraulic Machines, LaxmiPublications.

ReferenceBooks:

1. HeatTransferby R.K. Rajput, LaxmiPublication.
2. Hydraulics &FluidMechanicsbyP.N. Modiand S.N.Seth, Rajsons Publications.
3. *OnlineSource:* www.nptel.ac.in, You tube video.

7. SessionPlan

Topiccoverage andInternal Test	No. of Sessions(in hrs.)	Activity (lecture, tutorial, lab practice, field studies/field-trip, Workshop etc.)	Assignme nt (project, assignme nt, field study, seminar, etc.)	Suggested Reading (Book, Video, Online source, etc.)
Module-1 (8 Hrs)				
Forceson SubmergedBodies: CausesforDragand Lift,Drag andLiftCoefficients,Dragon a Sphereand aCylinder	2	Lecturer	Assignme ntwith problem solving	1.FluidMechanicsbyR.K. Bansal and Hydraulic Machines, Laxmi Publications. https://www.youtube.com/watch?v=5ltjFEei3AI
Terminalvelocity ofaBody, Stroke’s Law,Development of Lift and Drag on a Stationary and RotatingCylinder	2+2	Lecturer + Lab Practice	Assignme ntwith problem solving	1.FluidMechanicsbyR.K. Bansal and Hydraulic Machines, Laxmi Publications. https://www.youtube.com/watch?v=hUP5igTjvuc https://www.youtube.com/watch?v=AcsrBCEJz-Y https://www.youtube.com/watch?v=mQwlmXtRu5k
Magnus Effect, Stagnation Points,Introduction toAirfoil Theory.	2	Lecturer	Assignme ntwith problem solving	1.FluidMechanicsbyR.K. Bansal and Hydraulic Machines, Laxmi Publications. https://www.youtube.com/watch?v=AJl8EvLp1G0
Module II(8 Hrs)				

Incompressible flow: Navier-stokes equation (without derivation)	1+2	Lecturer + Lab Practice	Assignment with problem solving	2. Hydraulics & Fluid Mechanics by P.N. Modi and S.N. Seth Rajsons Publications., https://www.youtube.com/watch?v=JH3I-NliCkM
Exact solutions of Navier-stokes equation	1	Lecturer + Lab Practice	Assignment with problem solving	2. Hydraulics & Fluid Mechanics by P.N. Modi and S.N. Seth, Rajsons Publications.
Poiseuille flow	2	Lab Practice	Assignment with problem solving	3. Hydraulics & Fluid Mechanics by P.N. Modi and S.N. Seth Rajsons Publications. https://www.youtube.com/watch?v=A8f0YfkXwds https://www.youtube.com/watch?v=fTEGOMWIKZ0
Couette flow, Movement of Piston in a Dashpot.	2	Lab Practice	Assignment with problem solving	3. Hydraulics & Fluid Mechanics by P.N. Modi and S.N. Seth, Rajsons Publications. https://www.youtube.com/watch?v=PQTRdX6-4kQ
Module III (5 Hrs)				
Compressible flow: Basic equations of Compressible Fluid Flow: Continuity Equation and General Energy Equation	2	Lecturer	Assignment with problem solving	1. Fluid Mechanics by R.K. Bansal and Hydraulic Machines, Laxmi Publications. https://www.youtube.com/watch?v=4EADzHBJtE
Velocity of Pressure Wave in a Fluid, Subsonic, Sonic and Supersonic Flow	2	Lecturer	Assignment with problem solving	1. Fluid Mechanics by R.K. Bansal and Hydraulic Machines, Laxmi Publications.
Mach Number, Wave Propagation in a Compressible Fluid, Stagnation Properties.	1	Lecturer	Assignment with problem solving	1. Fluid Mechanics by R.K. Bansal and Hydraulic Machines, Laxmi Publications.

Module IV(13 Hrs)				
Fourier's Law of Conduction, General Heat Conduction Equation in Different Coordinate Systems (No Derivation)	1	Lecturer	Assignment with problem solving	<p>1. Heat and Mass Transfer, R.K. Rajput, Laxmi Publications.</p> <p>2. Fundamentals of Heat and Mass Transfer, by R.C. Sachdeva, 2nd Edition.</p> <p>https://www.youtube.com/watch?v=gcY6832h_Nw</p> <p>https://www.youtube.com/watch?v=bA3EzToAWOE</p> <p>https://www.youtube.com/watch?v=pRnURDgfByE</p> <p>https://www.youtube.com/watch?v=Atnjo7dD_bA</p> <p>http://nptel.ac.in/courses/112108149/pdf/M1/Student_Slides_M1.pdf</p> <p>https://www.youtube.com/watch?v=VO_3WW6ZcWw</p> <p>https://www.youtube.com/watch?v=zFkJy_VocCk</p>
One Dimensional Steady State Conduction in Plane Wall	1	Lecturer	Assignment with problem solving	<p>1. Heat and Mass Transfer, R.K. Rajput, Laxmi Publications.</p> <p>2. Fundamentals of Heat and Mass Transfer, by R.C. Sachdeva, 2nd Edition.</p> <p>http://nptel.ac.in/courses/112108149/pdf/M2/Student_Slides_M2.pdf</p> <p>https://www.youtube.com/watch?v=HbzUeBCmjNQ</p> <p>https://www.youtube.com/watch?v=mhWPR3xNPRE</p> <p>https://www.youtube.com/watch?v=zM86XDUsMmA</p> <p>https://www.youtube.com/watch?v=40A4p0HrWik</p>
Composite wall, Composite Cylinders and Composite Spheres with Convective Atmosphere	1	Lecturer	Assignment with problem solving	<p>1. Heat and Mass Transfer, R.K. Rajput, Laxmi Publications.</p> <p>2. Fundamentals of Heat</p>

				and Mass Transfer, by R.C. Sachdeva, 2nd Edition. http://nptel.ac.in/courses/112108149/pdf/M2/Student_Slides_M2.pdf
Electrical Analogy, Conduction with Heat Generation	1	Lecturer	Assignment with problem solving	1. Heat and Mass Transfer, R.K. Rajput, Laxmi Publications. 2. Fundamentals of Heat and Mass Transfer, by R.C. Sachdeva, 2nd Edition.
Overall Heat Transfer Coefficients,	2	Lab Practice	Assignment with problem solving	1. Heat and Mass Transfer, R.K. Rajput, Laxmi Publications. 2. Fundamentals of Heat and Mass Transfer, by R.C. Sachdeva, 2nd Edition.
Critical Thickness of Insulation,	1	Lecturer	Assignment with problem solving	1. Heat and Mass Transfer, R.K. Rajput, Laxmi Publications. 2. Fundamentals of Heat and Mass Transfer, by R.C. Sachdeva, 2nd Edition.
Heat transfer from Extended Surfaces,	1	Lecturer	Assignment with problem solving	1. Heat and Mass Transfer, R.K. Rajput, Laxmi Publications. 2. Fundamentals of Heat and Mass Transfer, by R.C. Sachdeva, 2nd Edition. https://www.youtube.com/watch?v=rKcTidz-1P4 https://www.youtube.com/watch?v=DTXpnhTOI20http://nptel.ac.in/courses/112108149/pdf/M3/Student_Slides_M3.pdf
Effectiveness and Efficiency	2	Lab Practice	Assignment with problem solving	1. Heat and Mass Transfer, R.K. Rajput, Laxmi Publications. 2. Fundamentals of Heat and Mass Transfer, by R.C. Sachdeva, 2nd Edition.
Unsteady State Heat Conduction	2	Lab Practice	Assignment with	1. Heat and Mass Transfer, R.K. Rajput, Laxmi

			problem solving	Publications. 2. Fundamentals of Heat and Mass Transfer, by R.C. Sachdeva, 2nd Edition. https://www.youtube.com/watch?v=Di8G5iPDPEQ https://www.youtube.com/watch?v=seNR8waoBgE
Lumped heat Capacity System and Lumped Capacitance Method.	1	Lecturer	Assignment with problem solving	1. Heat and Mass Transfer, R.K. Rajput, Laxmi Publications. 2. Fundamentals of Heat and Mass Transfer, by R.C. Sachdeva, 2nd Edition.
Module V (10 Hrs)				
Convection: Hydrodynamic and Thermal Boundary Layer, Principles and Governing Equations	2	Lecturer	Assignment with problem solving	1. Heat and Mass Transfer, R.K. Rajput, Laxmi Publications. 2. Fundamentals of Heat and Mass Transfer, by R.C. Sachdeva, 2nd Edition. http://nptel.ac.in/courses/112108149/pdf/M6/Student_Slides_M6.pdf
Forced Convection: External flow over a Flat plate, Cylinder, Sphere and non-circular Ducts, use of Empirical Relations	2+2	Lecturer+ Lab Practice	Assignment with problem solving	1. Heat and Mass Transfer, R.K. Rajput, Laxmi Publications. 2. Fundamentals of Heat and Mass Transfer, by R.C. Sachdeva, 2nd Edition.
Internal flow through pipe, Annular spaces and non-Circular Conduits, Natural Convection: Vertical, Horizontal, Inclined Surfaces	2+2	Lecturer+ Lab Practice		1. Heat and Mass Transfer, R.K. Rajput, Laxmi Publications. 2. Fundamentals of Heat and Mass Transfer, by R.C. Sachdeva, 2nd Edition.
Module VI (5 Hrs)				
Heat transfer with phase change: - Film Wise and Drop Wise Condensation	1+2	Lecturer+ Lab Practice		1. Heat and Mass Transfer, R.K. Rajput, Laxmi Publications. 2. Fundamentals of Heat and Mass Transfer, by R.C. Sachdeva, 2nd Edition.

Boiling Heat transfer, Regimes of Boiling.	2	Lab Practice		<p>1. Heat and Mass Transfer, R.K. Rajput, Laxmi Publications.</p> <p>http://nptel.ac.in/courses/112108149/pdf/M8/Student_Slides_M8.pdf</p> <p>https://www.youtube.com/watch?v=NaSMTsscEao</p> <p>https://www.youtube.com/watch?v=N1yZwRcQSZw</p>
Module VII (7 Hrs)				
Radiation: Electromagnetic spectrum, blackbody emission, emissive power, laws of radiation, nature of black and grey bodies, concepts	1+2	Lecturer+ Lab Practice		<p>1. Heat and Mass Transfer, R.K. Rajput, Laxmi Publications.</p> <p>2. Fundamentals of Heat and Mass Transfer, by R.C. Sachdeva, 2nd Edition.</p> <p>https://www.youtube.com/watch?v=5GoZZKcNZiQ</p> <p>https://www.youtube.com/watch?v=tZiZyoYT80</p> <p>http://nptel.ac.in/courses/112108149/pdf/M9/Student_Slides_M9.pdf</p>
Radiation Shape Factor, Thermal Resistance and Electrical Analogy	1+2	Lecturer+ Lab Practice		<p>1. Heat and Mass Transfer, R.K. Rajput, Laxmi Publications.</p> <p>2. Fundamentals of Heat and Mass Transfer, by R.C. Sachdeva, 2nd Edition.</p> <p>https://www.youtube.com/watch?v=TiOpUAI_9mk</p> <p>https://www.youtube.com/watch?v=szEOmHKjzhs</p>
Radiation Heat Transfer between two Surfaces, reradiating Surface, Radiation Shield	1	Lecturer		<p>1. Heat and Mass Transfer, R.K. Rajput, Laxmi Publications.</p> <p>2. Fundamentals of Heat and Mass Transfer, by R.C. Sachdeva, 2nd Edition.</p>

**CENTURION UNIVERSITY OF TECHNOLOGY AND
MANAGEMENT, ODISHA**

SCHOOL OF PARAMEDICS & ALLIED HEALTH SCIENCES



Centurion
UNIVERSITY

**BACHELORE OF SCIENCE IN
CLINICAL MICROBIOLOGY**

2017

SYLLABUS

Preface: Clinical Microbiology helps to diagnose and prevent disease through clinical laboratory tests. It is complementary to medical science. It involves analysis of body matter such as Collection of samples like body fluid, tissue, and blood and diagnoses them. It also covers micro-organism screening, sterilization of laboratorial environment and equipments, Antibiotic sensitivity tests.

Clinical Microbiologists are an integral part of the medical profession. These professionals get involved in practical and technical work to aid correct diagnosis and effective functioning of Microbiological Laboratory.

With adequate knowledge and experience, Clinical Microbiologist having +2 Sc with biology qualification can work in supervisory or management positions in laboratories and hospitals. They can also work as Laboratory Manager/Consultant/supervisor, health care Administrator, Hospital Outreach coordination, laboratory information system Analyst/Consultant, educational consultant/coordinator etc. Additional opportunities are available in molecular diagnostics, molecular biotechnology companies and in vitro fertilization laboratories as well as in research labs.

Programme: B.Sc. in Clinical Microbiology.

Duration: Three years (Six semesters) full-time programme with 6 months internship in the last semester.

Eligibility: +2 Science with Physics, Chemistry & Biology or equivalent degree

Examination: Examination rules will be as per guideline of CUTM Examination hand book.

Internship: A candidate will have to undergo internship for a period of six calendar months in a hospital/Diagnostics Centre equipped with modern microbiology laboratory facility or in a fully equipped pathology laboratory, which fulfills the norms decided by the University.

Dissertation will be compulsory to all students. Students will carry out dissertation work individually or in the group of not more than three students. The format for dissertation/Internship report will be similar to the research thesis style; incorporating chapters on: Introduction, Materials and Methods, Results and Discussion and References / Bibliography. The dissertation will be submitted in atypewritten and bound form.

Degree: On successful completion of three year programme, the candidate will be awarded with “**Bachelor of Science in Clinical Microbiology (B.Sc.-CMB)**” from Centurion University.

Bachelor of Science in Clinical Microbiology Course Structure

SEMESTER-I

SI NO	CODE	SUBJECT	SUBJECT TYPE Lecture+ Tutorial+ Practice (L+T+P)	CREDITS
1	BSCM1101	Introductory Cell Biology	3+1+0	4
2	BSCM1102	Human Anatomy & Physiology	4+0+0	4
3	BSCM1103	Basic Haematology	3+1+0	4
4	BSCM1104	Instrumentation & Techniques	3+1+0	4
5	BSCM1105	Human Anatomy, Physiology & Haematology Practical	0+0+6	4
	Total			20

SEMESTER-II

SL NO	CODE	SUBJECT	SUBJECT TYPE (L+T+P)	CREDITS
1	FCBS0101	Environmental Science	3+1+0	4
2	FCHU1201	Foundations of English Communication	0+0+3	2
3	BSCM1201	General Microbiology	3+1+0	4
4	BSCM1202	Clinical Biochemistry	3+1+0	4
5	BSCM1203	Clinical Pathology & Diagnosis	3+1+0	4
6	BSCM1204	Clinical Pathology, Biochemistry & Microbiology Practical	0+0+6	4
	Total			22

SEMESTER-III

SL NO	CODE	SUBJECT	SUBJECT TYPE L+T+P	CREDIT
1	BSCM2301	Immunology	3+1+0	4

2	BSCM2302	Systemic Bacteriology	3+1+0	4
3	BSCM2303	Molecular Biology	3+1+0	4
4	BSCM2304	Systemic Virology & Mycology	3+1+0	4
5	FCHU0202	Communicative Practice Laboratory-2	0+0+3	2
6	BMCM2306	Bacteriology, Virology & Mycology Practical	0+0+6	4
	Total			22

SEMESTER-IV

SL NO	CODE	SUBJECT	SUBJECT TYPE L+T+P	CREDIT
1	BSCM2401	Public Health Microbiology	3+1+0	4
2	BSCM2402	Pharmaceutical Microbiology	3+1+0	4
3	BSCM2403	Industrial Microbiology	3+1+0	4
4	BSCM2404	Biochemistry	3+1+0	4
5	BSCM2405	Basic Computer & Information technique	0+0+6	4
6	BSCM2406	Industrial, Public Health Microbiology & Biochemistry Lab.	0+0+6	4
	Total			24

SEMESTER-V

SL NO	CODE	SUBJECT	SUBJECT TYPE L+T+P	CREDIT
1	BSCM3501	Epidemiology	3+1+0	4
2	BSCM3502	Diagnostic Bacteriology	3+1+0	4
3	BSCM3503	Diagnostic Virology	3+1+0	4

4	BSCM3504	Diagnostic Mycology	3+1+0	4
5	BSCM3505	Diagnostic Parasitology	3+1+0	4
6	BSCM3506	Research Methodology	3+1+0	4
7	BSCM3507	Epidemiology & Diagnosis microbiology lab	0+0+6	4
	Total			28

SEMESTER-VI				
SL NO	CODE	SUBJECT	SUBJECT TYPE L+T+P	CREDIT
1	BSCM3601	Project	NA	12
2	BSCM3602	Internship	NA	12
	Total			24

INTERNSHIP

Minimum 720 hours (calculated based on 8 hours per day, if 90 working days in a 6 months)

Syllabus
1st semester B. Sc Clinical Microbiology

BSCM1101- Introductory Cell Biology

Subject Name	Code	Type of course	L-T-P	Prerequisite
Introductory Cell Biology	BSCM1101	Lecture+ Tutorial	3-1-0	Fundamental Science

Course Objective

- Determine the parts of the cell membrane and the cell wall
- Distinguish the types and mechanism of mutation
- Compare and contrast the events of cell cycle and its regulation
- Understand the dynamic character of cellular organelles

Course Outcome

- Describe the fundamental principals cellular biology
- Develop a deeper understanding of cell structure and how it relates to cell functions.
- Understand how cells grow, divide, and die and how these important processes are regulated.
- Understand cell signaling and how it regulates cellular functions. Also how its dis-regulation leads to cancer and other diseases.

Unit-1

Biology & Its Branches; Scientific methods in Biology; Scope of biology and career options in Medical Laboratory Sciences; Characters of living organisms (elementary idea of metabolism, transfer of energy at molecular level, open and closed systems, homoeostasis, growth and reproduction, adaptation, survival, death). Origin and Evolution of life - Theories of Evolution; Evidence of Evolution; Sources of Variations (mutation, recombination, genetic drift, migration, natural selection); Concept of species; Specification and Isolation (geographical and reproductive); Origin of species.

Unit-2

Cell organelles and their functions- nucleus, mitochondria, plastids, endoplasmic reticulum, Golgi complex, lysosomes, microtubules, centriole, vacuole, cytoskeleton, cilia and flagella, ribosomes. Molecules of cell ; inorganic and organic materials - water, salt, mineral ions, carbohydrates, lipids, amino acids, proteins, vitamins, hormones and steroids.

Unit-3

Cell as a basic unit of life - discovery of cell, cell theory, cell as a self - contained unit; prokaryotic and eukaryotic cell; unicellular and multicellular organisms; Ultrastructure of

prokaryotic and eukaryotic cell - cell wall, cell membrane - unit membrane concept (Fluid-Mosaic model); membrane transport; cellular movement (exocytosis, endocytosis)

Unit-4

Cell respiration: Metabolism, carbohydrate metabolism, cell respiration-: stage I- Glycolysis, stage II- Pyruvic acid oxidation, stage III- Krebs citric acid cycle, stage IV- oxidation phosphorylation.

Components of respiratory chain, energy relationships during cell respirations during cell respiration, types of respiration. Pathways in intermediary metabolism of carbohydrates.

Suggested Readings

1. Molecular biology of the cell by Alberts Bruce, publisher Garland Science
2. Molecular Biology by Friefelder David, Publisher Narosa
3. Introduction to Cell biology by John K Young, World Scientific publishing company
4. Introduction to biology ,3rd tropic edition by D G Maackean
5. A Term wise Text book on biology by VIDYA

BSCM1102-Human Anatomy and Physiology

Subject Name	Code	Type of course	L-T-P	Prerequisite
Human Anatomy and Physiology	BSCM1102	Lecture	4-0-0	Fundamental Science

Course Objective

- To identify different types of cells and describe their functions.
- To identify the organelles of a typical cell and describe their functions.
- To identify the major components of the integumentary system and describe their functions.
- To identify the major structures of the skin and describe their functions
- To identify the major components of the skeletal system and describe their functions.
- To identify the major components of the circulatory, endocrine, nervous system etc and describe their functions.

Course Outcome

- Use anatomical terminology to identify and describe locations of major organs of each system covered.
- Explain interrelationships among molecular, cellular, tissue, and organ functions in each system.
- Describe the interdependency and interactions of the systems.
- Explain contributions of organs and systems to the maintenance of homeostasis.
- Identify causes and effects of homeostatic imbalances.
- Describe modern technology and tools used to study anatomy and physiology.

Unit-1

Scope of Anatomy and physiology. Definition of various terms used in Anatomy. Structure of cell, function of its components with special reference to mitochondria and microsomes.

Elementary tissues: Describe about the elementary tissues of the body, i.e. epithelial tissue, muscular tissue, connective tissue and nervous tissue. Cell division, meiosis and mitosis

Skeletal System: Structure and function of different human Bones, Skelton & Joints. Classification of joints and their function. Joint disorders.

Practice: Demonstration of individual bone from skeleton..

Identification of different organs and system from chart.

Unit-2

Blood, Composition, Structure, classifications, Rh factor, Grouping, Normal and Abnormal Structure of different blood cells, synthesis of blood cells, mechanism of blood clot, blood circulation in body. Cardiovascular System: Structure and functions and Position of Heart. Various parts of the heart. Blood supply in Artery and veins. Conducting system of the Heart. Cardiac output. Blood pressure and Pulses and its normal recording. Brief information about cardiovascular disorders.

Respiratory system: Various parts of respiratory system and their functions, physiology of respiration. Other respiratory organs, their structure and fuctions. Mechanism of respiration.

Practice: Demonstration the morphology of different blood cells

Measurement of Blood pressure, impulses, Heart beats, respiration rate etc.

Unit-3

Urinary System: Various parts of urinary system and their functions, structure and functions of kidney. Physiology of urine formation . Patho-physiology of renal diseases and edema.

Digestive System: names of various parts of digestive system and their functions. Structure and functions of liver, physiology of digestion and absorption.

Endocrine System: Endocrine glands and Hormones. Reproductive system. Structure and function of sense organs.

Practice: Identification of different organs and system from chart.

Suggested Readings:

1. Text book Anatomy & Physiology for nurses by Evelyn Pearce, Publisher Faber& Faber.
2. Text book Anatomy and Physiology for nurses by Sears, Publisher Edward Arnold.
3. Anatomy & Physiology- by Ross and Wilson, Publisher Elsevier.
4. Anatomy& Physiology: Understanding the human body by Clark, Publisher Jones & Bartlett.
5. Anatomy and Physiology for nurses by Pearson, Publisher Marieb & Hoehn.
6. Anatomy and Physiology by N Murgesh, Publisher satya.

BSCM1103- Basic Haematology

Subject Name	Code	Type of course	L-T-P	Prerequisite
Basic Haematology	BSCM1103	Lecture+Tutorial	3-1-0	Basic Medical science

Course Objective

- The overall aims are that the student should obtain advanced knowledge of the most common hematologic diseases & understanding the concept of Blood cells and other blood components.
- Be able to handle an investigation of hemorrhagic disorder and laboratory abnormalities such as anaemia, polycythemia, leukopenia, leukocytosis, thrombocytopenia, thrombocytosis, elevated ESR etc within hematology.
- Clinically relevant hematological analysis for deeper understanding of Evaluate normal and abnormal cell morphology with associated diseases and other blood components.

Course Outcome

- Differentiate various laboratory test findings with their associated clinical conditions.
- Identify the various skills necessary to perform blood counts, evaluate blood elements, and report results within the stated limits of accuracy.
- Describe the various components of blood, their functions, and roles in various disease states.
- To be able to demonstrate good skills in the relevant Hematology laboratory methodology.
- Collection of blood for the investigations.
- Be able to distinguish the developmental stages of blood cells. It will also cover Bone marrow examination.
- To learn about tests carried out for hematological investigations.
- To be able to carry out blood sampling.

Unit-1

Introduction to Haematology, definition, importance, important equipment and chemicals, various test performed in Haematology laboratory. Focusing different blood cells through microscope.

Practice: Demonstration of instruments used in haematology- Microscope, Blood Cell counter, Shari's. Apparatuses.

Unit -2

Synthesis of blood in Bone marrow- Erythropoiesis, leucopoiesis, thrombopoiesis

Anticoagulants, definition, Uses, Different types, mode of action, their merits and demerits, Morphology of normal blood cells, abnormal morphology & diseases.

Practice: Demonstration of different blood cell, their synthesis from slide presentation or chart. Demonstration the normal and abnormal morphology of different blood cells.

Unit-3

Collection and preservation of blood: Different methods of collection, preservation, changes in stored blood normal and absolute values in haematology, RBC count, WBC count, Platelet count, DLC value, HB, MCH, MCV, MCHC, ESR, PCV.

Blood Film: different types, methods of preparations, staining, Different types of stains, Romanowsky stains: principle of staining, different stains, their composition and preparation, methods of staining.

Practice: Collection of blood by different methods. Preparation of DLC, TLC, TRBC etc Estimation of ESR, Hb and diagnosis procedure of different blood tests.

Unit-4

Haematological Disorders

- a. Classification of Anaemia: Morphological & etiological.
- b. Iron Deficiency Anaemia: Distribution of body Iron, Iron Absorption, causes of iron deficiency, lab findings.
- c. Megaloblastic Anaemia: Causes, Lab findings.
- d. Haemolytic Anaemia: Definition, causes, classification & lab findings.
- e. Bone Marrow : Cell composition of normal adult Bone marrow, Aspiration, Indication, Preparation & Staining, Special Stain for Bone Marrow -Periodic Acid Schiff, Sudan Black
- f. Leukaemia : Classification, Blood Picture, Differentiation of Blast Cells.

Practice: Estimation procedure of sickle cell, Identification of different abnormal morphology of blood. Different normal and abnormal morphology of RBCs, WBCs, Platelet.

Suggested Reading

1. Textbook of Medical Laboratory Technology P.B Gotkar Mumbai, Bhalani Publishing House
2. Text book of Medical Laboratory Technology by Paraful B. Godkar, Publisher Bhalani
3. Text book of Medical Laboratory Technology (2nd edition) by V.H Talib, Publisher CBS
4. Atlas of hematology (5th edition) by G.A. McDonald, Publisher Churchill Livingstone
5. Medical Laboratory Technology By K.L Mukharjee, Publisher McGraw Hill education pvt limited

BSCM1104- Instrumentation & Techniques

Subject Name	Code	Type of course	L-T-P	Prerequisite
Instrumentation & Techniques	BSCM1104	Lecture+Tutorial	3-1-0	Fundamental Science

Course Objective

- To learn the principle, instrumentation & application of Microscopy
- Principle, instrumentation & application of Centrifugation
- Principle of Spectroscopy

Course Outcome

- After completion of the course the student will be efficient in handling the microscopy equipment's.
- They will also be able to have idea about handling instruments like centrifuge, spectrophotometer, chromatography, flow cytometer, Automated and semi- automated Biochemistry analyzer.
- Each graduate will meet expected outcomes in communications, computation, and human relations, per the University General requirements.

Unit -1

Microscope: different type of microscope operation and care of binocular and monocular microscope in details Light, phase contrast, interference, fluorescence, polarization and electron microscopy (principle, parts and its application)

Photometry: Basic principal and operation.

Practice: Demonstration, operation, and Quality control of different types of microscopes.

Unit-2

UV-V is spectrometry and colorimetric instrumentation and its application.

Centrifuge: Basic principle, type analytical and preparative centrifuges, different density gradient centrifuge and its application. Blood analyzer: Principle, working and its application. Demonstration and Maintenance of Laminar Flow.

Practice: Operation, Demonstration and Quality control of Centrifuge, UV-Vis spectrometer, Colorimeter.

Unit-3

Microtome: Principle, working and its uses. Incubator, hot air oven and autoclave: Principle, working and its uses. Operation Techniques and Maintenance of different another microbiological instruments

Practice: Working procedure of microtome, Incubator, Hot air oven, autoclave and others

Suggested Reading

1. A Textbook of Medical Laboratory Technology by P Godkar, Publisher Bhalani
2. Textbook of Clinical laboratory methods and diagnosis by Ales C.Sonnenwirth & Leonard Jarret.
3. A Procedure Manual for Routine Diagnostic Tests Vol. I and II by KL Mukherjee, Publisher McGraw Hill education pvt limited
4. Manual of lab and diagnostic tests by Lippincott Williams Wilkins, New York, Fischbach, 2005.

5. Medical laboratory science theory and practice by J Ochei and Kolhatkar, Publisher TBS

BSCM1105-Anatomy, Physiology & Haematology Lab

Subject Name	Code	Type of course	L-T-P	Prerequisite
Anatomy, Physiology & Haematology Lab	BSCM1105	Practice	0-0-4	Basic Medical Science

Course Objective

- To identify the cell, different organelles and describe their functions.
- To identify the major organ systems of the human body and describe their functions.
- The overall aims are that the student should obtain advanced knowledge of the most common hematologic diseases & understanding the concept of Blood cells and other blood components.
- Clinically relevant hematological analysis for deeper understanding of Evaluate normal and abnormal cell morphology with associated diseases and other blood components.

Course Outcome

- Use anatomical terminology to identify and describe locations of major organs of each system covered.
- Explain interrelationships among molecular, cellular, tissue, and organ functions in each system.
- Describe the interdependency and interactions of the systems.
- Differentiate various laboratory test findings with their associated clinical conditions.
- Identify the various skills necessary to perform blood counts, evaluate blood elements, and report results within the stated limits of accuracy.
- Describe the various components of blood, their functions, and roles in various disease states.

Anatomy, Physiology & Haematology

Demonstrate the different body parts, their position, Structure from charts, models. Identification of different joints and bones.

Demonstration of various parts of centrifuge; its functioning and care , Demonstration of various parts of microscope its functioning and care ,Cleaning and drying of glass and plastic ware,

Preparation of various anticoagulants, Collection of venous and capillary blood, Cleaning of glass-syringes and its sterilization .Preparation of buffers, Preparation of the stains and other reagents , Preparation of peripheral blood film (PBF), To stain a peripheral blood Film by Leishman - stain, Haemoglobin estimation (oxy Hb and cyanmethaemoglobin method)

Complete Blood Counts, Determination of Haemoglobin, TRBC Count by Haemocytometers, TLC by Haemocytometer, Differential Leukocyte count, Determination of Platelet Count.

Determination of ESR by wintrobes, Determination of ESR by Westergeren's method, Determination of PCV by Wintrobes, Erythrocyte Indices- MCV, MCH, MCHC. Reticulocyte Count, Absolute Eosinophil Count, Morphology of Red Blood Cells.

Demonstration of various parts of body, tissues of body , parts of digestive system , parts of respiratory system ,parts of excretory system

Suggested Reading:-

1. A Textbook of Medical Laboratory Technology by P Godkar, publisher Bhalani
2. Hand book of Medical Lab Technology By V S talib, Publisher CBS
3. Practical Haematology(8th edition) by Sir John, Publisher Churchill Livingstone
4. Clinical Hematology by Christopher A. Ludlam
5. A Procedure Manual for Routine Diagnostic Tests Vol. I and II by KL Mukherjee
Publisher McGraw Hill education pvt limited,

2nd semester B. Sc Clinical Microbiology

FCBS0101-Environmental Science

Subject Name	Code	Type of course	L-T-P	Prerequisite
Environmental Science	FCBS0101	Lecture+Tutorial	3-1-0	Fundamental Science

Course Objectives

- To understand the concept of multi-disciplinary nature of Environmental Science where different aspects are dealt with a holistic approach.
- Students will develop a sense of community responsibility by becoming aware of environmental issues in the larger social context.
- One must be environmentally educated.

Course Outcome

- Understand the natural environment and its relationships with human activities.
- Characterize and analyze human impacts on the environment.
- Integrate facts, concepts, and methods from multiple disciplines and apply to environmental problems.
- Design and evaluate strategies, technologies and methods for sustainable management of environmental systems and for the remediation or restoration of degraded environments.

Unit-1

Environment and its multidisciplinary nature; Need for public awareness; Renewable and non-renewable resources–forest, water, mineral, land, food and energy resources; Structure and function of ecosystems of forest, grass land, desert and aquatic types.

Unit-2

Biodiversity and its conservation: Biodiversity at global, national and local levels; Threats to biodiversity - Habitat loss; wild life poaching and man - wildlife conflicts; Endangered and endemic species; conservation measures.

Causes, effects and control measures of pollution, air, water and noise pollution; Nuclear hazards; solid-waste management–Causes, effects and control measures; Management of disasters due to natural causes of floods, earthquakes, cyclones and landslides.

Unit-3

Social issues and the environment; Sustainable environment, Water conservation measures; Rain water harvesting; Resettlement and rehabilitation of people; Climate change and global warming; Acid rain; Ozone layer depletion; water land reclamation; Consumerism and waste products; Features of Environment Protection Act, Air pollution and Control of Pollution Acts; Water Pollution and its Control Act. Effects of Pollution explosion on environment and public health; Need for value education to Protect environment and resources.

Text Book:

1. Anubhav Kaushik & C.P. Kaushik: Environmental Studies-New age International Publishers.

Reference Books:

1. Benny Joseph: Environmental Studies-Tata Mac Graw Hill
2. E. Bharucha: Text book of Environmental Studies for under graduate courses– Universities Press. (Book prepared by UGC Committee.

FCHU1201- Foundations of English Communication

Subject Name	Code	Type of course	L-T-P	Prerequisite
Foundations of English Communication	FCHU 1201	Practice	0-0-3	Fundamental Science

Course Objectives

- To develop vocabulary and grammar knowledge
- To develop reading comprehension skills

Course Outcome

- Development of academic and sub-technical vocabulary
- Enhancement of basic language skills, i.e., listening, speaking, reading and writing
- Development of grammatical competence
- Confidence level improvement

Unit-1

READING SKILLS (7hrs.)

Read one of the following books:

- Animal Farm

- Alice in Wonderland
- Guide
- Malgudi Days
- Harry Potter
- Amar Chitra Katha

Comprehension Skills: Students will respond to comprehension lessons from the chosen book.

Unit-2

WRITING SKILLS (7hr.)

Students learn grammar and usage by writing passages, and getting formal feedback on these.

Unit-3

LISTENING SKILLS (6hrs.)

Students respond to questions based on listening to videos, audio, or speaking assignments of classmates.

Unit-4

SPEAKING SKILLS (7hrs.)

Speaking assignments based on chosen book or contemporary topics.

TEXT BOOKS:

Esteras, Santiago Remacha and Fabre, Elena Marco. (2007).

Professional English in Use ICT Student's Book. Cambridge: Cambridge University Press.

REFERENCES:

Grellet, F. (1981). Developing Reading Skills. Cambridge: Cambridge University Press

McCarthy, M. & O'Dell, F. (2008).

Academic Vocabulary in Use. Cambridge: Cambridge University Press.

Ur Penny, (1992). Five-Minute Activities: A Resource Book of Short Activities (Cambridge Handbooks for Language Teachers). Cambridge: CUP

F Klippel. (1984). Keep Talking. Cambridge: CUP

BSCM1201- General Microbiology

Subject Name	Code	Type of course	L-T-P	Prerequisite
General Microbiology	BSCM1201	Lecture+Tutorial	3-1-0	Medical Science

Course Objective

- Describe the use of microorganism in different industries to produce valuable products like drugs, beverages and different food products etc.
- To developed skills for growing microorganisms in the laboratory for the production of different products by different microorganisms.

Course Outcome

- Students has acquired a fairly good knowledge of how microbes are used in the fermentative production of organic acids, alcohols, enzymes, antibiotics and various foods in the industry.
- Enhances analytic ability of various physical parameters which affect production of industrial products by the microorganisms and the safety aspects of the production and use of these products.
- The conceptual understanding of the subject provides opportunities for employability and scopes for higher education.
- Develops laboratory skills in producing alcohol and enzymes by fermentative process using bacteria/yeast.

Unit-1

Introduction to Microbiology ,Definition, history, relationship of micro-organisms to man, and safety guideline in a microbiology laboratory . Morphology of bacterial cell wall , Anatomy and chemical structure of a bacterial cell including spores, flagella, pili and capsules . Sporulation . Classification of bacteria according to cell wall and shape (arrangement).
Bacterial Growth and Nutrition of bacteria . Bacterial growth curve and bacterial nutrition.

Practice: Preparation of culture media, demonstrate aerobic and anaerobic culture.

Demonstration the different culture plate and bacterial growth, identification of bacteria.

Unit-2

Classification of micro-organisms with special reference to bacteria General – Biological
Sterilization ,Definition, sterilization by dry heat, moist heat (below, at and above 100o C), autoclave and hot air oven its structure and functioning, preventive measures, controls and sterilization indicators, sterilization by radiation and filtration, Antiseptics and Disinfectants
Definitions, types, properties, use of disinfectants and antiseptics, efficiency testing of disinfectants; use of laminar flow – principle and function.

Practice:- Demonstrate the different methods of sterilization with handling Hot air oven, Autoclave.

Handling Of compound microscope. Demonstration of Antiseptics, Spirit, Cetrimide & Povidone-iodine.

Demonstration the disinfectants and precaution while using disinfectants

Unit-3

Staining techniques

Methods of smear preparation, Gram stain, AFB stain, Albert's stain and special staining for spore, capsule and flagella, Culture Media, Liquid and solid media, defined and synthetic media, routine laboratory media (basal, enriched, selective, enrichment, indicator, and transport media).
Different Culture, media their preparation and uses in microbial growth.

Practice: Demonstration the different staining procedure like Gram stain, Zn stain, Albert's stain etc Demonstrate different microbial growth in different media. Identify the morphology.

Suggested Reading:-

1. Medical Laboratory Technology by Kanai Lal Mukherjee; Tata McGraw Hill, New Delhi

2. An Introduction to Medical Laboratory Technology by FJ Baker; Butterworth – Heinemann; Oxford
3. Practical Book of Medical Microbiology by Satish Gupta; JP Brothers, New Delhi
4. Medical Laboratory Manual for Tropical Countries Vol. I and II by Monica Cheesbrough; Cambridge University Press; UK
5. Textbook of Medical Laboratory Technology by Praful B Godkar; Bhalani Publishing House, Mumbai
6. Text book of Medical Microbiology by Gruckshiank

BSCM1202- Clinical Biochemistry

Subject Name	Code	Type of course	L-T-P	Prerequisite
Clinical Biochemistry	BSCM1202	Lecture+ Tutorial	3-1-0	Fundamental Science

Course Objective

- To understand the concept of metabolism of carbohydrates
- To understand the significance of amino acids, proteins
- Use of enzymes in enhancing metabolic reactions
- Role of lipids

Course Outcome

- After completion of the course the student will be developed a very good understanding of various biomolecules which are required for development and functioning of cells.
- Would have understood the significance of carbohydrates in energy generation and as storage food molecules for cells.
- They would have understood the significance of proteins and enzymes in accelerating various metabolic activities.
- The conceptual understanding of the subject provides opportunities for skill enhancement and scopes for higher education.

Unit-1

biomedical importance & properties. Brief outline of metabolism : Glycogenesis & glycogenolysis (in brief), Glycolysis, citric acid cycle & its significance, HMP shunt & Gluconeogenesis (in brief), regulation of blood glucose level.

Unit-2

Amino acids - Definition, classification, essential & non essential amino acids. Chemistry of Proteins & their related metabolism - Introduction, definition, classification, biomedical importance. Metabolism : Transformation, Decarboxylation, Ammonia formation & transport, Urea cycle, metabolic disorders in urea cycle, catabolism of amino acids especially Phenylalanine, Tyrosine & Tryptophan, Creatine, Creatinine , Proteinuria.

Practice:-Operation procedure of Centrifuge machine, colorimeter, spectrophotometer etc

Estimation of Liver function test, Kidney function test, Thyroid , Lipid profile . Estimation of bile pigment , bile salt, bilirubin etc.

Unit-3

Chemistry of Lipids & their related metabolism - Introduction, definition, classification, biomedical importance, essential fatty acids. Brief outline of metabolism : Beta oxidation of fatty acids, fatty liver, Ketosis, Cholesterol & its clinical significance, Lipoproteins in the blood composition & their functions in brief, Atherosclerosis.

Diabetes mellitus - definition, types, features, gestation diabetes mellitus , glucose tolerance test, glycosurias, Hypoglycaemia & its causes.

Practice: - Demonstrate the estimation of Blood sugar by manual method and through Auto Analytic Technique. Demonstrate different biochemical test comes under the above unit.

Suggested Reading

1. Text book of Medical Laboratory Technology, P.B. Godkar 2nd Edn. 2003 Bhalani Publication.
2. Text book of Biochemistry, M. A. Siddique 8th Edn.1993 Vijay Bhagat Scientific Book Co., Patna.
3. Medical Biochemistry by AC Dey.
4. Handbook of Christen Medical Association, India Medical Laboratory Technology- Robert H. Carman.

BSCM1203-Clinical Pathology & Diagnosis

Subject Name	Code	Type of course	L-T-P	Prerequisite
Clinical Pathology & Diagnosis	BSCM1203	Lecture+ Tutorial	3-1-0	Fundamental Science

Course Objective

- Analyze body fluid for diagnosis of disease
- Analyze waste product for diagnosis of disease
- Understanding DOT Policy
- Understand Physiological disorder and infectious disease
- Analysis of pregnancy

Course Outcome

- Able to collect pathological specimen
- Able to detect diabetes, ketosis, nephritis, jaundice and other physiological disorder
- Able to detect infectious disease (UTI, Hematuria, Filaria, Dysentery, Ulcer, TB, etc.)
- Preservation and processing of pathological sample.
- Identification of Parasites
- Analysis of Infertility disorder

Unit-1

Composition, collection and preservation of urine for various tests, physical chemical and microscopic examination of urine, estimation of total albumin, Specific gravity, litmus paper, tests for albumin, sugar, blood, bile salts and pigments, urobilinogen, ketones bodies etc. Urine meter, Esbachl's Albuminometer, preparation of various reagents.

Practice: Collection procedures of urine, Important precursors for collecting samples.

Physical and Chemical and Microscopic examination of urine.

Unit-2

Stool- Sample collection, physical, chemical and microscopic examination. Sputum- Sample collection, stain and study of A.F.B. Cerebrospinal Fluid: Pandy's test, Cell count, cell type differential count and malignant cells. Cells stain; cell morphology and detection of malignant cells in peritoneal fluid, pleural fluid, pericardial fluid, and synovial fluid. Differences between transudates and exudates. Semen Sample collections microscopic examination for count and morphology.

Practice: Collection procedures and important precursors for collecting samples like STOOL, CSF, SEMEN and different body fluids.

Physical and Chemical and Microscopic examination of different samples.

Unit-3

ANATOMIC PATHOLOGY: 1. Reception, Registration, preservation and processing of specimens. Haematoxyline and eosine staining procedure, mounting of stained sections, Filing of paraffin blocks, and slides. Method of decalcification, Sharpening and honing Knives techniques, using of microtome.

2. Museum: Mounting of specimens, labeling, maintenance of specimens and catalogue etc.

Post mortem/ Autopsy: Maintenance of the records of the Dead Bodies and specimens received, Autopsy techniques, Autopsy instruments, cold storage plants, legal aspects etc.

Practice : Handling clinical laboratory equipment .

Preparation of some stains, and reagents for clinical diagnosis purpose.

Suggested Reading

1. Textbook of Clinical laboratory methods and diagnosis by Gradwohls, Publisher Mosby
2. Manual Text book of lab and diagnostic tests by Lippincott Williams Wilkins, New York.
3. Medical laboratory science theory and practice by J Ochei and Kolhatkar, 2002, Tata McGraw- Hill, Publisher TBS

BSCM1204- Clinical pathology, Microbiology & Clinical Biochemistry lab

Subject Name	Code	Type of course	L-T-P	Prerequisite
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Clinical pathology, Microbiology & Clinical Biochemistry lab	BSCM1204	Practical	0-0-4	Fundamental Science
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Course Objective

- Analyze body fluid for diagnosis of disease
- Understand Physiological disorder and infectious disease
- To know various Culture media and their applications and also understand various physical and chemical means of sterilization
- To master aseptic techniques and be able to perform routine culture handling tasks safely and effectively

Course Outcome

- Able to detect diabetes, ketosis, nephritis, jaundice and other physiological disorder
- Able to detect infectious disease (UTI, Hematuria, Filaria, Dysentery, Ulcer, TB, etc.)
- Preservation and processing of pathological sample.
- Provides knowledge on growth of microorganism.
- Provides knowledge Culturing microorganism and Liver function test, Kidney function test, Lipid profile.

Clinical Pathology and Microbiology-

Urine analysis Physical, Chemical, Microscopic, Microbiological. Stool analysis Physical, Chemical, Microscopic, Microbiological. Sputum analysis Physical, Chemical, Microscopic, Microbiological. Semen analysis Physical, Chemical, Microscopic, Microbiological. Sterilization, Media Preparation, Bacteriological examination of pus. Bacteriological examination of trout swab.

Laboratory study of parasites in stool, blood. Giardia lamblia, Entamoeba

Clinical Biochemistry-

Demonstration the centrifuge machine. Demonstration of Colorimeter.

Estimation of Liver function test, Kidney function test, Lipid profile. Estimation of Glucose in urine and blood .

Estimation of Protein in urine and blood.

Suggested Reading

1. Manual of lab and diagnostic tests by Lippincott Williams Wilkins, Fischbach, 2005 New York..
2. Clinical laboratory methods and diagnosis by Gradwohls, 2000, Publisher Mosby
3. Medical laboratory science theory and practice, J Ochei and Kolhatkar, 2002, publisher TBS

4. Medical laboratory technology Vol.1 by K. L. Mukherjee, 2007, publisher Tata McGraw Hill.

3rd semester B. Sc Clinical Microbiology

BSCM2301- Immunology

Subject Name	Code	Type of course	L-T-P	Prerequisite
Immunology	BSCM2301	Lecture+ Tutorial	3-1-0	Fundamental Science

Course Objective

- Understanding the concept of Innate & adaptive immune system; complement system; Hypersensitivity.
- Clinically relevant serological analysis for deeper understanding of antigen-antibody interaction.

Course Outcome

- Application of Immunology in disease diagnosis.
- Students will be able to understand and explain the basis of allergy and allergic diseases along with immunological tolerance and autoimmunity.
- The conceptual understanding of the subject provides opportunities for employability and scopes for higher education.

Unit-1

Immunity: Classification, Measurement of immunity, Local immunity, Herd immunity. Antigens: Types of antigen, Antigenic Determinant or Epitome, Determinants of Antigenicity Tolerogens, Biological Classes of antigens , Superantigens. Antibodies-Immunoglobulins: Antibody structure, Immunoglobulin classes of Antigens, Antigenic Determinants on Immunoglobins.

Practice: Collection of blood sample by vein puncture, separation and preservation of serum. Raising haemolysin in Rabbit and performing its titration for Rose- Waaler test.

Unit-2

The Complement System: Principal pathways of Complement activation, Quantitation of Complement C. and its Components. Biosynthesis of complement , Complement Deficiencies.

Antigen-Antibody Reactions: Antigen-Antibody Interactions, General characteristics of Antigen-Antibody Reactions, Antigen-Antibody measurement, Parameters of serological tests, Serological Reactions.

Practice: - Preparation of Phosphate buffers, Vernol buffer, ASO buffer, Richardsons buffer Buffers of different pH and molarity , tris buffer, Standardization of cell concentration by spectrophotometer

Unit-3

Immune Response: Types of Immune response, Humoral immunity, Fate of Antigen in tissues, Production of Antibodies, Cell-mediated Immune Responses, Cytokines, Immunological tolerance, Theories of immune Response .

Hypersensitivity Reactions: Classification of hypersensitivity reactions, Type I Hypersensitivity (IgE Dependent). Type II Hypersensitivity: Cytolytic and Cytotoxic. Type III Hypersensitivity -Immune Complex-mediated, Type IV Hypersensitivity-Delayed Hypersensitivity, Shwartzman Reaction.

Practice:- Performance of Serological tests i.e. Widal, Brucella Tube Agglutination ,VDRL (including Antigen Preparation), ASO (Antistreptolysin 'O'),C-Reactive Protein (Latex agglutination), Rheumatoid factor (RF) Latex agglutination, Rose Waaletest

Suggested Readings:

1. Text book of Microbiology by Ananthanereyan & Paniker, Publisher Universities press
2. Short text book of Medical microbiology by Satish Gupt, Publisher Jaypee brothers
3. Medical laboratory Technology vol.I ,II, III by K L Mukherjee, Publisher McGraw Hill education
4. Medical Laboratory manual for tropical countries Vol II Microbiology by Monia Cheesbrough, publisher Butterworth Heinemann ltd
5. Immunology by Ivan Roitt, JonathaanBrostoff and David Male
6. Practical Medical Microbiology by Mackie & MacCartney Volume 1 and 2

BSCM2302- Systemic Bacteriology

Subject Name	Code	Type of course	L-T-P	Prerequisite
Systemic Bacteriology	BSCM2302	Lecture+Tutorial	3-1-0	Fundamental Science

Course Objective

- To learn opportunities in the basic principles of medical microbiology and infectious disease.
- To study mechanisms of infectious disease transmission, principles of aseptic practice, and the role of the human body's normal microflora.
- To understand the importance of pathogenic bacteria in human disease with respect to infections of the respiratory tract, gastrointestinal tract, urinary tract, skin and soft tissue.

Course Outcome

- The course provides the conceptual basis for understanding pathogenic microorganisms and the mechanisms by which they cause disease in the human body.
- Recall the relationship of this infection to symptoms, relapse and the accompanying pathology.
- Explain the methods of microorganism's control, e.g. chemotherapy & vaccines. Solve problems in the context of this understanding.

Unit 1

Morphology, Metabolism, Pathogenesis, Laboratory Diagnosis, Prevention and Control of:

a. Cocci (Gram Positive):

Aerobic: Micrococcus spp., Staphylococcus spp., Streptococcus spp.

Anaerobic: Peptococcus spp., Peptostreptococcus spp., Villanelle spp., Acidaminococcus spp., Megasphaera spp., Coprococcus spp., Ruminococcus spp. and others.

b. Cocci (Gram Negative): Aerobic: Neisseria spp., Anaerobic Gram negative bacteria .

Unit 2

Morphology, Metabolism, Pathogenesis, Laboratory Diagnosis, Prevention and Control of:

a. Aerobic non-spore forming gram positive bacilli:

Bacillus spp., Corynebacterium spp., Actinomyces pyogenes, Nocardia spp., Mycobacterium spp.- pathogenic, Tubercle bacilli and MOTT bacilli (Atypical mycobacterium) and

Hansen's bacilli and others.

b. Anaerobic: Bifidobacterium spp., Eubacterium spp., Actinomyces spp., Propionibacterium, Arachnia spp., Clostridium spp and others.

Unit 3

Morphology, Metabolism, Pathogenesis, Laboratory Diagnosis, Prevention and Control of Gram Negative Bacilli

Aerobic: Enterobacteriaceae , Citrobacter spp , Edwardsiella spp ,Enterobacter spp , Escherichia coli , Ewingella , Hafnia spp., Klebsiella spp , Kluyvera ,Leclercia , Leminorella, Moellerella, Morganella spp , Pantoea ,Proteus spp. , Porvidencia spp. ,Rahnella Salmonella spp, Serratia spp ,Shigella spp ,Tatumella ,Yersinia spp and others.

BSCM2303- Molecular Biology

Subject Name	Code	Type of course	L-T-P	Prerequisite
Molecular Biology	BSCM2303	Lecture+Tutorial	3-1-0	Fundamental Science

Course Objective

- To provide depth knowledge of biological or medicinal processes through the investigation of the underlying molecular mechanisms.
- Understanding of chemical and molecular processes that occur in and between cells. Understanding will become such that can be able to describe and explain processes

and their meaning for the characteristics of living organisms.

Course Outcome

- Conduct independent work in a laboratory.
- Read scientific articles and gain a critical understanding of their contents.
- Give a spoken and written presentation of scientific topics and research results.
- Present hypotheses and select, adapt and conduct molecular and cell-based experiments to either confirm or reject the hypotheses.

Unit 1

Introduction: a. Introduction to molecular biology, b. Molecular biology of cell,

Evolution and Molecular structure of cell and its organelles,

Types of cells. Including different kinds of Prokaryotic and eukaryotic cells,

Cell growth, Cell adhesion, cell junctions and extra cellular matrix organelles, Cell cycle, Cell membrane and its structure (fluid-mosaic model)

Factors influencing on membrane fluidity, asymmetry of membrane and membrane transport (active and passive)

Unit 2

Molecular Nature of the Genetic Material in Prokaryotic and Eukaryotic Cells:

Molecular biology of Genes , DNA: Molecular structure, types: Primary, secondary and tertiary ,The Double helix, types

RNA: Molecular structure, types. Evolution of DNA and RNA , Gene and genetic codes

Unit 3

General Concept on:

a. Regulation of the Gene Expression

b. Regulating the Metabolism:

The Lac- Operon system. , Catabolic repression, The Trp Operon system: regulating the biosynthesis of the tryptophan , Gene expression in Eukaryotic cells ,Plasmids: types, maintenance and functions

Unit 4

DNA Replication and Gene Expression: DNA Replication: Semi conservative Nature of DNA Replication ,DNA Replication in prokaryotic Cells ,DNA Replication in Eukaryotic cell Enzymes involved in DNA Replication: DNA polymerases ,Proofreading, post-replication Modification of DNA. Transferring information from DNA to RNA ,Synthesis of RNA , RNA polymerase , Initiation and Termination of Transcription , Post transcription modification of the RNA Protein Biosynthesis: Translation of the genetic code ,Translation of m RNA ,Role of RNA in protein synthesis , Forming the polypeptides- elongation ,Termination of the protein biosynthesis .

Subject Name	Code	Type of course	L-T-P	Prerequisite
Systemic Virology & Mycology	BSCM2304	Lecture+Tutorial	3-1-0	Fundamental Science

Course Objective

- To learn opportunities in the basic principles of medical microbiology and infectious disease.
- To study mechanisms of infectious disease transmission, principles of aseptic practice, and the role of the human body's normal microflora.
- To understand the importance of pathogenic Virus and fungus in human disease with respect to infections of the respiratory tract, gastrointestinal tract, urinary tract, skin and soft tissue.

Course Outcome

- The course provides the conceptual basis for understanding pathogenic microorganisms and the mechanisms by which they cause disease in the human body.
- Know the methods used in studying viruses and fungi.
- Recall the relationship of this infection to symptoms, relapse and the accompanying pathology.
- Explain the methods of microorganism's control, e.g. chemotherapy & vaccines. Solve problems in the context of this understanding.

Unit 1

Introduction and Scope of Virology. General Properties of Viruses and Structure (Morphology) Classification of Medically Important Viruses . Genetic material , Organ system involved , Transmission

Unit 2

Replication of Viruses, Virus Host Interaction, Bacteriophage .Epidemiology, Pathogenesis, Treatment, Prevention and Control of Viral Diseases (DNA Viruses) *Adenoviridae, Poxviridae, Herpes viridae, Papoviridae, Parvoviridae, Hepadnaviridae* Epidemiology, Pathogenesis, Treatment, Prevention & Control of Viral Diseases (RNA Viruses): *Orthomyxoviridae, Paramyxoviridae, Picorna viridae, Corona viridae, Togaviridae, Rhabdoviridae, Retroviridae, Coronaviridae, Bunyaviridae, Arenaviridae, Filoviridae, Reoviridae and Calciviridae*

Unit 3

Mycology: Introduction: Scope and medical importance of fungi- Molds, Mushouroom, Yeast. Definition: Mycology, Medical Mycology, Mycetes, Mycosis, Thallus, Hypha, Mycelium, Coenocyte, Rhizoids and Club. Classification, Structure and Physiology of fungi: Cryptogam (Thallophyta: Fungi Algae), Phenerogam, Pseudomycets, Schizomycetes (Bacteria Actinomycetes, Actinomycetaliae, Nocardia, Yeasts) Myxomycetes (Slime, Molds), Eumycetes (True fungi), Ascomycetes (Histoplasma, Candida, Blastomycosis), Basidiomycetes (Cryptococcus, Rhizopus), Phycomycetes Mucor, Epidermophyton Fungi imperfecti: (Trichophyton).

Unit 4

Vegetative Structure (Morphology) of Fungi : Septate, aseptate, Plectenchyma, Prosenchyma, Pseudoparenchyma, Modification of Plectenchyma (Rhizomorph, Sclerotia, Stroma).

Mode of Nutrition of Fungi :Saprophytes ,Parasites (Obligate parasite, Facultative parasite, Ectoparasite, Endo-parasite) , Symbionts: Lichen Pathogenic Group of Fungi:Opportunistic pathogens ,True pathogens: *Blastomyces dermatitidis* ,*Cooccidioides immitis*, *Paracoccidioides brasiliensis* ,*Histoplasma capsulatum*.

A. Dermatophytes :*Mycrosporium* (Hair, skin) ,*Tricophyton* (Skin, hair, nail) ,*Epidermophyton* (Skin, nail) , *Aspergillus spp.*

B. Dermatomycosis (*Candida albicans*, *Cryptococcus neoformans*)

FCHU0202-Communicative Practice Laboratory-2

Subject Name	Code	Type of course	L-T-P	Prerequisite
Communicative Practice Laboratory-2	FCHU0202	Practice	0-0-2	Fundamental Science

Course Objectives

- To master Study Skills
- To acquire strategic competence to use both spoken & written language to use in a wide range of communication strategies
- To acquire Business Performance Skills

Course Outcomes

- The students will be able to Write effectively for a variety of professional and social settings. They will practice writing as a process of motivated inquiry engaging others writers' ideas as they explore and develop their own. They will demonstrate an ability to revise for content and edit for grammatical and stylistic clarity. And they will develop an awareness and confidence in their own voice as a writer.
- Become accomplished, active readers who appreciate ambiguity and complexity, and who can articulate their own interpretations with an awareness and curiosity for other perspectives.
- Demonstrate the skills needed to participate in a conversation that builds knowledge collaboratively; listening carefully and respectfully to others' view points; articulating their own ideas in relation to other voices and ideas. Students will be able to prepare, organize and deliver and engaging oral presentation. A student is required to take up five lab tests of 100 marks- at least two tests in written mode and three tests in spoken mode.

Unit-1

FRIENDLY COMMUNICATION (9 HOURS)

- Doing Things with Words: To ask for information, help, permission; To instruct, command, request, accept, refuse, prohibit, persuade

- Practice of Formulaic Expressions: Greetings, farewells, introductions, thanks, apologies, regrets, good wishes, congratulations, condolences, offers.
- Conversation Practice in familiar and unfamiliar situations (This module will be practiced through conversation activities in pairs & groups)

Unit-2

GRAMMAR AND VOCABULARY (9 HOURS)

- The focus will be on the appropriate usage of language.
- Elimination of common errors
- Editing passages
- Word power A-Z: Easy and quick techniques
- Vocabulary building exercises (Open Source Language Laboratory will be used to take quizzes and practice grammar & vocabulary)

Unit-3

PHONETICS AND SPOKEN ENGLISH (12 HOURS)

- Students will be trained to find out the correct pronunciation of words with the help of a dictionary /software, to enable them to monitor and correct their own pronunciation.
- Pronunciation Guidelines: Consonants and Vowels
- Pronunciation practice (for accent neutralization), particularly of problem sounds, in isolated words as well as sentences
- Speaking Techniques: Using correct stress patterns, developing voice quality
- Rhythm and Intonation (Reading aloud of dialogues, speeches etc. for practice in pronunciation) (In this module, the learners will use video series from BBC & Sky Pronunciation Suite to improve spoken English)

TEXT BOOKS: Dwyer, J. (2000).

The Business Communication Handbook. New Jersey: Prentice Hall.

REFERENCES:

Brown, G & Yule, G. (1983). *Teaching the Spoken Language*. Cambridge: Cambridge University Press. Brown, H. D. (1994). *Teaching by Principles: An Interactive Approach to Language Pedagogy*. New Jersey: Prentice Hall.

BSCM2306- Bacteriology, Virology & Mycology Lab

Subject Name	Code	Type of course	L-T-P	Prerequisite
Bacteriology, Virology & Mycology Lab	BSCM2306	Practice	0-0-4	Fundamental Science

Course Objective

- To understand the importance of pathogenic Virus and fungus in human disease with respect to infections of the respiratory tract, gastrointestinal tract, urinary tract, skin and soft tissue.
- To know various Culture media and their applications and also understand various physical and chemical means of sterilization and various staining techniques.

Course Outcome

- The course provides the conceptual basis and methods used in studying viruses and fungi.
- Recall the relationship of this infection to symptoms, relapse and the accompanying pathology.
- Provides knowledge on growth of microorganism.
- Provides knowledge Culturing microorganism.

Bacteriology

Preparation and use of different stains in bacteriology laboratory Grams stain

ZN stain Albert stain Spore stain Capsule stain Flagella stain Motility test

Preparation and use of different media in bacteriology laboratory

Isolation & identification of different groups of bacteria in laboratory Antimicrobial susceptibility testing .

Virology

Demonstration of virus isolation techniques .

Demonstration of cell and tissue culture techniques used for virus isolation. Serological techniques used in diagnostic virology.

Mycology

Organization of laboratory – Mycology

Preparation of different media, chemical and stain for fungus study. Isolation and identification of different fungi of medical important .

4th semester BSc Clinical Microbiology

BSCM2401- Public Health Microbiology

Subject Name	Code	Type of course	L-T-P	Prerequisite
Public Health Microbiology	BSCM2401	Lecture+ Tutorial	3-1-0	Fundamental Science

Course Objective

- To learn the occurrence, abundance and distribution of microorganism in the community and their role in the associated with Public health and also learn different methods for their detection and characterization.
- To understand the basic principles of environment microbiology and be able to apply these principles to understanding and solving environmental problems – Water pollution and waterborne diseases, Air pollution and airborne infections.

Course Outcome

- Explain prognosis of diseases and become aware about the role of medical microbiology in public health
- Understanding the role of microbiologist in public health
- Study of Air borne & water borne infection

Unit 1

Introduction to Public Health:

Definition, scope, concept and importance of public health microbiology, Roles of microbiologist in public health, Concept of health and disease, Indicators of health, Microbial association of water, air and soil, Basic concept on pollution (air, water, noise, radiation and waste pollution) and public health hazard in the community.

Unit 2

Air Borne Infections: 1. Introduction: Air and its composition, Microbial air pollution, Sources of air pollution & control, Indicator of air pollution – WHO guide line (microbial pollution).
2. Air borne diseases: Transmission of pathogens, Respiratory infection (Viral, bacterial, fungal), Sources of infection, characters of organisms and controls of:
Bacterial pneumonia, Diphtheria, Tuberculosis, Influenza, Measles .
3. Method of measuring microorganisms in air.

Practice:- Selection, collection, preservation and transportation of samples from the community to the laboratory.

Unit 3

Water Borne Infections: 1. Introduction : Definition of wholesome and safe water, Nature, cycle, sources, importance and quality (WHO guide line) of water. Water pollution and sanitation,
2. Microorganisms in water: Transmission of pathogens, Water borne diseases (Viral, bacterial, protozoal), Sources of infection, characters of organisms and control of:
Hepatitis, Cholera, Typhoid, Amoebiasis, Giardiasis, Poliomyelitis
Water Pollution Control . Method of Measuring Microorganisms in Water . Water Treatment, Control of Water Borne Diseases.

Practice:- Isolation and Identification of microorganisms from air.

Isolation and Identification of microorganisms from water and evaluation of water quality

Suggested Reading

1. Text Book of Microbiology, by Ghimire P. & Parajuli K. Vidhyarthi Pustak Bhandar Publication, Kathmandu.
2. Text Book of Social and Preventive Medicine by Park JE and Park K
3. Evidence Based Public Health By Brownson, RC., Baker, EA., Leet. TL., Follespie. KN
4. ,Oxford University Press
5. The Quest for Health, Educational Enterprises, Kathmandu, by Dixit H.
6. Epidemiology for Public Health Practice, by Friis, RH., and Sellers, TA, 2nd Edition, Gaithersburg, MD: Aspen Publication,
7. Modern Food Microbiology, . by Jay, J, H 3rd Edition CBS Publication and Distributors Delhi 1987.
8. Introduction to Soil Microbiology, Martin Alecender, by Academic press, 1961.

BSCM2402- Pharmaceutical Microbiology

Subject Name	Code	Type of course	L-T-P	Prerequisite
Pharmaceutical Microbiology	BSCM2402	Lecture+Tutorial	3-1-0	Fundamental Science

Course Objective

- Understanding of types & synthesis of antimicrobial agents
- Manufacture of antibiotics
- To understand the mechanism of action of antibiotics
- To study how microorganisms are known to develop resistance to antibiotics

Course Outcome

- With the completion of the course, the students will acquire detailed knowledge of antimicrobial agents, their mechanism of action and basis of resistance of microbes to these antimicrobials, formulations.
- They will develop an understanding of different types of disinfectants/antiseptics and their uses, evaluation of their bactericidal and bacteriostatic action.
- The conceptual understanding of the subject provides opportunities for employability and scopes for higher education.

Unit 1

Introduction to Pharmaceutical Microbiology: Scope ,Importance ,Chemical disinfectants, Antiseptic ,Antibiotics, Preservatives , Static and cidal activity (fungus, bacteria) ,Germicidal activities
Types of Antibiotics and Synthetic Antimicrobial Agents :
Antibiotics , Types and Classification of antibiotics , Synthetic antibiotics , Antiviral drug

Unit 2

Manufacture of Antibiotics : Production of penicillin , Production of streptomycin
Assessment of New Antibiotics : Parameters, determination of the usefulness of antibiotics (in vitro and in vivo) ,Pharmacokinetics and Pharmacodynamics of Antimicrobial agents
Antibiotic Assay : Microbiological method , Disc diffusion technique ,Dilution technique ,Rapid method

Unit 3

Mechanisms of Action of Antibiotics :Cell wall synthesis inhibitors , Inhibitors of protein biosynthesis , Inhibitors of tetrahydrofolate , Disorganize the cytoplasm membrane.
Mode of Action of Antibiotics and Bacterial Resistance to Antibiotics :
Mode of action of antibiotics (cell wall cytoplasmic membrane, cytoplasm and compounds) ,Biochemical mechanisms of resistance , Genetic basis of antibiotic resistance , Problems in antibiotic therapy due to resistance

Evaluation of Antibiotics and Non-antibiotics Agents: Preliminary evaluation, Evaluation of Static activity (fungus, bacteria), Evaluation of Germicidal activities (fungus, bacteria)
Microbial Spoilage and Preservation of Pharmaceutical Products.

Suggested Reading

1. W B Hugo and A D Russel, Pharmaceutical Microbiology, 2nd Edition
2. Ghimire P. Hand book of Practical Microbiology, 2003, Pravesh Publication, Kathmandu

BSCM2403-Industrial Microbiology

Subject Name	Code	Type of course	L-T-P	Prerequisite
Industrial Microbiology	BSCM2403	Lecture+Tutorial	3-1-0	General Microbiology

Course Objective

- Describe the use of microorganism in different industries to produce valuable products like drugs, beverages and different food products etc.
- To developed skills for growing microorganisms in the laboratory for the production of different products by different microorganisms.

Course Outcomes

- Students has acquired a fairly good knowledge of how microbes are used in the fermentative production of organic acids, alcohols, enzymes, antibiotics and various foods in the industry.
- Enhances analytic ability of various physical parameters which affect production of industrial products by the microorganisms and the safety aspects of the production and use of these products.
- The conceptual understanding of the subject provides opportunities for employability and scopes for higher education.
- Developes laboratory skills in producing alcohol and enzymes by fermentative process using bacteria/yeast.

Unit 1

Introduction to Industrial Microbiology: Introduction, History, Definition and scope. Industrial Equipment and Uses.

Fermentation Process: Primary and secondary screening, Detection and assay of fermentation products- Physical and chemical assays, Biological assay

Stock culture, Fermentation media , Inoculums preparation , Increasing products , Phage

Practice-: Observational visit to a beer/alcohol factory.

Observational visit to pharmaceutical, food and dairy industry.

Unit 2

Typical Fermentation Process:

Antibiotic drug fermentation - Penicillin , Streptomycin , Bacterial insecticide ,Other antibiotics- Acetone , Lactic acid , Brewing

Biological Waste Treatment / Bioremediation: Anaerobic fermentation

Production of: Vitamin , Vaccines , Milk & Milk Products, Food , Bakers yeast , Food and feed yeasts, Mushrooms , Vinegar

Enzymes: Amylase , Proteolytic enzyme , Pectinases , Invertase Other enzymes

Unit 3

Industrial effluent: Introduction, Industrial pollution, Microbiology of Domestic sewage Methods for the treatment of industrial effluent and sewage.

Practice- Detection of Fermentation , Biological waste treatment.

Suggested Reading

L. E. Casida, JR., *Industrial Microbiology*, 1991, Wiley Eastern Limited, New Delhi,

BSCM2404- Biochemistry

Subject Name	Code	Type of course	L-T-P	Prerequisite
Analytical Biochemistry	BSCM2404	Lecture+Tutorial	3-1-0	Fundamental Science

Course Objective

- Understanding the concept of Biochemical analyzing instruments both automated and semi automated.
- To learn about how to Care & Maintenance of Equipment & Chemicals.
- To learn normal ranges of biochemical components in our body.
- Clinically relevant biochemical analysis for deeper understanding of all biochemical components i.e., Proteins, Electrolytes, Hormones etc.

Course Outcome

- Understanding of instrumentation technique & principle of spectrophotometry, colorimetry, photometry and electrolyte analyzer.
- To learn about Various tests carried out for biochemical analysis & Hormone investigations.

- To learn about safety precautions and handling the equipment in biochemical laboratory.

Unit-1

Spectrophotometry and colorimetry, Introduction, Theory of spectrophotometry and colorimetry, Lambert's law and Beer's law, Applications of colorimetry and spectrophotometry.

Practice:- Practice: Cleaning of the Laboratory glass ware, Preparation of distilled Water,

Principle, working and maintenance of pH meter, To prepare 0.1 N HCl solution, 0.2N HCl solution, 0.1 molar H₂SO₄, 0.2 Molar Sodium carbonate solution, Demonstration of Osmosis and dialysis.

Demonstration of the instrument Spectrophotometry according to Lambert's and Beer's law

Unit-2

Photometry, Introduction, General principles of flame photometry, Limitations of flame Photometry, Instrumentation, Applications of flame photometry, Atomic absorption Spectroscopy – Principle & applications

Practice:- Demonstration of Photometry, general principles, limitation of Photometry.

Unit-3

Automation in clinical Biochemistry,

Method of estimation and assessment for: a. Glucose tolerance test, b. Insulin tolerance test, c. Xylose excretion test.

Clearance test for renal function. Gastric analysis, LFT, KFT, Lipid profile, Qualitative test for Urobilinogens, Barbiturates, T₃, T₄ and TSH, 17 Ketosteroids. Principles, clinical significance and procedures for estimation, of Acid phosphatase, Alkaline phosphatase, Lactate dehydrogenase, Aspartate transaminase, Alanine, transaminase and Creatine phosphokinase.

Suggested readings

- Handbook of Christen Medical Association, India (CMAI) Medical Laboratory Technology- Robert H. Carman. 2nd Edn. CMAI, New Delhi.
- Text book of Medical Laboratory Technology, P.B. Godkar 2nd Edn. Bhalani Publication.
- Handbook of Biochemistry by M. A. Siddique 8th Edn. Vijay Bhagat Scientific Book

BSCM2405- Basic Computer & Information Technique

Subject Name	Code	Type of course	L-T-P	Prerequisite
Basic Computer & Information Technique	BSCM2405	Practice	0-0-4	Fundamentals of Computer

Course Objective

- Identify the function of computer hardware components.
- Identify the factors that go into an individual or organizational decision on how to purchase computer equipment.
- Identify how to maintain computer equipment and solve common problems relating to computer hardware.
- Identify how software and hardware work together to perform computing tasks and how software is developed and upgraded
- Identify different types of software, general concepts relating to software categories, and the tasks to which each type of software is most suited or not suited.

Course Outcome

- Understand the fundamental hardware components that make up a computer's hardware and the role of each of these components.
- Understand the difference between an operating system and an application program, and what each is used for in a computer.
- Describe some examples of computers and state the effect that the use of computer technology has had on some common products

Unit-1

Introduction to computer: introduction, characteristics of computer, block diagram of computer, generations of computer, computer languages.

Input output devices: input devices(keyboard, point and draw devices, data scanning devices, digitizer, electronic card reader, voice recognition devices, vision-input devices), output devices(monitors, pointers, plotters, screen image projector, voice response systems).

Unit-2

Processor and memory: The Central Processing Unit (CPU), main memory.

Storage Devices: sequential and direct access devices, magnetic tape, magnetic disk, optical disk, mass storage devices.

Introduction to MS-Word: introduction, components of a word window, creating, opening and inserting files, editing a document file, page setting and formatting the text, saving the document, spell checking, printing the document file, creating and editing of table, mail merge.

Unit-3

Introduction to Excel: introduction, about worksheet, entering information, saving workbooks and formatting, printing the worksheet, creating graphs.

Introduction to power-point: introduction, creating and manipulating presentation, views, formatting and enhancing text, slide with graphs. Introduction of Operating System: introduction, operating system concepts, types of operating system. Introduction to MS-DOS: History of DOS, features of MS-DOS, MS-DOS Commands (internal and external).

Unit-4

Introduction of windows: History, features, desktop, taskbar, icons on the desktop, operation with folder, creating shortcuts, operation with windows (opening, closing, moving, resizing, minimizing and maximizing, etc.). Computer networks: introduction, types of network (LAN, MAN, WAN, Internet, Intranet), network topologies (star, ring, bus, mesh, tree, hybrid), components of network.

Internet and its Applications: definition, brief history, basic services (E-Mail, File Transfer Protocol, telnet, the World Wide Web (WWW)), www browsers, use of the internet. Application of Computers in various fields: Medical, Education, Railway, Defense, Industry, Management, Sports, Commerce, Internet.

Suggested readings :

1. Objective Computer Awareness
2. Computer Networking (Global Edition)

BSCM2406- Industrial, Public Health Microbiology & Biochemistry lab.

Subject Name	Code	Type of course	L-T-P	Prerequisite
Industrial, Public Health Microbiology & Biochemistry lab.	BSCM2406	Practice	0-0-4	General Microbiology

Course Objective

- Describe the use of microorganism in different industries to produce valuable products like drugs, beverages and different food products etc.
- To learn the occurrence, abundance and distribution of microorganism in the community and their role in the associated with Public health and also learn different methods for their detection and characterization.
- To understand the significance of carbohydrates in energy generation and as storage food molecules for cells. To understand the significance of amino acids, proteins.

Course Outcomes

- Enhances analytic ability of various physical parameters which affect production of industrial products by the microorganisms and the safety aspects of the production and use of these products.
- Understanding the role of microbiologist in public health

- They would have understood the significance of proteins and enzymes in accelerating various metabolic activities.
- The conceptual understanding of the subject provides opportunities for skill enhancement and scopes for higher education and would have understood the principles of Liver function test, kidney function test, lipid profile etc.

Industrial Microbiology:

1. Observational visit to a beer/alcohol factory.
2. Observational visit to pharmaceutical, food and dairy industry.
3. Detection of Fermentation
4. Biological waste treatment.

Public Health Microbiology:

1. Isolation and identification of microorganism from different food products: meat, canned juice, milk, cheese and ice cream.
2. Isolation and identification of microorganism transmitted through vector, insect.
3. Isolation and identification of microorganism (STIs)
4. Isolation and Identification of microorganisms (hospital acquired infection)

Biochemistry:

1. Estimation of Glucose in Urine and in Blood .
2. Estimation of Protein in Urine and Blood .
3. Estimation of Urea in blood .
4. Estimation of uric acid in blood .
5. Estimation of serum bilirubin
6. Estimation of Total Cholesterol in blood .
7. Estimation of HDL Cholesterol.
8. Estimation of LDL Cholesterol .
9. Estimation of TG, Estimation of Creatinine in Blood
10. Estimation of serum calcium
11. To measure electrolytes Sodium , Potassium & Chloride.

5th semester B.Sc Medical Lab. Technology

BSCM3501 –Epidemiology

Subject Name	Code	Type of course	L-T-P	Prerequisite
Epidemiology	BSCM3501	Lecture+Tutorial	3-1-0	Fundamental Science

Course Objective

- Understand the basic epidemiological methods and study designs.
- Understand and discuss population based perspective to examine disease and health – related events.
- Discuss the ethical issues in epidemiological research.
- Explain the importance of epidemiology for informing scientific, ethical, economic and political discussion of health issues.
- Describe a public health problem in terms of person, place, and time.
- Evaluate the strengths and limitations of epidemiologic reports
- Apply concepts, methods, and tools of public health data collection, analysis and interpretation, and the evidence-based reasoning and informatics approaches that are essential to public health practice.

Course Outcome

- Distinguish between definitions of epidemiology and clinical epidemiology and public health research.
- Apply the terminology of the Epidemiologic Triad to an infectious disease.
- Describe the important historic events in the field of epidemiology.

Unit 1

Introduction to Principles of Epidemiology:

History, Definition, and scope of epidemiology, Achievements in epidemiology ,Terms &Terminologies used in epidemiology.

Measuring Health and Disease :Definitions of health and disease, Measures of disease frequency
Use of available information ,Comparing disease occurrence

Unit 2

Concept of Epidemiological Study: Basic concepts of epidemiology Descriptive / Analytical ,Applied/Experimental ,Field Epidemiology Concept of Prevention and Control of Diseases:
Causation in epidemiology :The concept of cause , Establishing the cause of a disease
Epidemiological markers , Phenotypic and genetic markers including molecular epidemiology.
Disease surveillance : Clinical , Laboratory

Unit 3: Applied Epidemiology:

Communicable disease epidemiology ,Clinical epidemiology ,Environmental & occupational epidemiology , Nutritional epidemiology ,Reproductive epidemiology , Social epidemiology
Food epidemiology.

Epidemiology, Health services and health Policy :

Health care planning, Monitoring & evaluation ,The planning cycle ,Epidemiology, public policy and health policy ,Healthy public policy in practice

Suggested Reading

1. Basic Epidemiology. By Beaglehole R., Bonita R., Kjellstrom , World Health Organization, Geneva,
2. Field Epidemiology, By B Gregg, 2nd Edition, Oxford University Press, 2002

3. Gordis L. *Epidemiology*, 2nd Edition, WB Saunders Company Aharcourt Health Sciences Company, Philadelphia.
4. *Epidemiology in Medicine*, by Lippincott Eilliams and Wilkins, and Walters Kluwer Company
5. *Epidemiology, Principle and Method*, McMahon B, Trichopoulos D, by 2nd Edition, Boston, Little, Brown.

BSCM3502 -Diagnostic Bacteriology

Subject Name	Code	Type of course	L-T-P	Prerequisite
Diagnostic Bacteriology	BSCM3502	Lecture+ Tutorial	3-1-0	Fundamental Science

Course Objective

- | |
|---|
| <ul style="list-style-type: none"> • To confirm the suspicion of infectious bacterial disease. • To identify the etiologic agent by isolating the causative bacterial pathogen. |
|---|

Course Outcome

- | |
|---|
| <ul style="list-style-type: none"> • Study of Lab diagnosis for Enteric infection, Respiratory tract Infection, Oral & Stomach infection, Urinary tract infections. • Study of control measures for nosocomial infection. • Student can safeguard himself & society and can work diagnostics and hospitals |
|---|

Unit 1

Aerobic Culture:

Scope and importance of aerobic culture, Factors affecting aerobic culture, Various media and techniques of aerobic culture.

Laboratory Diagnosis of Enteric Infections: (Terminology, mechanism of infection, etiology, conventional and rapid diagnostic methods) Enteric fever / Typhoid fever, Bacterial endocarditis, Bacteraemia, Septicemia, Pyrexia of unknown origin (PUO).

Unit 2

Laboratory Diagnosis of Respiratory Tract Infection (RTI):

(Terminology, mechanism of infection, etiology, conventional and rapid diagnostic methods) Lower RTI, Upper RTI .

Laboratory Diagnosis of Urinary Tract Infection: Terminology, mechanism of infection, etiology, conventional and rapid diagnostic methods)

Unit 3

Laboratory Diagnosis of Oral, Thourroat and Stomach Infection: (Terminology, mechanism of infection, etiology, conventional and rapid diagnostic methods) Gingivitis and anaerobic infection of oral cavity .

Peptic ulcer (with emphasis in mechanism of peptic ulcer caused by *Helicobacter pylori*) .

Laboratory Diagnosis of Eye Infection: (Terminology, mechanism of infection, etiology, conventional and rapid diagnostic methods) Corneal ulcer, Conjunctivitis .

Suggested Reading

1. Medical Laboratory Manual for Tropical Countries, by Cheesbrough M., Vol. I & II, Edition, ELBS.
2. *Clinical Microbiology*, by Stoker, Edward Arnold.
3. *Manual Clinical Microbiology*, by Lynnette, E. H., 8th Edition, American Society for Microbiology, Washington DC.
4. Basic Bacteriology Laboratory manual, WHO

BSCM3503- Diagnostic Virology

Subject Name	Code	Type of course	L-T-P	Prerequisite
Diagnostic virology	BSCM3503	Lecture+ Tutorial	3-1-0	Basic virology

Course Objective

- Understanding laboratory diagnosis of virus by both conventional and molecular approach.
- To produce a cadre of specialized medical virologists who would help establish clinical diagnostic services in various hospitals/centres.

Course Outcome

- Organise sample collection, transportation, processing and storage in an appropriate manner.
- Plan, write and implement research projects in virology, analyze their results and publish these in peer-reviewed journals.
- Coordinate with concerned agencies regarding viral diseases and their outbreaks.
- Plan and execute epidemiological studies and provide advice in relation to viral diseases.

Unit 1

Laboratory Organization: Room (space), Electricity, Water supply, Sterility Sampling in Diagnostic Virology: Selection, collection, storage, transportation and processing of samples. Electron Microscope: Principle, importance and use

Unit 2

Laboratory Diagnosis of Viral Infections : Virus isolation, Inoculation in laboratory animal, Egg inoculation ,Tissue culture, Recognition of viral growth-Cytopathic effec ,Haemadsorption (Hd) ,

Immunofluorescence or immunoperoxidase staining, Interference. Identification of virus-Neutralization (N), Haemagglutination – inhibition (HI), Immunofluorescence or immunoperoxidase staining, Electronic microscope (EM). Direct demonstration of virus or virus antigens - Serology - Immunofluorescence , Electronic Microscopy , Histological demonstration of inclusion bodies, Serological tests: Detection of viral antigen ,Detection of anti viral antibodies. (Rising titer in paired sera: 4–fold or more -Detection of IgM Complement fixation (CF), Haemagglutination inhibition (HAI), Neutralization (N), Immuno- fluorescence (IFA) , Enzyme immunoassay.

Unit-3

Laboratory Diagnosis of Important

a. DNA Viruses and b. RNA Viruses, Antiviral Drugs

Practice-: Practical sessions (Laboratory Practices) will be based in the Hospital Laboratory performing diagnostic tests available / requested, in Diagnostic Virology laboratory

BSCM3504- Diagnostic Mycology

Subject Name	Code	Type of course	L-T-P	Prerequisite
Diagnostic Mycology	BSCM3504	Lecture+Tutorial	3-1-0	Fundamental Science

Course Objective

- To confirm the suspicion of fungal disease.
- To identify the etiologic agent by isolating the causative fungal pathogen.

Course Outcome

- This course provides learning opportunities in the basic principles of medical microbiology and infectious fungal diseases.
- The course provides the conceptual basis for understanding pathogenic fungi and the mechanisms by which they cause disease in the human body.
- Student can safeguard himself & society and can work diagnostics and hospitals

Unit 1

Introduction to Diagnostic Mycology: Medically important fungi , Opportunistic Fungi Fungal Diseases: Mycoses

1. Superficial mycoses:
2. Subcutaneous mycoses:
3. Cutaneous mycoses: Trichophytosis, Microsporiosis, Epidermophytosis.
4. Systemic mycoses: Histoplasmosis, Blastomycosis, Cryptococcosis, Coccidioidosis, Paracoccidioidosis .

Unit 2

Pathogenesis and Laboratory Diagnosis of Mycotic Infections :

Aspergillus spp, Candida albicans, Fusarium spp, Cryptococcus neoformans, Histoplasma capsulatum, Sporothrix spp, Philophora spp., Trichophyton microsporium, Epidermophyton spp. Blastomyces dermatitidis, Coccidioides immitens,

Unit 3

Isolation and Identification of Fungi (Laboratory Diagnosis):

A. Selection, collection and transportation of specimens 5 hours

Skin, Hair, Nail, Mucous membranes, Ear, eye, Corneal ulcer, Pus, Blood, Biopsy, Sputum, Urine, Vaginal and Cervical swab, Stool samples, Plural and peritoneal fluid, Superficial, sub-cutaneous and cutaneous samples.

B. Smear Preparation: 2 hours

KOH Preparation, 20% KOH with 20% Glycerol, KOH – DMSO (Dimethyl Sulphoxide) 100% Lactophenol Cotton Blue , India ink preparation.

Practice:-Antifungal Sensitivity Test: Antibiotics. Stock solution of drug Dilution technique , Sensitivity test by different method , Minimal inhibitory concentration (MIC) and Minimal fungicidal concentration (MFC)

Serological Test: Identification of Antigen, Antibody and Metabolites in Body Fluid&Serum.

BSCM3505- Diagnostic Parasitology

Subject Name	Code	Type of course	L-T-P	Prerequisite
Diagnostic Parasitology	BSCM3505	Lecture+Tutorial	3-1-0	Basic Parasitology

Course Objective

- To explain the mechanisms of pathogenesis from a gross, microscopic and molecular perspective.
- Recognize the diagnostic stage of the infection under the microscope and to manage the infected patient.
- To examine parasites and parasitism, emphasizing the influence of parasites on the ecology and evolution of free-living species, and the role of parasites in global public health.

Course Outcome

- Organise sample collection, transportation, processing and storage in an appropriate manner.
- Plan, write and implement research projects in parasitology, analyze their results and publish these in peer-reviewed journals.
- Coordinate with concerned agencies regarding protozoan and helminth diseases and their outbreaks.
- Plan and execute epidemiological studies and provide advice in relation to protozoan diseases.

Unit 1

Laboratory Organization (Parasitology Lab) Selection, Collection, Perseveration and Transportation of Samples

Unit-2

Laboratory Diagnosis, of the Intestinal and Vaginal Parasites: 28 hours (Terminology, mechanism of infection, etiology, conventional and rapid diagnostic methods) Protozoa: Entamoeba histolytica , Giardia lamblia, Trichomonas spp , Cyrptosporidium , Cyclospora cayantensis , Isospora Helminthes Ascaries lumbricoides , Hook worm: Anacylostoma and Necator, Enterobius vermicularis, Trichuris trichuira , Strongloides spp. ,Taenia spp., Echinococcus spp. , Hymonolepisnana, Tissue and Blood Parasites: Malaria sps , Kalaazar , Wacheria spp. Brugia, Loaia, , Oncocerca, Dracuhculus , Paragonimus westermani/hertmani

Unit 3

Laboratory Diagnosis of Various Parasites: 6 hours Direct method, Indirect method, Rapid methods, Molecular Technique Parasite Culture. Different Stains used in Diagnostic Parasitology.

Practice:- Practical sessions (Laboratory Practices) will be based in the Hospital Laboratory performing diagnostic tests available / requested, in Diagnostic Parasitology laboratory

BSCM3506 -Research Methodology

Subject Name	Code	Type of course	L-T-P	Prerequisite
Research Methodology	BSCM3506	Lecture+ Tutorial	3-1-0	Fundamental Science

Course Objective

- To equip students with a basic understanding of the underlying principles of quantitative and qualitative research methods.
- Provide students with in-depth training on the conduct and management of research from inception to completion using a wide range of techniques.

Course Outcome

- Students can understand the ethical and philosophical issues associated with research in education
- This study provides knowledge on various modes of presenting and disseminating research findings.
- Enable students to acquire expertise in the use and application of the methods of data collection and analysis.
- Provide learning opportunities to critically evaluate research methodology and findings.
- Enable students to be reflexive about their role and others' roles as researchers.

Unit 1

Introduction to Research Methodology: 4 hours Meaning and Nature of Research-
Meaning, definition and characteristics of health research Importance of health research in nursing field .

Foundation of Scientific Research -

Scientific Thinking, Research Idea and the thought Process: Reasoning, Deduction, Induction, Combining Induction and Deduction, and Reflective thinking and the Scientific Method, Scientific Research. Identification and Analysis of Research Problem

Selection of a problem, Sources Criteria, Defining a problem, Characteristics of a problem, Criteria of good research questions, Steps in analyzing the research problem.

Unit 2

Proposal Development:

Basic steps involved in the health research proposal development

process Literature Review:

Importance and Sources, Strategies for gaining access to information, Library search, Computer search. Research Title and Objectives

Criteria for selecting a research title , Formulation of research objectives , Types of research objectives , Qualities of research objective

Research Hypothesis: Definition , Qualities of research hypothesis Importance and types of research hypothesis .

Unit 3

Variables :Definition, Importance, Qualitative and Quantitative variables Dependent and Independent variables

Confounding variables, Background variables, Operational definition (defining variables), Indicator. Research Design : Purpose of research design,

Types of study designs: Interventional study design - Exploratory, Descriptive (case study / case series, cross-sectional, longitudinal), Analytical (case control, cohort) study designs; Non Interventional study design - Pre experimental (pre test post test), Quasi experimental, True

experimental (Completely Randomized, Completely Randomized Block, Factorial, Time Series) study designs.

Unit 4

Sampling Design and Procedure :

Definition, Importance, Characteristics of a good sample

Qualities of sampling frame, Population concept and parameter, Types of sampling units,

Types of Sampling – Non probability sampling (purposive, quota, convenient, snowball etc.), Probability sampling (simple random, systematic, stratified, cluster, multistage, PPS etc.)

Techniques to choose appropriate sampling procedure, Sampling errors, Sample size, Testing reliability of sample

Qualitative and Quantitative Techniques used in Health Research Process. Data Collection Methods:

Pre-testing Data Collection Tools and Making Work Plan:Preparation of working schedule Gantt chart.

Data Processing and Analysis

Coding/decoding, Editing , Preparation of master tables ,Master field books, Dummy table preparation , Data processing and analysis plan – Selection of appropriate statistical techniques.

Research Ethics and Research Proposal Format.

Suggested Reading

1. WHO, Health Research Methodology: A guide for training in research Methods, 2nd Edition, WHO-WIPRO.
2. A Student's Guide to Methodology by Clough P and Nutbrown C. Sage Publication .
3. National Ethical Guidelines for Health Research in Nepal, Available at Nepal Health Research Council.
4. Field Trials of Health Interventions in Developing Countries by Smith PG, Morrow.

BSCM3507- Epidemiology and Microbiology Practical

Subject Name	Code	Type of course	L-T-P	Prerequisite
Epidemiology and Microbiology Practical	BSCM3507	Practice	0-0-4	Fundamental Science

Course Objective

- Understand the basic epidemiological methods and study designs.
- Understand and discuss population based perspective to examine disease and health – related events.
- Discuss the ethical issues in epidemiological research.
- Explain the importance of epidemiology for informing scientific, ethical, economic and political discussion of health issues.
- To confirm the suspicion of infectious bacterial disease.
- To identify the etiologic agent by isolating the causative bacterial pathogen.

Course Outcome

- Distinguish between definitions of epidemiology and clinical epidemiology and public health research.
- Apply the terminology of the Epidemiologic Triad to an infectious disease. Describe the important historic events in the field of epidemiology.
- Study of Lab diagnosis for pus, mycobacterium, venereal diseases, GI Tract, Meningitis and Encephalitis.
- Handling of Clinical Specimen for Microbial Study
- Student can safeguard himself & society and can work diagnostics and hospitals

Epidemiology

Filed investigation of an outbreak /disease prevalence study in a community.

Diagnosis Microbiology

Anaerobic Culture

Laboratory Diagnosis of Pus .

Laboratory Diagnosis of Mycobacterium Infection Laboratory Diagnosis of Venereal Diseases

Laboratory Diagnosis of GI Tract .

Laboratory Diagnosis of Meningitis and Encephalitis Laboratory Organization and Management

Handling of Clinical Specimen for Microbial Study Performance of different Tests Rapid

Diagnostic Tests 6 hours Molecular Tests 8 hours

Interpretation of Test Results 5 hours Test reporting

6th semester B.sc Clinical microbiology

Internship Thesis Guideline

This Guideline is designed to provide students the knowledge and practice of public health research activity, to enable them to carry out researches and solve research related problems and to help them in writing thesis and defend their work. Upon successful completion of the course, the students shall be able to:

- Search relevant scientific literature
- Develop a research proposal
- Employ appropriate data collection techniques and tools
- Manage collected data
- Analyze data with appropriate statistical techniques
- Write thesis
- Defend the findings

Proposal Development:

At the ending of third year (Sixth Semester), students individually consultation with designated faculties and extensive literature survey will develop research proposal during the initial 6 months period.

Data Collection/ Thesis Writing:

Students will carry out data collection, data management, data analysis, and thesis writing during the remaining period (Six Semester).

The Dissertation should have following format:

1. Title

2. Introduction
3. Materials and Methods
4. Results
5. Discussion
6. Conclusion
7. Recommendation
8. References
9. Appendix

BSCM3601-Project

Subject Name	Code	Type of course	L-T-P	Prerequisite
Project	BSCM3601	Project		Basic Medical science

Project work:-

Suggested Project title

1. Antibacterial activity of sweet orange(citrus sinensis) on Staphylococcus aureus and Escherchia coli isolated from wound infected.
2. The incidence of Salmonella and Escherchia coli in livestock (Poultry) feeds
3. Microbial evaluation of milk from a diary farm.
4. Gastroenteritis in primary school children (6-12yr) of specific locality.
5. Comparative analysis of microbial load of the main water production and water available to CUTM campus.

BSCM3602- Internship

Subject Name	Code	Type of course	L-T-P	Prerequisite
Internship	BSCM3602	Project		Basic Medical science

Internship

- Case record
- Lab management and ethics
- Evaluation -Guide(internal)
- Industries guide(external)
- University-project report/ Viva

**CENTURION UNIVERSITY OF TECHNOLOGY AND
MANAGEMENT, ODISHA**

SCHOOL OF PARAMEDICS & ALLIED HEALTH SCIENCES



Centurion
UNIVERSITY

Shaping Lives...
Empowering Communities...

**BACHELOR OF SCIENCE IN
MEDICAL LABORATORY TECHNOLOGY**

2017

SYLLABUS

Preface: Medical Laboratory Technology helps to diagnose and prevent disease through clinical laboratory tests. It is complementary to medical science. It involves analysis of body matter such as fluid, tissue, and blood. It also covers micro-organism screening, chemical analyses, and cell count.

Medical Technologists are an integral part of the medical profession. These professionals get involved in practical and technical work to aid correct diagnosis and effective functioning of Biochemical Laboratories.

With adequate knowledge and experience, Medical Laboratory Technologists having B.Sc MLT qualification can work in supervisory or management positions in laboratories and hospitals. They can also work as Laboratory Manager/Consultant/supervisor, health care Administrator, Hospital Outreach coordination, laboratory information system Analyst/Consultant, educational consultant/coordinator etc. Additional opportunities are available in molecular diagnostics, molecular biotechnology companies and in vitro fertilization laboratories as well as in research labs.

Programme: B.Sc. in Medical Laboratory Technology

Duration: Three years (Six semesters) full-time programme with 6 months internship in the last semester.

Eligibility: +2 Science with Physics, Chemistry & Biology or equivalent degree

Examination: Examination rules will be as per guideline of CUTM Examination hand book.

Internship: A candidate will have to undergo internship for a period of six calendar months in a hospital/Diagnostics Centre equipped with modern pathology laboratory facility or in a fully equipped pathology laboratory, which fulfills the norms decided by the University.

Dissertation will be compulsory to all students. Students will carry out dissertation work individually or in the group of not more than three students. The format for dissertation/Internship report will be similar to the research thesis style; incorporating chapters on: Introduction, Materials and Methods, Results and Discussion and References / Bibliography. The dissertation will be submitted in a typewritten and bound form.

Degree: On successful completion of three year programme, the candidate will be awarded with “**Bachelor of Science in Medical Laboratory Technology (B.Sc.-MLT)**” from Centurion University.

BACHELOR OF SCIENCE IN MEDICAL LABORATORY TECHNOLOGY

SEMESTER-I				
SL NO	CODE	SUBJECT	SUBJECT TYPE Lecture+ Tutorials + Practice (L+T+P)	CREDITS
1	BSMT1101	Introductory Biology	3+1+0	4
2	BSMT1102	Basic Anatomy and Physiology	4+0+0	4
3	BSMT1103	Basic Haematology	3+1+0	4
4	BSMT1104	Basic Medical Instrumentation and Technique	3+1+0	4
5	BSMT1105	Anatomy , Physiology & Hematology Lab	0+0+6	4

Total			20
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SEMESTER-II				
SL NO	CODE	SUBJECT	SUBJECT TYPE (L+T+P)	CREDITS
1.	FCBS0101	Environmental Science	3+1+0	4
2.	FCHU1201	Foundations of English Communication	0+0+3	2
3.	BSMT1201	Microbiology	3+1+0	4
4.	BSMT1202	Basic Biochemistry	3+1+0	4
5.	BSMT1203	Clinical Pathology	3+1+0	4
6.	BSMT1204	Clinical Pathology & Microbiology Lab	0+0+6	4
Total				22

SEMESTER-III				
SL NO	CODE	SUBJECT	SUBJECT TYPE (L+T+P)	CREDITS
1	BSMT2301	Immunology	3+1+0	4
2	BSMT2302	Applied Hematology	3+1+0	4
3	BSMT2303	Applied Biochemistry	3+1+0	4
4	BSMT2304	Basic Histology	3+1+0	4
5	FCHU0202	Communicative Practice Laboratory-2	0+0+3	2
6	BSMT2305	Immunology & Histology Lab	0+0+6	4
Total				22

SEMESTER-IV				
SL NO	CODE	SUBJECT	SUBJECT TYPE (L+T+P)	CREDITS
1.	BSMT2401	Parasitology	3+1+0	4
2.	BSMT2402	Advance Biochemistry	3+1+0	4
3.	BSMT2403	Advanced Hematology	3+1+0	4
4.	BSMT2404	Human Values & Professional Ethics	3+1+0	4

5.	BSMT2405	Basic Computers and Information Science	0+0+6	4
6.	BSMT2406	Biochemistry & Advanced Microbiology Lab	0+0+6	4
Total				24

SEMESTER-V				
SL NO	CODE	SUBJECT	SUBJECT TYPE (L+T+P)	CREDITS
1	BSMT3501	Transfusion Medicine	3+1+0	4
2	BSMT3502	Medical Laboratory Management	3+1+0	4
3	BSMT3503	Immunopathology	3+1+0	4

4	BSMT3504	Introduction To Quality and Patient Safety	3+1+0	4
5	BSMT3505	Medical Law and Ethics	3+1+0	4
6	BSMT3506	Mycology & Virology	3+1+0	4
7	BSMT3507	Mycology & Virology Lab	0+0+6	4
TOTAL				28

SEMESTER-VI				
SL NO	CODE	SUBJECT	SUBJECT TYPE (L+T+P)	CREDITS
1.	BSMT3601	Project	NA	12
2.	BSMTI3602	Internship	NA	12
		Total		24

INTERNSHIP

Minimum 720 hours (calculated based on 8 hours per day, if 90 working days in a 6 months)

Syllabus

First semester B.sc Medical Lab. Technology BSMT1101-Introductory Biology

Subject Name	Code	Type of course	L-T-P	Prerequisite
Introductory Biology	BSMT1101	Theory+ Practice	3-1-0	Fundamental Science

Objective:

- Determine the parts of the cell membrane and the cell wall
- Distinguish the types and mechanism of mutation
- Compare and contrast the events of cell cycle and its regulation
- Understand the dynamic character of cellular organelles

Course outcome

- Describe the fundamental principals cellular biology
- Develop a deeper understanding of cell structure and how it relates to cell functions.
- Understand how cells grow, divide, and die and how these important processes are regulated.
- Understand cell signaling and how it regulates cellular functions. Also how its dis-regulation leads to cancer and other diseases.

Subject: BSMT1101- Introductory Biology

(LTP: 3+1+0)(Credit: 4)

Unit-1

Biology & Its Branches; Scientific methods in Biology; Scope of biology and career options in Medical Laboratory Sciences; Characters of living organisms (elementary idea of metabolism, transfer of energy at molecular level, open and closed systems, homeostasis, growth and reproduction, adaptation, survival, death). Origin and Evolution of life - Theories of Evolution; Evidence of Evolution; Sources of Variations (mutation, recombination, genetic drift, migration, natural selection); Concept of species; Specification and Isolation (geographical and reproductive); Origin of species.

Unit-2

Diversity of living organisms, Systematic; Need, history and types of classification (artificial, natural, polygenetic); biosystematics; binomial nomenclature; Two kingdom system, Five kingdom System, their merits and demerits, status of bacteria and virus.

Unit-3

Cell as a basic unit of life - discovery of cell, cell theory, cell as a self - contained unit; prokaryotic and eukaryotic cell; unicellular and multicellular organisms; Ultrastructure of prokaryotic and eukaryotic cell - cell wall, cell membrane - unit membrane concept (Fluid-Mosaic model); membrane transport; cellular movement (exocytosis, endocytosis)

Unit-4

Cell organelles and their functions- nucleus, mitochondria, plastids, endoplasmic reticulum, Golgi complex, lysosomes, microtubules, centriole, vacuole, cytoskeleton, cilia and flagella, ribosomes. Molecules of cell; inorganic and organic materials - water, salt, mineral ions, carbohydrates, lipids, amino acids, proteins, vitamins, hormones and steroids.

Suggested Readings

1. Molecular biology of the cell by Alberts Bruce, publisher Garland Science
2. Molecular Biology by Friefelder David, Publisher Narosa
3. Introduction to Cell biology by John K Young, World Scientific publishing company
4. Introduction to biology ,3rd tropic edition by D G Maackean
5. A Term wise Text book on biology by VIDYA

BSMT1102-Human Anatomy & Physiology

Subject Name	Code	Type of course	L-T-P	Prerequisite
Human Anatomy and Physiology	BSMT1102	Theory	4-0-0	Fundamental Science

Objective:

- To identify different types of cells and describe their functions.
- To identify the organelles of a typical cell and describe their functions.
- To identify the major components of the integumentary system and describe their functions.
- To identify the major structures of the skin and describe their functions
- To identify the major components of the skeletal system and describe their functions.
- To identify the major components of the circulatory, endocrine, nervous system etc and describe their functions.

Course outcome

- Use anatomical terminology to identify and describe locations of major organs of each system covered.
- Explain interrelationships among molecular, cellular, tissue, and organ functions in each system.
- Describe the interdependency and interactions of the systems.
- Explain contributions of organs and systems to the maintenance of homeostasis.
- Identify causes and effects of homeostatic imbalances.
- Describe modern technology and tools used to study anatomy and physiology.

Subject: BSMT1102- Human Anatomy And Physiology

(LTP: 4+0+0)(Credit: 4)

Unit-1

Scope of Anatomy and physiology. Definition of various terms used in Anatomy. Structure of cell , function of its components with special reference to mitochondria and microsomes.

Elementary tissues: Elementary tissues of the body, i.e. epithelial tissue, muscular tissue, connective tissue and nervous tissue.

Skeletal System: Structure and function of Skelton .Classification of joints and their function. Joint disorders.

Practice: *Demonstration of individual bone from skeleton..*

Identification of different organs and system from chart .

Unit-2

Cardiovascular System: Composition of blood, functions of blood elements. Blood group and coagulation of blood. Brief information regarding disorders of blood . Name and functions of lymph glands. Structure and functions of various parts of the heart. Blood pressure and its recording . Brief information about cardiovascular disorders .

Respiratory system: Various parts of respiratory system and their functions, physiology of respiration.

Practice: *Demonstration the morphology of different blood cells
Measurement of Blood pressure, impulses, Heart beats, respiration rate etc.*

Unit-3

Urinary System: Various parts of urinary system and their functions, structure and functions of kidney. Physiology of urine formation. Patho-physiology of renal diseases and edema .Digestive System: names of various parts of digestive system and their functions. Structure and functions of liver, physiology of digestion and absorption .

Endocrine System: Endocrine glands and Hormones. Reproductive system . Structure and function of sense organs .

Practice: *Identification of different organs and system from chart.*

Suggested Readings:

1. Text book Anatomy & Physiology for nurses by Evelyn Pearce, Publisher Faber& Faber.
2. Text book Anatomy and Physiology for nurses by Sears, Publisher Edward Arnold.
3. Anatomy & Physiology- by Ross and Wilson, Publisher Elsevier.
4. Anatomy& Physiology: Understanding the human body by Clark, Publisher Jones & Bartlett.
5. Anatomy and Physiology for nurses by Pearson, Publisher Marieb & Hoehn.
6. Anatomy and Physiology by N Murgesh, Publisher satya.

BSMT1103-Basic Haematology

Subject Name	Code	Type of course	L-T-P	Prerequisite
Basic Hematology	BSMT1103	Theory+Practice	3-1-0	Basic Medical science

Objective:

- The overall aims are that the student should obtain advanced knowledge of the most common hematologic diseases & understanding the concept of Blood cells and other blood components.
- Be able to handle an investigation of hemorrhagic disorder and laboratory abnormalities such as anaemia, polycythemia, leukopenia, leukocytosis, thrombocytopenia, thrombocytosis, elevated ESR etc within hematology.
- Clinically relevant hematological analysis for deeper understanding of Evaluate normal and abnormal cell morphology with associated diseases and other blood components .

Course outcome

- Differentiate various laboratory test findings with their associated clinical conditions.
- Identify the various skills necessary to perform blood counts, evaluate blood elements, and report results within the stated limits of accuracy.
- Describe the various components of blood ,their functions, and roles in various disease states.
- To be able to demonstrate good skills in the relevant Hematology laboratory methodology.
- Collection of blood for the investigations.

- Be able to distinguish the developmental stages of blood cells. It will also cover Bone marrow examination.
- To learn about tests carried out for hematological investigations.
- To be able to carry out blood sampling.

Subject: BSMT1103- Basic Hematology

(LTP: 3+1+0)(Credit: 4)

Unit-1

Introduction to Hematology, definition, importance, important equipment and chemicals, various tests performed in Hematology laboratory.

Practice: *Demonstration of instruments used in hematology- Microscope, Blood Cell counter, Shari's Apparatuses.*

Unit -2

Composition and function of blood, Function of normal cellular components

Formation of blood, Erythropoiesis, leucopoiesis, thrombopoiesis

Anticoagulants, definition, Uses, Different types, mode of action, their merits and demerits.

Morphology of normal blood cells, abnormal morphology & diseases.

Practice: *Demonstration of different blood cell, their synthesis from slide presentation or chart. Demonstration the normal and abnormal morphology of different blood cells.*

Unit-3

Collection and preservation of blood: different methods of collection, preservation, changes in stored blood normal and absolute values in hematology, RBC count, WBC count, Platelet count, DLC value, HB, MCH, MCV, MCHC, ESR, PCV.

Blood Film: different types, methods of preparations, staining, Different types of stains, Romanowsky stains: principle of staining, different stains, their composition and preparation, methods of staining.

Practice: *Preparation of DLC, TLC, TRBC etc. Estimation of ESR, Hb and values of MCH, MCV, MCHC, ESR, PCV.*

Unit-4

Hematological Disorders

- Classification of Anemia: Morphological & etiological.
- Iron Deficiency Anemia: Distribution of body Iron, Iron Absorption, causes of iron deficiency, lab findings.
- Megaloblastic Anemia: Causes, Lab findings.
- Hemolytic Anemia: Definition, causes, classification & lab findings.
- Bone Marrow: Cell composition of normal adult Bone marrow, Aspiration, Indication, Preparation & Staining, Special Stain for Bone Marrow -Periodic Acid Schiff, Sudan Black
- Leukemia: Classification, Blood Picture, Differentiation of Blast Cells.

Practice: *Collection of blood by different methods. Different normal and abnormal morphology of RBCs, WBCs, Platelet.*

Suggested Reading

1. Textbook of Medical Laboratory Technology P.B Gotkar Mumbai, Bhalani Publishing House
2. Text book of Medical Laboratory Technology by Paraful B. Godkar, Publisher Bhalani

3. Text book of Medical Laboratory Technology (2nd edition) by V.H Talib, Publisher CBS
4. Atlas of hematology (5th edition) by G.A. McDonald, Publisher Churchill Livingstone
5. Medical Laboratory Technology By K.L Mukharjee, Publisher McGraw Hill education pvt limited

BSMT1104-Basic Medical Instrumentation & Techniques

Subject Name	Code	Type of course	L-T-P	Prerequisite
Basic Medical Instrumentation and Techniques	BSMT1104	Theory+Practice	3-1-0	Fundamental Science

Objective:

- To learn the principle, instrumentation & application of Microscopy
- Principle, instrumentation & application of Centrifugation
- Principle of Spectroscopy

Course outcome

- After completion of the course the student will be efficient in handling the microscopy equipment's.
- They will also be able to have idea about handling instruments like centrifuge, spectrophotometer, chromatography, flow cytometer, Automated and semi- automated Biochemistry analyzer.
- The conceptual understanding of the subject provides opportunities for skill enhancement and scopes for higher education.

Subject: BSMT1104-Basic Medical Instrumentation & Techniques (LTP: 3+1+0)(Credit: 4)

Unit -1

Microscope: different type of microscope operation and care of binocular and monocular microscope in details Light, phase contrast, interference, fluorescence, polarization and electron microscopy (principle, parts and its application)

Photometry: Basic principle and operation.

Practice: Demonstration, operation, and Quality control of different types of microscopes.

Unit-2

UV-V is spectrometry and colorimetric instrumentation and its application.

Centrifuge: Basic principle, type analytical and preparative centrifuges, different density gradient centrifuge and its application. Blood analyzer: Principle, working and its application.

Practice: Operation, Demonstration and Quality control of Centrifuge, UV-Vis spectrometer, Colorimeter.

Unit-3

Microtome: Principle, working and its uses. Incubator, hot air oven and autoclave: Principle, working and its uses.

Practice: Working procedure of microtome, Incubator, Hot air oven, autoclave.

Suggested Reading

1. A Textbook of Medical Laboratory Technology by P Godkar, Publisher Bhalani

2. Textbook of Clinical laboratory methods and diagnosis by Ales C.Sonnenwirth & Leonard Jarret.
3. A Procedure Manual for Routine Diagnostic Tests Vol. I and II by KL Mukherjee, Publisher McGraw Hill education pvt limited
4. Manual of lab and diagnostic tests by Lippincott Williams Wilkins, New York, Fischbach, 2005.
5. Medical laboratory science theory and practice by J Ochei and Kolhatkar, Publisher TBS

BSMT1105-Anatomy, physiology & Haematology Lab

Subject Name	Code	Type of course	L-T-P	Prerequisite
Anatomy, physiology & Haematology Lab	BSMT1105	Practice	0-0-4	Fundamental Science

Objective:

- To identify the major structures of the skin and describe their functions
- To identify the major components of the skeletal system and describe their functions.
- Clinically relevant hematological analysis for deeper understanding of Evaluate normal and abnormal cell morphology with associated diseases and other blood components.

Course outcome

- To be able to demonstrate good skills in the relevant Hematology laboratory methodology.
- Collection of blood for the investigations.
- Be able to distinguish the developmental stages of blood cells.It will also cover Bone marrow examination.
- Explain contributions of organs and systems to the maintenance of homeostasis.
- Identify causes and effects of homeostatic imbalances.
- Describe modern technology and tools used to study anatomy and physiology.

Subject: BSMT1105- Anatomy, physiology and hematology lab (LTP: 0+0+6)(Credit: 4)

1. Demonstration of various parts of centrifuge; its functioning and care , Demonstration of various parts of microscope its functioning and care ,Cleaning and drying of glass and plastic ware, Preparation of various anticoagulants, Collection of venous and capillary blood, Cleaning of glass-syringes and its sterilization .Preparation of buffers, Preparation of the stains and other reagents , Preparation of peripheral blood film (PBF), To stain a peripheral blood Film by Leishman - stain, Haemoglobin estimation (oxy Hb and cyanmethaemoglobin method)
2. Complete Blood Counts, Determination of Hemoglobin, TRBC Count by Hemocytometers, TLC by Hemocytometer , Differential Leukocyte count, Determination of Platelet Count.
3. Determination of ESR by wintrobes, Determination of ESR by Westergren's method,
4. Determination of PCV by Wintrobes, Erythrocyte Indices- MCV, MCH, MCHC. Reticulocyte
5. Count, Absolute Eosinophil Count, Morphology of Red Blood Cells.
6. Demonstration of various parts of body ,tissues of body , parts of digestive system , parts of
7. respiratory system ,parts of excretory system

Suggested Reading:-

1. A Textbook of Medical Laboratory Technology by P Godkar, publisher Bhalani
2. Hand book of Medical Lab Technology By V S talib, Publisher CBS
3. Practical Haematology(8th edition) by Sir John, Publisher Churchill Livingstone
4. Clinical Hematology by Christopher A. Ludlam
5. A Procedure Manual for Routine Diagnostic Tests Vol. I and II by KL Mukherjee Publisher McGraw Hill education pvt limited

2nd semester B. Sc Medical Lab. Technology

FCBS0101-Environmental Science

Subject Name	Code	Type of course	L-T-P	Prerequisite
Environmental Science	FCBS0101	Theory+ Practice	3-1-0	Fundamental Science

Objective:

- Students will investigate and understand and model the concepts of ecology.
- Students will investigate and understand the earth's atmosphere and how it affects living organisms.
- Identify the major concerns of the atmosphere and the impact on living organisms.
- To explain the reasons for global warming, the ozone hole and acid rain and the measures being taken for prevention.
- To understand the concept of multi-disciplinary nature of Environmental Science where different aspects are dealt with a holistic approach.

- Students will develop a sense of community responsibility by becoming aware of environmental issues in the larger social context.
- One must be environmentally educated.

Course outcome

- Understand the natural environment and its relationships with human activities.
- Characterize and analyze human impacts on the environment.
- Integrate facts, concepts, and methods from multiple disciplines and apply to environmental problems.
- Design and evaluate strategies, technologies and methods for sustainable management of environmental systems and for the remediation or restoration of degraded environments.

Subject: FCBS0101-Environmental Science

(LTP: 3+1+0)(Credit: 4)

Course Objectives:

1. To understand the concept of multi-disciplinary nature of Environmental Science where different aspects are dealt with a holistic approach.

2. Students will develop a sense of community responsibility by becoming aware of environmental issues in the larger social context.

3. One must be environmentally educated.

Course outcome

1. Understand the natural environment and its relationships with human activities.
2. Characterize and analyze human impacts on the environment.
3. Integrate facts, concepts, and methods from multiple disciplines and apply to environmental problems.
4. Design and evaluate strategies, technologies and methods for sustainable management of environmental systems and for the remediation or restoration of degraded environments.

Unit-1

Environment and its multidisciplinary nature; Need for public awareness; Renewable and non-renewable resources—forest, water, mineral, land, food and energy resources; Structure and function of ecosystems of forest, grass land, desert and aquatic types.

Unit-2

Biodiversity and its conservation: Biodiversity at global, national and local levels; Threats to biodiversity - Habitat loss; wild life poaching and man - wildlife conflicts; Endangered and endemic species; conservation measures.

Causes, effects and control measures of pollution, air, water and noise pollution; Nuclear hazards; solid-waste management—Causes, effects and control measures; Management of disasters due to natural causes of floods, earthquakes, cyclones and landslides.

Unit-3

Social issues and the environment; Sustainable environment, Water conservation measures; Rain water harvesting; Resettlement and rehabilitation of people; Climate change and global warming; Acid rain; Ozone layer depletion; water land reclamation; Consumerism and waste products; Features of Environment Protection Act, Air pollution and Control of Pollution Acts; Water Pollution and its Control Act. Effects of Pollution explosion on environment and public health; Need for value education to Protect environment and resources.

Text Book:

1. Anubhav Kaushik & C.P. Kaushik: Environmental Studies-New age International Publishers.

Reference Books:

1. Benny Joseph: Environmental Studies-Tata Mac Graw Hill
2. E. Bharucha: Text book of Environmental Studies for under graduate courses– Universities Press. (Book prepared by UGC Committee.

FCHU1201 Foundations of English Communication

Subject Name	Code	Type of course	L-T-P	Prerequisite
Foundations of English Communication	FCHU1201	Practice	0-0-3	General English

Objective:

- To develop vocabulary and grammar knowledge.
- To develop reading comprehension skills.

Course outcome

- Development of academic and sub-technical vocabulary.
- Enhancement of basic language skills i.e listening, speaking, reading and writing.
- Development of grammatical competence.
- Confidence level improvement.

Subject: FGHU1201 Foundations of English Communication (LTP: 0+0+3)(Credit: 2)

Unit-1

READING SKILLS (7hrs.)

Read one of the following books:

- Animal Farm
- Alice in Wonderland
- Guide
- Malgudi Days
- Harry Potter
- Amar Chitra Katha

Comprehension Skills: Students will respond to comprehension lessons from the chosen book.

Unit-2

WRITING SKILLS (7hr.)

Students learn grammar and usage by writing passages, and getting formal feedback on these.

Unit-3

LISTENING SKILLS (6hrs.)

Students respond to questions based on listening to videos, audio, or speaking assignments of classmates.

Unit-4

SPEAKING SKILLS (7hrs.)

Speaking assignments based on chosen book or contemporary topics.

TEXT BOOKS:

Esteras, Santiago Remacha and Fabre, Elena Marco. (2007).

Professional English in Use ICT Student's Book. Cambridge: Cambridge University Press.

REFERENCES:

Grellet, F. (1981). Developing Reading Skills. Cambridge: Cambridge University Press

McCarthy, M. & O'Dell, F. (2008).

Academic Vocabulary in Use. Cambridge: Cambridge University Press.

Ur Penny, (1992). Five-Minute Activities: A Resource Book of Short Activities (Cambridge

Handbooks for Language Teachers). Cambridge: CUP F Klippel. (1984).

Keep Talking. Cambridge: CUP

BSMT1201-Basic Microbiology

Subject Name	Code	Type of course	L-T-P	Prerequisite
Basic Microbiology	BSMT1201	Theory-Practice	3-1-0	General Biology

Objective:

- To know various Culture media and their applications and also understand various physical and chemical means of sterilization.
- To know General bacteriology and microbial techniques for isolation of pure cultures of bacteria, fungi and virus .

- To master aseptic techniques and be able to perform routine culture handling tasks safely and effectively.

Course outcome

- Understanding the details of microorganism morphology and metabolism.
- Broad idea regarding the different types of staining.
- Understanding the sterilization and its types.

Subject: BSMT1201- Basic Microbiology

(LTP: 3+1+0)(Credit: 4)

Unit-1

Introduction to Microbiology

Definition, history, relationship of micro-organisms to man, and safety guideline in a microbiology laboratory . Morphology of bacteria , Anatomy of a bacterial cell including spores, flagella and capsules
Bacterial Growth and Nutrition of bacteria . Bacterial growth curve and bacterial nutrition .

Practice: *Preparation of culture media, demonstrate aerobic and anaerobic culture.
Demonstration the different culture plate and bacterial growth, identification of bacteria .*

Unit-2

Classification of micro-organisms with special reference to bacteria General – Biological
Sterilization ,Definition, sterilization by dry heat, moist heat (below, at and above 100o C), autoclave and hot air oven its structure and functioning, preventive measures, controls and sterilization indicators, sterilization by radiation and filtration, Antiseptics and Disinfectants
Definitions, types, properties, use of disinfectants and antiseptics, efficiency testing of disinfectants ; use of laminar flow – principle and function.

Practice:- *Demonstrate the different methods of sterilization with handling Hot air oven, Autoclave.
Handling Of compound microscope . Demonstration of Antiseptics, Spirit, Cetrimide & Povidone-iodine .
Demonstration the disinfectants and precaution while using disinfectants*

Unit-3

Staining techniques

Methods of smear preparation, Gram stain, AFB stain, Albert's stain and special staining for spore, capsule and flagella, Culture Media, Liquid and solid media, defined and synthetic media, routine laboratory media (basal, enriched, selective, enrichment, indicator, and transport media)

Practice: *Demonstration the different staining procedure like Gram stain, Zn stain, Albert's stain etc*

Suggested Reading:-

1. Medical Laboratory Technology by Kanai Lal Mukherjee; Tata McGraw Hill, New Delhi
2. An Introduction to Medical Laboratory Technology by FJ Baker; Butterworth – Heinemann; Oxford
3. Practical Book of Medical Microbiology by Satish Gupta; JP Brothers, New Delhi
4. Medical Laboratory Manual for Tropical Countries Vol. I and II by Monica Cheesbrough; Cambridge University Press; UK
5. Textbook of Medical Laboratory Technology by Praful B Godkar; Bhalani Publishing House, Mumbai
6. Text book of Medical Microbiology by Gruckshiank

Subject Name	Code	Type of course	L-T-P	Prerequisite
Basic Biochemistry	BSMT1202	Theory-Practice	3-1-0	Basic Medical Science

Objective:

- Understanding the different bio molecule structure and metabolism and metabolic pathway.
- Clinically relevant biochemical analysis for deeper understanding of all biochemical components i.e., Proteins, Electrolytes, Hormones etc.

Course outcome

- To learn about tests carried out for biochemical investigations.
- Understanding of principle of biochemical Clinical biochemistry tests.
- To learn normal ranges and abnormal ranges of biochemical components and hormones.
- To study about diseases related to biochemical and hormone imbalance in human body.

Subject: BSMT1202- Basic Biochemistry

(LTP: 3+1+0)(Credit: 4)

Unit-1

Enzymes - Introduction, definition, classification, coenzymes, isoenzymes, properties, factors affecting enzyme action, enzyme inhibition, diagnostic value of serum enzymes - Creatinine kinase, Alkaline phosphatase, Acid phosphatase, LDH, SGOT, SGPT, Amylase, Lipase, Carbonic anhydrase etc.

Unit-2

Chemistry of carbohydrates & their related metabolism - Introduction, definition, classification, biomedical importance & properties. Brief outline of metabolism : Glycogenesis & glycogenolysis (in brief), Glycolysis, citric acid cycle & its significance, HMP shunt & Gluconeogenesis (in brief), regulation of blood glucose level.

Unit-3

Amino acids - Definition, classification, essential & non essential amino acids . Chemistry of Proteins & their related metabolism – Introduction, definition, classification, biomedical importance. Metabolism : Transformation, Decarboxylation, Ammonia formation & transport, Urea cycle, metabolic disorders in urea cycle, catabolism of amino acids especially Phenylalanine, Tyrosine & Tryptophan, Creatine, Creatinine, Proteinuria.

Unit-4

Chemistry of Lipids & their related metabolism – Introduction, definition, classification, biomedical importance, essential fatty acids. Brief out line of metabolism : Beta oxidation of fatty acids, fatty liver, Ketosis, Cholesterol & it's clinical significance, Lipoproteins in the blood composition & their functions

in brief, Atherosclerosis.

Diabetes mellitus - definition, types, features, gestation diabetes mellitus , glucose tolerance test, glycosurias, Hypoglycemia & its causes.

Suggested Reading

1. Text book of Medical Laboratory Technology, P.B. Godkar 2nd Edn. 2003 Bhalani Publication.
2. Text book of Biochemistry, M. A. Siddique 8th Edn.1993 Vijay Bhagat Scientific Book Co., Patna.
3. Medical Biochemistry by AC Dey.
4. Handbook of Christen Medical Association, India Medical Laboratory Technology- Robert H. Carman.

BSMT1203-Clinical Pathology

Subject Name	Code	Type of course	L-T-P	Prerequisite
Clinical Pathology	BSMT1203	Theory-Practice	3-1-0	Basic biology

Objective:

- Analyze body fluid for diagnosis of disease
- Analyze waste product for diagnosis of disease
- Understanding DOT Policy
- Understand Physiological disorder and infectious disease

Course outcome

- Able to collect pathological specimen
- Able to detect diabetes, ketosis, nephritis, jaundice and other physiological disorder
- Able to detect infectious disease (UTI, Hematuria, Filaria, Dysentery, Ulcer, TB, etc.)
- Preservation and processing of pathological sample.
- Identification of Parasites

Subject: BSMT1203-Clinical pathology

(LTP: 3+1+0)(Credit: 4)

Unit-1

URINE: Urine meter, Esbachl's Albuminometer, preparation of various reagents. Composition, collection and preservation of urine for various tests, physical chemical and microscopic examination of urine, estimation of total albumin, Specific gravity, litmus paper, tests for albumin, sugar, blood, bile salts and pigments, urobilinogen, ketones bodies etc.

Practice: Collection procedures of urine, Important precursors for collecting samples.
Physical and Chemical and Microscopic examination of urine .

Unit-2

STOOL: Sample collection, physical, chemical and microscopic examination.

SPUTAM : Sample collection, stain and study of A.F.B.

CEREBROSPINAL FLUID: Pandy's test, Cell count, cell type differential count and malignant cells.

BODIES FLUID: Cells stain; cell morphology and detection of malignant cells in peritoneal fluid, pleural fluid, pericardial fluid, and synovial fluid. Differences between transudates and exudates.

SEMEN: Sample collection, microscopic examination for count and morphology and morphology.

Practice: *Collection procedures and important precursors for collecting samples like STOOL, CSF, SEMEN and different body fluids.*

Physical and Chemical and Microscopic examination of different samples.

Unit-3

ANATOMIC PATHOLOGY: 1. Reception, Registration, preservation and processing of specimens. Haematoxyline and eosine staining procedure, mounting of stained sections, Filing of paraffin blocks, and slides. Method of decalcification, Sharpening and honing Knives techniques, using of microtome.

2. Museum: Mounting of specimens, labeling, maintenance of specimens and catalogue etc.

Post mortem/ Autopsy: Maintenance of the records of the Dead Bodies and specimens received, Autopsy techniques, Autopsy instruments, clod storage plants, legal aspects etc.

Practice : *Handling clinical laboratorial equipment.*

Preparation of some stains, and reagents for clinical diagnosis purpose.

Suggested Reading

1. Textbook of Clinical laboratory methods and diagnosis by Gradwohls, Publisher Mosby
2. Manual Text book of lab and diagnostic tests by Lippincott Williams Wilkins, New York.
3. Medical laboratory science theory and practice by J Ochei and Kolhatkar, 2002, Tata McGraw- Hill, Publisher TBS
4. Medical laboratory technology Vol.1 by K. L. Mukherjee, 2007, Publisher Tata McGraw Hill.

BSMT1204-Clinical Pathology & microbiology lab

Subject Name	Code	Type of course	L-T-P	Prerequisite
Clinical Pathology & Microbiology lab	BSMT1204	Practice	0-0-4	Basic Pathology and microbiology

Objective:

- Analyze body fluid for diagnosis of disease
- Analyze waste product for diagnosis of disease
- To know General bacteriology and microbial techniques for isolation of pure cultures of bacteria, fungi and virus.
- To master aseptic techniques and be able to perform routine culture handling tasks safely and effectively.

Course outcome

- Understanding the details of microorganism morphology and metabolism.
- Broad idea regarding the different types of staining.
- Understanding the sterilization and its types.
- Able to collect pathological specimen
- Able to detect diabetes, ketosis, nephritis, jaundice and other physiological disorder

Subject: BSMT1204-Clinical pathology and microbiology lab

(LTP: 0+0+6)(Credit: 4)

(1) **Urine analysis** Physical, Chemical, Microscopic, Microbiological.

- (2) Stool analysis Physical, Chemical, Microscopic, Microbiological.
- (3) Sputum analysis Physical, Chemical, Microscopic, Microbiological.
- (4) Semen analysis Physical, Chemical, Microscopic, Microbiological.
- (5) Sterilization, Media Preparation, Bacteriological examination of pus.
- (6) Bacteriological examination of trout swab.
- (7) Laboratory study of parasites in stool, blood. Giardia lamblia, Entamoeba

Suggested Reading

1. Manual of lab and diagnostic tests by Lippincott Williams Wilkins, Fischbach, 2005 New York..
2. Clinical laboratory methods and diagnosis by Gradwohl's, 2000, Publisher Mosby
3. Medical laboratory science theory and practice, J Ochei and Kolhatkar, 2002, publisher TBS
4. Medical laboratory technology Vol.1 by K. L. Mukherjee, 2007, publisher Tata McGraw Hill.

3rd semester B.sc Medical Lab. Technology

BSMT2301-Immunology

Subject Name	Code	Type of course	L-T-P	Prerequisite
Immunology	BSMT2301	Theory-Practice	3-1-0	Fundamental Science

Objective:

- Understanding the concept of Innate & adaptive immune system; complement system; Hypersensitivity.
- Clinically relevant serological analysis for deeper understanding of antigen-antibody interaction.
- To understand the concept of cells of immune system and organs of immune system.

Course outcome

- The student will learn the application of Immunology in disease diagnosis.
- Complement system followed by the body on encountering an Antigen.
- Immune Response produced on encounter with foreign body.
- The students will learn the role of immunity in fighting disease, along with consequence of undesirable expression of immune system such as, hypersensitivity and auto immune disease.

Subject: BSMT2301-Immunology

LTP: (3+1+0)(Credit:4)

Unit-1

Immunity: Classification, Measurement of immunity, Local immunity, Herd immunity.

Antigens: Types of antigen, Antigenic Determinant or Epitome, Determinants of Antigenicity

Tolerogens, Biological Classes of antigens, Superantigens.

Antibodies-Immunoglobulins: Antibody structure, Immunoglobulin classes of Antigens, Antigenic Determinants on Immunoglobulins.

Practice: Collection of blood sample by vein puncture, separation and preservation of

serum

Raising haemolysin in Rabbit and performing its titration for Rose-Waaler test.

Unit-2

The Complement System: Principal pathways of Complement activation, Quantitation of Complement

(C) and its Components. Biosynthesis of complement, Complement Deficiencies.

Antigen-Antibody Reactions: Antigen-Antibody Interactions, General characteristics of Antigen-Antibody Reactions, Antigen-Antibody measurement, Parameters of serological tests, Serological Reactions.

Practice: - Preparation of Phosphate buffers, Vernol buffer, ASO buffer, Richardsons buffer Buffers of different pH and molarity, tris buffer, Standardization of cell concentration by spectrophotometer

Unit-3

Immune Response: Types of Immune response, Humoral immunity, Fate of Antigen in tissues, Production of Antibodies, Cell-mediated Immune Responses, Cytokines, Immunological tolerance, Theories of immune Response.

Hypersensitivity Reactions: Classification of hypersensitivity reactions, Type I Hypersensitivity (IgE Dependent). Type II Hypersensitivity: Cytolytic and Cytotoxic. Type III Hypersensitivity -Immune Complex-mediated, Type IV Hypersensitivity-Delayed Hypersensitivity, Shwartzman Reaction.

Practice: - Performance of Serological tests i.e. Widal, Brucella Tube Agglutination, VDRL (including Antigen Preparation), ASO (Antistreptolysin 'O'), C-Reactive Protein (Latex agglutination), Rheumatoid factor (RF) Latex agglutination, Rose Waaletest

Suggested Readings:

1. Text book of Microbiology by Ananthanereyan & Paniker, Publisher Universities press
2. Short text book of Medical microbiology by Satish Gupt, Publisher Jaypee brotthers
3. Medical laboratory Technology vol.I ,II, III by K L Mukherjee, Publisher McGraw Hill education
4. Medical Laboratory manual for tropical countries Vol II Microbiology by Monia Cheesbrough, publisher Butterworth Heinemann ltd
5. Immunology by Ivan Roitt, JonathanBrostoff and David Male
6. Practical Medical Microbiology by Mackie & MacCartney Volume 1 and 2

BSMT2302-Applied Haematology

Subject Name	Code	Type of course	L-T-P	Prerequisite
Applied Hematology	BSMT2302	Theory-Practice	3-1-0	Basic science Medical

Objective:

- The overall aims are that the student should obtain advanced knowledge of the most common hematologic diseases & understanding the concept of Blood cells and other blood components.

- Be able to handle an investigation of hemorrhagic disorder and laboratory abnormalities such as anaemia, polycythemia, leukopenia, leukocytosis, thrombocytopenia, thrombocytosis, elevated ESR etc within hematology.
- Clinically relevant hematological analysis for deeper understanding of Evaluate normal and abnormal cell morphology with associated diseases and other blood components.

Course outcome

- Differentiate various laboratory test findings with their associated clinical conditions.
- Identify the various skills necessary to perform blood counts, evaluate blood elements, and report results within the stated limits of accuracy.
- Describe the various components of blood, their functions, and roles in various disease states.
- To be able to demonstrate good skills in the relevant Hematology laboratory methodology.

Subject: BSMT2302- Applied Hematology

LTP:(3+1+0)(Credit:4)

Unit-1

Definition and classification of anemia .

Definition, classification and laboratory diagnosis of leukaemias

Definition and laboratory diagnosis of Leukamoid reactions

Cytochemical staining , procedure and their significance in various haemopoietic disorders.

Laboratory diagnosis of iron deficiency anaemia, Laboratory diagnosis of megaloblastic anaemia

Laboratory diagnosis of haemolytic anemia .

Practice: *Collection of blood from different body parts. Data and record Maintain , Handling hematological equipments.*

Unit-2

Chromosomal studies in various haematological disorders and their significance.

Mechanism of normal fibrinolysis and Laboratory diagnosis of hyperfibrinolysis .

Mechanism and laboratory diagnosis of disseminated intravascular coagulation (DIC).

Laboratory diagnosis of Haemophilia and von-willebrand disease . Laboratory diagnosis of

Idiopathic thrombocytopenic purpura (ITP), Platelet function tests and their interpretation .

Various radioactive isotopes used in hematology

Practice: - *To estimate serum iron and total iron binding capacity. To detect whether the given specimen is G6PD deficient or normal. To estimate Hb-F in a given blood sample . To estimate plasma and urine Haemoglobin in the given specimens. To demonstrate the presence of Hb-S by Sickling and solubility tests.*

Unit-3

L.E.cell phenomenon-

a. Definition of L.E.cell , **b.** Demonstration of L.E.cell by various methods **c.** Clinicals

Physiological variations in Hb, PCV, TLC and Platelets .

Investigations of a case suffering from bleeding disorders.

Quantitative assay of coagulation factors - **a.** Principle **b.** Procedure

Biomedical waste management in hematology laboratory (Other than Radioactive material)

Practice:- *Demonstration of functional aspect of blood cell counter*

Study the RBCs abnormal morphological form -a.Variation in size , shape and staining

Character , b. Red cell inclusion

Identify morphologically the-Immature Erythroid series of cells

Suggested readings

1. Text book of Medical Laboratory Technology by Paraful B. Godkar, Bhalani Publisher
2. Text book of Practical Hematology by JB Dacie
3. Hand book of Medical Laboratory Technology(2nd edition) by V.H. Talib, publisher CBS
4. Hematology (International edition) Emmanuel C. Besa Harwal Publisher
5. Practical Hematology(8th edition) by Sir John, Publisher Churchill livingstone
6. Clinical Hematology by Christopher A. Ludlam, Publisher Churchill livingstone
7. Clinical Diagnosis & Management by Laboratory methods(20th edition) by John Bernard Henry

BSMT2303-Applied Biochemistry

Subject Name	Code	Type of course	L-T-P	Prerequisite
Applied Biochemistry	BSMT2303	Theory-Practice	3-1-0	Basic Medical science

Objective:

- Understanding the concept of Biochemical analyzing instruments both automated and semi automated.
- Understanding about different biochemical test.

Course outcome

- Understanding of instrumentation technique & principle of spectrophotometry, colometry, photometry and electrolyte analyzer.
- To learn about safety precautions and handling the equipment in a biochemical laboratory.
- Students will explain/describe the synthesis of proteins, lipids, nucleic acids, and carbohydrates and their role in metabolic pathways

Subject: BSMT2303-Applied Biochemistry

LTP

:(3+1+0)(Credit:4) Unit- 1

Automation in clinical Biochemistry,

Method of estimation and assessment for: a. Glucose tolerance test ,b. Insulin tolerance test, c. Xylose excretion test.

Practice:- Demonstration the centrifuge machine ,Demonstration of Colorimeter.

Unit-2

Clearance test for renal function . Gastric analysis, LFT , KFT, Lipid profile, Qualitative test for Urobilinogens ,Barbiturates, T3, T4 and TSH, 17 Ketosteroids. Principles, clinical significance and procedures for estimation, of Acid phosphatase, Alkaline phosphatase, Lactate dehydrogenase, Aspartate transaminase, Alanine, transaminase and Creatine phosphokinase.

Practice:- Estimation of Liver function test, Kidney function test, Lipid profile.

Unit-3

Qualitative analysis of renal calculi . Chemical examination of cerebrospinal fluid , Brief knowledge

about rapid techniques in clinical biochemistry.

Practice:- Estimation of Glucose in urine and blood .

Estimation of Protein in urine and blood .

Suggested readings

1. Text book of Medical Laboratory Technology by P. B. Godker, Publisher Bhalani.
2. Text book of Medical Biochemistry by Chaterjee & Shinde, Publisher JPB
3. Medical Laboratory Technology by Mukherjee, Publisher
4. Principal of Biochemistry by Lehninger, Publisher Kalyani
5. Practical Clinical Biochemistry by Harold Varley, Publisher CBS.

BSMT2304- Basic Histology

Subject Name	Code	Type of course	L-T-P	Prerequisite
<i>Basic Histology</i>	BSMT2304	Theory-Practice	3-1-0	Basic Medical science

Objective:

- Understanding the concept of histotechnology; Basic concepts about routine methods of examination of tissues Collection.
- perform routine laboratory procedures encompassing all major areas of the histology laboratory.
- Clinically relevant onchological analysis for deeper understanding of abnormal cell growth at anywhere in human body.

Course Outcome

- The students will learn about various staining procedures for demonstration of different substances & various cytological investigations.
- The students will learn about special staining procedures & handling & testing of various cytological specimens.
- Reception and labeling of histological specimens.
- Use of antiseptics, disinfectants and insecticides in a tissue processing laboratory.

Subject: BSMT2304 –Basic Histology

LTP:(3+1+0)(Credit:4)

Unit-1

Introduction to histotechnology, Care , maintenance and Safety measures of laboratory equipment used in histotechnology. Basic concepts about routine methods of examination of tissues Collection and transportation of specimens for histological examination, fixation Various types of fixatives used in a routine histopathology laboratory- Simple fixatives ,Compound fixatives ,Special fixatives for demonstration of various tissue elements.

Practice: *Demonstration of instruments used for dissection.*

Use of antiseptics, disinfectants and insecticides in tissue processing laboratory .

Unit-2

Decalcification Criteria of a good decalcification agent, Technique of decalcification

Followed with selection of tissue, fixation, decalcification, neutralization of acid an thorough washing. Various types of decalcifying fluids, Processing of various tissues for histological examination ,Embedding, Schedule for manual or automatic Tissue processing, Components & principles of various types of a tissue processors .

Practice: -Method of Decalcification, fixation, Embedding , manual or automatic tissue processing.

Unit-3

Section Cutting , Sharpening of Microtome Knives, Honing, Stropping, various types of microtome and their applications ,Freezing Microtome and various types of Cryostats, Staining, Impregnation and Mountains, Commonly used mountains in histotechnology lab. General Staining Procedures for Paraffin Infiltrated and Embedded tissue . Nuclear Stains and Cytoplasmic stain, Equipment and Procedure for manual Staining and Automatic Staining Technique . Mounting of Cover Slips, Labeling and Cataloguing the Slides .

Practice: - Procedure for manual Staining and Automatic Staining Technique.

Suggested readings

1. Color text book of histology by Gartner &Hiatt ,publisher Elsevier
2. Netter’s essential histology by William Ovalle, publisher Elsevier
3. Histology E-book by Barry Mitchell, publisher Elsevier
4. Textbook of Histology (color atlas) by Krishna Garg , Indira Bahl, Mohini kaul, publisher CBS
5. Textbook of Histology and a Practical Guide by JP Gunasegaran , Publisher Elsevier

FCHU0202-Communicative Practice Laboratory-1

Subject Name	Code	Type of course	L-T-P-	Prerequisite
Communicative Practice Laboratory-1	FCHU0202	practice	0-0-2	General english

Objective:

- To expose the students to a variety of self- instructional, learner- friendly modes of language learning. To enable them to learn better pronunciation through stress on word accent, intonation, and rhythm. To maintain good linguistic - through accuracy in grammar, pronunciation and vocabulary.

Course Outcome

- Ability to communicate fluently in different business situation
- Effective oral and written communication
- Appropriate word usage with correct pronunciation

- Clarity of word stress and intonation

Subject: FCHU0202 -Communicative Practice Laboratory-1

(LTP: 0+0+3)(Credit: 2)

The language laboratory acts as a platform for learning, practicing and producing language skills through interactive lessons and communicative mode of teaching.

Unit-1

FRIENDLY COMMUNICATION (9 HOURS)

- **Doing Things with Words: To ask for information, help, permission; To instruct, command, request, accept, refuse, prohibit, persuade**
- **Practice of Formulaic Expressions: Greetings, farewells, introductions, thanks, apologies, regrets, good wishes, congratulations, condolences, offers.**
- **Conversation Practice in familiar and unfamiliar situations (This module will be practiced through conversation activities in pairs & groups)**

Unit-2

GRAMMAR AND VOCABULARY (9 HOURS)

- **The focus will be on the appropriate usage of language.**
- **Elimination of common errors**
- **Editing passages**
- **Word power A-Z: Easy and quick techniques**
- **Vocabulary building exercises (Open Source Language Laboratory will be used to take quizzes and practice grammar & vocabulary)**

Unit-3

PHONETICS AND SPOKEN ENGLISH (12 HOURS)

- **Students will be trained to find out the correct pronunciation of words with the help of a dictionary /software, to enable them to monitor and correct their own pronunciation.**
- **Pronunciation Guidelines: Consonants and Vowels**
- **Pronunciation practice (for accent neutralization), particularly of problem sounds, in isolated words as well as sentences**
- **Speaking Techniques: Using correct stress patterns, developing voice quality**
- **Rhythm and Intonation (Reading aloud of dialogues, speeches etc. for practice in pronunciation) (In this module, the learners will use video series from BBC & Sky Pronunciation Suite to improve spoken English)**

TEXT BOOKS: Dwyer, J. (2000).

The Business Communication Handbook . New Jersey: Prentice Hall.

REFERENCES:

Brown, G & Yule, G. (1983).Teaching the Spoken Language. Cambridge: Cambridge University Press. Brown, H. D. (1994). Teaching by Principles: An Interactive Approach to Language Pedagogy. New Jersey: Prentice Hall.

BSMT2305-Immunology and Histology lab (LTP: 0+0+4)(Credit:4)

Subject Name	Code	Type of course	L-T-P	Prerequisite
<i>Immunology and Histology lab</i>	BSMT2305	Practice	0-0-4	Basic immunology & Histology

Objective:

- perform routine laboratory procedures encompassing all major areas of the histology laboratory.
- Clinically relevant onchological analysis for deeper understanding of abnormal cell growth at anywhere in human body.
- Clinically relevant serological analysis for deeper understanding of antigen-antibody interaction.

Course Outcome

- The students will learn about various staining procedures for demonstration of different substances & various cytological investigations.
- The students will learn about special staining procedures & handling & testing of various cytological specimens.
- The student will learn the application of Immunology in disease diagnosis.

Subject: BSMT2305-Immunology and Histology lab

(LTP: 0+0+6)(Credit:4)

Immunology

Collection of blood sample by vein puncture, separation and preservation of serum

Raising haemolysin in Rabbit and performing its titration for Rose-Waaler test

Preparation of Phosphate buffers, Vernol buffer, ASO buffer, Richardsons buffer,

Buffers of different pH and molarity, tris buffer, Standardization of cell concentration by spectrophotometer

Performance of Serological tests i.e.

- a. Widal,
- b. Brucella Tube Agglutination,
- c. VDRL (including Antigen Preparation),
- d. ASO (Antistreptolysin 'O')
- e. C-Reactive Protein (Latex agglutination)
- f. Rheumatoid factor (RF) Latex agglutination
- g. Rose Waaler test,

Demonstration of antigen / antibody determination by Immunofluorescence,

Immunodiffusion, precipitation in agarosegel(ouchterlony),CCIEP, ELISA, SDSPAGE and western blotting.

Histotechnology

Demonstration of instruments used for dissection

Use of antiseptics, disinfectants and insecticides in a tissue processing laboratory

Reception and labeling of histological specimens

Preparation of various fixatives -Helly's fluid, Zenker's fluid, Bouin's fluid , Corney's fluid,

10% Neutral formalin, Formal saline , Formal acetic acid, Pereyn's fluid

To perform embedding and casting of block .

To process a bone for decalcification .
 To prepare 70% alcohol from absolute alcohol.
 Processing of tissue by manual and automated processor method
 To demonstrate various part and types of microtome .
 To learn sharpening of microtome knife (Honing and stropping technique)
 To perform section cutting , learn mounting of stained smears.
 To practice attachment of tissue sections to glass slides
 To learn using tissue floatation bath drying of sections in incubator (-560 C)
 To perform & practice the Haematoxylin and Eosin staining technique
 To perform & practice the Mallory's Phosphotungstic Acid Haematoxylin (PTAH)

4th semester B.Sc Medical Lab. Technology

BSMT2401-Parasitology

Subject Name	Code	Type of course	L-T-P-	Prerequisite
Parasitology	BSMT2401	Theory-Practice	3-1-0	Basic biology

Objective:

- Describe basic morphology, life cycle, pathogenesis, lab diagnosis and treatment of parasites (Protozoa, metazoa and Helminth)
- Perform appropriate laboratory techniques used in the processing of specimens and identification of parasites.

Course Outcome

- Identification of pathogenic parasite in disease diagnosis and treatment.
- The conceptual understanding of the subject provides opportunities for employability and scopes for higher education.
- To serve as a resource for the clinical laboratories professionals in the different region.

Subject: BSMT2401- Parasitology

(LTP:3+1+0)(Credit:4)

Unit-1

Introduction to Medical Parasitology , General characteristics of protozoa and helminthes
 Collection, Transport, processing and preservation of samples for routine parasitological investigations .

Practice:- Method of sample Collection, Transport, processing and preservation of samples for routine parasitological investigations.

Unit-2

Morphology, life cycle and lab-diagnosis of Giardia and Entamoeba
 Morphology, life cycle and lab-diagnosis of Roundworms and Hookworms
 Morphology, life cycle and lab-diagnosis of T. solium and T. saginata
 Morphology, life cycle and lab-diagnosis of Malarial parasite with special refrence to P.vivax and P.falciparum .

Practice:- *Laboratory diagnosis of hydrated cyst and cysticercosis*
Concentration techniques for demonstration of Ova (Principles and applications)
Routine Stool examination for detection of intestinal parasites.
Identification of adult worms from model's or slide's.
Identification of different parasites their morphology from slide's

Suggested Reading

1. Text book of Parasitology by N C Dey, publisher New central book agency
2. Text book of Parasitology by Chaterjee, publisher CBS
3. Text book of microbiology by Ananthanereyan, Publisher universities press
4. Medical Parasitology by RL Ichhpujani and Rajesh Bhatia, jaypee publisher
5. Short text book of medical microbiology by Satish gupt, Publisher Jaypee

BSMT2402-Advance Biochemistry

Subject Name	Code	Type of course	L-T-P	Prerequisite
Advance Biochemistry	BSMT2402	Theory- Practice	3-1-0	Basic medical sciences

Objective:

- To learn the principle, instrumentation & application of Microscopy.
- Principle, instrumentation & application of Centrifugation.
- Principle of Spectroscopy.

Course Outcome

- After completion of the course the student will be efficient in handling the microscopy equipment's.
- They will also be able to have idea about handling instruments like centrifuge, spectrophotometer, chromatography, flow cytometer, Automated and semi- automated Biochemistry analyzer.
- Students will explain/describe the synthesis of proteins, lipids, nucleic acids, and carbohydrates and their role in metabolic pathways

Subject: BSMT2402-Advance Biochemistry

(LTP:3+1+0)(Credit:4)

Unit-1

Spectrophotometry and colorimetry, Introduction, Theory of spectrophotometry and colorimetry , Lambert's law and Beer's law ,Applications of colorimetry and spectrophotometry.

Practice:- Practice: Cleaning of the Laboratory glass ware, Preparation of distilled Water, Principle, working and maintenance of pH meter, To prepare 0.1 N HCl solution, 0.2N HCl

solution.,0.1 molar H₂SO₄, 0.2 Molar Sodium carbonate solution, Demonstration of Osmosis and dialysis.

Demonstration of the instrument Spectrophotometry according to Lambert's and Beer's law

Unit-2

Photometry, Introduction, General principles of flame photometry, Limitations of flame Photometry, Instrumentation, Applications of flame photometry , Atomic absorption Spectroscopy – Principle & applications

Practice:- Demonstration of Photometry, general principles, limitation of Photometry.

Unit-3

Chromatography Introduction, definition, types of chromatograph, Paper Chromatography: Introduction, principle, types , details for qualitative and Quantitative analysis, application

Thin layer chromatography: Introduction, experimental techniques, application of TLC, Limitations,

High performance thin layer chromatography

Column chromatography: Introduction, principle column efficiency, application of

Column chromatography Gas chromatography: Introduction principle, instrumentation,

Application Ion exchange chromatography: Introduction, Definition and principle, cation and Anion exchangers , application.

Practice:- Demonstration of Chromatography, Demonstration of Gel Chromatography

Unit-4

Electrophoresis: Introduction, principle, Instrumentation, types of electrophoresis - paper and gel electrophoresis ,application.

Suggested readings

1. Handbook of Christen Medical Association, India (CMAI) Medical Laboratory Technology- Robert H.Carman. 2nd Edn. CMAI, New Delhi.
2. Text book of Medical Laboratory Technology, P.B. Godkar 2nd Edn. Bhalani Publication.
3. Handbook of Biochemistry by M. A. Siddique 8th Edn. Vijay Bhagat Scientific Book

BSMT2403-Advance Hematology

Subject Name	Code	Type of course	L-T-P	Prerequisite
Advance Haematology	BSMT2403	Theory- Practice	3-1-0	Basic haematology

Objective:

- The overall aims are that the student should obtain advanced knowledge of the most common hematologic diseases & understanding the concept of Blood cells and other blood components.
- Demonstrate an understanding of the components of human blood and characteristics, functions, and abnormalities and disease states of each.
- Demonstrate proficiency in the skills necessary to perform blood cell counts, and evaluation of blood elements within stated limits of accuracy.

Course Outcome

- Differentiate various hematological procedures and the use of basic equipment essential to working in a Hematology Laboratory.
- Discuss differences between Quality control, Quality Assurance, and Continuing Quality Improvement principles as used in the Hematology Laboratory.
- Categorize various hematology analyses , operational principles of various hematology instruments, and troubleshooting of various instruments.
- Explain the principles and theories utilized in a variety of problem-solving situations.

Subject: BSMT2403-Advance Hematology

(LTP:3+1+0)(Credit:4)

Unit-1

Definition and classification of anemia's , Laboratory diagnosis of iron deficiency anemia.

Laboratory diagnosis of megaloblastic anemia , Laboratory diagnosis of hemolytic anemia.

Definition, classification and laboratory diagnosis of leukemia's

Definition and laboratory diagnosis of Leukamoid reactions Cytochemical staining, procedure and their significance in various haemopoietic disorders. Chromosomal studies in various hematological disorders and their significance. Mechanism of normal fibrinolysis and Laboratory diagnosis of hyperfibrinolysis .

Mechanism and laboratory diagnosis of disseminated intravascular coagulation (DIC).

Practice:- Demonstrate the different abnormal morphology of RBCs in Anemia cases.

Laboratory diagnosis of hemolytic anemia, leukemia's, Leukamoid reactions

Unit-2

Laboratory diagnosis of Hemophilia and von-will brand disease. Laboratory diagnosis of Idiopathic thrombocytopenic purpura (ITP) ,Platelet function tests and their interpretation.

Unit-3

Measurement of:

a. Blood volume, b. Determination of Red cell volume and Plasma volume, c. Red cell life span, d. Platelet life span .Estimate serum iron, total iron, Hb-F, Plasma and urine hemoglobin.

Demonstrate the presence of Hb-S by Sickling and solubility ,Perform various Platelet function test.

Practice:- Demonstration the sickle cells

Suggested readings

1. Text book of Medical Laboratory Technology by Paraful B. Godkar Practical Hematology Publisher JB Dacie, Bhalani publisher
2. Text book of Medical Laboratory Technology(2nd edition) by V.H. Talib, publisher CBS
3. Hematology (International edition) EmmanuelC.BesaHarwal Publisher
4. Practical Hematology (8th edition) by Sir John , publisher Churchill livingstone

BSMT2404-Human value & professional ethics

Subject Name	Code	Type of course	L-T-P	Prerequisite
Human value & professional ethics	BSMT2404	Theory Practical	3-1-0	NA

Objective:

- The course provides an introduction to ethics generally and more specifically to medical ethics, examining in particular the principle of autonomy, which informs much of medical law. The course then considers the general part of medical law governing the legal relationship between medical practitioners and their patients.
- It considers the legal implications of the provision of medical advice, diagnosis and treatment. Selected medico-legal issues over a human life are also examined. These may include reproductive technologies, foetal rights, research on human subjects, organ donation, the rights of the dying and the legal definition of death.

Course Outcome

- The ethical underpinnings of the law as it relates to medicine,
- The law of negligence in the context of the provision of healthcare,
- Legal and ethical issues surrounding end and beginning of life decisions,
- The maintenance of professional standards in the healthcare profession, and

Subject: BSMT2404-Human value

(LTP: 3+1+0)(Credit:4)

& professional ethics

Unit-1.

Course Introduction - Need, Basic Guidelines, Content and Process for Value Education

Understanding the need, basic guidelines, content and process for Value Education.

Self Exploration-what is it?- its content and process; 'Natural Acceptance' and Experiential

Validation- as the mechanism for self exploration.

Continuous Happiness and Prosperity- A look at basic Human Aspirations

Right understanding, Relationship and Physical Facilities- the basic requirements for fulfillment of Aspirations of every human being with their correct priority

Understanding Happiness and Prosperity correctly- A critical appraisal of the current scenario

Method to fulfill the above human aspirations: understanding and living in harmony at various Levels

Unit- 2.

Understanding Harmony in the Human Being - Harmony in Myself!

Understanding human being as a co-existence of the sentient 'I' and the material 'Body'

Understanding the needs of Self ('I') and 'Body' - Sukh and Suvidha

Understanding the Body as an instrument of 'I' (I being the doer, seer and enjoyer)

Understanding the characteristics and activities of 'I' and harmony in 'I'

Understanding the harmony of I with the Body: Sanyam and Swasthya; correct appraisal of Physical needs, meaning of Prosperity in detail
 Programs to ensure Sanyam and Swasthya

Unit- 3

Understanding Harmony in the Family and Society- Harmony in Human-Human Relationship

Understanding harmony in the Family- the basic unit of human interaction

Understanding values in human-human relationship; meaning of Nyaya and program for its

Fulfillment to ensure Ubhay-tripti; Trust (Vishwas) and Respect (Samman) as the foundational values of relationship

Understanding the meaning of Vishwas; Difference between intention and competence

Understanding the meaning of Samman, Difference between respect and differentiation; the other salient values in relationship

Understanding the harmony in the society (society being an extension of family): Samadhan,

Samridhi, Abhay, Sah-astitva as comprehensive Human Goals

Visualizing a universal harmonious order in society- Undivided Society (AkhandSamaj), Universal Order (SarvabhaumVyawastha)- from family to world family!

BSMT2405-Basic Computers & Information science

Subject Name	Code	Type of course	L-T-P	Prerequisite
<i>Basic Computers & Information science</i>	BSMT2405	Practice	0-0-4	Fundamentals of Computer

Objective:

- Identify the function of computer hardware components.
- Identify the factors that go into an individual or organizational decision on how to purchase computer equipment.
- Identify how to maintain computer equipment and solve common problems relating to computer hardware.
- Identify how software and hardware work together to perform computing tasks and how software is developed and upgraded
- Identify different types of software, general concepts relating to software categories, and the tasks to which each type of software is most suited or not suited

Course Outcome

- Understand the fundamental hardware components that make up a computer's hardware and the role of each of these components.
- Understand the difference between an operating system and an application program, and what each is used for in a computer.
- Describe some examples of computers and state the effect that the use of computer technology has had on some common products

Subject:BSMT2405-BasicComputers&Information science

(LTP:0+0+6)(Credit:4)

Unit-1

Introduction to computer: introduction, characteristics of computer, block diagram of computer, generations of computer, computer languages.

Input output devices: input devices(keyboard, point and draw devices, data scanning devices, digitizer, electronic card reader, voice recognition devices, vision-input devices), output devices(monitors, pointers, plotters, screen image projector, voice response systems).

Unit-2

Processor and memory: The Central Processing Unit (CPU), main memory.

Storage Devices: sequential and direct access devices, magnetic tape, magnetic disk, optical disk, mass storage devices.

Introduction to MS-Word: introduction, components of a word window, creating, opening and inserting files, editing a document file, page setting and formatting the text, saving the document, spell checking, printing the document file, creating and editing of table, mail merge.

Unit-3

Introduction to Excel: introduction, about worksheet, entering information, saving workbooks and formatting, printing the worksheet, creating graphs.

Introduction to power-point: introduction, creating and manipulating presentation, views, formatting and enhancing text, slide with graphs. Introduction of Operating System: introduction, operating system concepts, types of operating system. Introduction to MS-DOS: History of DOS, features of MS-DOS, MS-DOS Commands (internal and external).

Unit-4

Introduction of windows: History, features, desktop, taskbar, icons on the desktop, operation with folder, creating shortcuts, operation with windows (opening, closing, moving, resizing, minimizing and maximizing, etc.). Computer networks: introduction, types of network (LAN, MAN, WAN, Internet, Intranet), network topologies (star, ring, bus, mesh, tree, hybrid), components of network.

Internet and its Applications: definition, brief history, basic services (E-Mail, File Transfer Protocol, telnet, the World Wide Web (WWW)), www browsers, use of the internet. Application of Computers in various fields: Medical, Education, Railway, Defense, Industry, Management, Sports, Commerce, Internet.

Suggested readings :

1. Objective Computer Awareness
2. Computer Networking (Global Edition)

BSMT2406-Biochemistry &Advanced Microbiology Lab

Subject Name	Code	Type of course	L-T-P	Prerequisite
Biochemistry&Advanced Microbiology Lab	BSMT2406	Practice	0-0-4	Basic microbiology

Objective:

- To know various Culture media and their applications and also understand various physical and chemical means of sterilization
- To know General bacteriology and microbial techniques for isolation of pure cultures of bacteria, fungi and virus
- To master aseptic techniques and be able to perform routine culture handling tasks.

Course Outcome

- This study demonstrates the theory and practical skills in microscopy and their handling techniques and staining procedures.
- Understanding the details of microbial cell organelles.
- Provides knowledge on the growth of microorganism.

Subject:BSMT2406-Biochemistry&AdvancedMicrobiologyLab

(LTP:0+0+6)(Credit:4)

Practical-1

Estimation of Glucose in Urine and in Blood .

Estimation of Protein in Urine and Blood .

Estimation of Urea in blood .

Estimation of uric acid in blood .

Estimation of serum bilirubin

Estimation of Total Cholesterol in blood .

Estimation of HDL Cholesterol.

Estimation of LDL Cholesterol .

Estimation of TG, Estimation of Creatinine in Blood

Estimation of serum calcium

To measure electrolytes Sodium , Potassium & Chloride.

Practical-2

To demonstrate the instruments used to seed culture media

To learn techniques for Inoculation of bacteria on culture media

To isolate specific bacteria from a mixture of organisms .

To demonstrate simple staining (Methylene blue)

To prepare India ink preparation to demonstrate negative staining .

Bacterial identification: To demonstrate reagent preparation and procedure for

Gram stain, Albert stain, Neisser's staining, Z-N staining, Capsule staining , Demonstration of flagella by staining methods,Spore staining ,To demonstrate spirochetes by Fontana staining procedure

To prepare the reagent and demonstrate following biochemical tests with positive and negative control bacteria:

Catalase , Coagulase , Indole, Methyl Red (MR) ,VogesProskauer (VP),Urease , Citrate ,Oxidase , TSIA, Nitrate reduction ,Carbohydrate fermentation , Huger and leifson, Bile solubility , H₂S production Demonstration and motility , Decarboxylases, CAMP , Hippurate hydrolysis, Naglar's reaction

5th semester B.sc Medical Lab. Technology

BSMT3501-Transfusion Medicine

Subject Name	Code	Type of course	L-T-P	Prerequisite
Transfusion Medicine	BSMT3501	Theory-Tutorial	3-1-0	Basic biology

Objective:

- To provide an outstanding education in all aspects of blood banking and transfusion medicine and prepare fellows for a career in a blood center or in a hospital transfusion service, either in an academic center or in a community hospital.

Course Outcome

- Describe the principles of patient identification.
- Perform pre-transfusion testing, including ABO and/or Rh testing, red blood cell (RBC) antibody screen and antibody identification.
- Learn adverse reactions of transfusion techniques.

Subject: BSMT3501-Transfusion Medicine

(LTP:3+1+0)(Credit:4)

Unit-1

Introduction of transfusion medicine.

Blood products and transfusion procedures, summary information about blood products and hemostatic agents.

Basics of red cell immunology and compatibility testing, Pre transfusion and transfusion procedure.

Practice: Demonstrate the different method for blood collection.

Identify the different organs for transfusion medicine.

Demonstrate Pre transfusion and transfusion procedure.

Unit-2

Clinical transfusion: Surgery and critical illness, planned surgery.

Clinical transfusion in the medical setting , Immunoglobulin for the prevention of infection.

Practice: Demonstrate routine test on blood donation, ABO blood grouping.

Identify anemic disorders, renal disorders, congenital hemostatic disorders, Immunological Disorders etc.

Unit-3

Transfusion in antenatal obstetric and neonatal care.

Adverse effects of transfusion

Suggested Reading

1. Text book of Blood banking and transfusion medicine by Sally V. Rudmann Publisher Elsevier Health Sciences
2. Handbook of Transfusion Medicine, Editor D B L McClelland, United Kingdom Blood Services 4th Edition
3. Medical Laboratory Technology By K.L Mukherjee ,Publisher McGraw Hill education pvt limited

BSMT3502 –Medical Laboratory Management

Subject Name	Code	Type of course	L-T-P	Prerequisite
Medical Laboratory Management	BSMT3502	Theory-practice	3-1-0	Fundamental Science

Objective:

- Explain and apply principle of effective test utilization
- Interpret, implement and complying law, regulation, accrediting standards and guidelines of Govt. and NG organizations.
- Design, implement and evaluate resources in lab
- Communicate effectively with laboratory personnel and health care professional.
- Explain and apply the major principle and tactics of laboratory administration.

Course Outcome

- Become professional competent in medical laboratory
 - Exhibit a sense of commitment to the ethical and human aspect of patient care
 - Recognize the role of clinical laboratory scientist in the assurance of quality health care
- Application of safety and governmental regulation and standards as applied to medical laboratory practice.

Subject:BSMT3502 –Medical Laboratory Management (LTP:3+1+0)(Credit:4)

Unit-1

Ethical Principles and standards for a clinical laboratory professional-

Duty to the patient, Duty to colleagues and other professionals, Duty to the society

Good Laboratory Practice (GLP) Regulations and Accreditation-

Introduction to Basics of GLP and Accreditation, Aims of GLP and Accreditation

,Advantages of Accreditation

Brief knowledge about Nation and International Agencies for clinical laboratory accreditation

Awareness / Safety in a clinical laboratory-General safety precautions, HIV : pre- and Post-exposure guidelines, Hepatitis B & C : pre- and Post-exposure guidelines, Drug Resistant Tuberculosis

Unit-2

Patient management for clinical samples collection, collection of sample, transportation and

preservation, Sample accountability-Purpose of accountability, Methods of accountability

Sample analysis-Introduction, Factors affecting sample analysis

Reporting results-Basic format of a test report, Reported reference range, Clinical Alerts, Abnormal

results, Turnaround time, Results from referral laboratories, Release of examination results

Alteration in reports

Unit-3

Quality Management system-Introduction,

Ethical Principles and standards for a clinical laboratory professional-

Duty to the patient-Duty to colleagues and other professionals, Duty to the society

Good Laboratory Practice (GLP) Regulations and Accreditation-

Introduction to Basics of GLP and Accreditation, Aims of GLP and Accreditation,

Advantages of Accreditation, Brief knowledge about Nation and International Agencies for clinical laboratory accreditation

Awareness / Safety in a clinical laboratory

General safety precautions-HIV : pre- and Post-exposure guidelines, Hepatitis B & C : pre- and Post-exposure guidelines, Drug Resistant Tuberculosis.

Unit-4

Patient management for clinical samples collection, collection of sample, transportation and

preservation, Sample accountability-Purpose of accountability, Methods of accountability

Sample analysis-Introduction, Factors affecting sample analysis

Reporting results, Basic format of a test report, Reported reference range, Clinical Alerts,
Abnormal results, Turnaround time, Results from referral laboratories, Release of examination results

BSMT3503-Immunopathology

Subject Name	Code	Type of course	L-T-P	Prerequisite
Immunopathology	BSMT3503	Theory- Practice	3- 1- 0	Fundamental Science

Objective:

- To understand how the immune system is working, about the components of the immune system, their functioning, the defense mechanisms against different pathogens (viruses, bacteria, and parasites), the pathogenesis of immune diseases (hypersensitivity, autoimmunity, immunodeficiencies), and on the mechanisms underlying the rejection of the transplants and the antitumor immune response.
- It also provides knowledge of the main immunological techniques used in research and diagnostics.

Course Outcome

- To know and describe the organization and functioning of the immune system, its cells and its molecules.
- To know the principles of diagnostic tests described on immunological techniques.
- To know the fundamental stages of the immune system and its changes over the course of life (intrauterine life, newborn, adult, elderly)
- *The conceptual understanding of the subject provides opportunities for employability and scopes for higher education.*

Subject:BSMT3503-Immunopathology

(LTP:3+1+0)(Credit:4)

Unit-1

Basic Components of the Immune System

Immunological Techniques, Immune Regulation, Immunological Aspects of Infection

Immunological Aspects of Immunodeficiency Diseases

Unit-2

Autoimmunity, Chronic Lymphocytic Leukemia

Immunology of HIV Infections

Immunological Aspects of Allergy and Anaphylaxis

Immunological Aspects of Skin Diseases

Unit-3

Experimental Approaches to the Study of Autoimmune Rheumatic Diseases

Immunological Aspects of Cardiac Disease

Immunological Aspects of Chest Diseases: The Case of Tuberculosis

Immunological Aspects of Gastrointestinal and Liver Immunological

Aspects of Endocrine Disease

Immunological Aspects of Renal Disease Immunological Aspects of Transplantation.

Suggested Readings:

1. Text book of Microbiology by Ananthanereyan & Paniker, Publisher Universities press
2. Short text book of Medical microbiology by Satish Gupt, Publisher Jaypee brotthers
3. Medical laboratory Technology vol.I ,II, III by K L Mukherjee, Publisher McGraw Hill education
4. Medical Laboratory manual for tropical countries Vol II Microbiology by Monia Cheesbrough, publisher Butterworth Heinemann ltd
5. Immunology by Ivan Roitt, JonathaanBrostoff and David Male.

BSMT3504-Introduction to Quality And Patient Safety

Subject Name	Code	Type of course	L-T-P	Prerequisite
Introduction To Quality And Patient Safety	BSMT3504	Theory-practice	3-1-0	Fundamental Science

Objective:

- Knowing patient safety
- Report Distribution system
- Laboratory infection control Policy
- Bio-Medical waste management
- Understanding Patient rights
- ISO Policy for medical laboratory

Course Outcome

- Know about rights and duties of patient
- Know about right and duties of lab technician
- Understand various policy to manage lab
- Understand infection control procedure

Subject: BSMT3504-IntroductionToQualityAndPatientSafety (LTP:3+1+0)(Credit:4)

Unit-1

Introduction – the science of safety Medical Error & Metacognition

Investigating an Error/ Root cause analysis Responding to Adverse events

Error reporting systems Disclosure

Health Literacy and Patient Safety Human Factors Engineering .

Unit-2

Teamwork and Communication Culture of Safety/ Leadership

Thinking about Quality 1 Thinking about Quality

Components of Measurement Measure development and evaluation

Regulation and accountability Case Mix Adjustment

Spring Break , Patient Satisfaction Using large datasets for quality evaluation
Quality Measure Presentations .

Unit-3

Introduction to Quality Improvement Innovation and Adoption
Knowledge Translation Evaluation of Implementation

Lean Methodology and Problem Solving Audit and Feedback; Process mapping; Trigger tool

Information Technology in Quality Improvement

Quality Improvement Project Presentations

BSMT3505-Medical law and Ethics

Subject Name	Code	Type of course	L-T-P	Prerequisite
Medical law and Ethics	BSMT3505	Theory-practice	3-1-0	Fundamental Science

Objective:

- The course provides an introduction to ethics generally and more specifically to medical ethics, examining in particular the principle of autonomy, which informs much of medical law. The course then considers the general part of medical law governing the legal relationship between medical practitioners and their patients.
- It considers the legal implications of the provision of medical advice, diagnosis and treatment. Selected medico-legal issues over a human life are also examined. These may include reproductive technologies, foetal rights, research on human subjects, organ donation, the rights of the dying and the legal definition of death.

Course Outcome

- The ethical underpinnings of the law as it relates to medicine,
- The law of negligence in the context of the provision of healthcare,
- Legal and ethical issues surrounding end and beginning of life decisions,
- The maintenance of professional standards in the healthcare profession, and
- The role of policy in the formation of law as it relates to medicine.

Subject: BSMT3505-Medical law and Ethics

(LTP:3+1+0)(Credit:4)

Unit-1

Course Introduction - Need, Basic Guidelines, Content and Process for Value Education

Understanding the need, basic guidelines , content and process for Value Education.

Self Exploration–what is it?- its content and process; ‘Natural Acceptance’ and

Experiential Validation- as the mechanism for self exploration . Continuous Happiness and Prosperity- A look at basic Human Aspirations.

Unit-2

Understanding Harmony in the Nature and Existence - Whole existence as Co-existence-

Understanding the harmony in the Nature

Interconnectedness and mutual fulfillment among the four orders of nature recyclability and

self-regulation in nature .

Understanding Existence as Co-existence (*Sah-astitva*) of mutually interacting units in all-pervasive space. Holistic perception of harmony at all levels of existence .

Unit-3

Understanding Harmony in the Human Being - Harmony in Myself!

Understanding Harmony in the Family and Society- Harmony in Human-Human Relationship

. Implications of the above Holistic Understanding of Harmony on Professional Ethics .

Practice:-To visit the following places, meet people visiting/living/working in that environment, understand their life style, understand value of human life in each environment and share with them the aspects of their joys and sorrows: Charitable and Government Hospitals, Orphanages, Old age homes, Training Institute for handicapped , Drug De-Addiction centers ,Schools in rural areas, Industries Slums

BSMT3506-Myiology & Virology

Subject Name	Code	Type of course	L-T-P	Prerequisite
Myiology & Virology	BSMT3506	Theory-Practice	3-1-0	Fundamental Science

Objective:

- To describe the characteristics and diseases caused by pathogenic viruses and fungi.
- To perform basic laboratory techniques in myiology, to isolate fungus from clinical samples.
- Understanding different methods of virus cultivation.
- Understanding collection, transportation and preservation methods of clinical specimen.

Course Outcome

- Broad idea about structure and basic characteristics of virus and fungus.
- Plan, write and implement research projects in virology and myiology analyze their results and publish these in peer-reviewed journals.
- Coordinate with concerned agencies regarding viral and fungal diseases and their outbreaks.
- Plan and execute epidemiological studies and provide advice in relation to viral diseases.

Sub:BSMT3506-Myiology & Virology

(LTP:3+1+0)(Credit:4)

Unit-1

Introduction to medical myiology, Basic concepts about superficial and deep Mycoses .

Taxonomy and classification and general characteristics of various medically important fungi .

Normal fungal flora .

Morphological, cultural characteristics of common fungal laboratory contaminants

Culture media used in myiology.

Practice:- To prepare culture media used routinely in myiology. To perform all the staining techniques for identification of fungi as mentioned in theory syllabus.

Unit-2

Direct microscopy in Medical myiology laboratory .

Processing of clinical samples for diagnosis of fungal infections i.e. Skin, nail, hair, pus, sputum, CSF and other body fluids.

Techniques used for isolation and identification of medically important fungi
Methods for identification of yeasts and moulds .

Practice-: To identify given yeast culture (By performing various identification techniques studied in theory. To identify given mould culture (By performing various identification techniques studied in theory. To demonstrate dimorphism in fungi

Unit-3

Introduction to medical virology, Classification of viruses . Introduction to medically important viruses . Collection, transportation and storage of sample for viral diagnosis
Staining techniques used in Virology. Processing of samples for viral diagnosis (Egg inoculation and tissue culture) .

Practice--: Demonstration of fertilized hen egg. Demonstration of various inoculation routes in fertilized hen egg. Inoculation of fertilized hen egg through various routes .

BSMT3507-Mycology & Virology lab.

Subject Name	Code	Type of course	L-T-P	Prerequisite
Mycology & Virology Lab	BSMT3507	Practice	0-0-4	Basic microbiology

Objective:

- To describe the characteristics and diseases caused by pathogenic viruses and fungi.
- To perform basic laboratory techniques in mycology, to isolate fungus from clinical samples.
- Understanding different methods of virus cultivation.
- Understanding collection, transportation and preservation methods of clinical specimen.

Course Outcome

- To describe the characteristics and diseases caused by pathogenic viruses and fungi.
- To perform basic laboratory techniques in mycology, to isolate fungus from clinical samples.
- Understanding different methods of virus cultivation.
- Understanding collection, transportation and preservation methods of clinical specimen.

Sub: BSMT3507-Mycology & Virology lab.

(LTP:3+1+0)(Credit:4)

1. To prepare culture media used routinely in mycology.
2. To perform all the staining techniques for identification of fungi as mentioned in theory syllabus.
3. To identify given yeast culture (By performing various identification techniques studied in theory).
4. To identify given mould culture (By performing various identification techniques studied in theory).
5. To demonstrate dimorphism in fungi
6. To process clinical samples for laboratory diagnosis of fungal infections i.e.
 - a) Skin
 - b) Nail
 - c) Hair
 - d) Body fluids and secretions
7. To use mice for lab diagnosis of any fungal infection
8. Demonstration of fertilized hen egg.
9. Demonstration of various inoculation routes in fertilized hen egg
10. Inoculation of fertilized hen egg through various routes.

6th semester B.sc Medical Lab. Technology

Internship Thesis Guideline

This Guideline is designed to provide students the knowledge and practice of public health research activity, to enable them to carry out researches and solve research related problems and to help them in writing thesis and defend their work. Upon successful completion of the course, the students shall be able to:

- Search relevant scientific literature
- Develop a research proposal
- Employ appropriate data collection techniques and tools
- Manage collected data
- Analyze data with appropriate statistical techniques
- Write thesis
- Defend the findings

Proposal Development:

At the ending of third year (Sixth Semester), students individually consultation with designated faculties and extensive literature survey will develop research proposal during the initial 6 months period.

Data Collection/ Thesis Writing:

Students will carry out data collection, data management, data analysis, and thesis writing during the remaining period (Six Semester).

The Dissertation should have following format:

1. Title
2. Introduction
3. Materials and Methods
4. Results
5. Discussion
6. Conclusion
7. Recommendation
8. References
9. Appendix

Subject: BSMT3601-Project

(Project) (Credit: 12)

BSMT3601-Project

Subject Name	Code	Type of course	L-T-P	Prerequisite
Project	BSMT3601	Project	0-0-12	Basic medical science

Project work:-

Suggested Project title

1. Serum electrolytes/urea/creatinine in pregnant women with Malaria Parasitamia.
2. Urinary tract infection in adult students in CUTM Campus.
3. Blood groups, Prothrombin time(PT), Activated partial thromboplastin time(APTT) among Undergraduate student.
4. Gastroenteritis in primary school children (6-12yr) of specific locality.

BSMT3602- Internship

Subject Name	Code	Type of course	L-T-P	Prerequisite
Internship	BSMT3602	Internship	0-0-12	Basic medical science

Subject: **BSMT3602- Internship** (Practice) (Credit: 12)

Internship

- Case record
- Lab management and ethics
- Evaluation -Guide(internal)
 - Industries guide(external)
 - University-project report/ Viva

**CENTURIONUNIVERSITYOFTECHNOLOGYANDM
ANAGEMENT,ODISHA**

SCHOOL OF PARAMEDICS & ALLIED HEALTH SCIENCES



**Centurion
UNIVERSITY**

*Shaping Lives...
Empowering Communities...*

**MASTER OF SCIENCE
IN APPLIED & CLINICAL MICROBIOLOG
Y**

2017

SYLLABUS

M.Sc in Applied and Clinical Microbiology

Preface: Medical microbiology is the branch of medical science concerned with the prevention, diagnosis and treatment of infectious diseases. In addition, this field of science studies various clinical applications of microbes for the improvement of health. There are four kinds of microorganisms that cause infectious disease: bacteria, fungi, parasites and viruses and one type of infectious protein called Prion.

A medical microbiologist studies the characteristics of pathogens, their modes of transmission, mechanism of infection and growth. Using this information, a treatment can be revised.

Medical microbiologist often serves as a consultant of physician, providing identification of pathogen and suggesting treatment option.

Scope: M.Sc in Applied and Clinical Microbiology gives opportunity for specialized study in the field of medical & clinical microbiology. Candidates who successfully complete M. Sc in Applied and Clinical Microbiology course may obtain jobs as

- Specialized technologist in Microbiology or supervisor of clinical laboratories in hospitals.
- Laboratory scientists in Biomedical and research institutes.
- Teachers in training institutes of Medical Laboratory Technology/graduate & postgraduate programme of microbiology & related areas.
- Utilize or apply the concepts, theories and principles of laboratory science.
- Demonstrate the ability to plan an effect the change in laboratory practice and health care delivery system.
- Establish collaborative relationship with members of other disciplines.
- Demonstrate interest in continued learning and research for personal and professional advancement.
- Be able to interpret or guide the development of medical diagnostics in need locally and cheaply
- Be able to manage and guide appropriately equipped and staffed clinical microbiology laboratories
- Be a highly skilled human resource for the emerging pharmaceutical/medical industry
- Be able to participate in supervised or team-research in universities, industry or government
- Demonstrate advanced knowledge in the fields of Clinical Microbiology and Immunology, with excellent skills to teach and communicate this knowledge
- Demonstrate independent critical and analytical thinking, both within their field of study, and beyond, for the use of their knowledge for service to others.
- Be able to guide patient care and the public on the pathology, pathogenesis and clinical manifestation, mode of transmission, prevention and current control methods for infections of public health importance
- Be a highly skilled human resource in the management of an increasing number of patients with tissue/Organ transplants, Cancers and immune deficiencies

- Be able to critique and evaluate the impact of the existing national disease control programmes on the epidemiology of infectious diseases and advise on improving them
- Have acquired critical and analytical skills required for further studies in specialized areas of microbiology or related studies
- Identify and suggest possible solutions to ethical dilemmas that occur in their work and field of study, and understand the importance of professional ethics in all aspects of scientific communication and laboratory work
- Demonstrate competence in the laboratory, including application of the scientific method and appropriate use of basic and state-of-the-art laboratory tools and techniques
- Demonstrate written and oral skills necessary for communication of research, knowledge, and ideas to scientists and non-scientists alike

Programme: M.Sc. in Applied and Clinical Microbiology

Duration: Two years (Four semesters) full-time programme with 6 months internship in the last semester.

Eligibility: Bachelor's degree in any branch of Life Science / Agriculture / Pharmacy / Veterinary / Medicine (MBBS/BDS).

Examination: Examination rules will be as per guideline of CUTM Examination handbook.

Internship : A candidate will have to undergo internship for a period of six calendar months in a hospital/Diagnostics Centre /Research Institution equipped with modern laboratory facility, which fulfill the norms decided by the University. Dissertation will be compulsory to all students. Students will carry out dissertation work individually or in the group of not more than three students. The format for dissertation/Internship report will be similar to the research thesis style; incorporating chapters on: Introduction, Materials and Methods, Results and Discussion and References/Bibliography. The dissertation will be submitted in a typewritten and bound form.

Degree: The degree of M.Sc in Applied and Clinical Microbiology course of the University shall be conferred on the candidates who have pursued the prescribed course of study for not less than two academic years and have passed examinations as prescribed under the relevant scheme and completed 6 months of compulsory internship in the last semester.

On successful completion of three year programme, the candidate will be awarded with **“Master of Science in Applied and Clinical Microbiology (M.Sc.-CMB)”** from Centurion University.

MASTER OF SCIENCE IN APPLIED & CLINICAL MICROBIOLOGY

Programme Structure

SEMESTER-I				
SLNO	CODE	SUBJECT	SUBJECTTYPE Lecture+ Tutorial+ Practice(L+T+P)	CREDITS
1	MSCM1101	GeneralMicrobiology	3+1+0	4
2	MSCM1102	HumanAnatomy&Physiology	4+0+0	4
3	MSCM1103	Biomolecules	3+1+0	4
4	MSCM1104	AnalyticalTechniques	3+1+0	4
5	MSCM1105	BasicMicrobiologyLab	0+0+6	4
Total				20

SEMESTER-II				
SLNO	CODE	SUBJECT	SUBJECT TYPE(L+ T+P)	CREDITS
1.	FCBS0101	EnvironmentalScience	3+1+0	4
2.	FCHU0203	BusinessCommunication	0+0+3	2
3.	MSCM1201	SystematicBacteriology	3+1+0	4
4.	MSCM1202	Molecular Biology andClinicalBiochemistry	3+1+0	4
5.	MSCM1203	MedicalParasitologyandMycology	3+1+0	4
6.	MSCM1204	Appliedmicrobiology	3+1+0	4
7.	MSCM1205	Bacteriology,Parasitology& MycologyLab	0+0+6	4
Total				26

SEMESTER-III				
SL NO	CODE	SUBJECT	SUBJECT TYPE(L+T+P)	CREDITS
1	MSCM2301	Immunology&Virology	3+1+0	4
2	MSCM2302	DiagnosticBacteriology	3+1+0	4
3	MSCM2303	Biochemistry	3+1+0	4
4	MSCM2304	Histology	3+1+0	4
5	MSCM2305	ResearchMethodology	3+1+0	4
6	FCHU0204	CommunicativePracticeLaboratory–II	0+0+3	2
7	MSCM2306	Immunology,Histopathology&BiochemistryLab	0+0+6	4
Total				26

SEMESTER-IV				
SLNO	CODE	SUBJECT	SUBJECTTYPE(L+T+P)	CREDITS
1.	MSCM2401	Project	NA	12
2.	MSCM2402	Internship	NA	12
Total				24

INTERNSHIP

Minimum 720 hours (calculated based on 8 hours per day, if 90 working days in 6 months)

Syllabus

1st semester M.Sc. in Applied and Clinical Microbiology

MSCM1101- General Microbiology

Subject Name	Code	Type of course	L-T-P	Prerequisite
General Microbiology	MSCM1101	Lecture+Tutorial	3-1-0	Fundamental Science

Objective

- To know various Culture media and their applications and also understand various physical and chemical means of sterilization
- To know General bacteriology and microbial techniques for isolation of pure culture bacteria, fungi and virus
- To master aseptic techniques and be able to perform routine culture handling tasks safely effectively

Course outcome

- This study demonstrates the theory and practical skills in microscopy and their handling techniques and staining procedures.
- Understanding the details of microbial cell organelles.
- Provides knowledge on growth of microorganism.
- Provides knowledge culturing microorganism.

Unit-1

History and scope of Microbiology, Recent trends and developments in modern microbiology. Identification, characterization and classification of microorganisms. Distinguishing characteristics between prokaryotic and eukaryotic cells. Structure and function of Cell wall of bacteria, cell membranes, flagella, pili, capsule, gas vesicles, carboxysomes, magnetosomes and phycobolisolomes.

Unit-2

Methods of sterilization: Physical methods – Dry heat, moist heat, radiation methods, filtration methods, chemical methods and their application. Concept of containment facility, sterilization at industrial level. Different staining techniques used in bacteriology.

Practice: - Demonstration the different type of Sterilization technique and operation of the Instruments used in microbiological lab. Demonstration of various parts of microscope. Demonstrate the different staining techniques.

Unit-3

Bacterial nutrition – Nutritional requirement of bacteria. Cultivation of aerobes and anaerobes, Reproduction in bacteria and spore formation. Bacterial growth curve and bacterial nutrition

Media. Culture Media, Liquid and solid media, defined and synthetic media, routine laboratory media (basal, enriched, selective, enrichment, indicator, and transport media).

Practice: - Preparation and demonstration of different culture media, biochemical tests, growth of Bacteria.

Suggested Readings

1. Textbook of Medical Laboratory Technology by Praful B Godkar, Publisher Bhalani
2. Text book of Medical Microbiology by Gruckshiank
3. Medical Laboratory Technology by Kanai Lal Mukherjee, Publisher Tata McGrawHill
4. An Introduction to Medical Laboratory Technology by FJ Baker, Publisher Butterworth
5. Practical Book of Medical Microbiology by SatishGupt, Publisher JaypeeBrothers
6. Medical Laboratory Manual for Tropical Countries Vol. I and II by Monica Cheesbrough

MSCM1102- Anatomy and Physiology

Subject Name	Code	Type of course	L-T-P	Prerequisite
Human Anatomy and Physiology	MSCM	Lecture	4-0-0	Fundamental Sciences

Objective

- To identify different types of cells and describe their functions.
- To identify the organelles of a typical cell and describe their functions.
- To identify the major components of the integumentary system and describe their functions.
- To identify the major structures of the skin and describe their functions
- To identify the major components of the skeletal system and describe their functions.
- To identify the major components of the circulatory, endocrine, nervous system etc and describe their functions.

Course outcome

- Use anatomical terminology to identify and describe locations of major organs of each system covered.
- Explain interrelationships among molecular, cellular, tissue, and organ functions in the system.
- Describe the interdependency and interactions of the systems.
- Explain contributions of organs and systems to the maintenance of homeostasis.
- Identify causes and effects of homeostatic imbalances.
- Describe modern technology and tools used to study anatomy and physiology.

Unit-1

Scope of Anatomy and physiology. Definition of various terms used in Anatomy. Structure of cell, function of its components with special reference to mitochondria and microsomes.

Elementary tissues: Elementary tissues of the body, i.e. epithelial tissue, muscular tissue, connective tissue and nervous tissue.

Skeletal System: Structure and function of Skelton. Classification of joints and their function. Joint disorders.

Practice: Demonstration of individual bone from skeleton Identification of different organs and system from chart.

Unit-2

Cardiovascular System: Composition of blood, functions of blood elements. Blood group and coagulation of blood. Brief information regarding disorders of blood. Name and functions of lymph glands. Structure and functions of various parts of the heart. Blood pressure and its recording. Brief information about cardiovascular disorders.

Respiratory system: Various parts of respiratory system and their functions, physiology of respiration.

Practice: Demonstration the morphology of different blood cells

Measurement of Blood pressure, impulses, Heart beats, respiration rate etc.

Unit-3

Urinary System: Various parts of urinary system and their functions, structure and functions of kidney. Physiology of urine formation. Patho-physiology of renal diseases and edema.

Digestive System: names of various parts of digestive system and their functions. Structure and functions of liver, physiology of digestion and absorption.

Endocrine System: Endocrine glands and Hormones. Reproductive system Structure and function of senseorgans.

Practice: Demonstration of various parts of body, tissues of body, parts of digestive system, parts of respiratory system, parts of excretorysystem. Identification of different organs and system from chart

Suggested Readings:

1. Text book Anatomy & Physiology for nurses by Evelyn Pearce, Publisher Faber&Faber.
2. Text book Anatomy and Physiology for nurses by Sears, Publisher EdwardArnold.
3. Anatomy & Physiology- by Ross and Wilson, PublisherElsevier.
4. Anatomy& Physiology: Understanding the human body by Clark, Publisher Jones &Bartlett.
5. Anatomy and Physiology for nurses by Pearson, Publisher Marieb&Hoehn.
6. Anatomy and Physiology by N Murgesh, Publishersatya.

MSCM1103-Biomolecules

Subject Name	Code	Type of course	L-T	Prerequisite
Biomolecules	MSCM1103	Lecture+Tutorial	3-1-0	Fundamental Science

Objective

To study the structure and function of biomolecules and the vital processes that occurs in l organisms.

Course Outcomes

- Provide students with learning experiences that help in still deep interests in learning biochemistry
- Develop broad and balanced knowledge and understanding of biomolecules, key biochemical concepts, principles and theories related to biochemistry
- Equip students with appropriate tools of analysis and with theoretical, technical and analytical skills to tackle issues and problems in the field of biochemistry.

Unit-1

Major Biomolecules: Carbohydrates – Classification, chemistry, properties, and function – mono, di, oligo and polysaccharides. bacterial cell wall polysaccharides. Conjugated polysaccharides– glycoproteins, muriensandlipopolysaccharides.

Lipids – classification, chemistry, properties and function – free fatty acids, triglycerides, phospholipids, glycolipids & waxes. Conjugated lipids – lipoproteins. Major steroids of biological importance – prostaglandins.

Unit -2

Amino acids and proteins – classification, structure and function. Essential amino acids & amphoteric nature of amino acids and reactions and functions of carboxyl and amino groups and side chains. Peptide structure. Ramachandran's plot. Methods for isolation and characterization of proteins. Structural levels of proteins – primary, secondary, tertiary and quaternary, denaturation of proteins. Hydrolysis of proteins. Protein sequencing using various methods.

Unit -3

Nucleic acids – structure, function and their properties. Structural polymorphism of DNA, RNA. Structural characteristics of RNA.

Sources, Chemistry and biochemical functions of water-soluble vitamins. Chemistry of Porphyrins – Heme, Cytochromes, Chlorophylls, xanthophylls, Bacteriochlorophylls & algal pigments, Carotenoids

Unit-4

Biological oxidation, Biological redox carriers, biological membranes, electron transport, oxidative phosphorylation and mechanism. Bacterial photosynthesis, photosynthetic electron transport

Mineral metabolism – phosphorus, potassium, calcium and Trace elements – molybdenum, zinc, manganese, cobalt and copper. Influence of minerals on the production of toxins. Role of trace elements on microbial enzymes.

Suggested readings

1. Text book of Medical Laboratory Technology by P. B. Godker, Publisher Bhalani.
2. Text book of Medical Biochemistry by Chaterjee & Shinde, Publisher JPB
3. Medical Laboratory Technology by Mukherjee, Publisher
4. Principal of Biochemistry by Lehninger, Publisher Kalyani
5. Practical Clinical Biochemistry by Harold Varley, Publisher CBS.

MSCM1104-Analytical Techniques

Subject Name	Code	Type of course	L-T	Prerequisite
Analytical Techniques	MSCM1104	Lecture+Tutorial	3-1	Fundamental Science

Objective

- To learn the principle, instrumentation & application of Microscopy
- Principle, instrumentation & application of Centrifugation
- Chromatographic techniques
- Electrophoretic techniques
- Principle of Spectroscopy

Course outcome

- After completion of the course the student will be efficient in handling the microscopes.
- They will also be able to have idea about handling instruments like centrifuge, spectrophotometer, chromatography, flow cytometer, Automated and semi- automatic Biochemistry analyzer.
- They will gain knowledge on the principle behind and the application of NMR, X-ray diffraction, ESR.
- The conceptual understanding of the subject provides opportunities for skill enhancement scopes for higher education.

Unit-1

Microscopy– Microscopic techniques: Basic principles and applications of light, phase – contrast microscopy (phase annulus, phase plate, specimen preparations), fluorescent microscopy (filters, dark field condenser, complex optical system, sample preparations) and electron microscopy (Magnetic lenses, electron beams, condensers, types of electron microscopy – scanning and transmission, sample preparations - fixing of specimens, preparation of blocks, Microtomy – sectioning, microtomy and staining, negative staining techniques of biological samples), cytometry and flow cytometry

Practice: Demonstration of different Microscopes with their operation and maintain technique.

Preparing specimens for observing under above microscopes.

Unit-2

Principles of Centrifugation – Centrifugation techniques-preparative and analytical methods, density gradient centrifugation.

General principles and applications of chromatography – Paper, Thin layer, Column, Ion exchange, Affinity chromatography, Gelfiltration, Gas, HPLC, FPLC.

Electrophoresis – moving boundary, zone (Paper Gel) electrophoresis, Immunoelectrophoresis. Immunoblotting Isoelectric focusing, 2-Delectrophoresis.

Practice: Demonstration the Centrifuge, Different Electrophoresis, Auto /Semi auto Analyzer, Microtome. Maintenance and Quality control of Medical Lab Equipment's.

Unit-3

Principles, Laws of absorption and radiation. Visible, ultraviolet, infrared and mass spectrophotometry. Absorption spectra, fluorescence flame photometry, Principles of colorimetry, Turbidometry, Viscometry. Determination of size, shape and molecular weight of macromolecules– osmotic pressure, flow birefringence, optical rotatory dispersion. light scattering, diffusion, sedimentation and X-ray diffraction, NMR, ESR.

Suggested Reading

1. Instrumental Methods of Chemical Analysis by CHATWAL &ANANAD.
2. Practical Biochemistry: Principles and techniques by WILSON &WALKER.
3. Physical Biochemistry: Application to Biochemistry and Molecular biology (2nd edition) by FREIFELDER.
4. Biochemical methods (2nd edition) by SADASIVAM &MANICKAM.
5. Biophysical Chemistry: Principles and techniques by UPADHYAY, UPADHYAY &NATH.
6. HAWK'S Physiological Chemistry by OSER.

MSCM1105- Basic microbiology lab

Subject Name	Code	Type of course	L-T	Prerequisite
General Microbiology	CUTM1711	Practice	0-0-	Fundamental Science

Objective

- To know various Culture media and their applications and also understand various physical and chemical means of sterilization
- To know General bacteriology and microbial techniques for isolation of pure culture bacteria, fungi and virus
- To master aseptic techniques and be able to perform routine culture handling tasks safely effectively

Course outcome

- This study demonstrates the theory and practical skills in microscopy and their handling

techniques and staining procedures.

- Understanding the details of microbial cell organelles.
- Provides knowledge on growth of microorganism.
- Provides knowledge culturing microorganism.

1. Demonstration of various parts of centrifuge; its functioning and care, Demonstration of various parts of microscope its functioning and care, Cleaning and drying of glass and plastic ware , Preparation of various anticoagulants , Collection of venous and capillary blood ,Cleaning of glass ,syringes and its sterilization. Preparation of buffers , Preparation of the stains and other reagents , Preparation of peripheral blood film (PBF) ,To stain a peripheral blood Film by Leishman , stain ,Hemoglobin estimation (oxy Hb and cyanmethaemoglobin method)
2. Preparation of bacterial smear and staining – Gram’s ,Acid-fast, Staining of bacterial spores flagella, capsule, spirochaetes
3. Preparation of media, cultivation of bacteria, Biochemical tests for identification of bacteria, Preservation of stock cultures of bacteria.
4. Demonstration of various parts of body ,tissues of body, parts of digestive system, parts of respiratory system ,parts of excretory system

Suggested Reading

1. A Procedure Manual for Routine Diagnostic Tests Vol. I and II by KL Mukherjee; Tata McGraw Hill Publishers, New Delhi
2. A Textbook of Medical Laboratory Technology by P Godkar, Bhalani Publishing House, Mumbai

2nd semester M.Sc. in Applied and Clinical Microbiology

FCBS0101-Environmental Science

Subject Name	Code	Type of course	L-T	Prerequisite
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Environmental Science	FCBS010	Lecture+Tutorial	3-1-	Fundamental Science
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Objectives

- To understand the concept of multi-disciplinary nature of Environmental Science where different aspects are dealt with a holistic approach.
- Students will develop a sense of community responsibility by becoming aware of environmental issues in the larger social context.
- One must be environmentally educated.

Course outcome

- Understand the natural environment and its relationships with human activities.
- Characterize and analyze human impacts on the environment.
- Integrate facts, concepts, and methods from multiple disciplines and apply to environmental problems.
- Design and evaluate strategies, technologies and methods for sustainable management of environmental systems and for the remediation or restoration of degraded environments.

UNIT-I

Environment and its multidisciplinary nature; Need for public awareness; Renewable and non-renewable resources—forest, water, mineral, land, food and energy resources; Structure and function of ecosystems of forest, grass land, desert and aquatic types.

UNIT -II

Biodiversity and its conservation: Biodiversity at global, national and local levels; Threats to biodiversity - Habitat loss; wild life poaching and man - wildlife conflicts; Endangered and endemic species; conservation measures.

Causes, effects and control measures of pollution, air, water and noise pollution; Nuclear hazards; solid-waste management—Causes, effects and control measures; Management of disasters due to natural causes of floods, earthquakes, cyclones and landslides.

UNIT-III

Social issues and the environment; Sustainable environment, Water conservation measures; Rain water harvesting; Resettlement and rehabilitation of people; Climate change and global warming; Acid rain; Ozone layer depletion; water land reclamation; Consumerism and waste products; Features of Environment Protection Act, Air pollution and Control of Pollution Acts; Water Pollution and its Control Act. Effects of Pollution explosion on environment and public health; Need for value education to Protect environment and resources.

Text Book:

1. AnubhavKaushik& C.P. Kaushik: Environmental Studies-New age International Publishers.

Reference Books:

1. Benny Joseph: Environmental Studies-Tata Mac GrawHill

2. E. Bharucha: Text book of Environmental Studies for under graduate courses– Universities Press. (Book prepared by UGCCCommittee.

FCHU0203-Business Communication

Subject Name	Code	Type of course	L-T	Prerequisite
Business Communication	FCHU0203	Practice	0-0-	Fundamental Science

Objectives

- The course on Business Communication focuses on the basic skills required to be an effective communicator. It aims at imparting the communication skills that are needed in the academic and professional pursuits.
- This is directed towards helping the students gain skills in comprehension, group discussions, presentations, interviews, active listening, technical writing and the ability to manage cross-cultural interactions. The focus is on the difficulty experienced by individual students, and the effort to explore a useful strategy for self-improvement. This is achieved through an amalgamation of lecture-oriented approach of teaching with the task-based skill-oriented methodology of learning.

Course Outcomes

- Understand the differences between general communication and business communication
- Development of basic language skills, i.e., listening, speaking, reading and writing
- Effective participation in group discussion and job interviews.

Unit-1

UNDERSTANDING COMMUNICATION IN BUSINESS (8 hrs.)

- The module is a guide to organization communication. It is directed towards enabling students to develop the skills necessary to manage the human resources of their organization.
- General Communication and Business Communication
- Communication in Organizational Settings: Patterns of Communication in the Business World – Upward, Downward, Horizontal Grapevine etc, Channels of Communication- Internal and External, Formal and Informal
- Introduction to Cross Cultural Communication
- Strategies to Overcome Communication Barriers

Unit-2

READING AND WRITING (10 hrs.)

- This unit works on the competency in reading and writing skills through such tasks/activities as reading books, articles, magazines, novels, developing outlines, key expressions, situations, slogan writing and theme building exercises, dialogue writing, interpreting pictures, technical writing.
- Importance of Developing Reading Skills
- Sub-Skills of Reading: Predicting Content, Skimming & Scanning, Topic sentence and supporting details, Inferential Reading, Guessing the Meaning of Unfamiliar Words, Note Making

- Importance of Writing Skills and Principles of Effective Writing ♣ Writing Process: Pre- writing, Drafting and Re-Writing
- Paragraph Writing
- Summaries and Abstracts Page |10
- Business Correspondence: Writing Business Letters, E-mail Messages, Memo, Notice, Circulars, Reports, Proposals
- Career Communication: Writing Resume/ CV and Job Application Letter

Unit-3

LISTENING AND SPEAKING (9 HOURS)

- Listening is the mother of all speaking. This unit aims to achieve competence in speaking i.e., the ability to communicate orally in clear, coherent, and persuasive language appropriate to purpose, occasion, and audience. The module focuses on developing this competency which includes acquiring poise and developing control of the language through experience in making presentations to small groups, to large groups, and through the media.
- Listening Skills: Listening Process, Hearing and Listening, Types and Barriers, Effective Listening Strategies
- Common forms of Oral Communication in the Business World:
- Meetings: Organize Meetings, Preparing an Agenda, Chairing a Meeting, Drafting Resolutions, Writing Minutes
- Persuasive Speaking: Improving Fluency and Self-Expressions, Articulation, Good Pronunciation, Voice Quality
- Making an Oral Presentation: Planning, Preparing and Delivery
- Facing an Interview: Preparation, Types of Interview, Do's and Don'ts
- Group Discussions: Debate and GD, Types of GD, GD Etiquette (Treatment: Developing listening and speaking skills through various activities, such as role play activities, practicing short dialogues, JAM, group discussions, debates, speeches, listening to news bulletins, viewing and reviewing documentaries and short films etc.)

TEXT BOOKS:

An Introduction to Professional English and soft skills by B.K Das et al., Cambridge University Press

REFERENCES:

Effective Technical Communication, M. Ashraf Rizvi, TMH Publications. Business Communication, Krizan. Merrier. Logan. Williams, Thomson Business Communication Today, Courtland L Bovee, John V Thill & Mukesh Chaturvedi, Pearson Education. Business communication by Meenakshi Raman and Prakash Singh (Oxford) Business Communication, Urmila Rai & S.M Rai, Himalaya Publishing House

MSCM1201-Systematic Bacteriology

Subject Name	Code	Type of course	L-T-P	Prerequisite
Systemic Bacteriology	MSCM1201	Lecture+Tutorial	3-1-0	Fundamental Scien

Objective

- To learn opportunities in the basic principles of medical microbiology and infectious diseases.
- To study mechanisms of infectious disease transmission, principles of aseptic practice, and role of the human body's normal microflora.
- To understand the importance of pathogenic bacteria in human disease with respect to infections of the respiratory tract, gastrointestinal tract, urinary tract, skin and soft tissue.

Course outcome

- The course provides the conceptual basis for understanding pathogenic microorganisms and the mechanisms by which they cause disease in the human body.
- Recall the relationship of this infection to symptoms, relapse and the accompanying pathology.
- Explain the methods of microorganism's control, e.g. chemotherapy & vaccines. Solve problems in the context of this understanding.

Unit-1

Morphology, culture, identification, pathogenesis, clinical findings, laboratory diagnosis, epidemiology and pathogenesis of following bacterial infections

Staphylococcus, Streptococcus, Enterococcus, Micrococcus, Gram positive anaerobic cocci, Neisseria, Moraxella, Branhamella

Unit-2

Bacillus, Corynebacteria, Listeria, Erysipelothrix, Lactobacillus, Clostridium, Brucella, Propionibacterium, Prevotella, Eubacterium, Leptotrichia, Fusobacterium, Gardnerella, Actinobacils, Bordetella, Legionella, Calymato bacterium, Campylobacter, Helicobacter, Bacteriodes, Tropheryma.

Unit-3

Mycobacterium, Actinomyces, Nocardia, Mycoplasma, Ureaplasma, Rickettsiae, Chlamydia, Spirochaetes, Enterobacteriaceae- Escherichia coli, Shigella, Salmonella, Klebsiella, Proteus, Morganella, Providencia, Citrobacter, Enterobacter, Serratia, Yersinia, Pasteurella, Francisella. Vibrio, Aeromonas, Plesiomonas, Pseudomonas, Acinetobacter, Alcaligenes, Achromobacter. Normal bacterial flora of human beings.

Suggested Reading

1. Medical Laboratory Technology by Kanai Lal Mukherjee; Tata McGraw Hill, New Delhi
2. An Introduction to Medical Laboratory Technology by FJ Baker; Butterworth – Heinemann; Oxford
3. Practical Book of Medical Microbiology by Satish Gupta; JP Brothers, New Delhi
4. Medical Laboratory Manual for Tropical Countries Vol. I and II by Monica Cheesbrough; Cambridge University Press; UK
5. Textbook of Medical Laboratory Technology by Praful B Godkar; Bhalani Publishing House, Mumbai
6. Text book of Medical Microbiology by Gruckshiank

MSCM1202-Molecular Biology and Clinical Biochemistry

Subject Name	Code	Type of course	L-T-P	Prerequisite
Molecular Biology and Clinical Biochemistry	MSCM1202	Lecture+Tutorial	3-1-0	Fundamental Science

Objective

- Understanding the central dogma of life
- To understand the concept of gene regulation and its impact
- The use of several molecular diagnostic techniques for disease interpretation
- Understanding the concept of Biochemical analyzing instruments, chemicals and no ranges of biochemical components in our body.
- Clinically relevant biochemical analysis for deeper understanding of all biochemical components i.e., Proteins, Electrolytes, Hormones etc

Course outcome

- After completion of the course the student will be gain knowledge of the significance of genes and proteins.
- They will understand the mechanism of gene expression and protein synthesis,
- The significance of gene expression regulation will become clear.
- The students will understand the use of several molecular techniques in disease diagnosis.
- To learn about tests carried out for biochemical investigations.
- Understanding of principle of biochemical Clinical biochemistry tests.

Unit-1

Chemistry of Nucleic acids: DNA Structure and function, RNA Types: Structure and function. Replication, Transcription, genetic code, Translation, Regulation of transcription and translation, Ageing, malignant transformation of cells and role of oncogenes. Apoptosis, cell regeneration.

Unit-2

Molecular diagnostics: Recombinant DNA Technology, Polymerase chain reaction, application of PCR in diagnosis of pathogens, Site directed mutagenesis, DNA finger printing, DNA Foot Printing, antisense RNA technology, chromosomal walking, inherited genetic disorders in man and gene therapy

Unit-3

Metabolic disorders and Diagnostic enzymology: Disorders of metabolism: carbohydrate, Lipids, Amino acids and Nucleic acids. Diagnostic enzymes: Role of Enzymes in Clinical Practice: Marker enzymes in myocardium, liver and pancreas. Tumour markers, Radio isotope techniques

Unit-4

Organ function tests: Liver function tests, Bile pigment metabolism, tests for liver function. Jaundice and its type, Functions of Kidney, Urine formation and renal function tests disease of kidney, Renal Calculi: Theory of formation and analysis, Gastric Analysis, Composition of gastric juice, concepts of free and bound acid, Fractional Test Meal.

*Practice: Operation procedure of Centrifuge machine, colorimeter, spectrophotometer etc Estimation of Liver function test, Kidney function test, Thyroid, Lipid profile.
Estimation of bile pigment, bile salt, bilirubin etc.*

Suggested Reading

1. Text book of Medical Laboratory Technology, P.B. Godkar 2nd Edn. 2003 Bhalani Publication.
2. Text book of Biochemistry, M. A. Siddique 8th Edn. 1993 Vijay Bhagat Scientific Book Co., Patna.
3. Medical Biochemistry by AC Dey.
4. Handbook of Christen Medical Association, India Medical Laboratory Technology- Robert H. Carman.

MSCM1203-Medical Parasitology & Mycology

Subject Name	Code	Type of course	T-P-P	Prerequisite
Medical Parasitology and Mycology	MSCM1203	Lecture+Tutorial	3-1-0	Fundamental Science

Objective

- Describe basic morphology, life cycle, pathogenesis, lab diagnosis and treatment of parasites and fungi.
- Perform appropriate laboratory techniques used in the processing of specimens for identification of parasites and fungi.
- Describe basic principle and procedures of isolation of fungus and parasites from clinical samples like stool, vaginal swab etc.
- Perform appropriate laboratory techniques used in the processing of specimens for identification of parasites and fungi.

Course outcome

- Identification of pathogenic parasite and fungus in disease diagnosis and treatment.
- The conceptual understanding of the subject provides opportunities for employability scopes for higher education.
- To serve as a resource for the clinical laboratories professionals in the different region.

Unit-1

General Parasitology, Classification of medically important parasites, epidemiology of parasitic infections, immunology of human parasitic infections. Diagnostic parasitology- Systematic study of following parasites (Geographical distribution, habitat, morphology and life cycle, risk of infection, pathogenesis, laboratory diagnosis prophylaxis and serological diagnosis)

Unit-2

Protozoa – Intestinal amoeba, free living pathologic amoeba, giardia, trichomonas, balantidium, isospora, cryptosporidium, microspora, cyclospora Plasmodia, leishmania, trypanasoma, toxoplasma, babesia. Helminthes– Cestodes – Taenia, Echinococcus, Diphylobothrium, Hymenolepsis, Multiceps Trematodes- Schistosoma, Fasciola, Fasciolepis, Paragonimus, Clonorchis, Opisthorchis. Nematodes- Ascaris, Hookworm, Trichuris, Enterobius, Strongyloides, Filaria, Trichinella, Toxocara, Dracunculus Biological vectors.

Practice: Collection & transport of specimens. Examination of stool for parasites. Examination of blood & bone marrow for parasites. Demonstrate different staining technique

Unit-3

General Mycology – Fungus – Classification Fungal Structure & Morphology, Reproduction in fungi, Immunity to Fungal Infections. Culture Media in Mycology, Stains in Mycology. Normal fungal flora of human beings. Diagnostic Mycology - Epidemiology, Pathogenesis, Laboratory Diagnosis of Fungal Infections. Specimen collection, preservation, Transportation & Identification of Mycological Agent. Biochemical tests for fungal identification Anti-fungal agents, invitro tests. Serological tests for mycotic infections. Use of laboratory animals in Mycology. Typing of fungi Preparation of fungal antigens & their standardization.

Unit-4

Method of different sample collection and preservation for mycological examination.

Media & Stains preparation for Mycology, Diagnostic Methods in Mycotic Infections, Identification test in Mycology, Serological tests in Mycology Skin tests. Animal inoculation techniques.

Practice: Collection & transport of specimens Examination of stool for parasites. Examination of blood & bone marrow for parasites. Examination of other body fluids & biopsy specimens for parasites. Culture techniques for parasites. Serological diagnostic methods, skin tests.

Suggested Reading

1. Text book of Parasitology by N C Dey, publisher New central bookagency
2. Text book of Parasitology by Chaterjee, publisher CBS
3. Text book of microbiology by Ananthanereyan, Publisher universitiespress
4. Medical Parasitology by RL Ichhpujani and Rajesh Bhatia, Jaypeepublisher
5. Short text book of medical microbiology by Satish Gupta, Publisher Jaypee

MSCM1204- Applied Microbiology

Subject Name	Code	Type of course	L-T	Prerequisite
Applied Microbiology	MSCM1204	Lecture+Tutorial	3-1	Fundamental Science

Objective

- To impart knowledge of the basic principles of bacteriology, virology, including nature of pathogenic microorganisms, pathogenesis, laboratory diagnosis, transmission, prevention and control of diseases common in the country

Course outcome

- To know the applications of microbiology in diagnostics, hospitals and community
- Learn principles underlying diagnostic tests and handle kits for diagnosis of diseases
- Explain prognosis of diseases and become aware about the role of medical microbiology in public health

Unit-1

The normal flora, collection and transport of clinical specimens Collection and preliminary processing of specimens.

Unit-2

Diagnostic microbiology- an approach to laboratory diagnosis Rapid and automation methods in diagnostic microbiology Molecular techniques in microbiology Serological and skin tests

Unit-3

Microbiology in the service of human being Community microbiology Emerging and re-emerging Microbial disease Nosocomial infections

Unit-4

Hospital and laboratory waste Diagnostic virology, Emergency microbiology Bacteriology of Milk, Air and Water

Suggested Reading

- Medical Parasitology by RL Ichhpujani and Rajesh Bhatia, Jaypee publisher
- Short text book of medical microbiology by Satishgupt, Publisher Jaypee

MSCM1205- Bacteriology, Parasitology & Mycology Lab

Subject Name	Code	Type of course	T-P-Pj	Prerequisite
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Bacteriology, Parasitology & Mycology I	MSCM1205	Theory	0-3-0	Fundamental Science
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Objective

- Describe basic morphology, life cycle, pathogenesis, lab diagnosis and treatment of parasitology, bacteria and fungi.
- Perform appropriate laboratory techniques used in the processing of specimens and identification of parasites, bacteria and fungi.
- Describe basic principle and procedures of isolation of fungus and parasites from clinical samples like stool, vaginal swab etc.
- Perform appropriate laboratory techniques used in the processing of specimens and identification of parasites, bacteria and fungi.

Course outcome

- Identification of pathogenic parasite and fungus in disease diagnosis and treatment.
- The conceptual understanding of the subject provides opportunities for employability scopes for higher education.
- To serve as a resource for the clinical laboratories professionals in the different region.

1. Collection & transport of specimens Examination of stool for parasites. Examination of blood & bone marrow for parasites. Examination of other body fluids & biopsy specimens for parasites. Laboratory diagnosis of hydrated cyst and cysticercosis, Concentration techniques for demonstration of Ova (Principles and applications), Routine Stool examination for detection of intestinal parasites.
2. Identification of adult worms from model's or slide's. Identification of different parasites their morphology from slide's. Culture techniques for parasites. Serological diagnostic methods, skin tests.
3. Media & Stains preparation for Mycology, Diagnostic Methods in Mycotic Infections, Identification test in Mycology, Serological tests in Mycology Skin tests. Animal inoculation techniques.
4. To prepare culture media used routinely in mycology
5. To perform all the staining techniques for identification of fungi as mentioned in theory syllabus. To identify given yeast culture (By performing various identification techniques studied in theory).

3rd semester M. Sc. Applied and Clinical Microbiology MSCM2301- Immunology & Virology

Subject Name	Code	Type of course	L-T-P	Prerequisite
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Immunology & Virology	MSCM23	Lecture+Tutorial	3-1-0	Fundamental Science
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Objective

- Understanding the concept of Innate & adaptive immune system; complement system Hypersensitivity.
- Clinically relevant serological analysis for deeper understanding of antigen-antibody interaction.
- To understand the concept of cells of immune system and organs of immune system.
- To understand the properties of virus, diagnosis of important viruses and vaccination.

Course Outcome

- The student will learn the application of Immunology in disease diagnosis.
- Complement system followed by the body on encountering an Antigen.
- Immune Response produced on encounter with foreign body.
- The students will learn the role of immunity in fighting disease, along with consequences of undesirable expression of immune system such as, hypersensitivity and auto immune disease.
- They will gather knowledge regarding the properties, diagnosis of virus and vaccination against them.
- The conceptual understanding of the subject provides opportunities for employability scopes for higher education.

Unit - 1

Introduction to Immunology: Immunity, Type (Innate & adaptive immune response). Organs of Immune System: Primary and Secondary lymphoid organ. Ontogeny and phylogeny of Lymphocytes: T and B Lymphocytes, Null Antigen, Antibody. Cell of Immune System: Mononuclear cell and granulocytes, Antigen presenting cell. Antigen, Haptens: Factors effecting immunogenicity, epitopes (Properties of it) Antibodies: Structure, Types and function.

Unit - 2

Complement System: Role of complement system in immune response, complements and Components and Activation pathways. Monoclonal antibodies: Production characterization and applications in diagnosis, therapy and basic research. Antigen-Antibody interaction, avidity & affinity measurement. Hypersensitivity: Definition, factor causing hypersensitivity. Common hypersensitivity reaction, types, classification based on the time taken for reaction. Auto Immune disease. Serological Reactions.

Unit-3

Medical Virology General Properties of viruses, Detection of viruses and antigens in clinical specimens, Serological diagnosis of virus infections. Cultivation of viruses. Arthropod borne and rodent borne virus diseases, Picorna viruses and diseases. Hepatitis viruses: Rabies and other neuro viruses: Orthomyxoviruses and paramyxoviruses. Pox, Adeno, Herpes, Reo, Rota and HIV Viruses, Oncogenic viruses, Viral vaccines, their

Preparation and their immunization schedules. Viruses of importance to bacteria, Bacteriophages, their structure, types, Typing and application in bacterial genetics.

Suggested Readings:

1. Practical Medical Microbiology by Mackie & MacCartney Volume 1 and 2
2. Text book of Microbiology by Ananthanereyan
3. Medical Microbiology by Paniker & Satish Gupte
4. Medical laboratory Technology vol. I, II, III by Mukherjee
5. Medical Laboratory manual for tropical countries Vol II Microbiology by Monia Cheesbrough
6. Immunology by Ivan Roitt, Jonathan Brostoff and David Male
7. Immunology by Kuby

MSCM2302-Diagnostic Bacteriology

Subject Name	Code	Type of course	L-T-P	Prerequisite
Diagnostic Bacteriology	MSCM2302	Lecture+Tutorial	3-1-0	Fundamental Science

Objective

- To confirm the suspicion of infectious bacterial disease.
- To identify the etiologic agent by isolating the causative bacterial pathogen

Course Outcome

- Study of Lab diagnosis for Enteric infection, Respiratory tract Infection, Oral & Stomach infection, Urinary tract infections.
- Study of control measures for nosocomial infection.
- Student can safeguard himself & society and can work diagnostics and hospitals

Unit-1

Laboratory strategy in the diagnosis of various Infective syndromes: Samples of choice, Collection, transportation and processing of samples for laboratory diagnosis of the following complications:

a) Septicemia and bacteraemia, b) Upper Respiratory tract infections, c) Lower Respiratory tract infections, d) Wound, skin, and deep sepsis, e) Urinary tract infections, f) Genital Tract infections, g) Meningitis, h) Gastro intestinal infections, i) Enteric fever, j) Tuberculosis (Pulmonary and Extra-pulmonary), k) Pyrexia of unknown origin

Practice: collection of different specimens from different organs. Record maintaining process. Preparation and use of different media in bacteriology laboratory. Isolation and identification of different groups of bacteria in laboratory.

Unit-2

Antibiotic susceptibility testing in bacteriology- a. Definition of antibiotics, b. Culture medium used for Antibiotic susceptibility testing, c. Preparation and standardization of inoculum, d. Control bacterial strains, e. Choice of antibiotics, f. MIC and MBC, g. Various methods of Antibiotic susceptibility testing with special reference to Stokes method and Kirby-Bauer method, h. Tests for production of β -lactamase

Practice: Antimicrobial susceptibility testing

Unit-3

Bacteriological examination of water, milk, food and air –

- a) Examination of water - Collection and transportation of water sample, Presumptive coliform count, Eijkman test, Introduction and importance of other bacteria considered as indicators of faecal contamination
- b) Examination of Milk and milk products - Basic Concepts regarding gradation of milk, Various tests for Bacteriological examination
- c) Examination of food articles -Basic Concepts regarding classification of food like frozen food, canned food, raw food, cooked food etc. Various tests for Bacteriological examination with special reference to food poisoning bacteria
- d) Examination of Air -Significance of air bacteriology in healthcare facilities, Collection processing and reporting of an air sample.

*Practice: Sterility testing of I/v fluids -a. Collection, transportation and processing of I/v fluids for bacterial contamination, b. Recording the result and interpretation
Nosocomial Infection, Epidemiological markers.*

Suggested Readings:

1. Practical Medical Microbiology by Mackie & MacCartney Volume 1 and 2
2. Text book of Microbiology by Ananthanereyan
3. Medical Microbiology by Paniker & Satish Gupte
4. Medical laboratory Technology vol. I, II, III by Mukherjee
5. Medical Laboratory manual for tropical countries Vol II Microbiology by Monia Cheesbrough

MSCM2303-Biochemistry

Subject Name	Code	Type of course	L-T-P	Prerequisite
Biochemistry	MSCM2303	Lecture+ Tutorial	3-1-0	Basic Medical science

Objective

- Understanding the concept of Biochemical analyzing instruments, chemicals and normal ranges of biochemical components in our body.
- Clinically relevant biochemical analysis for deeper understanding of all biochemical components i.e., Proteins, Electrolytes, Hormones etc

Course Outcome

- To learn about tests carried out for biochemical investigations.
- Understanding of principle of biochemical Clinical biochemistry tests.
- To learn normal ranges and abnormal ranges of biochemical components and hormones
- To study about diseases related to biochemical and hormone imbalance in human body.

Unit -1

Carbohydrate: Introduction, Carbohydrate Metabolism: Glycolysis, Gluconeogenesis, HMP, and its regulations, Disorders of carbohydrates metabolism related to each cycle (inborn error of metabolism) Proteins: Different metabolic pathway of amino acid. Amino acids oxidation. Transamination, deamination and pathways leading to acetylco-A. Decarboxylation of Amino acids, formation of nitrogenous excretion products. Urea cycle and ammonia excretion. Lipid: Biosynthesis and oxidation of fatty acids, Ketone bodies formation and their oxidation. Regulation and inborn error of lipid metabolism

Unit -2

Biochemical aspects of Hormone: Hormone receptors and intracellular messengers, Adenylatecyclase, protein kinase and phosphodiesterase. Role of Insulin, glucagon's, epinephrine and their mechanism. Various endocrine and regulatory systems mediated by cyclic AMP. Vitamin: Fat and Water soluble and their deficiency. Mineral metabolism: Minor and Major (Cu, Fe, Ca, Mg & P). Inborn error of Nucleic acids metabolism

Unit- 3

LFT, KFT, Lipid profile, Estimation of Glucose / GOD – POD method. Draw a standard graph of GTT curve, Introduction of electrophoresis.

Practice- Demonstration the centrifuge machine, Demonstration of Colorimeter, Estimation of Glucose in urine and blood, Estimation of Protein in urine and blood, Estimation of Liver function test, Kidney function test, Lipid profile.

Suggested readings

1. Text book of Medical Laboratory Technology by P. B. Godker, Publisher Bhalani.
2. Text book of Medical Biochemistry by Chaterjee & Shinde, Publisher JPB
3. Medical Laboratory Technology by Mukherjee, Publisher
4. Principal of Biochemistry by Lehninger, Publisher Kalyani
5. Practical Clinical Biochemistry by Harold Varley, Publisher CBS.

MSCM2304- Histology

Subject Name	Code	Type of course	L-T-P	Prerequisite
Histology	MSCM2304	Lecture+ Tutorial	3-1-0	Basic Medical Science

Objective

- Understanding the concept of histotechnology; Basic concepts about routine method examination of tissues Collection.
- Perform routine laboratory procedures encompassing all major areas of the histo laboratory.
- accurately and proficiently embed tissue and understand the principles of microtomy.
- Clinically relevant onchological analysis for deeper understanding of abnormal cell grow anywhere in human body.
- The conceptual understanding of the subject provides opportunities for employability scopes for higher education.

Course Outcome

- In this section students will be made aware of terminology used in histotechnology, var instruments and their maintenance and also learn the processing of various samples histopathological investigations.
- Reception and labeling of histological specimens.
- Use of antiseptics, disinfectants and insecticides in a tissue processing laboratory.
- The students will learn about various staining procedures for demonstration of diff substances & various cytological investigations.
- The students will learn about special staining procedures & handling & testing of var cytological specimens.

Unit-1

Introduction to histotechnology, Care, maintenance and Safety measures of laboratory equipment used in histotechnology. Basic concepts about routine methods of examination of tissues Collection and transportation of specimens for histological examination, fixation Various types of fixatives used in a routine histopathology laboratory- Simple fixatives, Compound fixatives, Special fixatives for demonstration of various tissue elements.

Practice: Practice: Demonstration of instruments used for dissection.

Use of antiseptics, disinfectants and insecticides in tissue processing laboratory.

Unit-2

Decalcification Criteria of a good decalcification agent

Technique of decalcification followed with selection of tissue, fixation, decalcification, neutralization of acid and thorough washing. Various types of decalcifying fluids

Processing of various tissues for histological examination, Embedding
 Schedule for manual or automatic tissue processing, Components & principles of various types of a tissue processors.

Practice: -Method of Decalcification, fixation, Embedding, manual or automatic tissue processing.

Unit-3

Section Cutting, Sharpening of Microtome Knives, Honing, Stropping, various types of microtome and their applications, Freezing Microtome and various types of Cryostats.

Staining, Impregnation and Mountants, Commonly used mountants in histotechnology lab. General Staining Procedures for Paraffin Infiltrated and Embedded tissue.

Nuclear Stains and Cytoplasmic stain, Equipment and Procedure for manual Staining and Automatic Staining Technique. Mounting of Cover Slips, Labeling and Cataloguing the Slides.

Practice: Demonstration of instruments used for dissection .Use of antiseptics, disinfectants and insecticides in tissue processing laboratory. Preparation of various fixatives- Hell's fluid, Zenker's fluid, Formal saline, Formal acetic acidetc.

Demonstration various parts and types of microtome.

Suggested Readings

1. Color text book of histology by Gartner & Hiatt, publisher Elsevier
2. Netter's essential histology by William Ovalle, publisher Elsevier
3. Histology E-book by Barry Mitchell, publisher Elsevier
4. Textbook of Histology (color atlas) by Krishna Garg, Indira Bahl, Mohinikaul, publisher CBS
5. Textbook of Histology and a Practical Guide by JP Gunasegaran, Publisher Elsevier.

MSCM2305- Research Methodology

Subject Name	Code	Type of course	L-T	Prerequisite
Research Methodology	MSCM2305	Theory	3-1	Fundamental Science

Objective

- To equip students with a basic understanding of the underlying principles of quantitative qualitative research methods.
- Provide students with in-depth training on the conduct and management of research inception to completion using a wide range of techniques.

Course Outcome

- Students can understand the ethical and philosophical issues associated with research education
- This study provides knowledge on various modes of presenting and disseminating research findings.
- Enable students to acquire expertise in the use and application of the methods of

collection and analysis.

- Provide learning opportunities to critically evaluate research methodology and findings.
- Enable students to be reflexive about their role and others' roles as researchers.

Unit-1

Introduction to Research: Definition, Scope, Limitations, and Types. Objectives of Research. Research Process. Research Designs.

Practice: Related to above unit.

Unit-2

Data Collection: Secondary Data, Primary Data, and Methods of Collection. Scaling Techniques: Concept, Types, Rating scales & Ranking Scales
Scale Construction Techniques, Multi-Dimensional Scaling. Sampling Designs: Concepts, Types and Techniques Sample Size Decision.

Practice: Demonstrate the data collection technique, scaling and sampling.

Unit-3

Theory of Estimation and Testing of Hypothesis

Small & Large Sample Tests, Tests of Significance based on t, F, Z test and Chi-Square Test. Designing Questionnaire.

Interviewing.

Tabulation, Coding, Editing. Interpretation and Report Writing.

Suggested Readings

1. Research Methodology kindle edition by R. Panneerselvam publisher PHI Learning; 2 edition
2. Research Methodology: Methods and Techniques Paperback – Abridged, Audiobook, Box set by C R Kothari, publisher newage

FCHU0204- Communicative Practice Laboratory-II

Subject Name	Code	Type of course	T-P-Pj	Prerequisite
Communicative Practice Laboratory-II	FCHU0204	Practice	0-0-3	Fundamental Science

Objectives

- To master Study Skills
- To acquire strategic competence to use both spoken & written language to use in a wide range of communication strategies
- To acquire Business Performance Skills

Course Outcomes

- The students will be able to Write effectively for a variety of professional and social settings. They will practice writing as a process of motivated inquiry engaging others writers' ideas they explore and develop their own. They will demonstrate an ability to revise for content

edit for grammatical and stylistic clarity. And they will develop an awareness and confidence in their own voice as a writer.

- Become accomplished, active readers who appreciate ambiguity and complexity, and who articulate their own interpretations with an awareness and curiosity for other perspectives.
- Demonstrate the skills needed to participate in a conversation that builds knowledge collaboratively; listening carefully and respectfully to others' view points; articulating own ideas in relation to other voices and ideas. Students will be able to prepare, organize, deliver and engage in oral presentation. A student is required to take up five lab tests of marks- at least two tests in written mode and three tests in spoken mode.

Unit-1

LISTENING (6 HOURS) Exercises on Active Listening:

- The whole group listens to any speech/news broadcast in English and notes down the important points. They listen again to check their points and evaluate themselves. The group then compares points to see how well they have understood the broadcast.

Unit-2

SPEAKING (8 HOURS)

- Situational Dialogues / Role Play: Organization Communication
- Oral Presentations- Prepared and Extempore
- 'Just a minute' Sessions (JAM)
- Debates
- Mock Meetings
- Cracking Job Interviews: Mock Sessions
- Group Discussions on current topics (This module will be practiced through speaking activities like role plays, presentations, and discussions)

Unit-3

READING (8 HOURS)

- Students will be given practice in reading and comprehension 6-8 passages of 100-300 words each, on topics of General as well as professional interest. The texts will be supported by suitable exercises designed to foster comprehension skills and vocabulary enrichment. Students are encouraged to read newspapers, articles, books and novels.
- Reading Comprehension Exercises Through Tests, Writing Summary and Presenting, Note Making
- Review Presentation (Movie/ Article/Book)
- Vocabulary Building Exercises (This module encourages extensive use of reading materials)

Unit-4

WRITING (8 HOURS)

- The Writing Lab content is designed to acquaint the students not only with the techniques of effective writing but also give them an insight into planning and writing documents that produce results.

- Short Paragraphs on current general and technical topics
- Creative Writing: Idea Generation
- Business Letters, Email Messages, Project Writing
- Writing Resumes and Cover Letters (* Students will be required to produce and submit by the end of second semester a 350- 500 words project report on a topic of their choice. The project should involve data collection, analysis and reporting. Ten marks (out of 100 marks allocated for Lab Test) will be set apart for the project.)

TEXT BOOK:

An Introduction to Professional English and soft skills by B.K Das et al., Cambridge University Press

REFERENCES:

Effective Business Communication, Asha Kaul, Prentice Hall Professional Communication, Aruna Koneru, TMH

MSCM2306- Immunology, Histopathology & Biochemistry Lab

Subject Name	Code	Type of course	L-T-P	Prerequisite
Immunology Lab	MSCM2306	Practice	0-0-4	Fundamental Science

Objective

- Understanding the concept of Innate & adaptive immune system; complement system Hypersensitivity.
- Clinically relevant serological analysis for deeper understanding of antigen-antibody interaction.
- To understand the concept of cells of immune system and organs of immune system.
- To understand the properties of virus, diagnosis of important viruses and vaccination.
- Distinguish normal tissues and organs by microscopic appearance when shown a microscopic image (light or electron microscopic photomicrograph) or glass slide.
- Analyze body fluid for diagnosis of disease
- Understand Physiological disorder and infectious disease.

Course Outcome

- The student will learn the application of Immunology in disease diagnosis.
- Complement system followed by the body on encountering an Antigen.
- Immune Response produced on encounter with foreign body.
- The students will learn the role of immunity in fighting disease, along with consequent undesirable expression of immune system such as, hypersensitivity and auto immune disease.
- They will gather knowledge regarding the properties, diagnosis of virus and vaccination against them.
- The conceptual understanding of the subject provides opportunities for employability scopes for higher education.
- After completion of the Practical student will be able to understand the use of instruments used in the lab.

dissection , embedding and casting of block and use of microtome.

- Able to detect Glucose ,Proteins, Urea, Uric acid, Creatinine, Bilirubin, Lipids.

Unit-1

Collection of blood sample by vein puncture, separation and preservation of serum

Performance of Serological tests i.e.-Widal, Brucella Tube Agglutination, VDRL (including Antigen Preparation), ASO (Antistreptolysin 'O') , (Latex agglutination) , Rheumatoid factor (RF) Latex agglutination, Rose Waaler test,

Demonstration of antigen / antibody determination by Immunofluorescence, Immunodiffusion, precipitation in agarose gel (Ouchterlony), CIEP, ELISA, SDS-PAGE and western blotting.

Unit-2

Hazards & safety measures in clinical Biochemistry laboratory .

Quality control and quality assurance in a clinical biochemistry laboratory .

Laboratory organization, management and maintenance of records

Principles of assay procedures, Normal range in blood, Serum, Plasma and Urine and reference values for : a. Glucose b. Proteins c. Urea d. Uric acid e. Creatinine f. Bilirubin g. Lipids Principles, procedures for estimation & assessment of the following including Errors involved and their corrections :

a. Sodium, Potassium and Chloride, Iodine. b. Calcium, Phosphorous and Phosphates

Unit-3

Demonstration of instruments used for dissection

Use of antiseptics, disinfectants and insecticides in a tissue processing laboratory

Reception and labeling of histological specimens.

To perform embedding and casting of block

To process a bone for decalcification

To prepare 70% alcohol from absolute alcohol

Processing of tissue by manual and automated processor method

To demonstrate various part and types of microtome

To learn sharpening of microtome knife (Honing and stropping technique) .

To perform section cutting.

To practice attachment of tissue sections to glass slides.

4th semester M. Sc. in Applied and Clinical Microbiology

Internship Thesis Guideline

This Guideline is designed to provide students the knowledge and practice of public health research activity, to enable them to carry out researches and solve research related problems and to help them in writing thesis and defend their work. Upon successful completion of the course, the students shall be able to:

- Search relevant scientific literature
- Develop a research proposal
- Employ appropriate data collection techniques and tools
- Manage collected data
- Analyze data with appropriate statistical techniques

- Writethesis
- Defend thefindings

Proposal Development:

At the ending of second year (fourth Semester), students individually consultation with designated faculties and extensive literature survey will develop research proposal during the initial 6 months period.

Data Collection/ Thesis Writing:

Students will carry out data collection, data management, data analysis, and thesis writing during the remaining period (fourth Semester).

The Dissertation should have following format:

1. Title
2. Introduction
3. Materials andMethods
4. Results
5. Discussion
6. Conclusion
7. Recommendation
8. References
9. Appendix

MSCM2401-PROJECT

Subject Name	Code	Type of course	Credit	Prerequisite
Project	MSCM2401	NA	12	Basic Medical science

Project work:

- **Microbiology:**

Suggested Project title

1. Hepatitis C viruses among pregnant women/people living withHIV/AIDS.

2. Antibacterial activity of honey on staphylococcus Aureus, escherichia coli and streptococcus Pyogen isolated from wound.
3. Susceptibilities of salmonella Typhi and other bacterial pathogens to antibiotics and hot aqueous extract of hibiscus sabdariffa.
4. Isolation and identification of bacteria from food vendors and some vegetable available.
5. Urinary tract infections in adult students of centurion university, BBSR campus
6. Air borne microbiological disorders (DOTS centre)

MSCM2402 - INTERNSHIP

Subject Name	Code	Type of course	Credits	Prerequisite
Internship	MSCM2402	NA	12	Basic Medical science

Internship

- Caserecord
- Lab management and ethics
- Evaluation-Guide(internal)
 - Industries guide(external)
 - University-project report/ Viva



School of Forensic Sciences

M.Sc. Forensic Science

Programme Outcome:

POs: Forensic Science postgraduate will be able to:

POs	Outcomes
PO1	Forensic knowledge: Apply knowledge of mathematics, various disciplines of science and basic principles of forensic in investigation.
PO2	Knowledge of psychology and law related to forensic science. Understanding of psychology of criminal mind and modus operandi of crime and statistical analysis in forensic science.
PO3	Knowledge and understanding of crime scene and their management, Visit crime scene and help the police officials in proper collection, preservation and handling of scientific evidences which will aid in maintaining the integrity of evidences.
PO4	Individual and team work: Function affectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings in the field of forensic Science.
PO5	Identification of individuals by knowledge and understanding of Fingerprints. Identify and analyse the questioned documents to aid the police officials and court of law.
PO6	Understanding of different instruments used for forensic analysis and perform experiments as well as to carry out problem analysis and data interpretation of instrumental analysis
PO7	Understanding of professional and ethical responsibility of forensic scientist.
PO8	Communication: Communicate and convey effectively on various activities of forensics with proper understanding of scientific and legal terminologies.
PO9	Understanding of drugs analysis, explosive materials, adulteration analysis as well as poison detection and analysis in forensic science.
PO10	Knowledge and understanding of biological aspects, serological analysis and DNA profiling as well as medico legal aspects in forensic science.

PO11	Understanding and knowledge of ballistics for the analysis of fire arms and projectiles in forensic science.
PO12	Life- long learning: Recognize the need for lifelong learning in the broadest contest of challenges and recent advances in the field of forensic science.
PO13	Project Management: Demonstrate knowledge & understanding of the forensic science and apply these to one's own work, as a member and leader in a team, to manage projects in forensic science.
PO14	Use of modern techniques, skills, and instruments necessary for forensic expert or any person working in such field.
PO15	Make a robust report on the basis of scientific analysis to administer the court of law.

PSO (Program Specific Outcomes)

Sl No.	Program Specific Outcomes
PSO1	Post-graduate will be able to develop skill and knowledge which can be applied in the jobs of Forensic Science
PSO2	Post-graduate will be able to pursue higher studies and research
PSO3	Post-graduate will be able to use software and technologies that can be effectively used to solve various problems encountered during investigations.

Course Outcome (CO)

1st Semester

MSFS1101 Introduction to Forensics, Psychology, Law and Statistics

Course Outcomes: On completion of this course, the successful students should be able to:

CO	Statements
CO-1	Understand criminal mind, their Modus Operandi.
CO-2	Understand the Law used in Forensic science.
CO-3	Get idea about statistical analysis and can use in forensic science.

MSFS1102 Instrumental Techniques

Course Outcomes: On completion of this course, the successful students should be able to:

CO	Statements
CO-1	Understand the instrumentation and basic concept of the instruments.
CO-2	Understand the process for analysis of different evidences.

MSFS 1103 Crime Scene Management and Forensic Physics

Course Outcomes: On completion of this course, the successful students should be able to:

CO	Statements
CO-1	Visit the crime scene, conduct the investigation, processed the evidence and sent to FSL.
CO-2	Understanding of different type of evidence, formulation of hypothesis, reconstruction of the crime scene.

MSFS 1104 Fingerprints and Questioned Documents

Course Outcomes: On completion of this course, the successful students should be able to:

CO	Statements
CO-1	Know about the important of fingerprint, pattern and their characteristics. Knowledge of analysis of fingerprints and identification of individuals on the basis of fingerprint pattern.
CO-2	Knowledge of documents evidences and their examination process and techniques.
CO-3	Get knowledge on different techniques and recent technologies developed used in fingerprint and questioned documents.

FCHU1203 Business Communication

Course Outcomes: On completion of this course, the successful students should be able to:

CO	Statements
CO-1	Know the basic terminologies.
CO-2	Will be able to communicate with different officers and convey the important information of forensic aspects.

MSFS1105 Instrumental Techniques Laboratory

Course Outcomes: On completion of this course, the successful students should be able to:

CO	Statements
CO-1	Get knowledge on using different instruments, understanding the concept of the instruments.
CO-2	To know the different instruments required for respective evidences and prepare the results to administer the court of law.

MSFS1106 Crime Scene Management and Forensic Physics Laboratory

Course Outcomes: On completion of this course, the successful students should be able to:

CO	Statements
CO-1	Skills to investigate the crime scene, find out the evidence and forward the evidence to FSL for analysis.
CO2	Formulate the hypothesis of the crime and reconstruction of the crime scene.

MSFS1107 Finger prints and Questioned Documents Laboratory

Course Outcomes: On completion of this course, the successful students should be able to:

CO	Statements
CO-1	Skills to analyse the fingerprint. Compare the fingerprint to match and identify the individuals.
CO2	Skills to analyse the different documents and find out the contents and characteristics of the documents. Analyse the authenticity of the documents. Detect the forgery in the documents.

2ND SEMESTER**MSFS 1201 Quality Management, Narcotic Drugs, Explosives, and Forensic Chemistry**

Course Outcomes: On completion of this course, the successful students should be able to:

CO	Statements
CO-1	Impart the concept of quality management and quality assurance.

CO-2	Knowledge of drugs, analysis of drugs and their forensic aspects.
CO3	Knowledge of explosive and the material used as explosive. Analysis of residue material and parts of the explosives. Detection of the cause of the explosion.

MSFS1202 Forensic Biology and Forensic Medicine

Course Outcomes: On completion of this course, the successful students should be able to:

CO	Statements
CO-1	Know the biological material used in forensic science. Understand the wild life forensic, entomology and odontology.
CO-2	Understand the autopsy used in forensic science. Determine the cause of death and time of death and understanding the medico legal aspects.

MSFS1203 Forensic Serology and DNA Profiling

Course Outcomes: On completion of this course, the successful students should be able to:

CO	Statements
CO-1	Know the body fluids analysis and serological techniques.
CO-2	Impart the knowledge of DNA and DNA analysis. Understand the basic concept of individualisation and uniqueness of DNA in identification of individuals.

MSFS1204 Forensic Toxicology and Pharmacology

Course Outcomes: On completion of this course, the successful students should be able to:

CO	Statements
CO-1	Impart the knowledge of poison and their analysis. Detection of poison in the body or body fluids.
CO-2	Understanding of drug interaction with body and drug toxicity.

MSFS1205 Forensic Ballistics and Computer Forensics

Course Outcomes: On completion of this course, the successful students should be able to:

CO	Statements
CO-1	Impart the knowledge of different firearms and projectile. Understanding of bullet and cartridge cases and gunpowder.
CO-2	To understand the computer parts, digital platform, cyber-crime and cyber laws.

MSFS1206 Quality Management, Narcotic Drugs, Explosives, and Forensic Chemistry Laboratory

Course Outcomes: On completion of this course, the successful students should be able to:

CO	Statements
CO-1	Skill to identify the quality of the different product. Examination of different product as per BIS standards.
CO-2	Identification of NDPS drugs and detection of different drugs by different techniques.
CO-3	Identification of explosives materials and detection of explosives by different techniques.

MSFS1207 Forensic Biology and Forensic Medicine Laboratory

Course Outcomes: On completion of this course, the successful students should be able to:

CO	Statements
CO-1	Skill to analyse the biological material and detection of age, sex, race, height and species origin.
CO-2	Identification of injuries and various types of death by post-mortem examination.

MSFS1208 Forensic Serology and DNA Profiling Laboratory

Course Outcomes: On completion of this course, the successful students should be able to:

CO	Statements
CO-1	Skill to analyse the body fluids and different serological techniques for serological analysis.
CO-2	Identification of individuals by DNA profiling.

MSFS1209 Forensic Toxicology and Pharmacology Laboratory

Course Outcomes: On completion of this course, the successful students should be able to:

CO	Statements
CO-1	Skill to analyse the type of poison and detection of different type of poison in body.
CO-2	Analyse the drug interaction and bioavailability of the drug in the body and their metabolites.

MSFS12010 Forensic Ballistics and Computer Forensics Laboratory

Course Outcomes: On completion of this course, the successful students should be able to:

CO	Statements
CO-1	Skill to analyse the different firearms and projectiles. Identification and detection of gunshot residue, gunshot powder, range, marks and characters of projectiles.
CO-2	Analysis of storage media, deleted files and information from digital platform and tracking.

3RD SEMESTER

Specialisation in Forensic Chemistry and Toxicology

MSFS2101 Pharmacology and Pharmaceutical Drug Analysis

Course Outcomes: On completion of this course, the successful students should be able to:

CO	Statements
CO-1	Understand about the drug, factors, bioavailability, and responses of drugs.
CO-2	Understanding the different agents of drugs, designer drugs and NDPS substances.
CO-3	Analysis of drugs and agents.

MSFS2102 Concepts of Toxicology

Course Outcomes: On completion of this course, the successful students should be able to:

CO	Statements
CO-1	Get knowledge on different toxic substances and their identification and detection.
CO-2	Understanding of analytical methods of toxicology and application of toxicology.

MSFS2103 Modern and Applied Analytical Forensic Chemistry

Course Outcomes: On completion of this course, the successful students should be able to:

CO	Statements
CO-1	Acquainted with proper knowledge chemistry of drugs and different laws related to drugs. Understanding the process of analysis involved to identify the drugs.

MSFS2104 Pharmacology and Pharmaceutical Drug Analysis Laboratory

Course Outcomes: On completion of this course, the successful students should be able to:

CO	Statements
CO-1	Qualitative and quantitative analysis of various chemicals.
CO-2	Instrumental analysis of various chemicals.

MSFS2105 Concepts of Toxicology Laboratory

Course Outcomes: On completion of this course, the successful students should be able to:

CO	Statements
CO-1	Ability to detect the drugs by various analytical techniques.
CO-2	Ability to detect the poison by various analytical techniques from biological and non-biological matrices.

MSFS2106 Modern and Applied Analytical Forensic Chemistry Laboratory

Course Outcomes: On completion of this course, the successful students should be able to:

CO	Statements
CO-1	Ability to detect the different drug component. Identify and detect the cause of fire and explosion and analyse the residue materials.
CO-2	Skill to detect the food adulteration in food and identify the adulterated material in food.

Specialisation in Forensic Biology

MSFS2111 Molecular Biology and Genetics

Course Outcomes: On completion of this course, the successful students should be able to:

CO	Statements
CO-1	Understand about the serological methods, enzymes and proteins for criminal investigation. Understanding of parameter and factors in forensic DNA typing.
CO-2	Understanding the different methods and techniques used for DNA analysis and development in technologies and methods for DNA analysis.
CO-3	Understanding of Bioinformatics, population structure and DNA databases.

MSFS 2112 Biotechnology in Pharmaceutical Sciences

Course Outcomes: On completion of this course, the successful students should be able to:

CO	Statements
CO-1	Get knowledge on recombinant DNA technology and genetically modified organism. Understanding of Blotting techniques and molecular therapy.
CO-2	Understanding of quality control and assurances, regulatory affairs and intellectual property rights.

MSFS2113 Environmental Biotechnology

Course Outcomes: On completion of this course, the successful students should be able to:

CO	Statements
CO-1	Acquainted with proper knowledge of environmental forensic, analysis of the component of pollutants and materials.
CO-2	Acquainted with the knowledge of waste management and detection of waste material in the environments.

MSFS2114 Molecular Biology and Genetics Laboratory

Course Outcomes: On completion of this course, the successful students should be able to:

CO	Statements
CO-1	Extraction and estimation of DNA from different sources. Genotyping of the DNA with different markers and interpretation of the result to aid the police officials and court of law.

CO-2	Extraction and estimation of proteins from different sources. Analysis of protein structure using RASMOL software.
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MSFS2115 Biotechnology in Pharmaceutical Sciences Laboratory

Course Outcomes: On completion of this course, the successful students should be able to:

CO	Statements
CO-1	Skills to isolate DNA from different sources and GMO detection.
CO-2	Ability to handle blotting techniques and identification and detection of production of industrial products.

MSFS2116 Environmental Biotechnology Laboratory

Course Outcomes: On completion of this course, the successful students should be able to:

CO	Statements
CO-1	Ability to detect the pollutants material in the environment and analysis of the pollutants.
CO-2	Skill to identify the adulterated material in food and examine the food quality.

Specialisation in Forensic Physics

MSFS2121 Advances in Physical Techniques

Course Outcomes: On completion of this course, the successful students should be able to:

CO	Statements
CO-1	Ability to detect the various techniques Such as Microscopes, etc.
CO-2	Skill to identify the examination of nanotechnology and Forensic Engineering

MSFS 2122 Concepts of Conventional and Modern Ballistics

Course Outcomes: On completion of this course, the successful students should be able to:

CO	Statements
CO-1	Identifications and Examination of Ammunitions Range of Fire.
CO-2	Analysis and Examination of GSR Material with various Standards

MSFS2123 Audio Recognition and Video Analysis

Course Outcomes: On completion of this course, the successful students should be able to:

CO	Statements
CO-1	Identification and Examination of Voice samples using Gold wave Software, Automatic Speaker recognition.
CO-2	Examination of Audio and Video analysis using AMphed Five.

MSFS2124 Advances in Physical Techniques Laboratory

Course Outcomes: On completion of this course, the successful students should be able to:

CO	Statements
CO-1	Ability to detect the various techniques Such as Microscopes, etc.
CO-2	Skill to identify the examination of nanotechnology and Forensic Engineering

MSFS2125 Concepts of Conventional and Modern Ballistics Laboratory

Course Outcomes: On completion of this course, the successful students should be able to:

CO	Statements
CO-1	Identifications and Examination of Ammunitions Range of Fire.
CO-2	Analysis and Examination of GSR Material with various Standards

MSFS2126 Audio Recognition and Video Analysis Laboratory

Course Outcomes: On completion of this course, the successful students should be able to:

CO	Statements
CO-1	Identification and Examination of Voice samples using Gold wave Software, Automatic Speaker recognition.
CO-2	Examination of Audio and Video analysis using AMphed Five.

Specialisation in Fingerprints and Questioned Documents

MSFS2131 Modern Trends in Fingerprint Sciences

Course Outcomes: On completion of this course, the successful students should be able to:

CO	Statements
CO-1	Fundamental and principle of fingerprints and their detection methods.
CO-2	Understanding of development and detection of fingerprints from various methods.

MSFS 2132 Questioned Document and Forensic Accounting

Course Outcomes: On completion of this course, the successful students should be able to:

CO	Statements
CO-1	Understanding of writing forgery and documents forgery. Examination of questioned documents and writings.
CO-2	Understanding of frauds, money laundering and financial reports.

MSFS2133 Forensic Photography and Biometric Traits

Course Outcomes: On completion of this course, the successful students should be able to:

CO	Statements
CO-1	Principle and techniques of photography and understanding the crime scene photography with various light sources.
CO-2	Knowledge of different biometric techniques and biometrics analysis.

MSFS2134 Modern Trends in Fingerprint Sciences Laboratory

Course Outcomes: On completion of this course, the successful students should be able to:

CO	Statements
CO-1	Skill to analyse the fingerprint with microscopic techniques and comparison of male and female fingerprint with specific reference and with AFIS method..
CO-2	Development of fingerprint with various chemical and physical methods.

MSFS2135 Questioned Document and Forensic Accounting Laboratory

Course Outcomes: On completion of this course, the successful students should be able to:

CO	Statements
CO-1	Skill to examination of ink, paper age, currency notes and detection of forgery of the documents.
CO-2	Examination of passports, stamps, stamps impression.

MSFS2136 Forensic Photography and Biometric Traits Laboratory

Course Outcomes: On completion of this course, the successful students should be able to:

CO	Statements
CO-1	Do crime scene photography, evidences photography and videography. Development of photographic prints.
CO-2	Do photography with various light sources and with various filters. Analysis of various biometrics.

MSFS2107 : Assignment

Course Outcomes: On completion of this course, the successful students should be able to:

CO	Statements
CO-1	Understanding of writing the proper content with professional language and with proper explanation.

MSFS2108: SEMINAR

Course Outcomes: On completion of this course, the successful students should be able to:

CO	Statements
CO-1	Get familiar and skilled to deliver in seminar

MSFS2200: Dissertation/project

Course Outcome : On completion of this course, the successful students should be able to:

CO	Statements
CO-1	Have understanding of research methodology and lab work/field work.

2018-19

The following colour represents the syllabus revision, skill, employability and entrepreneurship.

Green : Skill

Pink : Employability

Sky : Entrepreneurship

Odisha

CHOICE BASED CREDIT SYSTEM

COURSE STRUCTURE & SYLLABUS

BASKET - I



Centurion
UNIVERSITY

Shaping Lives...
Empowering Communities...

School of Engineering & Technology

2018

BASKET - I
(Basic Sciences)

<i>Course Code</i>	<i>Course Title</i>	<i>Course Type</i>	<i>Credits</i>	<i>Prerequisite</i>	<i>Department Offering</i>
<i>FCBS0101</i>	<i>Environmental Science</i>	<i>Theory</i>	<i>3</i>	<i>Nil</i>	<i>Chemistry</i>
<i>FCBS 0102</i>	<i>Differential Equations</i>	<i>Theory</i>	<i>3</i>	<i>Nil</i>	<i>Mathematics</i>
<i>FCBS 0103</i>	<i>Linear Algebra & Vector Calculus</i>	<i>Theory</i>	<i>3</i>	<i>Nil</i>	<i>Mathematics</i>
<i>FCBS 0104</i>	<i>Integral Transform</i>	<i>Theory</i>	<i>3</i>	<i>Nil</i>	<i>Mathematics</i>
<i>FCBS 0105</i>	<i>Complex Analysis</i>	<i>Theory</i>	<i>3</i>	<i>Nil</i>	<i>Mathematics</i>
<i>FCBS0106</i>	<i>Discrete Mathematics</i>	<i>Theory</i>	<i>3</i>	<i>Nil</i>	<i>Mathematics</i>
<i>FCBS0107</i>	<i>Calculus</i>	<i>Theory</i>	<i>3</i>	<i>Nil</i>	<i>Mathematics</i>
<i>FCBS0108</i>	<i>Probability & Statistics</i>	<i>Theory</i>	<i>3</i>	<i>Nil</i>	<i>Mathematics</i>
<i>FCBS0109</i>	<i>Numerical Methods</i>	<i>Theory</i>	<i>3</i>	<i>FCBS0102 Differential Equations</i>	<i>Mathematics</i>
<i>FCBS0401</i>	<i>Applied Analytical Chemistry</i>	<i>Theory + Practice</i>	<i>3</i>	<i>Nil</i>	<i>Chemistry</i>
<i>FCBS0402</i>	<i>Industrial Chemistry</i>	<i>Theory + Practice</i>	<i>3</i>	<i>Nil</i>	<i>Chemistry</i>
<i>FCBS0403</i>	<i>Applied Engineering Materials</i>	<i>Theory + Practice</i>	<i>3</i>	<i>Nil</i>	<i>Chemistry</i>
<i>FCBS0404</i>	<i>Electricity and Magnetism</i>	<i>Theory + Practice</i>	<i>4</i>	<i>Nil</i>	<i>Physics</i>
<i>FCBS0405</i>	<i>Basic Mechanics and Properties of Matter</i>	<i>Theory + Practice</i>	<i>4</i>	<i>Nil</i>	<i>Physics</i>
<i>FCBS0406</i>	<i>Optics and Optical Fibres</i>	<i>Theory + Practice</i>	<i>4</i>	<i>Nil</i>	<i>Physics</i>

Environmental Science

Subject Name	Code	Type of course	T-P-Pr (Credit)	Prerequisite
Environmental Science	FCBS0101	Theory	3	Nil

Course Objective:

- To understand the concept of multi-disciplinary nature of Environmental Science where different aspects are dealt with a holistic approach.
- Students will develop a sense of community responsibility by becoming aware of environmental issues in the larger social context.
- One must be environmentally educated.

Course Outcome:

- Understand the natural environment and its relationships with human activities.
- Characterize and analyze human impacts on the environment.
- Integrate facts, concepts, and methods from multiple disciplines and apply to environmental problems.
- Design and evaluate strategies, technologies and methods for sustainable management of environmental systems and for the remediation or restoration of degraded environments.

Evaluation System

	Component	% of Marks	Method of Assessment
Internal Examination	Midterm Test	30	Written examination
	Assignment	05	Report and Presentation
	Attendance	05	Attendance percentage
	Total	40	
External Examination		60	Written examination
Total		100	

MODULE-I

Environment and its multidisciplinary nature; Need for public awareness; Renewable and non renewable resources—forest, water, mineral, land, food and energy resources; Structure and function of ecosystems of forest, grass land, desert and aquatic types.

MODULE -II

Biodiversity and its conservation: Biodiversity at global, national and local levels; Threats to biodiversity - Habitat loss; wild life poaching and man - wildlife conflicts; Endangered and endemic species; conservation measures.

Causes, effects and control measures of pollution, air, water and noise pollution; Nuclear hazards; solid-waste management—Causes, effects and control measures; Management of disasters due to natural causes of floods, earthquakes, cyclones and landslides.

MODULE-III

Social issues and the environment; Sustainable environment, Water conservation measures; Rain water harvesting; Resettlement and rehabilitation of people; Climate change and global warming; Acid rain; Ozone layer depletion; water land reclamation; Consumerism and waste products; Features of Environment Protection Act, Air pollution and Control of Pollution Acts; Water Pollution and its Control Act. Effects of Pollution explosion on environment and public health; Need for value education to Protect environment and resources.

Text Book: Anubhav Kaushik & C.P. Kaushik : Environmental Studies-New age International Publishers.

Reference Books:

1. Benny Joseph : Environmental Studies-Tata Mac Graw Hill
2. E. Bharucha : Text book of Environmental Studies for Under graduate courses– Universities Press. (Book prepared by UGC Committee.

Differential Equations

Subject Name	Code	Type of course	T-P-Pr (Credit)	Prerequisite
Differential Equations	FCBS 0102	Theory	3	Nil

Course Objectives:

- To understand most of the physical phenomena from Science and Engineering which are modeled by differential equations.
- To find and interpret the solutions of the ODE & PDE appearing in signal systems, dynamical systems, stability theory and a number of applications to scientific and engineering problems.
- To develop the ability to apply differential equations to significant applied and/or theoretical problems.

Course Outcomes: Upon successful completion of this course, the student will be able to:

- Learn fundamental concepts of ODE & PDE theories and where and how such equations arise in applications to scientific and engineering problems.
- Be competent in solving linear/non-linear 1st & higher order ODEs & PDEs using analytical solution methods to obtain their exact solutions.
- Recognize the major classification of ODEs & PDEs and the qualitative differences between the classes of equations.

Evaluation System

	Component	% of Marks	Method of Assessment
Internal Examination	Midterm Test	30	Written examination
	Assignment	05	Report and Presentation
	Attendance	05	Attendance percentage
	Total	40	
External Examination		60	Written examination
Total		100	

MODULE-I (12 Hours)

First Order Differential Equations: Separable Equations, Homogeneous & Non-homogeneous Equations, Exact Differential Equations, Integrating Factor, Linear Differential Equations, Bernoulli Equation.

MODULE-II (15 Hours)

Second & Higher Order Linear Differential Equations: Linear Dependence and Independence of Solutions, Wronskian, Constant Coefficient Homogeneous Equations, Cauchy-Euler Equation, Nonhomogeneous Equations, Method of Variation of Parameter, Method of Inverse Operator, Legendre Equation.

MODULE-III (15Hrs)

Partial Differential Equation of First Order, Linear and Non-linear Partial Differential Equations, Charpit's Method, Homogeneous and Non-homogeneous Linear Partial Differential Equations with Constant Coefficients, Cauchy Type Differential Equation.

Text Book:

1) Higher Engineering Mathematics by B.V. Raman Publisher: TMH
Chapters: 8 (8.1 to 8.10); 9 (9.1 to 9.7), 18 (18.1 to 18.8) **Reference**

Book: 1) Advanced Engineering Mathematics by P.V.O'Neil Publisher: Thomson

Linear Algebra & Vector Calculus

Subject Name	Code	Type of course	T-P-Pr (Credit)	Prerequisite
Linear Algebra & Vector Calculus	FCBS 0103	Theory	3	Nil

Course Objectives:

- To apply concepts of Linear Algebra & Vector Calculus to the problems related to models in work, circulation and flux Problems, hydrodynamics and fluid dynamics, electrical circuits, networking, linear programming, graph theory, computer graphics, cryptography, thermodynamics, construction of curves and surfaces through specified points etc.
- To solve the system of linear equations appearing in the problems of electrical engineering, mechanical engineering, applied mechanics etc.
- To apply vectors in higher dimensional space in experimental data, storage and warehousing, electrical circuits, graphical images, mechanical systems and in physics.

Course Outcomes:

Upon successful completion of this course, the student will be able to:

- Use matrix operations to solve systems of linear equations and be able to determine the nature of the solutions.
- Compute with the characteristic polynomial, eigenvalues, eigenvectors and eigenspaces of a matrix as well as the geometric and the algebraic multiplicities of an eigenvalue and then to diagonalise that matrix.
- Determine the important quantities associated with scalar and vector fields.

Evaluation System

	Component	% of Marks	Method of Assessment
Internal Examination	Midterm Test	30	Written examination
	Assignment	05	Report and Presentation
	Attendance	05	Attendance percentage
	Total	40	
External Examination		60	Written examination
Total		100	

MODULE-I (14 Hours)

Linear Algebra, Basic Concepts, Linear System of Equations, Solution by Gauss Elimination, Conditions of Existence and Uniqueness of Solutions, Rank of a Matrix, Determinants and Cramer's Rule, Linear Dependence and Independence.

MODULE-II (14 Hours)

Eigen Values and Eigen Vectors, Basis, Symmetric, Skew-Symmetric and Orthogonal Matrices, Complex Matrices, Similarity of Matrices, Diagonalization.

MODULE-III (14 Hours)

Vector Differential Calculus: Vector Algebra, Inner Product, Vector Product, Vector & Scalar Functions and Fields, Derivatives, Gradient of a Scalar Field, Directional Derivative, Divergence of a Vector Field, Curl of a Vector Field.

Text Book:

1) *Advanced Engineering Mathematics* by E. Kreyszig Publisher: Johnwiley & Sons Inc-8th Edition Chapters: 6 (6.1 to 6.6); 7 (7.1, 7.3 to 7.5), 8 (8.1 to 8.4, 8.9 to 8.11) **Reference Books:**

1) *Advanced Engineering Mathematics* by P.V.O' Neil Publisher: Thomson

Mathematical Methods by Potter & Goldberg ; Publisher : PHI

Integral Transform

Subject Name	Code	Type of course	T-P-Pr (Credit)	Prerequisite
Integral Transform	FCBS 0104	Theory	3	Nil

Course Objectives: To describe the ideas of Fourier and Laplace Transforms and indicate their applications in the fields such as Signal & System, Digital Signal Processing, Image Processing, Theory of Control Systems, Differential Equations and many others.

- To use Fourier series for solving boundary value problems appearing in scientific & engineering problems.
- To get acquainted with the fact that the Laplace transform is related to the Fourier transform, but the Fourier transform expresses a function or signal as a series of modes of vibration (frequencies), whereas the Laplace transform resolves a function into its moments.

Course Outcomes: Upon successful completion of this course, the student will be able to:

- Obtain Laplace transform of simple functions, functions expressed in graphical form, integrals and derivatives.
- Solve differential & integral equations with initial conditions using Laplace transform.
- Compute the Fourier series representation of a periodic function, in both exponential and sine-cosine forms.
- Evaluate the Fourier transform of a continuous function and be familiar with its basic properties.

Evaluation System

	Component	% of Marks	Method of Assessment
Internal Examination	Midterm Test	30	Written examination
	Assignment	05	Report and Presentation
	Attendance	05	Attendance percentage
	Total	40	
External Examination		60	Written examination
Total		100	

MODULE-I (16 Hours)

Laplace Transforms, Transforms of Derivatives and Integrals, Derivatives and Integrals of Transforms, Shifting Properties, Unit Step Function, Dirac's Delta Function, Convolution, Inverse Transforms, Solution to Differential Equation, Integral Equation.

MODULE-II (12 Hours)

Periodic Functions, Trigonometric Series, Fourier Series, Fourier Expansion of Functions of any Period, Even and Odd Functions, Half Range Expansions,

MODULE-III (14Hrs)

Fourier Integrals: Fourier Sine Integral, Fourier cosine Integral. Fourier Transforms: Fourier Sine Transform, Fourier Cosine Transform.

Text Book:

Advanced Engineering Mathematics by E.Kreyszig
 Publisher: Johnwiley & Sons Inc-8th Edition Chapters:
 5 (5.1 to 5.6); 10 (10.1 to 10.4, 10.8, 10.9) **Reference**

Books:

- 1) *Advanced Engineering Mathematics* by P.V.O'Neil .Publisher: Thomson
- 2) *Higher Engineering Mathematics* by B.V.Raman .Publisher: TMH

Complex Analysis

Subject Name	Code	Type of course	T-P-Pr (Credit)	Prerequisite
Complex Analysis	FCBS 0105	Theory	3	Nil

Course Objectives:

- To understand the application of Complex Analysis to Two-Dimensional problems in Physics including Hydrodynamics and Thermodynamics and also in Engineering fields such as; Nuclear, Aerospace, Mechanical and Civil engineering, signal processing & communications.
- To acquire the skill of contour integration to evaluate complicated real integrals appearing in Engineering problems via residue calculus.

Course Outcomes: Upon successful completion of this course, the student will be able to:

- To get equipped with the understanding of the fundamental concepts of functions of a complex variable along with the concepts of analyticity, Cauchy-Riemann relations and harmonic functions.
- Evaluate complex contour integrals applying the Cauchy integral theorem, Cauchy integral formula and Residue theorem.
- Illustrate the applications of the calculus of residues in the evaluation of real integrals.

Evaluation System

	Component	% of Marks	Method of Assessment
Internal Examination	Midterm Test	30	Written examination
	Assignment	05	Report and Presentation
	Attendance	05	Attendance percentage
	Total	40	
External Examination		60	Written examination
Total		100	

MODULE-I (14 Hours)

Complex Analysis: Analytic Function, Cauchy-Riemann Equations, Laplace Equation, Harmonic Function, Linear Fractional Transformation.

MODULE-II (14 Hours)

Parametric representation, Line Integral in the Complex plane, Cauchy's Integral Theorem, Cauchy's Integral Formula, Derivatives of Analytic Function.

MODULE-III (14Hrs)

Power Series, Taylor's Series, Maclaurin Series, Laurent's Series, Singularities and Zeroes, Residue Theorem, Residue Integration Method, Evaluation of Real Integrals.

Text Book:

1) *Advanced Engineering Mathematics* by E. Kreyszig Publisher: John Wiley & Sons Inc-8th Edition Chapters: 12 (12.1 to 12.4, 12.9); 13, 14 (14.2, 14.4) & 15.

Reference Books:

1) *Advanced Engineering Mathematics* by P.V. O'Neil Publisher: Thomson

2) *Fundamentals of Complex Analysis (with Applications to Engineering and Science)* by E.B. Saff & A.D. Snider Publisher: Pearson

Discrete Mathematics

Subject Name	Code	Type of course	T-P-Pr (Credit)	Prerequisite
Discrete Mathematics	FCBS 0106	Theory	3	Nil

Course Objectives:

<p><i>To learn a particular set of mathematical facts and to apply their applications in many subjects of Computer Science and Engineering such as Cryptography, Theory of Computation & Data Networking.</i></p> <p><i>To understand mathematical reasoning in order to read, comprehend and construct mathematical arguments as well as to solve problems, occurred in the development of programming languages.</i></p> <p><i>To work with discrete structures such as graphs to study the structure of the world wide web, to model a computer network and to find the shortest path between two places in a transportation network.</i></p>
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Course Outcomes: Upon successful completion of this course, the student will be able to:

<ul style="list-style-type: none"> • Evaluate elementary mathematical arguments and identify fallacious reasoning. • Apply the logical structure of proofs and work symbolically with connectives and quantifiers to produce logically valid, correct and clear arguments. • Reformulate statements from common language to formal logic. Apply truth tables and the rules of propositional and predicate calculus. • Model and solve real-world problems using graphs, both quantitatively and qualitatively.
--

Evaluation System

	Component	% of Marks	Method of Assessment
Internal Examination	Midterm Test	30	Written examination
	Assignment	05	Report and Presentation
	Attendance	05	Attendance percentage
	Total	40	
External Examination		60	Written examination
Total		100	

MODULE-I (12 Hours)

Propositional Logic, Propositional Equivalence, Predicates and Quantifiers, Nested Quantifiers, Rules of Inference, Recurrence Relations, Solving Linear Recurrence Relations.

MODULE-II (16 Hours)

Relations and its properties, Representation of Relations, Closure of Relations, Equivalence Relations and Partitions, Partial Ordering, POSet, Hasse Diagram, Maximal & Minimal elements of a Poset, Supremum & Infimum of a Poset, Lattice, Basic properties of Lattices.

MODULE-III (14Hrs)

Introduction to Graph Theory, Graph terminology, Representation of graphs, Graph Isomorphism, Connectivity, Euler and Hamiltonian Paths, Planar graph, Graph Coloring, **Text Books:**

- 1 *Discrete Mathematics and its Applications* by K.H.Rosen Publisher: TMH, Sixth Edition
Chapters: 1(1.1 to 1.5) ; 6 (6.1, 6.2) ; 7; 8(8.1 to 8.5, 8.7, 8.8)
- 2 *Elements of Discrete Mathematics* by C.L.liu & D.P. Mohapatra Publisher: TMH, Third Edition Chapter: 11 (11.1 to 11.4) **Reference Books:**
Discrete and Combinatorial Mathematics by R.P.Grimaldi Publisher: Pearson
Discrete Mathematics and Applications by Thomas Koshy Publisher: Elsevier
Discrete Mathematical Structures by B. Kolman, R.C. Busby & S. Ross Publisher: PHI

Calculus

Subject Name	Code	Type of course	T-P-Pr (Credit)	Prerequisite
Calculus	FCBS0107	Theory	3	Nil

Objective

<ul style="list-style-type: none"> · To study how things change. It provides a framework for modeling systems in which there is change, and a way to deduce the predictions of such models. · To construct a relatively simple quantitative models of change, and to deduce their consequences. · The fundamental idea of calculus is to study change by studying “instantaneous” change, by which we mean change over tiny interval of time.
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Course Outcome

<p>Upon successful completion of this course, students will be able to:</p> <ul style="list-style-type: none"> · Understand the importance of linear functions in mathematics. · Understand the major problems of differential and integral calculus. · Understand and recognize other important classes of functions (such as trigonometric and rational functions), and be able to use calculus with these functions.
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Evaluation Systems

	Component	% of Marks	Method of Assessment
Internal Examination	Midterm Test	30	Written examination
	Assignment	05	Report and Presentation
	Attendance	05	Attendance percentage
	Total	40	
External Examination		60	Written examination
Total		100	

MODULE-I (6 Hours)

Asymptotes

MODULE-II (6 Hours)

Curve Tracing

MODULE-III (6 Hours)

Curvature

MODULE-IV (6 Hours)

Reduction Formulae

MODULE-V (6 Hours)

Vector Integral Calculus: Line Integrals.

MODULE-VI (6 Hours)

Surface Integrals, Green's Theorem

MODULE-VII (6 Hours)

Volume Integrals, Gauss's Theorem, Stokes' Theorem (without proof).

Text Books:

- 1) A Text book of Calculus Part-III : Shantinakaran
Chapters: 1 (Art 1 & 3), 3(Art 7, 8, 9)
- 2) A Text book of Calculus Part – II : Shantinakaran
Chapter: 8 (Art. 24, 25, 26),
- 3) A Text book of Calculus Part – II : Shantinakaran
Chapter: 10 (Art.33, 34, 35, 36, 37)
- 4) A Textbook of Vector Calculus by Shanti Narayan & P. K. Mittal, S. Chand & Co. , 2003
Chapters: 7 (7.1 to 7.6, 7.8 & 7.11)

Probability & Statistics

Subject Name	Code	Type of course	T-P-Pr (Credit)	Prerequisite
Probability & Statistics	FCBS0108	Theory	3	Nil

Objective

- To translate real-world problems into probability models.
- To motivate in students an intrinsic interest in statistical thinking.
- To recognize the role of and application of probability theory, descriptive and inferential statistics in many different fields of engineering.

Course Outcome

Upon successful completion of this course, students will be able to:

- Define and illustrate the concepts of sample space, events and compute the probability and conditional probability of events.
- Define, illustrate and apply the concepts of discrete and continuous random variables, the discrete and continuous probability distributions.
- Define, illustrate and apply the concept of the expectation to the mean, variance and covariance of random variables.
- Compute probabilities based on practical situations using the Binomial, Poisson and Normal distributions.

Evaluation Systems

	Component	% of Marks	Method of Assessment
Internal Examination	Midterm Test	30	Written examination
	Assignment	05	Report and Presentation
	Attendance	05	Attendance percentage
	Total	40	
External Examination		60	Written examination
Total		100	

MODULE-I

(6 Hours)

Probability: Sample space and Events, Principles of Counting, Classical definition of probability.

MODULE-II

(6 Hours)

Axioms of probability, Elementary theorems, Addition and Multiplication rules, Conditional probability.

MODULE-III

(6 Hours)

Probability Distributions: Discrete and Continuous Random Variables.

MODULE-IV

(6 Hours)

Probability Density and Distribution functions, Mean and Variance of Distributions. Binomial Distribution.

MODULE-V

(6 Hours)

Poisson Distribution, Normal Distributions, Poisson and Normal Distributions as Limiting forms of Binomial Distribution.

MODULE-VI

(6 Hours)

Statistics: Random Sampling, Population and Sample, Sample Mean and Variances.

MODULE-VII**(6 Hours)**

Point and Interval Estimations, Confidence Intervals, Fitting Straight Lines, Correlation and Regression.

Text Book:

- Advanced Engineering Mathematics by E. Kreyszig
 Publisher: John Willey & Sons Inc-8th Edition
 Chapters: 22(22.1 to 22.8), 23(23.1 to 23.3, 23.9, 23.10)

Reference Books:

- Statistical Methods By S.P. Gupta (31st Edition); Publisher: Sultan Chand & Sons.
- Mathematical Statistics By S.C. Gupta & V.K. Kapur (10th Edition); Publisher: Sultan Chand & Sons.

Numerical Methods

Subject Name	Code	Type of course	T-P-Pr (Credit)	Prerequisite
Numerical Methods	FCBS0109	Theory	3	FCBS0102 Differential Equations

Objective

<ul style="list-style-type: none"> To understand the limitations of analytical methods and the need for numerical methods and the ability to apply these numerical methods to obtain the approximate solutions to engineering and mathematical problems. Ability to decide and to derive appropriate numerical methods for approximating the solutions of various types of problems in engineering and science and analyze the error incumbent in any such numerical approximation. Ability to report analysis, solution and results in a standard engineering format.

Learning Outcome

<p>Upon successful completion of this course, students will be able to:</p> <ul style="list-style-type: none"> Perform error analysis to select an appropriate numerical model and to estimate errors in numerical solution of a given problem. Derive a variety of numerical algorithms/methods & compare the viability of different approaches to the numerical solutions of various mathematical problems arising in roots of linear and non-linear equations, interpolation and approximation, numerical differentiation and integration, system of linear algebraic equations and differential equations. Analyze and evaluate the accuracy of common numerical methods.
--

Evaluation Systems

	Component	% of Marks	Method of Assessment
Internal Examination	Midterm Test	30	Written examination
	Assignment	05	Report and Presentation
	Attendance	05	Attendance percentage
	Total	40	
External Examination		60	Written examination
Total		100	

MODULE-I (6 Hours)
Approximation and round of errors, Truncation error and Taylor's series, Roots of equation using Bisection Method.

MODULE-II (6 Hours)
Roots of equation using the false-position method, fixed point iteration, Newton-Raphson method, Secant method.

MODULE-III (6 Hours)
Solution of System of Linear algebraic equations: Gauss-Seidel method, Lagrange Interpolation.

MODULE-IV (6 Hours)
Newton divided difference interpolation, Inverse Interpolation, Lagrange Interpolation, Newton's forward and backward interpolation.

MODULE-V (6 Hours)
Numerical Differentiation, Numerical integration by the trapezoidal rule.

MODULE-VI (6 Hours)
Numerical integration by the Simpson's rules, Gauss quadrature rule.

MODULE-VII (6 Hours)
Solution of Ordinary Differential Equations: Euler's method, Improvement of Euler's method, Runge-Kutta methods.

Text Book:

- 1) Advanced Engineering Mathematics by E. Kreyszig
Publisher: John Willey & Sons Inc-8th Edition
Chapters: 17 (17.1 to 17.3, 17.5), 18 (18.3), 19 (19.1)

Reference Books:

- 1) Numerical Methods for Scientific and Engineering Computation by M. K. Jain, S. R. K. Iyengar & R.K. Jain; New Age International Publishers.
- 2) Introductory Methods of Numerical Analysis by S.S. Sastry; Third Edition, Prentice Hall India.

Applied Analytical Chemistry

Subject Name	Code	Type of course	T-P-Pr (Credit)	Prerequisite
Applied Analytical Chemistry	FCBS0401	Theory + Practice	3	Nil

Course Objective

- The aim of this course is to give students that are going to carry out an experimental work the necessary comprehension in analytical chemistry.
- The course will also provide the student with knowledge to be able to understand and critically evaluate experimental data produced by others.

Course outcome

- Explain fundamental principles for environmental analytical methods (titration, electrochemistry, instrumentation and basic parameters of water, soil, fuel etc)
- Point out suitable analytical techniques for analyzing a specific compounds in an environmental matrix
- Point out suitable techniques for sampling and handling of environmental samples
- Apply quality control on chemical analysis and laboratory work and explain its importance
- Plan and carry out laboratory experiments, including data analysis and conclusions
- Describe simple approaches for troubleshooting

Evaluation System

	<i>Component</i>	<i>% of Marks</i>	<i>Method of Assessment</i>
<i>Internal Examination</i>	Internal	20	Written examination
	Assignment	30	Report and Presentation
<i>External Examination</i>	<i>End Sem</i>	30	Written examination
	<i>Practice</i>	20	Experiment followed by Viva
<i>Total</i>		100	

Module-1

Water Analysis: Importance of water, different types of water, sources and uses of water, types of water pollutants and domestic and industrial significance of analysis of water. Removal of hardness by Lime-Soda, Zeolite and Ion exchange methods. Removal of DO and dissolved CO₂ from water by De-aeration method. Desalination of brackish water by Reverse osmosis and electro dialysis process. Water disinfection by bleaching powder, liquid Cl₂, and chloramine.

Practice:

1. Determination of total hardness by EDTA method, total dissolved solids, total alkalinity
2. Determination of Turbidity by nepheloturbidity meter, pH, Conductivity.
3. Determinations of BOD, COD, DO.

NB: The above parameters can also be determined by using water kits and the results are to be compared with those obtained manually.

Module-2

Soil Analysis: Composition of rocks and minerals, soil profile and properties.

Practice:

1. Determination of texture of soil.
2. Determination of moisture content in a soil sample, pH, electrical conductivity,
3. Determination of water holding capacity of soil.
4. Measurement of Calcium and Magnesium Using EDTA methods.

Module-3

Chemistry of fuels: Classification of fuels, composition and properties of Petroleum, LPG, Water gas, producer gas, CNG. Knocking – Mechanism of knocking, harmful effects, Anti knocking agents – TEL, Catalytic converters – Principle & working, Unleaded petrol, Power alcohol & Biodiesel. Photovoltaic cells - construction & working of a PV cell **Practice:**

1. Proximate analysis of fuel (Coal, biomass etc.) Moisture, Volatile content, Ash, fixed carbon
2. Testing of fuel properties of the plastic oil and bio diesel: Specific gravity by picnometer, flash point and fire point by pesky-Marten flash point apparatus, viscosity by Redwood viscometer, calorific value by bomb calorimeter

Industrial Chemistry

Subject Name	Code	Type of course	T-P-Pr (Credit)	Prerequisite
Industrial Chemistry	FCBS0402	Theory + Practice	3	Nil

Course Objective

Students may also explore in depth specialized areas of chemistry of materials, including ores, metals, cemenas well as dyes, oils, soaps

- Introduce the students to industrial processing principles as applicable to chemical and allied industries.
- Provide the students with the knowledge of how raw materials are sourced for various chemical industries and how these materials are processed.
- Provide students with advanced technical skills in Chemical Engineering that will enable them to (a) translate fundamental discoveries in materials and other high technology areas to commercial exploitation, and (b) adapt readily to the challenges presented in a diverse range of industrial sectors that can benefit from process engineering approaches.

Course outcome

- Appreciate better their future roles as chemists in Industrial establishments
- Be able to explain the origin of raw materials used in the chemical and allied industries
- Have a good understanding of how chemical raw materials are processed into finished products.
- Graduates find employment in, quality control, oil and petroleum industry, textile industry, dyes and paints industry, cement industry, just to name a few.

Evaluation System

<i>Internal Examination</i>	<i>Component</i>	<i>% of Marks</i>	<i>Method of Assessment</i>
	Internal	20	Written examination
	Assignment	30	Report and Presentation
<i>External Examination</i>	<i>End Sem</i>	30	Written examination
	<i>Practice</i>	20	Experiment followed by Viva
<i>Total</i>		100	

Module 1: Preparation of soap, dyes and oil analysis :

Introduction: Types of soap (soft and hard soap), methods of preparation of soap, mechanism, difference between fats and oils, physical properties of fats and oil, general introduction to chemistry of dye, various example of dyes, types of dyes.

Practice:

- Preparation of soap by saponification
- Determination of the properties different type of soap
 1. pH test
 2. Foam test
- Hard water test
- Determination of iodine number of oil
- Preparation of dyes (azo dyes): 2- naphthol + 4 - nitro aniline: salicylic acid + 4- nitro aniline
- Preparation of Phenyle.

Applications: Effect of water hardness in cleansing action of soap. Application of dyes to cloth

Module 2: Metals estimation from ores

Introduction: General introduction on ores, types of ore, important ore minerals, application of ores.

Practice:

- Estimation of Cu in copper ore
- Determination of Fe as ferrous iron in an ore sample
- Determination of Zn in Zinc ore by EDTA complex metric method

Module 3: Analysis of cement

Introduction: what is cement? types of cement, composition of cement, preparation of cement, applications.

Practice:

- Estimation of calcium in Portland cement
- Cement hydration and pH evaluation during curing
- To check the quality of cement (colour, texture, smell test, float test, shape test and strength test)

Applied Engineering Materials

Subject Name	Code	Type of course	T-P-Pr (Credit)	Prerequisite
Applied Engineering Materials	FCBS0403	Theory + Practice	3	Nil

Course Objective

- To understand the importance of the chemical approach to nanomaterials
- To study the preparation, analysis and applications of metal nanoparticles
- To develop an understanding of conjugated polymers and their applications
- To understand how polymer composition and architecture imparts unique properties and behavior
- To study organic-inorganic hybrid materials (COMPOSITES) and how the incorporation of metals in the polymer architecture leads to new properties and applications

Course outcome

- Know what it takes to have a career in nanotechnology
- Understand the need to increase Nanotechnology awareness
- Understand the definition of Nanotechnology
- Know the processing of Nanoparticles and Nanomaterials □ Know the application of Nanotechnology and nanomaterials

Evaluation System

Internal Examination	Component	% of Marks	Method of Assessment
	Internal	20	Written examination
	Assignment	30	Report and Presentation
External Examination	End Sem	30	Written examination
	Practice	20	Experiment followed by Viva
Total		100	

Module 1: Nano Materials:

Introduction, nano scale, applications in various fields.

Practice:

- Synthesis of Ag, Au nano particles by wet chemical methods. □ Synthesis of ZnO Nanoparticles by Precipitation Method □ Synthesis of Cu nano particles Sonochemical method.
- Synthesis of Fe nano particles Co-precipitation method.
- Thickness measurement by sol-gel process of coating.

Module 2: Polymers

Introduction, types of polymers, Polymerisation mechanisms.

Practice:

- Synthesis of Thiokol Rubber
- Synthesis of a Rubber Ball from Rubber Latex
- Synthesis of Polystyrene (PS)
- Synthesis of Polymethyl Methacrylate (PMMA) □ Synthesis of Nylon-6:6.
- Determination of molecular weight of polymers by visometry method.

Module 3: Composites

Introduction :Biopolymers or synthetic polymers reinforced with natural or biofibers(termed as bio composites) as a viable alternative to glass fibre composites.Biocomposites“ refers to those composites that can be employed in bioengineering.Biocomposites are composite materials, that is, materials formed by a matrix (resin) and a reinforcement of natural fibers (usually derived from plants or cellulose). Bio composites are the combination of natural fibers (biofibers) such as wood fibers (hardwood and softwood) or non - wood fibers (e.g., wheat, kenaf, hemp, jute, sisal, and flax) with polymer matrices from both renewable and non-renewable resources.

Practice:

- Synthesis of bio composite materials by using jute fibres and wood fibres

Electricity and Magnetism

Subject Name	Code	Type of course	T-P-Pr (Credit)	Prerequisite
Electricity and Magnetism	FCBS0404	Theory + Practice	4	Nil

Course Objective

- To understand electric circuit components and their use.
- To learn and verify the fundamental laws of electricity, learn how to use certain electrical devices. Understanding magnetic properties of matter and performing experiments to realize magnetism.

Course outcome

- Realizing the importance and use of electrical components in a circuit.
- Learning how to do different connections and their purpose.
- Understanding magnetism of matter and its applications

Evaluation Criteria

Internal Examination	Component	% of Marks	Method of Assessment
	Internal	20	Written examination
	Assignment	30	Report and Presentation
External Examination	End Sem	30	Written examination
	Practice	20	Experiment followed by Viva
Total		100	

Practice I Theory:

Electric field, Potential, EMF, capacitance, resistance, series connection, parallel connection, Kirchhoff's laws, RC circuits, LC circuits.

Lab:

1. Use a Multi-meter for measuring (a) Resistance, (b) AC and DC Voltages, (c) DC Current, (d) Capacitance and (e) Checking electrical fuses.
2. To determine an unknown Low Resistance using Potentiometer. 3. To determine an unknown Low Resistance using Carey Foster's Bridge.

Practice II

Theory: Electrical Circuits: AC Circuits: Kirchhoff's laws for AC circuits. Complex Reactance and Impedance. Series LCR Circuit: (1) Resonance, (2) Power Dissipation and (3) Quality Factor, and (4) Band Width. Parallel LCR Circuit.

Lab:

1. To verify the Superposition, and Maximum power transfer theorems.
2. To determine self-inductance of a coil by Anderson's bridge.
3. To study response curve of a Series LCR circuit and determine its (a) Resonant Frequency, (b) Impedance at resonance, (c) Quality factor Q, and (d) Band width.
4. To study the response curve of a parallel LCR circuit and determine its (a) Anti- resonant frequency and (b) Quality factor Q.

PRACTICE III

Theory: Magnetic Properties of Matter: Magnetization vector (**M**). Magnetic Intensity (**H**). Magnetic Susceptibility and permeability. Relation between **B**, **H**, **M**. Ferromagnetism. B-H curve and hysteresis. Electromagnetic Induction: Faraday's Law. Lenz's Law. Self Inductance and Mutual Inductance. Reciprocity Theorem. Energy stored in a Magnetic Field.

Lab:

2. To study the induced e.m.f. as a function of the velocity of the magnet.
3. Measurement of field strength B and its variation in a solenoid.
4. Determination of μ_r ratio.

Text Book:

1. *Electricity and Magnetism* By K. K. Tiwari, S. Chand Publishing References:
2. *Electricity and Magnetism*, By M. C. Saxena, Satya Prakash, V. P. Arora, Publisher: Pragati Prakashan
3. *Introduction to Electrodynamics*, by David J. Griffiths Prentice-Hall; 3 edition (2011) 4. *Electricity and Magnetism* by - D. C. Tayal, Himalaya Publishing, 2009.

Basic Mechanics and Properties of Matter

Subject Name	Code	Type of course	T-P-Pr (Credit)	Prerequisite
Basic Mechanics and Properties of Matter	FCBS0405	Theory + Practice	4	Nil

Course Objective

- To give the students overall idea about material properties and also hands on experience to measure them.
- To make them realize the applications of material properties.
- To expose them to phenomena like hydrostatics, elasticity, viscosity, surface tension and their applications in various places.
- Encouraging them to build simple models to explain the mechanical properties. **Theory:**

Course outcome

- To understand material properties and perform experiments on them.
- To understand the applications of material properties in real life.
- To be able to make small models for explain few mechanical properties.

Evaluation System

	<i>Component</i>	<i>% of Marks</i>	<i>Method of Assessment</i>
<i>Internal Examination</i>	Internal	20	Written examination
	Assignment	30	Report and Presentation
<i>External Examination</i>			
	<i>End Sem</i>	30	Written examination
	<i>Practice</i>	20	Experiment followed by Viva
<i>Total</i>		100	

Elasticity: Elastic constants, Relation among elastic constants, torsion of right circular cylinder, bending of beams, Vibration of loaded cantilever.

Lab:

1. Young's modulus by single/double cantilever
2. Young's modulus by Searle's method
3. Rigidity modulus using Barton's apparatus
4. Poisson's ratio

Practice II Theory:

Hydrostatics: hydrostatic force on a body, buoyancy, metacentric height, hydrostatic pressure, pressure measurement: manometer

Viscosity: Viscosity of fluids, Stoke's law, terminal velocity, Poiseuille's equation, Searle's viscometer.

Surface tension & surface energy: Pressure difference across curved liquid surface. **Lab:**

1. Viscosity by Stokes method
2. Viscosity by Poiseuille's method
3. Metacentric height of floating body
4. Measurement of Pressure by manometer
5. Surface tension by capillary rise method
6. Determination of surface tension by Quincke's method

Practice III:

Basic Mechanics

Theory: Kinematics and Kinetics, Effort amplification using levers and pulleys, Friction, Laws of friction.

Rotational Motion: Moment of Inertia, Theorem of Parallel and Perpendicular axes. Moment of inertia of circular disc.

Lab:

1. Effort-output ratio using combination of pulleys
2. Verification of laws of static and dynamic friction
3. Moment of inertia of fly wheel

Text Book:

1. *Elements of Properties of Matter, Dec 2010* by D.S. Mathur, S.Chand (G/L) & Company Ltd Reference Books:

1. *A Text Book of Fluid Mechanics* by R.K. Bansal, Laxmi Publishers, 2005
2. *Engineering Mechanics Statics and Dynamics* by A. K. Tayal, Umesh Publications.

Optics and Optics Fibre

Subject Name	Code	Type of course	T-P-Pr (Credit)	Prerequisite
Optics and Optics Fibre	FCBS0406	Theory + Practice	4	Nil

Course Objective

To understand optical phenomena.

- *To understand different light sources and their use*
- *Understand designing of microscope and artificial light sources*
- *Understanding optical fiber and its applications*

Course outcome

- *Students should understand optical phenomena.*
- *Students should learn about different light sources and their use*
- *Students should be able to understand optical fiber principle, operations and its applications.*

Evaluation System

	Component	% of Marks	Method of Assessment
Internal Examination	Internal	20	Written examination
	Assignment	30	Report and Presentation
External Examination	End Sem	30	Written examination
	Practice	20	Experiment followed by Viva
Total		100	

Practice I

Theory: Reflection and refraction of light. Mirror formula, lens maker's formula. Refraction through a prism. Dispersion, light sources: Principle and operations of sodium lamp, mercury lamp and LASER.

Lab:

1. To determine refractive index of the Material of a prism using sodium source.
2. To determine the dispersive power and Cauchy constants of the material of a prism using mercury source.
3. To determine the refractive index of glass slab using travelling microscope.
4. Designing of a compound microscope.

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Theory: Interference. Young's experiment, conditions for interference, Intensity distribution of fringes, Interference in thin films, Newton's rings.

Diffraction: types of diffraction, Fraunhofer diffraction at a single slit, diffraction at N-parallel slits and plane diffraction grating.

Polarization: Polariser and analyser, optical rotation and Polarimeter

Lab:

1. Determination of wavelength of light by Newton's ring method.
2. Determination of wavelength of LASER source by diffraction grating method
3. Thickness of thin paper by wedge-shaped films
4. Dispersive power and resolving power of a plane diffraction grating.
5. Polarimetry

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Theory: Optical properties—scattering, refraction, reflection, transmission & absorption. Introduction, principle of Laser, stimulated and spontaneous emission, Coherence (temporal and spatial) Ruby Laser, Application of Lasers.

Optical Fibres: Introduction, numerical aperture, step index and graded index fibres, attenuation

& dispersion mechanism in optical fibers (Qualitative only), application of optical fibres, optical communication (block diagram only)

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1. Measurement of attenuation and bending losses of an optical fibre.
2. Measurement of numerical aperture of a optical fibre
3. Study of spatial and temporal coherence of LASER

4. Making
of a light
guide

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1. *A Text Book of Optics by M.N. Avadhanulu, Brij Lal, N. Subrahmanyam, S Chand; 23rd Rev. Edn. References:*

2. *Optics by Ajoy Ghatak, McGraw Hill Education; 5 edition*

3. *Physics-I for engineering degree students by B.B. Swain and P.K.Jena.*

4. *Concepts in Engineering Physics by I Md. N. Khan.*

Centurion University of Technology and Management Odisha

COURSE STRUCTURE & SYLLABUS

BASKET - II



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**CENTURION UNIVERSITY OF TECHNOLOGY AND
MANAGEMENT**

School of Engineering & Technology

2018

CURRICULUM
COURSES OFFERED BY DEPARTMENT OF HUMANITIES AND
MANAGEMENT
BASKET - II

Course Code	Course Title	Course type	Credits	Prerequisite	Department Offering
FCHU1201	Foundations of English Communication	Workshop	2	Nil	Humanities
FCHU1202	Communicative Practice Laboratory -I	Workshop	2	Nil	Humanities
FCHU1203	Business Communication	Workshop	2	Nil	Humanities
FCHU1204	Communicative Practice Laboratory-II	Workshop	2	Nil	Humanities
FCHU1205	Corporate Readiness Laboratory	Workshop	2	Nil	Humanities
FCHU1206	IT Enabled Communication	Workshop	2	Nil	Humanities
FCHU1207	Career Communication	Workshop	2	Nil	Humanities
FCHU1208	Personality Development	Workshop	2	Nil	Humanities
FCHU1209	Seminar and Technical Writing	Workshop	2	Nil	Humanities
FCHU1210	Professional Etiquette	Workshop	2	Nil	Humanities
FCHU1211	Creative Writing	Workshop	2	Nil	Humanities
FCHU1212	English for Competition (GRE/GMAT/TOEFL/IELTS)	Workshop	2	Nil	Humanities
FCHU1213	Be a Contributor	Workshop	2	Nil	Humanities
FCHU0210	Life Skills Development (LSD) – I	Practice	2	Nil	Humanities
FCHU0211	Life Skills Development (LSD) – II	Practice	2	Nil	Humanities
FCHU0212	Life Skills Development (LSD) - III	Practice	2	Nil	Humanities
FCMG0114	Economics	Theory	2	Nil	Management
FCMG0102	Accounting & Finance	Theory	2	Nil	Management
FCMG0103	Management Processes and OB	Theory	2	Nil	Management
FCMG0104	Production and Operation Management	Theory	2	Nil	Management
FCMG0105	Marketing Management	Theory	2	Nil	Management
FCMG0108	Introduction to Research	Theory	2	Nil	Management

<i>FCMG0113</i>	<i>Indian Society and Culture</i>	<i>Theory</i>	<i>2</i>	<i>Nil</i>	<i>Management</i>
<i>FCMG0115</i>	<i>Human Rights</i>	<i>Theory</i>	<i>1</i>	<i>Nil</i>	<i>Management</i>
<i>FCMG0116</i>	<i>Introduction to Ethics</i>	<i>Theory</i>	<i>1</i>	<i>Nil</i>	<i>Management</i>
<i>FCMG1201</i>	<i>Disaster Management</i>	<i>Workshop</i>	<i>2</i>	<i>Nil</i>	<i>Management</i>
<i>FCMG1202</i>	<i>Ms Excel</i>	<i>Workshop</i>	<i>2</i>	<i>Nil</i>	
<i>FCMG0401</i>	<i>Gender Issues in Development</i>	<i>Theory+ Project</i>	<i>1</i>	<i>Nil</i>	<i>Management</i>

Note: The evaluation for Workshop type subject will be 100% internal by the concerned faculty.

SYLLABUS
FCHU1201 FOUNDATIONS OF ENGLISH COMMUNICATION

<i>Pre - requisites</i>	<i>Course Type</i>	<i>Credits</i>
<i>Nil</i>	<i>Workshop</i>	<i>2</i>

COURSE OBJECTIVES

To develop vocabulary and grammar knowledge

To develop reading comprehension skills

COURSE OUTCOMES

Development of academic and sub-technical vocabulary

Enhancement of basic language skills, i.e., listening, speaking, reading and writing

Development of grammatical competence

Confidence level improvement

This course aims to build the vocabulary, comprehension, and writing skills for effective communication in English language. It will focus on reading, listening to, and writing passages, as a means of learning communications skills.

The essential elements of this course will include:

MODULE-I: READING SKILLS (7hrs.)

Read **one** of the following books:

Animal Farm

Alice in Wonderland

Guide

Malgudi Days

Harry Potter

Amar Chitra Katha

Comprehension Skills: Students will respond to comprehension lessons from the chosen book.

MODULE-II: WRITING SKILLS (7hr.)

Students learn grammar and usage by writing passages, and getting formal feedback on these.

MODULE-III: LISTENING SKILLS (6hrs.)

Students respond to questions based on listening to videos, audio, or speaking assignments of classmates.

MODULE-IV: SPEAKING SKILLS (7hrs.)

Speaking assignments based on chosen book or contemporary topics.

TEXT BOOKS:

Esteras, Santiago Remacha and Fabre, Elena Marco. (2007). *Professional English in Use ICT Student's Book*. Cambridge: Cambridge University Press.

REFERENCES:

Grellet, F. (1981). *Developing Reading Skills*. Cambridge: Cambridge University Press

McCarthy, M. & O'Dell, F. (2008). *Academic Vocabulary in Use*. Cambridge: Cambridge University Press.

Ur Penny, (1992). *Five-Minute Activities: A Resource Book of Short Activities* (Cambridge Handbooks for Language Teachers). Cambridge: CUP

F Klippel. (1984). *Keep Talking*. Cambridge: CUP

EVALUATION SYSTEM (CONTINUOUS INTERNAL ASSESSMENT)

<i>Methods</i>	<i>Conversations-</i> <i>ation</i>	<i>Listening</i> <i>Comprehension</i>	<i>Book Review</i> <i>Presentation</i>	<i>Vocab.</i>	<i>Mid-I</i> <i>(Presentation)</i>	<i>Mid-II</i> <i>(Online)</i> <i>Common</i> <i>Errors</i>	<i>Mid-III</i> <i>(Written)</i>	<i>% of</i> <i>Marks</i> <i>100(Best 5)</i>
Total	20	20	20	20	20	20	20	100

S. No.	Topic	Pedagogy	Details	Instructional Hrs			
				Th	Pract	video	Proj
1	Getting to Know Each Other	Activity Based Learning	Catch the Ball Introductions Ice-breaker Share an interesting fact, stories, questions, memories, embarrassing moments or sometimes relevant to the context. Useful link: http://www.icebreakers.ws/small-group/catch-ball-introductions-icebreaker.html	0	1	0	0
2	Conversation Practice	Pair work using Realia	Formulaic Expressions Doing Things with Words/ Objects <u>Description:</u> Student practice real life situations like using maps, asking for directions, small talk on weather, holidays, parties and eating out.	0	1	1	0
3	Formal and Informal Communication	Degrees of Formality	Worksheet: Ask the students to work in small groups of 2/3. They must read through the phrases in the table, deciding whether each phrase is formal or informal in conversation a conversation situation. When they have finished, review the exercise as a class (answers provided in the worksheet)	0	1	1	0

S. No.	Topic	Pedagogy	Details	Instructional Hrs			
				Th	Pract	video	Proj
4	Shadowing	Pronunciation – intonation, stress, pause	Find an Audio to Listen & Repeat – BBC News, Seminar Talk, Ted Talk etc. https://www.youtube.com/watch?v=GVWFGIyNswI	0	1	1	0
5	Speech Acts	Plain English	Students can 'become' anyone they like for a short time! They will be encouraged to come forward and perform small speech acts and role-plays.	0	1	0	0
6	Ask Me Questions Challenge	Questions & Responses	Individual to respond- the whole class to ask questions. In this session, a student will learn communication management.	0	1	0	0
7	TED Talk Listening	Listening Comprehension	Ice-breaker: Talkathon Assignment: In groups of 4, you are going to create/write 10 questions about the TED Talk Afterwards, the groups of 4 will split up in new groups of 4 to discuss and compare their questions. Comprehension Test	0	1	1	0
8	Ted Talks	Communication & Confidence Body Language	Listen to a Ted Talk & make a presentation on a popular/contemporary topic	0	1	1	0
9	Reading Comprehension	Pre-reading	Students are encouraged to read any two books in the first semester. [Animal Farm/Old Man and The Sea/ Guide/Malgudi	0	1	1	0

	<i>Strategies - 1</i>		<i>Days/Amar Chitra Katha]</i>				
10	<i>Reading Comprehension Strategies - 2</i>	<i>Mid - reading</i>	<i>Students respond to comprehension lessons from the chosen books. [Comprehension Passages, Gap filling and Sentence Completion]</i>	0	1	1	0
11	<i>Reading Comprehension Strategies - 3</i>	<i>Post Reading</i>	<i>Students respond to comprehension lessons from the chosen books. [Summarizing/ Narrating/ Enacting/Vocabulary Quiz/]</i>	0	1	0	0
12	<i>Book Review</i>	<i>Writing Short Passages/ Paragraphs</i>	<i>Write a review of your favorite book in at least 250 words. Mention 3 specific learnings and 3 distinct ways in which you plan to incorporate them in your life. To choose from the recommended books.</i>	0	1	0	0
13	<i>News Reading</i>	<i>7 Cs of Communication</i>	<i>Group Activity: Campus/ National News Reading Students read notice boards and visit departments Prepare campus news headlines Present in the class</i>	0	1	0	0

S. No.	Topic	Pedagog	Details	Instructional Hrs			
				Th	Pract	video	Proj
14	<i>Writing to the Point</i>	<i>Word Usage and Sentence Structure Main Idea, Coherence & Cohesion</i>	<i>Each group is seated in a circle. In this activity, the leader of each group cannot see (either blind or blind fold using a handkerchief), but can hear the peer voice. Ask the leader to flip through the pages, and put the finger randomly on fifteen words from the chosen book in five minutes. The other participates copy the words that are closest to the finger. This time bound activity increases the curiosity of the students and engages them in exciting communication and completion of the task. Then, I ask the students to shape the randomly chosen disconnected words into a short poem/story/essay by adding a title to it. Read Out Loud in the Class</i>	0	1	0	0
15	<i>Word Power</i>	<i>Synonyms & Antonyms</i>	<i>App: SPEAK ENGLISH</i>	0	1	1	0
16	<i>Homonyms</i>	<i>Some confusable words Minimizing errors through discussions</i>	<i>Activity: Select the correct option, Use the confusables in sentences to bring out their meaning</i>	0	1	0	0
17	<i>Reading and Writing about visuals</i>	<i>Useful Expressions</i>	<i>Presentation about visuals Task: Selecting information from a visual</i>	0	1	0	0

18	Word Formation	Word structure Word hunt Vocabulary explorations	Group Activity: Students make word clouds	0	1	0	0
19	Vocabulary Building	Descriptive words	Activity : Describe yourself/ your favorite person using 5 descriptive words	0	1	0	0
20	Listen to Popular Songs	Verb tense and aspect of grammar Vocabulary Idioms and expressions	Listen to the song with lyrics Ask questions about the title Gap Filling Exercises	0	1	0	0
21	Vocabulary Development	Word Power	Quiz/ Puzzle	0	1	0	0
22	Grammar	Common Errors	Surprise Quiz & debriefing	0	1	0	0
23	Grammar	Correct Usage	Easy Grammar App-Practice Sets	0	1	0	0
24	English Language Enhancement-I	Tenses	Usage, Question and explanation Fill in the blanks	0	1	0	0
25	English Language Enhancement -II	Active and Passive	I am passive..../I am active activity	0	1	0	0
26	English Language Enhancement-III	Reported Speech	Assignment & debriefing	0	1	0	0
27	English Language Enhancement -IV	Subject-verb agreement	Online Quiz & debriefing	0	1	0	0
28	Learn Grammar with Fun	Conditionals	Activity: The whole class is divided into The Zero Conditional, The First conditional, The Second conditional, and The Conditional to perform the task	0	1	0	0

FCHU1202 COMMUNICATIVE PRACTICE LABORATORY –I

<i>Pre - requisites</i>	<i>Course Type</i>	<i>Credits</i>
<i>Nil</i>	<i>Workshop</i>	<i>2</i>

The language laboratory acts as a platform for learning, practicing and producing language skills through interactive lessons and communicative mode of teaching.

COURSE OBJECTIVES

To expose the students to a variety of self- instructional, learner- friendly modes of language learning.

To enable them to learn better pronunciation through stress on word accent, intonation, and rhythm.

To maintain good linguistic - through accuracy in grammar, pronunciation and vocabulary.

COURSE OUTCOMES

Ability to communicate fluently in different business situation

Effective oral and written communication

Appropriate word usage with correct pronunciation

Clarity of word stress and intonation

A student is required to take up five lab tests of 100 marks- three tests in spoken mode and two tests in written mode.

MODULE-I: FRIENDLY COMMUNICATION (9 HOURS)

Doing Things with Words: To ask for information, help, permission; To instruct, command, request, accept, refuse, prohibit, persuade

Practice of Formulaic Expressions: Greetings, farewells, introductions, thanks, apologies, regrets, good wishes, congratulations, condolences, offers.

Conversation Practice in familiar and unfamiliar situations

(This module will be practiced through conversation activities in pairs & groups)

MODULE-II: GRAMMAR AND VOCABULARY (9 HOURS)

The focus will be on the appropriate usage of language.

Elimination of common errors

Editing passages

Word power A-Z: Easy and quick techniques

Vocabulary building exercises

(Open Source Language Laboratory will be used to take quizzes and practice grammar & vocabulary)

MODULE-III: PHONETICS AND SPOKEN ENGLISH (12 HOURS)

Students will be trained to find out the correct pronunciation of words with the help of a dictionary /software, to enable them to monitor and correct their own pronunciation.

Pronunciation Guidelines: Consonants and Vowels

Pronunciation practice (for accent neutralization), particularly of problem sounds, in isolated words as well as sentences

Speaking Techniques: Using correct stress patterns, developing voice quality

Rhythm and Intonation

(Reading aloud of dialogues, speeches etc. for practice in pronunciation)

(In this module, the learners will use video series from BBC & Sky Pronunciation Suite to improve spoken English)

TEXT BOOKS:

Dwyer, J. (2000). *The Business Communication Handbook*. New Jersey: Prentice Hall.

REFERENCES:

Brown, G & Yule, G. (1983). *Teaching the Spoken Language*. Cambridge: Cambridge University Press.

Brown, H. D. (1994). *Teaching by Principles: An Interactive Approach to Language Pedagogy*. New Jersey: Prentice Hall.

EVALUATION SYSTEM (CONTINUOUS INTERNAL ASSESSMENT)

Methods	Role play	Speech Acts	Grammar Quiz	Story Telling	JAM	Vocabulary-Exercise	Vocabulary-Quiz	% of Marks 100(Best 5)
Total	20	20	20	20	20	20	20	100

SESSION PLAN: COMMUNICATIVE PRACTICE LABORATORY -1**MODULE I: FRIENDLY COMMUNICATION (9 HOURS)**

S. No.	Topic	Pedagogy	Details	Instructional Hrs.			
				Th	Prac	Vide o	Pro j
Lab-1	Ice-Breaking/ Introductory Session	Name Game and Other Ice-breaking Activities	Knowing Each Other http://www.buzzle.com/articles/classroom-icebreaker-activities-for-students.html http://cutmlanguagelab.org/course/view.php?id=3	0	2	0	0
Lab -2	Conversation Practice-I	Role Plays OSLL (Moodle)	Speech Acts/ Formulaic Expression http://cutmlanguagelab.org/course/view.php?id=3	0	2	0	0
Lab -3	Conversation Practice-Ii	Small Skits	Small Skits Using Formulaic Expressions http://www.lazybeescripts.co.uk/Scripts/Results.aspx?iSh=5&iSk=1&iMR=11&iXR=15&iPo=2&iI7=1&iAS=2&iPS=2 http://cutmlanguagelab.org/course/view.php?id=3	0	2	0	0

MODULE II: GRAMMAR AND VOCABULARY (12 HOURS)

S. No.	Topic	Pedagogy	Details	Instructional Hrs.			
				Th	Prac	Vide o	Pro j
Lab-4	Elimination of Common Grammatical Errors	Quiz OSLL (Moodle)	Emphasis on Tense, Verbs, Modals, Conditionals, Active and Passive Voice, Statements, Questions and Responses, Articles, Preposition & Concord http://cutmlanguagelab.org/course/view.php?id=3 http://www.learnenglishfeelgood.com	0	2	0	0

Lab - 5	Document Makeover	Assignment OSL (Moodle)	Editing passages: Grammatical and Construction errors http://cutmlanguagelab.org/course/view.php?id=3	0	2	0	0
Lab - 6	Vocabulary Building- Word Power	Assignment and Online practice	http://a4esl.org/ http://cutmlanguagelab.org/course/view.php?id3	0	2	0	0
Lab - 7 & 8	Vocabulary Building	Assignment and Online practice	Synonyms, Antonyms, Homophones, One-Word Substitution, Phrasal Verbs http://www.majortests.com/word-focus/vocabulary-tests.php http://www.grammarbank.com/synonyms-antonyms-worksheet.html http://cutmlanguagelab.org/course/view.php?id3	0	2	0	0

MODULE-III: PHONETICS AND SPOKEN ENGLISH (12 HOURS)

S. No.	Topic	Pedagogy	Details	Instructional Hrs.			
				Th	Prac	Vide o	Pro j
Lab -9	Phonetics-I	Online Practice OSL (Moodle)	Phonemic Transcription Using IPA Symbols, Stress Pattern in Words and Phrases http://usefulenglish.ru/phonetics/practice-consonants http://www.agendaweb.org/phonetic.html http://cutmlanguagelab.org/course/view.php?id=3 https://www.youtube.com/watch?v=htmkIboG9Q	0	1	1	0
Lab -10	Phonetics-Ii	Online Practice OSL (Moodle) Sky Pronunciation Suite	Rhythm and Intonation http://www.learning-english-online.net/areas/pronunciation/stress-and-intonation/ http://www.tolearnenglish.com/english_lessons/intonation-exercises http://cutmlanguagelab.org/course/view.php?id=3	0	2	0	0
Lab -11	Event Narration, Story Telling	Assignment	http://gdpi.hitbullseye.com/other-selection-tools-extempore.php http://cutmlanguagelab.org/course/view.php?id=3 http://grammar.about.com/od/developingessays/a/topnarrative07.htm	0	2	0	0

Lab -12	Speaking - Jam, Extempore	Activity Based OSLL (Moodle)	http://orelt.col.org/module/unit/3-practice-public-speaking http://cutmlanguagelab.org/course/view.php?id=3 https://www.youtube.com/watch?v=wV66cH5uQ https://www.youtube.com/watch?v=Mm-4T7qQS4	2	0	0
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FCHU1203 BUSINESS COMMUNICATION

<i>Pre - requisites</i>	<i>Course Type</i>	<i>Credits</i>
<i>Nil</i>	<i>Workshop</i>	<i>2</i>

COURSE OBJECTIVES

The course on Business Communication focuses on the basic skills required to be an effective communicator. It aims at imparting the communication skills that are needed in the academic and professional pursuits.

This is directed towards helping the students gain skills in comprehension, group discussions, presentations, interviews, active listening, technical writing and the ability to manage cross-cultural interactions. The focus is on the difficulty experienced by individual students, and the effort to explore a useful strategy for self-improvement. This is achieved through an amalgamation of lecture oriented approach of teaching with the task based skill oriented methodology of learning.

COURSE OUTCOMES

Understand the differences between general communication and business communication

Development of basic language skills, i.e., listening, speaking, reading and writing

Effective participation in group discussion and job interviews

MODULE-I: UNDERSTANDING COMMUNICATION IN BUSINESS (8 hrs.)

The module is a guide to organization communication. It is directed towards enabling students to develop the skills necessary to manage the human resources of their organization.

General Communication and Business Communication

Communication in Organizational Settings: Patterns of Communication in the Business World

– Upward, Downward, Horizontal Grapevine etc, Channels of Communication- Internal and External, Formal and Informal

Introduction to Cross Cultural Communication

Strategies to Overcome Communication Barriers

MODULE-II: READING AND WRITING (10 hrs.)

This unit works on the competency in reading and writing skills through such tasks/activities as reading books, articles, magazines, novels, developing outlines, key expressions, situations, slogan writing and theme building exercises, dialogue writing, interpreting pictures, technical writing.

Importance of Developing Reading Skills

Sub-Skills of Reading: Predicting Content, Skimming & Scanning, Topic sentence and supporting details, Inferential Reading, Guessing the Meaning of Unfamiliar Words, Note Making

Importance of Writing Skills and Principles of Effective Writing

Writing Process: Pre-writing, Drafting and Re-Writing

Paragraph Writing

Summaries and Abstracts

Business Correspondence: Writing Business Letters, E-mail Messages, Memo, Notice, Circulars, Reports, Proposals

Career Communication: Writing Resume/ CV and Job Application Letter

MODULE-III: LISTENING AND SPEAKING (9 HOURS)

Listening is the mother of all speaking. This unit aims to achieve competence in speaking i.e., the ability to communicate orally in clear, coherent, and persuasive language appropriate to purpose, occasion, and audience. The module focuses on developing this competency which includes acquiring poise and developing control of the language through experience in making presentations to small groups, to large groups, and through the media.

Listening Skills: Listening Process, Hearing and Listening, Types and Barriers, Effective Listening Strategies

Common forms of Oral Communication in the Business World:

Meetings: Organize Meetings, Preparing an Agenda, Chairing a Meeting, Drafting Resolutions, Writing Minutes

Persuasive Speaking: Improving Fluency and Self-Expressions, Articulation, Good Pronunciation, Voice Quality

Making an Oral Presentation: Planning, Preparing and Delivery

Facing an Interview: Preparation, Types of Interview, Do's and Don'ts

Group Discussions: Debate and GD, Types of GD, GD Etiquette

(Treatment: Developing listening and speaking skills through various activities, such as role play activities, practicing short dialogues, JAM, group discussions, debates, speeches, listening to news bulletins, viewing and reviewing documentaries and short films etc.)

TEXT BOOKS:

An Introduction to Professional English and soft skills by B.K Das et al., Cambridge University Press

REFERENCES:

Effective Technical Communication, M. Ashraf Rizvi, TMH Publications.

Business Communication, Krizan. Merrier. Logan. Williams, Thomson

Business Communication Today, Courtland L Bovee, John V Thill & Mukesh Chaturvedi, Pearson Education.

Business communication by Meenakshi Raman and Prakash Singh (Oxford)

Business Communication, Urmila Rai & S.M Rai, Himalaya Publishing House

EVALUATION SYSTEM (CONTINUOUS INTERNAL ASSESSMENT)

Methods	Role Plays (Org. Comm.)	Reading Comprehension & Note – Making	Listening & Individual Presentation	GD	Mid-I (Online Test on Vocabulary)	Mid-II (Written exam on module 2)	Mid-III (Oral Presentation)	% of Marks 100 (Best 5)
Total	20	20	20	20	20	20	20	100

SESSION PLAN: BUSINESS COMMUNICATION

S. No.	Topic	Pedagogy	Details	Instructional Hrs			
				Th	Pract	video	Proj
1	Introduction To Business Communication	Business games Written Assignment	What is Business Communication? General Communication vs. Professional Comm. Das, AIPE & SS,	0	1	0	0
2	General Communication & Business Communication	Audio-visual clips Communication game- Change your style	Difference in Style Degrees of Formality pp. 6-7 http://christopherhouse.blogspot.in/2012/08/difference-between-business.html	0	1	0	0

3	Communication In Organisational Settings	Small group work Role Plays Quiz	Internal Communication: Formal Communication Network Informal Communication Network External Communication Raman, BC, pp- 13-21 http://keydifferences.com/difference-between-formal-and-informal-communication.html	0	1	0	0
4	Understanding The Importance Of Cross-Cultural Communications	Flip class- Match your points Role Plays	The Global Marketplace The Multicultural Workforce Krizen, BC, Chapter 2 & Bovee, BCT, pp. 63- 65 http://study.com/academy/lesson/cross-cultural-communication-definition-strategies-examples.html	0	1	0	0

S. No.	Topic	Pedagogy	Details	Instructional Hrs			
				Th	Pract	video	Proj
5	Improving Intercultural Sensitivity	Communication Games and activities	Recognise Cultural Differences Overcome Ethnocentrism Study other Cultures Overcome Language Barriers Develop Effective intercultural Skills Bovee, BCT, pp. 66-82	0	1	0	0
6	Over Coming Miscommunication	Workshop (Emphasis on listening skill)	The Information Gap principle Organizational Structure Difference in Status Incorrect Choice of Medium Message Complexity Cultural Differences Psychological Barriers Noise, and barriers http://www.businesscoachphil.com/overcoming-miscommunication-at-work Raman, BC, pp.22-27	0	1	0	0
7	Strategies For Improving Organisational Communication	Good Listener Case Studies Role plays & presentations	Open Feedback, Simple Language, Avoid Overload, Walk the Talk http://debo10199businesscommunication.blogspot.in/2012/02/strategies-for-improving-organizational.html Raman, BC, pp.34-40	0	1	0	0

MODULE II: READING AND WRITING

S. No.	Topic	Pedagogy	Details	Instructional Hrs			
				Th	Pract	video	Proj
8	Importance Of Developing Reading Skills & Reading Strategies	Reading News clips	The Importance of Developing Reading Skills Vocabulary Skills Word Meaning Recognition Guessing the Meaning from Word Structure and Context Guidelines for Improving Reading Skill Types of Reading	0	1	0	0

			<i>Tips for Improving Reading Speed</i> Rizvi, ETC, pp. 219- 224 http://www.nclrc.org/essentials/reading/stratread.htm				
9	<i>The Sub-Skills of Reading</i>	<i>Guessing Game</i>	<i>Understanding the Main Idea and Supporting Details</i> <i>Reading between the Lines: Inferential Reading</i> <i>Understanding the Writer's Point Of View</i> <i>Making Predictions</i> · <i>Guessing the Meanings of Unfamiliar Words</i> · <i>Skimming and Scanning</i> Rizvi, ETC, pp. 228-250 http://literallycommunication.blogspot.in/2013/06/reading-skills-and-its-sub-skills.html	0	1	0	0
10	<i>Note-Making</i>	<i>Topicalizing</i> <i>Schematising</i> <i>Use of</i> <i>Reduction</i> <i>Devices</i> <i>Methods of</i> <i>Sequencing</i> <i>Practice in Note</i>	<i>Mechanics of Note Making</i> <i>Note Writing Techniques</i> Rizvi, ETC, pp.273-289 · http://www2.le.ac.uk/offices/ld/resources/study/notes	0	1	0	0

S. No.	Topic	Pedagogy	Details	Instructional Hrs			
				Th	Pract	video	Proj
11	<i>Importance of Writing Skills</i>	<i>Tasks on small paragraphs</i> <i>Creative writing</i>	<i>Writing Process: Pre-writing, Drafting and Re-writing Idea</i> <i>Mapping Writing and Editing</i> Rai, BC, pp. 182-192 http://smallbusiness.chron.com/importance-writing-skills-business-845.html	0	1	0	0
12	<i>Paragraph Writing</i>	<i>Written Assignment</i> <i>Developing story outline</i>	<i>Unity in writing</i> <i>Topic sentence</i> <i>Chronological order of development</i> <i>Using Connectives</i> <i>Organizing a Paragraph</i> <i>Adequate Development of supporting details</i> <i>Cohesion & Coherence in a Paragraph</i> Rizvi, ETC, pp.337-350 http://www.wikihow.com/Write-a-Paragraph	0	1	0	0
13	<i>Summaries & Abstracts</i>	<i>Written Assignment based on guidelines</i>	<i>Differences between Abstract and Summary</i> <i>Procedure for Writing Abstracts</i> <i>Procedure for writing summary</i> Rizvi, ETC, pp.290-307 http://www.uts.edu.au/current-students/support/helps/self-help-resources/academic-writing/abstract-and-executive-summary	0	1	0	0
14	<i>Writing Business Letter &</i>	<i>Written Assignment based on</i>	<i>Purpose & goal</i> <i>Principles of effective letter writing: Courtesy and consideration, Directness and</i>	0	1	0	0

	<i>Proposal</i>	<i>guidelines</i>	<i>conciseness, Avoid verbosity, Participial endings, Positive and direct statements, Clarity and precision Structure and layout Rizvi, ETC, pp.351-365 & Raman, BC, PP.256-260 http://www.writing-business-letters.com/business-proposal-letter.html</i>				
15	<i>Memo, Notice, Circulars & Email</i>	<i>Written Assignment based on guidelines</i>	<i>What is a Memo? Email writing format Characteristics of Effective Memo Difference between notice and circular Essentials of notice and notice format Rizvi, ETC, pp.423-436 http://www.umuc.edu/writingcenter/writingresources/effective_memos.cfm http://www.englishtransform.com/2014/04/difference-between-circular-memo-notice.html</i>	0	1	0	0
16	<i>Reports</i>	<i>Written Assignment based on guidelines</i>	<i>Definition and Types Deciding on Format and Length Structure / Parts of Formal Report Topics Covered in a Report Introduction, Body and Closing Krizen, BC, pp 259-303 & Rizvi, ETC, pp. 452-467 http://cgu.edu/pages/852.asp</i>	0	1	0	0

TREATMENT: Tasks/activities as reading books, articles, magazines, novels, developing outlines, key expressions, situations, slogan writing and theme building exercises, dialogue writing, interpreting pictures, technical writing.

MODULE III: LISTENING AND SPEAKING

S. No.	Topic	Pedagogy	Details	Instructional Hrs			
				Th	Pract	video	Proj
17	<i>Listening Skills</i>	<i>Effective Listening Strategies TED Talks: Listening and individual presentation</i>	<i>Listening Process Hearing and Listening Types and Barriers Rizvi, ETC, pp. 59-75 Video : https://www.youtube.com/watch?v=C8zNx_IarUw</i>	0	1	0	0
18	<i>Listening Attentively</i>	<i>News video clips and quizzing</i>	<i>Overall comprehension Extracting Detail information Listening between the lines Note taking Video https://www.youtube.com/watch?v=t2z9mdX1j4A</i>	0	1	0	0
19	<i>Persuasive Speaking</i>	<i>Inspirational audio-video clips for language</i>	<i>Communication module for persuasive meeting Feed back Taking care of non-verbal elements Decoding message Handling noise</i>	0	1	0	0

		improvement	Raman, BC, pp. 123- 169 & Rizvi, ETC, pp.195 -218 Video: https://www.youtube.com/watch?v=NBObNfR2n_4 Reference: http://www.speaking.pitt.edu/student/public-speaking/persuasive.html				
20	Oral Presentation	Individual presentation on Events	Improving Fluency and Self-Expressions Articulation Good Pronunciation, Voice Quality Planning & Preparing your Oral Presentation Types of Delivery Guidelines for Delivery: Verbal elements, non-verbal elements, visual elements Practice delivery elements Controlling Nervousness and Stage fright Handling questions responsively narration/JAM Raman, BC, pp. 123- 169 & Rizvi, ETC, pp.195 -218 http://www4.caes.hku.hk/epc/presentation/VIDEO https://www.youtube.com/watch?v=WJIOZfLQ5w4	0	2	0	0
21	Group Discussions	GD Sessions on current/ social issues	Nature of Group Discussion Characteristics of Group Discussion Skills Selection Group Discussions Subject knowledge Oral communication skills Team management Group Discussion Strategies Role Functions in Group Discussions Rizvi, ETC, pp 165-187 https://www.youtube.com/watch?v=ymcMo7JWSu8 http://placement.freshersworld.com/what-is-group-discussion/33122049	0	2	0	0
22	Group Discussions	GD Sessions on current/ social issues	Debate and GD Types of GD GD Etiquette		1		
23	Revision	TUTORIAL	Module - I		1		
24	Revision	TUTORIAL	Module - I		1		
25	Revision	TUTORIAL	Module - I		1		

FCHU1204 COMMUNICATIVE PRACTICE LABORATORY –II

<i>Pre - requisites</i>	<i>Course Type</i>	<i>Credits</i>
<i>Nil</i>	<i>Workshop</i>	<i>2</i>

The suggestive assignments in the laboratory are intended as learning activities to facilitate the students in accomplishing the language skills which are needed to succeed in the business world.

COURSE OBJECTIVES

To master Study Skills

To acquire strategic competence to use both spoken & written language to use in a wide range of communication strategies

To acquire Business Performance Skills

COURSE OUTCOMES

The students will be able to

Write effectively for a variety of professional and social settings. They will practice writing as a process of motivated inquiry engaging others writers' ideas as they explore and develop their own. They will demonstrate an ability to revise for content and edit for grammatical and stylistic clarity. And they will develop an awareness and confidence in their own voice as a writer. Become accomplished, active readers who appreciate ambiguity and complexity, and who can articulate their own interpretations with an awareness and curiosity for other perspectives.

Demonstrate the skills needed to participate in a conversation that builds knowledge collaboratively; listening carefully and respectfully to others' view points; articulating their own ideas in relation to other voices and ideas. Students will be able to prepare, organize and deliver and engaging oral presentation.

A student is required to take up five lab tests of 100 marks- at least two tests in written mode and three tests in spoken mode.

MODULE-I: LISTENING (6 HOURS)

Exercises on Active Listening: The whole group listens to any speech/news broadcast in English and notes down the important points. They listen again to check their points and evaluate themselves. The group then compares points to see how well they have understood the broadcast.

MODULE- II: SPEAKING (8 HOURS)

Situational Dialogues / Role Play: Organization Communication

Oral Presentations- Prepared and Extempore

'Just a minute' Sessions (JAM)

Debates

Mock Meetings

Cracking Job Interviews: Mock Sessions

Group Discussions on current topics

(This module will be practiced through speaking activities like role plays, presentations, and discussions)

MODULE-III: READING (8 HOURS)

Students will be given practice in reading and comprehension 6-8 passages of 100-300 words each, on topics of General as well as professional interest. The texts will be supported by suitable exercises designed to foster comprehension skills and vocabulary enrichment. Students are encouraged to read newspapers, articles, books and novels.

Reading Comprehension Exercises Through Tests, Writing Summary and Presenting, Note Making

Review Presentation (Movie/ Article/ Book)

Vocabulary Building Exercises

(This module encourages extensive use of reading materials)

MODULE-IV: WRITING (8 HOURS)

The Writing Lab content is designed to acquaint the students not only with the techniques of effective writing but also give them an insight into planning and writing documents that produce results.

Short Paragraphs on current general and technical topics

Creative Writing: Idea Generation

Business Letters, Email Messages, Project Writing

Writing Resumes and Cover Letters

(* Students will be required to produce and submit by the end of second semester a 350-500 word project report on a topic of their choice. The project should involve data collection, analysis and reporting. Ten marks (out of 100 marks allocated for Lab Test) will be set apart for the project.)

TEXT BOOK:

An Introduction to Professional English and soft skills by B.K Das et al., Cambridge University Press

REFERENCES:

Effective Business Communication, AshaKaul, Prentice Hall

Professional Communication, ArunaKoneru, TMH

EVALUATION SYSTEM (CONTINUOUS INTERNAL ASSESSMENT)

Methods	Listening Skills	Movie Review	Role Plays	Group Discussion	Mock Interview	JAM	Vocabulary/ Comprehension	% of Marks
Total	20	20	20	20	20	20	20	100(Best 5)

SESSION PLAN: COMMUNICATIVE PRACTICE LABORATORY –II

MODULE I: LISTENING (6 HOURS)

S No.	Topic	Pedagogy	Details	Instructional Hrs			
				Th	Pract	Video	Proj
Lab-1	Introduction and Ice Breakers	Activity - Based	Knowing Each Other, People's Bingo http://cutmlanguagelab.org/course/view.php?id=4	0	2	0	0
Lab - 2	Exercises On Active Listening	Activity Based	Feedback, Note Taking, Summarizing, Paraphrasing and Non-verbal Cues http://cutmlanguagelab.org/course/view.php?id=4 https://www.youtube.com/watch?v=cSohjLYOI2A	0	1	1	0
Lab - 3	Movie Review Presentation	Activity Based	The October Sky/ In Pursuit of Happiness/A Beautiful Mind/ Any Other http://cutmlanguagelab.org/course/view.php?id=4	0	1	1	0

MODULE II: SPEAKING (8 HOURS)

S. No.	Topic	Pedagogy	Details	Instructional Hrs			
				Th	Pract	Video	Pro
Lab-4	Organization Communication	Role play	Business Situations and Mock Meeting http://cutmlanguagelab.org/course/view.php?id=4 http://eduscapes.com/distance/course_activities/simulations.htm https://www.youtube.com/watch?v=3X51J-ZDMmE	0	2	0	0
Lab - 5	Oral Presentations	Activity OSLL (Moodle)	Prepared and Extempore/ Debate / 'Just a Minute' Talk (JAM) http://cutmlanguagelab.org/course/view.php?id=4	0	2	0	0
Lab - 6	Interview /Group Discussion	Mock Interview /Group Discussion OSLL (Moodle)	Frequently Asked Questions (FAQs) Discussion on Current Topics - General, Social, Political, Management, Creative, Education and Sports http://cutmlanguagelab.org/course/view.php?id=4 https://www.youtube.com/watch?v=ymcMo7JWSu8 https://www.youtube.com/watch?v=7gcsZ9H2I6s	0	2	0	0

MODULE-III: READING (8 HOURS)

S. No.	Topic	Pedagogy	Details	Instructional Hrs			
				Th	Pract	Video	Pro
Lab -7	Reading Assignment - I	Assignment , online practice and discussion	Reading abridged texts, relevant topics, and news articles http://cutmlanguagelab.org/course/view.php?id=4	0	2	0	0
Lab -8	Reading Assignment - Ii		Reading for comprehension and vocabulary http://cutmlanguagelab.org/course/view.php?id=4 http://www.majortests.com/sat/reading-comprehension.php	0	2	0	0

MODULE-IV: WRITING (8 HOURS)

S. No.	Topic	Pedagogy	Details	Instructional Hrs			
				Th	Pract	Video	Pro
Lab -9	Writing Short Paragraphs - General,	Assignment, online practice	Write, Rewrite, Expand, Correct, Complete, and Improve Paragraphs http://cutmlanguagelab.org/course/	0	2	0	0

	<i>Current and Technical Topics</i>	<i>and discussion</i>	view.php?id4				
Lab -10	<i>Idea Generation and Creative Writing</i>	<i>Assignment and discussion</i>	<i>Problem solving/decision making, Strategy development, Outline a proposal, Create a timeline Collaboration technique, Expression of creativity, Condensing various thoughts, Put visuals and text together</i> http://cutmlanguagelab.org/course/view.php?id=4	0	2	0	0
Lab -11	<i>Memo Writing & Emails</i>	<i>Assignment and discussion</i>	<i>Adopt the steps of writing process for preparing of memo and emails</i> http://cutmlanguagelab.org/course/view.php?id=4 https://www.youtube.com/watch?v=6zHLHc9CcvQ	0	2	0	0
Lab -12	<i>Preparation Of Business Reports/ Proposals And Presentation</i>	<i>Project Work and discussion</i>	<i>Adopt the steps of writing process for preparing business reports and proposals</i> http://cutmlanguagelab.org/course/view.php?id=4 mails https://www.youtube.com/watch?v=eLKVRDBAMyQ	0	2	0	0

FCHU1205CORPORATE READINESS LABORATORY

<i>Pre - requisites</i>	<i>Course Type</i>	<i>Credits</i>
<i>Nil</i>	<i>Workshop</i>	<i>2</i>

A real-time project approach in the laboratory is intended to provide a developmentally appropriate ambience, make the students proactive, encourage and motivate as well as develop skills to become a good listener, good communicator and responsible. A student will experience the challenging application process and at the same time prepare for the challenging world. The experience gained from working on projects can help one understand the appropriate and effective use of language skills. It also creates context in which learners engage in purposeful communication.

All communication activities are supported with the help of live projects on general techno-management or local themes which provide exposure to the students and help them to find a suitable job in the industry.

A student is required to take up five laboratory tests of 100 marks.

COURSE OBJECTIVES

Understand the process of communication

View communication from the perspective of each stakeholder

Plan and manage communication difficulties

Learn exactly how, when and what of communication

COURSE OUTCOMES

Understanding the convention of project report

Understanding the process of data collection and documentation

Preparation and presentation of project report

Preparation for various academic and professional needs

INSTRUCTION AND DELIVERY

Instruction- led facilitation highlights interactions between students and their facilitators, and emphasizes guidance from the facilitator who will track, assess and mentor them.

Students will make a team of four members who will take up real problems and run through the semester trying to solve the problems. The lab program will augment this learning with the right theory.

Participants will use PPTS, flash presentations or high impact presentations, flip charts, blogs, boards with graphical or pictorial representations, with captions and outlines, video display or any other best mode of presentation, post-it notes and group activities to document all processes and methodology.

OUTLINE

LAB1: Introduction to the Lab Program (Session will be driven by the Facilitators)

(Structure, Objective, Methodology, Objective of Choosing Project as a Vehicle to Learn the Course, Process of Carrying out the Project, Announcing the List of Projects)

LAB2: Discussion on Project Approach and Communication (Session will be driven by the Facilitators)

LAB3: Win Your Project: A Presentation by Groups (Session will be driven by the Students)

LAB4: Project Plan Presentation by Groups (Session will be driven by the Students)

LAB5: Review of Weekly Status Reports by the Guide, and Discussions (Session will be driven by the Students)

LAB6: Progress Presentation by Groups, and Feedback by Guide and Co-Guide (Session will be driven by the Students)

LAB7: Review of Documentation File/Dossier, and Feedback by Guide

LAB8: Progress Presentation and Submission of Dossier Containing Documentary Notes

(E.g., compilation of weekly status reports, minutes, photocopies of emails, feedbacks, testimonials, photographs)

LAB 9: Presentation on the Project, Feedback by the Guide and Co-guide

LAB 10: Final Presentation by Groups in front of a Panel and Submission of Project Work

TEXT BOOK:

The Essential Guide to Doing your Research Project by O'LEARY (2011)

REFERENCES:

Logical Framework Analysis, Capacity Building Workshop for Dryland Management, May 3-5, 2000

Professional Presentations by Goodale (2007)

EVALUATION SYSTEM (CONTINUOUS INTERNAL ASSESSMENT)

Methods	Win Your Project	Project Plan Presentation	Weekly Reports	Progress Presentation	Project Presentation	Documentation	Project Report	% of Marks 100 (Best 5)
Total	20	20	20	20	20	20	20	100

S. No.	Topic	Pedagogy	Details	Instructional Hrs			
				Th	Pract	video	Proj
1	Introduction to the Lab Program	Project-based Learning Discussion Beyond the class Learning	Structure, Objective, Methodology, Objective of Choosing Project as a Vehicle to Learn the Course, Process of Carrying out the Project (Session will be driven by the Facilitators)	0	2	0	0
2	Announcing the List of Projects		Topics available in OSLL (Moodle) http://cutmlanguagelab.org/	0	1	0	1
3	Project Approach & Communication		(Session will be driven by the Facilitators) https://www.youtube.com/watch?v=IybtFwYb7Oc	0	1	0	1
4	Win Your Project		Rationale for choosing the project topic What makes you say that you deserve the project?/ Why should we give you the project (Session will be driven by the Students)	0	1	0	1
5	Project Plan		Stakeholder Analysis, Objective Analysis, Situation Analysis, Problem Analysis, Strategy Analysis (Session will be driven by the Students)	0	1	0	1
6	6Review of Weekly Status		Dossier Verification/Reports by the Guide	0	1	0	1
7	Review of Progress	Project-based Learning Group	Progress Presentation by Groups, and Feedback by Guide and Co-Guide (Session will be driven by the Students)	0	1	0	1
8	Documentation Review	Presentation with Facilitator Beyond the class Learning	Review of Documentation File/Dossier, and Feedback by Guide	0	1	0	1
9	Progression Presentation	Project-based Learning	Progress Presentation and Submission of Dossier Containing Documentary Notes	0	1	0	1

	<i>and Report Submission</i>	<i>Presentation and Report Writing Beyond the class Learning</i>	<i>(E.g., compilation of weekly status reports, minutes, photocopies of emails, feedbacks, testimonials, photographs)</i>				
<i>10</i>	<i>Presentation on the Project</i>	<i>Project-based Learning Presentation Beyond the class Learning</i>	<i>Presentation on the Project, Feedback by the Guide and Co-guide</i>	<i>0</i>	<i>1</i>	<i>0</i>	<i>1</i>
<i>11</i>	<i>Project Work</i>	<i>Discussion</i>	<i>Performance Analysis</i>	<i>0</i>	<i>0</i>	<i>0</i>	<i>2</i>
<i>12</i>	<i>Communication</i>	<i>Discussion</i>	<i>Performance Analysis</i>	<i>0</i>	<i>2</i>	<i>0</i>	<i>0</i>

FCHU1206IT ENABLED COMMUNICATION

<i>Pre - requisites</i>	<i>Course Type</i>	<i>Credits</i>
<i>Nil</i>	<i>Workshop</i>	<i>2</i>

COURSE OBJECTIVE AND OUTCOME

Upon completing the syllabus, students should be able to:

- Speak confidently and fluently, in both formal and informal contexts.
- Write clearly, correctly and cogently
- Design and have a Home Page/Blog Space, Facebook Page and post comments/reports for collaboration & online presence
- Evolve from the role of an 'information provider', through 'motivator' and 'catalyst of change', to 'Change Agent'.

COURSE OUTLINE

MODULE I: CONCEPTUAL FOUNDATIONS

Pre-Course Assessment

Tell me a bit about yourself: Your background, your major, your professional aspirations ... your likes ... and maybe your favorite movie, and what you like to do in your spare time...

Do you know?

Introduction to IT Enabled Communication

Communication in the New Age Context and Demand for Communication Interventions

(This module includes pre-course assessments and presentations)

MODULE II: BLOG DESIGNING & POSTING

Step-by- Step to Writing a Blog: Researching, Brainstorming and Structuring, Writing, Posting, Editing and Accessorizing

Photoshop for Image, Editing and graphic design

(This module will be driven through methods like self-learning, learning by doing, and workshop)

MODULE III: TECHNOLOGY AND COMMUNICATION

Tools for Business Correspondence and web-based exercises

Creating and delivering high impact presentations with Slides and other Visuals

Video Documentaries

Video Conferencing Sites, Skype, Team Viewer

(This module will be facilitated through presentations, use of tools and technology)

TEXT BOOKS

Shirley Taylor, Model Business Letters (MBL) and Other Business Documents, 5th Edition.

Krizen. Merrier. Logan. Williams, Business Communication, and Thomson (BC: Krizen).

M.M. Monippally, Business Communication Strategies (BCS: MMM), TMH, New Delhi, 2001.

Arthur H. Bell & Dayle M. Smith, Management Communication (MC: AHB & DMS), Wiley Student Edition, 2005

LINKS

http://ctb.ku.edu/en/tablecontents/section_1017.htm

Useful websites for some topics will be linked to the course for improving language proficiency skills of the students.

www.a4esl.org

www.learnenglishfeelgood.com

EVALUATION SYSTEM (CONTINUOUS INTERNAL ASSESSMENT)

<i>Methods</i>	<i>Presenta- tion</i>	<i>Blog Design & Post</i>	<i>Video Documentary</i>	<i>E-mail Writing</i>	<i>Business Letters</i>	<i>Poster/ Template Design</i>	<i>Mid-Sem written Exam</i>	<i>% of Marks 100(Best 5)</i>
Total	20	20	20	20	20	20	20	100

MODULE I: CONCEPTUAL FOUNDATIONS (3HRS)

S. No.	Topic	Pedagogy	Details	Instructional Hrs			
				Th	Pract	video	Proj
1	Pre-Course Assessment [IT Enabled Communication]	Record pre-course assessments on communication management & technology by 'Probing & Doing'	Do you Know?	0	1	0	0
2	Tell me a bit about yourself	Know each other, and create a classroom philosophy through a game	Your background, your major, your professional aspirations ... your likes ... and maybe your favorite movie, and what you like to do in your spare time...	0	1	0	0
3	Communication in the New Age	Presentation	Context and Demand for Communication Interventions Explore top five social networking sites relevant to technology sector and present in the class, create and maintain online presence on Facebook, Google + or any other	0	1	0	0

MODULE II: BLOG DESIGNING & POSTING

S. No.	Topic	Pedagogy	Details	Instructional Hrs			
				Th	Pract	video	Proj
4	Step-by- Step to Writing a Blog - 1	Learning to Learn (Self-learning)	Researching	0	1	0	0
5	Step-by- Step to Writing a Blog - 2	Learning to Learn (Self-learning)	Brainstorming & Structuring	0	1	0	0
6	Step-by- Step to Writing a Blog - 3	Learning to Learn (Self-learning)	Writing & Posting	0	1	0	0
7	Step-by- Step to Writing a Blog - 4	Learning to Learn (Self-learning)	Editing & Accessorizing	0	1	0	0
8	Blog	Workshop (Self-learning)	One Day Workshop On Blog Design (CUTM e-content)	0	1	1	0
9	Blog Design	Posting assignments/ weekly reports/share what he/she has learnt (Doing)	Assignment: "Me in a Minute" blog post, email your blog's web address to the facilitators and peer group	0	1	0	0
10	Photoshop - 2	Self- Learning & Peer Learning	Editing and Graphic Design	0	1	1	0
11	Photoshop -3	Photoshop (FOSS) Training	Video tool www.spoken-tutorial.org	0	1	0	0
12	Photoshop	Workshop	One Day Workshop On Blog Design (CUTM e-content)	0	1	1	0

MODULE III: TECHNOLOGY AND COMMUNICATION

S. No.	Topic	Pedagogy	Details	Instructional Hrs			
				Th	Pract	video	Proj
13	Business Correspondence	Document Makeover, Web-based Exercises	Letters & Emails [Write to the point with correctness, conciseness, coherence and completeness]	0	1	0	0
14	Impress Presentation	Training and Practice	Language Laboratory Impress (FOSS)- Presentations (www.spoken-tutorial.org)	0	1	0	0
15	Enhancing presentation through slides and other visuals	Use of media for presenting the visual contents to reinforce the message, and create online presence	Equip the learners with techniques where they feel more confident in front of an audience Assignment [Improve the slides] Slide Share/ Upload on YouTube or Google +	0	1	0	0
16	Delivering High Impact Presentations	Video Recording & Peer Evaluation	Mastering the Art of Delivery, Preparing to Speak, Overcoming Anxiety, Handling Questions Watch-YouTube: Steve Jobs and iPod	0	1	0	0
17	Video Documentaries	Video documentary (Self- Learning)	Each student/group will make a short documentary movie (CSR, Facilities Labs, Student Projects etc.)	0	1	0	0
18	Making of Video Documentary	Workshop	One Day Workshop on Making Video Documentaries	0	1	1	0
19	Documentary Movie	10 min. video presentation by individuals/ groups	Feedback and Analysis	0	1	0	0
20	Video Conferencing	Free conference calls, webcam chat, video conferencing, group calls	Create Account & Practice [Skype, TeamViewer, Mobile]	0	1	0	0
21	Organize and Manage a Video Conference	Use video conference for business meetings Video conference etiquette & tips	Organise, Share & Collaborate	0	1	0	0

FCHU1207 CAREER COMMUNICATION

<i>Pre - requisites</i>	<i>Course Type</i>	<i>Credits</i>
<i>Nil</i>	<i>Workshop</i>	<i>2</i>

OBJECTIVES

- Prepare the graduates to acquire their dream jobs.*
- Build their mindset with right attitude, self-awareness, pro-activeness.*
- Build confidence, and enhance their communication skills to handle all situations.*

OUTCOMES

- Build the confidence of students*
- Trigger the thinking and analyzing ability of the learners to solve problems.*
- Readiness to work on their dream jobs.*

List of Experiments

LAB 1: Introduction to Career Communication

LAB 2: Presentation on Corporate House

Create an awareness and exposure on corporate life and culture.

Learners get exposure to corporate life and culture.

LAB 3: Corporate Quiz

LAB 4: Telephonic Conversation

Learners are equipped with basic knowledge and skill practice for improved telephonic communication.

LAB 5: Email Writing

Learn the characteristics of successful e- mail messages.

Create an effective e-mail message.

LAB 6: Mini Test on Email Writing

LAB 7: Learning Etiquette

Understand what etiquette is & why it's important.

Provide practical techniques and generally-accepted professional and ethical conduct or behaviour that will help create a favourable impression in social and professional life.

Practice proper manners like greeting, saying 'please', 'thank you'.

Appear professional and well groomed.

LAB 8 :Identifying Traits for Professional and Interpersonal Success

Understand the importance of effective interpersonal communication and traits for professional success.

Explore the significance of Active Listening, Problem Solving, Respect, Decision Making,

Empathy, Co-operation and Non-verbal communication for professional success.

LAB 9: Job-Application -Cover Letter

Develop the career writing skills of the learners with special emphasis on their interest in specific job positions, their strengths and what values they will bring to the organisation.

LAB 10: Job-Applications – CV

Produce a polished and impressive CV that can be tailored to each specific job application.

Develop the career writing skills of the learners with special emphasis on Statement of Purpose.

Provide with tools to showcase Unique Selling Points for the specified job description.

LAB 11: Participating in Group Discussion (GD)

Mock Interview on basic questions

LAB 12: Facing an Interview

EVALUATION SYSTEM (CONTINUOUS INTERNAL ASSESSMENT)

<i>Methods</i>	<i>Presentation</i>	<i>Corporate Quiz</i>	<i>Telephonic Conversation</i>	<i>Email Writing</i>	<i>CV</i>	<i>GD</i>	<i>Interview</i>	<i>% of Marks 100(Best 5)</i>
Total	20	20	20	20	20	20	20	100

SESSION PLAN: CAREER COMMUNICATION

S. No.	Topic	Pedagogy	Details	Instructional Hrs.			
				Th	Pract	video	Pro j
LA B-1	Introduction to Career Communication	Discussion	The Course introduces students to the resources and skills necessary for a successful job or internship search http://cutmlanguagelab.org/course/view.php?id=2	0	2	0	0
	Presentation on Corporate House	Team Presentation	Create an awareness and exposure on corporate life and culture. Learners get exposure to corporate life and culture. http://cutmlanguagelab.org/course/view.php?id=2 https://www.youtube.com/watch?v=g-_xABU21Yc	0	1	1	0
AB -3	Corporate Quiz	OSLL (Moodle) Quiz	This Corporate Quiz is an initiative to bring forth all the updates and insights from various industries. Through this quiz , students will be updated with the current happening in the present Corporate world http://cutmlanguagelab.org/course/view.php?id=2	0	2	0	0
LA B-4	Telephonic Conversation	Role play (Pair Work)	Learners are equipped with basic knowledge and skill practice for improved telephonic communication https://www.youtube.com/watch?v=mmXAqMQe0AI https://www.youtube.com/watch?v=6tfFRD0enV0	0	1	1	0
LA B-5	Email Writing	Doing	Learn the characteristics of successful e-mail messages. Create an effective e-mail message. http://cutmlanguagelab.org/course/view.php?id=2 https://www.youtube.com/watch?v=mmXAqMQe0AI	0	1	1	0
AB -6	Email Writing	Mini Test OSLL (Moodle)	(Questions from TCS) http://cutmlanguagelab.org/course/view.php?id=2 https://www.youtube.com/watch?v=LTKb5Fexcuk	0	2	0	0

S. No.	Topic	Pedagog	Details	Instructional Hrs.			
				Th	Pract	video	Pro j
LAB-7	Learning Etiquette	Demonstration Video	Understand what etiquette is & why it's important.	0	1	1	0

		<i>Analysis</i>	<i>Provide practical techniques and generally-</i>				
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			<i>behaviour that will help create a favourable impression in social and professional life.</i> http://cutmlanguagelab.org/course/view.php?id=2 https://www.youtube.com/watch?v=ieYuoQ9sMvA				
LAB -8	<i>Identifying Traits for Professional and Interpersonal Success</i>	<i>Group Activity Video Analysis</i>	<i>Understand the importance of effective interpersonal communication and traits for professional success.</i> <i>Explore the significance of Active Listening, Problem Solving, Respect, Decision Making, Empathy, Co-operation and Non-verbal communication for professional success.</i> http://cutmlanguagelab.org/course/view.php?id=2	0	1	1	0
LAB -9	<i>Job-Application - Cover Letter</i>	<i>Document Makeover</i>	<i>Develop the career writing skills of the learners with special emphasis on their interest in specific job positions, their strengths and what values they will bring to the organisation.</i> http://cutmlanguagelab.org/course/view.php?id=2 https://www.youtube.com/watch?v=37TbhadX0C8	0	2	0	0

FCHU1208PERSONALITY DEVELOPMENT

<i>Pre - requisites</i>	<i>Course Type</i>	<i>Credits</i>
<i>Nil</i>	<i>Workshop</i>	<i>2</i>

The laboratory aims at the promotion of the strategies for the personality development of the participants. The rationale behind this endeavor is the recognition of the multifaceted influence of the personality of the participants.

A student is required to take up five laboratory tests of 100 marks.

COURSE OBJECTIVE

Project the force of inner self, assert individuality, influence others and power to success.

COURSE OUTCOME

Learners develop a positive attitude and graceful personality.

LIST OF EXPERIMENTS

Lab 1: Self-Discovery/Self-Analysis

Identifying strengths and weaknesses through games and activities

Lab 2: Impression Management

Formation of impression, first and lasting impression, change: warm-up discussion

Lab 3: Body Language and Communication Style Profile Test

Lab 4 : Working on Attitude: Assertive, Aggressive, Passive

Measure your attitude, case study and role plays

Lab 5: Build Your Skills

Interpersonal Communication and Self

Lab 6: Team Building and Teamwork

Ice-breaker, test your team skills, exercise on stages of formation and effective teams

Lab 6: Explore Your Personality

Lab 7 : Motivation and Success

Ted talks, invited talks and success stories

Lab 8: Time Management

Identifying important time wasters, time management exercises

Lab 10 : Stress Management

Case-based discussions to identify causes of stress, and manage stress

Lab 11: Etiquette and Manners

Test your etiquette and manners, practice good manners

Lab 12 : Personality and Career Choice

Matching your career & personality

TEXT BOOKS:

Basic Managerial Skills for All, 9th Edition, E.H. McGrath, S.J.

Personality Development by [Harold R. Wallace & L. Ann Masters](#), 2006.

REFERENCES:

Personality Development by [John Aurther](#) .Reprint, 2009.

[Personality Development - Transform Yourself](#) by [Rajiv K. Mishra](#), 2004.

[Power of One - Personality and Self-Development](#) by [Dr. Abhishek Mishra](#), 2007.

EVALUATION SYSTEM (CONTINUOUS INTERNAL ASSESSMENT)

<i>Meth ods</i>	<i>Self- introductio n in sales pitch</i>	<i>Debate/ Extempor e</i>	<i>Presentatio n (USP)</i>	<i>Group Activity (Communicatio n)</i>	<i>Public Speaking on Current Topic</i>	<i>Case- based Discussion s</i>	<i>Motiva -tion Speech</i>	<i>% of Marks 100 (Best 5)</i>
Total	20	20	20	20	20	20	20	100

SESSION PLAN: PERSONALITY DEVELOPMENT

S. No.	Topic	Pedagogy	Details	Instructional Hrs			
				Th	Pract	video	Proj
1	Self-Discovery/Self-Analysis	Activity Based Learning	Game	0	2	0	0
2	Impression Management	Videos and interactions	19 tips to impress others https://www.buzzfeed.com/carolynkylstra/impress-literally-everyone-you-meet?utm_term=.nbz2MKVOJO#.qywdZLkQXO	0	1	1	0
3	Body Language and Communication Style Profile Test	Understanding of different postures and gestures through online test	http://www.queendom.com/queendom_tests/transfer	0	1	1	0
4	Working on Assertive, Aggressive, Passive	Role Plays and are Encouraged to watch videos	https://www.youtube.com/watch?v=O6eyUUKpoU8 Role plays	0	1	1	0
5	Build Your Skills	Videos	https://www.youtube.com/watch?v=w97dR3OJB1k http://www.investopedia.com/video/play/interpersonal-skills/	0	1	1	0
6	Team Building and Teamwork	Activity Based Learning	Coin Logo Time Required: 5-10 minutes Begin by asking all participants to empty their pockets, purses, and wallets of any coins they may have and place them on the table in front of them. If someone doesn't have any coins or only has very few, others in the room can share their coins with them. Instruct each person to create their own personal logo using the coins in front of them in just one minute. Other materials they may have on them, such as pens, notebooks, wallets, etc. can also be used in creation of the logo. If there is a particularly large group, people can be broken up into teams of 3-6 people and instructed to create a logo that represents them as a team or the whole room can gather to use the coins to create a logo for the organization/group/department/etc. Each solitary participant can explain their logo to the group or if the room was split into groups, the leader can have each group discuss what led to the team logo and what it says about them. Not only does this activity promote self and mutual awareness, but it also enables participants to get to know each other on a more personal level. http://www.livestrong.com/article/219775-team-building-exercises-for-small-groups/	0	1	1	0
7	Explore Your Personality	videos	https://www.16personalities.com/free-personality-test	0	1	1	0
8	Motivation		https://www.youtube.com/watch?v=ILEg5EZ	0	1	1	0

	<i>and Success</i>	<i>videos</i>	w3iQ https://www.youtube.com/watch?v=g-PNJHhf-ag				
9	<i>Stress Management</i>	<i>Classroom Exercise</i>	Time Wasters Exercise.pdf	0	1	0	0
10	<i>Etiquette and Manners</i>	<i>videos</i>	https://www.youtube.com/watch?v=55cXVve0Ipw for table manners https://www.youtube.com/watch?v=VLqKVfSG-bk for interview etiquette. https://www.youtube.com/watch?v=4-8AlriF908 for manners.	0	1	1	0

S. No.	Topic	Pedagogy	Details	Instructional Hrs			
				Th	Pract	video	Proj
11	<i>Personality and Career Choice</i>	<i>Classroom exercise</i>	rs_self-assessment.pdf	0	1	0	0
12	<i>Time Management</i>	<i>Group Activity</i>	<p>How long is a minute?</p> <p>At the beginning of session ask people to close their eyes for 30 seconds and after that to open it. Nobody can watch the clock and don't measure the time. Ask of participants to open their eyes after what they believe has been 30 seconds.</p> <p>Of course, they all open them at different times. Afterwards, we talk about our understanding of time. Even though everyone has an equal (24 hours a day or 30 seconds for exercise), in fact, we experience it and use it in different ways. Some of us experienced it as a short period, other as a long. This always works as a good opener.</p> <p>2) Cover all the clocks in the room, then ask participants to remove their wrist watches and stand up. Instruct them to sit down when they think 1 minute has elapsed after you shout "Start" to begin the countdown. You will be surprised with the results. Just enjoy the fun that follows this activity</p>	0	1	0	0

FCHU1209 SEMINAR AND TECHNICAL WRITING

<i>Pre - requisites</i>	<i>Course Type</i>	<i>Credits</i>
<i>Nil</i>	<i>Workshop</i>	<i>2</i>

Seminar allows students the opportunity to put all of information together. The students are required to prepare technical reports including oral presentations supported by written technical papers. Seminar is designed to assist students in preparing for their career.

COURSE OBJECTIVES

- Understand the requirements and ethics of technical writing in the 21st Century workplace.*
- Work professionally, individually and in a team to produce effective technical documents incorporating verbal, visual, and multimedia materials as necessary.*
- Communicate effectively by analyzing audience, organizing documents, writing clearly and precisely with no grammar errors and presenting the document with skillful design.*
- Locate, evaluate, and incorporate pertinent information.*
- Write clear, intelligent technical reports*
- Make seminar presentations*

COURSE OUTCOMES

- Understand how technical communication is used in the workplace.*
- Understand and use the principles of design in business and technical communication.*
- Apply useful descriptive language to your technical documents.*
- Students will gain experience in preparing a technical report including an oral presentation supported by a written technical paper.*

MODULE-I: TECHNICAL COMMUNICATION ESSENTIALS

COURSE OUTCOMES

- Describe the writing process most useful in today's technical writing environment.*
- Analyze an audience and consider appropriate writing situations to meet the audience's needs.*
- Understand the ethics of the workplace and apply those ethics to their technical and business writing.*

OUTLINE: Communicating in the Workplace, Technical Writing Process Today, Readers and Contexts of Use, Ethics in the Technical Workplace

MODULE- II: DOCUMENT DESIGN

COURSE OUTCOMES

- Create and use graphics that complement your business and technical communication.*

OUTLINE: Designing Documents and Interfaces, Creating and Using Graphics

MODULE-III: TECHNICAL COMMUNICATION STRATEGIES AND RESEARCHED REPORT WRITING

COURSE OUTCOMES

- Define terms clearly in technical documents.*
- Explain instructions and processes clearly.*
- Write clear proposals for business and technical situations.*
- Research and manage information.*
- Write an analytical report.*

OUTLINE: Researching and Managing Information, Organizing and Drafting, Technical Definitions, Technical Descriptions, Instructions and Documentation, Proposals, Analytical Reports

MODULE-IV: SEMINAR PRESENTATION

COURSE OUTCOME

- Students will not only learn from the experience gained in preparing and presenting their seminar, but will have the opportunity to observe and participate in the seminar given by their classmates.*

OUTLINE: Technical Report, Seminar Presentation

(Planning, Preparing, Organizing and Seminar Presentation are the 4 stages of this module)

TEXT BOOK:

Gerson, Sharon J. and Gerson, Steven M. (2007). *Technical Writing Process and Product*. Delhi: Pearson Education.

REFERENCES:

Effective Technical Communication, M. Ashraf Rizvi, TMH Publications.

Business Communication Today, Courtland L Bovee, John V Thill & Mukesh Chaturvedi, Pearson Education.

EVALUATION SYSTEM (CONTINUOUS INTERNAL ASSESSMENT)

Methods	Proposal Writing	Report Writing	Organizing Seminar	Document Formatting	Preparing a Technical Paper	Seminar Presentation-I	Seminar Presentation-II	% of Marks 100 (Best 5)
Total	20	20	20	20	20	20	20	100

SESSION PLAN: SEMINAR AND TECHNICAL WRITING

S. No.	Topic	Pedagogy	Details	Instructional Hrs			
				Th	Pract	video	Proj
1	Introduction to Technical Writing	Activity Based Learning	Writing Genres: Technical versus non-technical writings https://www.youtube.com/watch?v=LTDsgd0ytbE	0	1	0	0
2	Preparing to Write	Doing	Audience Analysis Brainstorming Organizing information Link: https://www.youtube.com/watch?v=wxKJT13EhuM	0	1	0	0
3	Gathering information	Google Search	How do we gather information? Ways, techniques and tools	0	2	0	0
4	Focusing on Writing Skills	Workshop	Brainstorming, Drafting, Editing	0	2	0	0
5	Technical Writing Conventions	Analysis and Discussion	Analysis of different case studies	0	1	0	0
6	Reporting	Learning to Learn Analysis and Discussion	FORMAT: Preliminary pages, Summary, Main section, Conclusion, Recommendations References	0	2	0	0

S. No.	Topic	Pedagogy	Details	Instructional Hrs			
				Th	Pract	video	Proj
7	Using and interpreting Graphics	Group work and Discussion	Matching Games : Texts and graphic types	0	2	0	0
8	Document Formatting	Workshop	Layouts Use of MS Word for Documenting	0	2	0	0

			Document templates APA Format (6th) - Microsoft Word 2010 https://www.youtube.com/watch?v=aWT9zgMPyiY				
9	Documentation	Workshop	Documenting Sources: https://www.youtube.com/watch?v=-H2fRG_Rtns	0	2	0	0
10	Introduction to Seminar	Discussion	Seminar : Needs and ways of preparation Video : https://www.youtube.com/watch?v=Rz2II40tQuI	0	1	0	0
11	Questioning Skills	Workshop	Asking and Responding to questions in Seminars TED TALK: https://www.youtube.com/watch?v=PkcHstP6Hi0	0	2	0	0
12	Analysis of various Seminars	Videos and Discussion	Analysis of Seminars: Pros and Cons How to make a seminar effective? https://www.youtube.com/watch?v=x7qPAY9JqE4	0	1	1	0
13	Preparing for a Seminar	Group Work	Grouping Selection of topics	0	1	0	0
14	Collection of Information	Workshop	Primary and secondary sources Preparing sample PPTs	0	2	0	0
15	Seminar Presentation-I	Group Work	Demonstration and Discussion	0	2	0	0
16	Seminar Presentation-II		Demonstration and Discussion	0	2	0	0

FCHU1210PROFESSIONAL ETIQUETTE

<i>Pre - requisites</i>	<i>Course Type</i>	<i>Credits</i>
<i>Nil</i>	<i>Workshop</i>	<i>2</i>

Etiquette begins with meeting and greeting. Good professional etiquettes indicate that you are a mature responsible, adult who can aptly represent any organization. Etiquettes center upon respect.

COURSE OBJECTIVES

- To recognize the importance of proper etiquette at workplace*
- To understand the elements and characteristics of proper etiquette*
- To behave professionally and gain respect*
- To develop an action plan to improve professionalism*

COURSE OUTCOMES

At the end of this course students would be able to learn:

- Professional behavior, standards for appearance, action and attitude in a business environment*
- Handle a variety of social and business situation*
- Different styles of communication based on different situations.*

MODULE- I: MEETING AND GREETING ETIQUETTE, OFFICE ETIQUETTE (7hrs)

- Personal Branding and First Impressions
- Introducing yourself and introducing a guest
- Professionalism at office
- Language styles, tone and attitude

MODULE-II: COMMUNICATION EXCELLENCE (7hrs)

- Techno Etiquette
- Phone Etiquette
- Email Etiquette
- Social Media Etiquette

MODULE-III: NETWORKING ETIQUETTE (6hrs)

- Business Card Etiquette
- Names
- Titles
- Net Etiquette
- Proper Introductions

MODULE-IV: BUSINESS ETIQUETTE (7)

- Presentation Etiquette
- Meeting Etiquette
- Dining Etiquette
- Global Etiquette

TEXT BOOK:

The New Etiquette, Real Manners for Real People in Real situations- An A-to-Z Guide by Marjabella Young Stewart, St. Martin Griffin.

Soft Skills, Know Yourself and the World, K.Alex.

REFERENCES:

Do's and Taboos of Hosting International Visitors, Roger E. Axtell, John Wiley & Sons, Inc.

Breaking through Culture Shock: What You Need to Succeed in International Business by Elisabeth Marx.

Dos and Taboos of International Trade by Roger E. Axtell, John Wiley & Sons, Inc. The Art of Writing Effective E-mails, Jayprakash, Sajitha, Himalayan Publications. International Communication Management-Individual & Organizational Outcomes by Antonio Ragus, Bookboon, 2010.

Business Communication for Success by Scott Mac Lean, Flat World Knowledge, 2010.

Effective Technical Communication, M. Ashraf Rizvi, TMH Publications.
EVALUATION SYSTEM (CONTINUOUS INTERNAL ASSESSMENT)

Methods	Introducing others, Small Talk	Role Play in formal & informal situations	Presentation	Telephonic interview	Email	Mock Meeting	Quiz on Professional Etiquette	% of Marks 100(Best 5)
Total	20	20	20	20	20	20	20	100

LESSON PLAN: PROFESSIONAL ETIQUETTE

S. No.	Topic	Pedagogy	Details	Instructional Hrs			
				Th	Pract	video	Proj
MODULE 1: MEETING & GREETING ETIQUETTE, OFFICE ETIQUETTE							
1	Personal Introduction	Role play on formal situation with proper introduction	http://smallbusiness.chron.com/first-impressions-business-etiquette-2908.html	0	1	0	0
2	Introducing Others	Knowing each other Fish bowl game	http://www.fasset.org.za/downloads/Office_Etiquette_Material/Handbook_Essential_Office_Etiquette.pdf				
3	Basics of Etiquette	Video clips Small skits	http://www.fasset.org.za/downloads/Office_Etiquette_Material/Handbook_Essential_Office_Etiquette.pdf	0	1	0	0
4	Interpersonal Etiquette	Video clips Activity on using speech acts with appropriate body language Guessing game	http://www.fasset.org.za/downloads/Office_Etiquette_Material/Handbook_Essential_Office_Etiquette.pdf	0	1	0	0
5	Professionalism And Front Office Etiquette	Video Clips Role play on front office management on their dream company Quiz	http://careerplanning.about.com/od/workplacesurvival/a/professionism.htm http://www.octech.edu/sites/www/Uploads/files/TRIO/Professionalism%20in%20the%20Workplace.pdf	0	1	0	0
6	Professional Conduct	Conversational practice and SWOT Analysis in pair/group task	http://www.fasset.org.za/downloads/Office_Etiquette_Material/Handbook_Essential_Office_Etiquette.pdf	0	1	0	0
7	Professionalism And Front Office Etiquette	Video Clips Role play on front office management on their dream company Quiz	http://careerplanning.about.com/od/workplacesurvival/a/professionism.htm http://www.octech.edu/sites/www/Uploads/files/TRIO/Professionalism%20in%20the%20Workplace.pdf	0	1	0	0
8	Formal & Informal Attire	Communication Game Quiz	http://www.fasset.org.za/downloads/Office_Etiquette_Material/Handbook_Essential_Office_Etiquette.pdf	0	1	0	0
9	Language Etiquette And Attitude	Enactment in different formal situations with appropriate communication styles	http://www.english.wisc.edu/rfyoung/336/attitudes.pdf https://blog.udemy.com/communication-styles/ http://www.english.wisc.edu/rfyoung/336/attitudes.pdf	0	1	0	0
10	Techno	Conversational	http://theedgeexecutivecoaching.com/arti	0	1	0	0

	<i>Etiquette</i>	<i>practice and Small skits</i>	cles/etiquette/techno-etiquette/# Question & Answers :http://www.workforce.com/articles/q-a-about-techno-etiquette				
11	<i>Smart Phone Etiquette</i>	<i>Dialogue Exchange Telephonic Quiz</i>	http://www.talkenglish.com/LessonPractice.aspx?ALID=483	0	1	0	0
12	<i>Email Etiquette Social Media Etiquette</i>	<i>Video Clips Written task practice Group work Debate</i>	http://www.businessemailletiquette.com/business-e-mail-etiquette-basics/ http://www.realsimple.com/work-life/work-life-etiquette/manners/social-media-etiquette http://www.moneycrashers.com/social-media-etiquette-tips-personal-business/ Video : https://www.youtube.com/watch?v=RFZwtkoNGrk https://www.youtube.com/watch?v=ootxiibcOWc	0	0	1	0

MODULE II: COMMUNICATION EXCELLENCE (7 HOURS)

S. No.	Topic	Pedagogy	Details	Instructional Hrs			
				Th	Pract	video	Proj
10	<i>Techno Etiquette</i>	<i>Conversational practice and Small skits</i>	http://theedgeexecutivecoaching.com/articles/etiquette/techno-etiquette/# Question & Answers :http://www.workforce.com/articles/q-a-about-techno-etiquette	0	1	0	0
11	<i>Smart Phone Etiquette</i>	<i>Dialogue Exchange Telephonic Quiz</i>	http://www.talkenglish.com/LessonPractice.aspx?ALID=483	0	1	0	0
12	<i>Email Etiquette Social Media Etiquette</i>	<i>Video Clips Written task practice Group work Debate</i>	http://www.businessemailletiquette.com/business-e-mail-etiquette-basics/ http://www.realsimple.com/work-life/work-life-etiquette/manners/social-media-etiquette http://www.moneycrashers.com/social-media-etiquette-tips-personal-business/ Video : https://www.youtube.com/watch?v=RFZwtkoNGrk https://www.youtube.com/watch?v=ootxiibcOWc	0	0	1	0

MODULE-III NETWORKING ETIQUETTE (6HRS)

S. No.	Topic	Pedagogy	Details	Instructional Hrs			
				Th	Pract	video	Proj
13	<i>Netiquette</i>	<i>Written Assignment Drafting Email</i>	http://jillbremer.com/articles/etiquette/techno-etiquette/ http://www.slideshare.net/MarcellineChitolie/techno-etiquette-final-copy	0	1	1	0
14	<i>Business Card</i>	<i>Presentations and</i>	http://www.careerealism.com/3-rules-	0	1	1	0

	<i>Etiquette</i>	<i>small group work</i>	to-smart-business-card-etiquette/				
15	<i>Forms of Addressing</i>	<i>Written assignment Scrabble and puzzles</i>	http://www.talkenglish.com/LessonPractice.aspx?ALID=483	0	1	1	0

MODULE IV: BUSINESS ETIQUETTE (7 hours)

S. No.	Topic	Pedagogy	Details	Instructional Hrs			
				Th	Pract	video	Proj
16	<i>Present ation Etiquette</i>	<i>Demonstration</i>	http://dianegottsman.com/2013/11/business-etiquette-9-powerful-presentation-tips/ http://dianegottsman.com/2012/07/stand-and-deliver-ten-tips-to-delivering-a-powerful-presentation/	0	1	1	0
17	<i>Meeting Etiquette</i>	<i>Mock Meeting</i>	http://businessculture.org/northern-europe/uk-business-culture/meeting-etiquette/ http://www.fasset.org.za/downloads/Office_Etiquette_Material/Handbook_Essential_Of_fice_Etiquette.pdf	0	1	1	0
18	<i>Dinning Etiquette</i>	<i>Activity on- Playing the role of the Host/Hostess, Playing the role of the Guest</i>	Rizvi, ETC, pp.139-164 Soft Skill, Dr.K.Alex-pp-203-219	0	1	1	0

S. No.	Topic	Pedagogy	Details	Instructional Hrs			
				Th	Pract	video	Proj
19	<i>Golden Rules of Global Etiquette</i>	<i>Discussion and Activity</i>	<i>Developing intercultural skill</i> http://www.kwintessential.co.uk/cultural-services/articles/international-business-etiquette.html http://www.kwintessential.co.uk/resources/country-profiles.html http://www.forbes.com/sites/susanadams/2012/06/15/business-etiquette-tips-for-international-travel/ http://www.marcaria.com/international-business-etiquette-customs-and-culture.asp	0	1	1	0
20	<i>Doubt Clearing</i>	<i>One-to-One Interaction</i>	<i>Practice</i>	0	1	0	0
21	<i>Recap</i>	<i>Discussion</i>	<i>Performance Analysis</i>	0	1	0	0

FCHU1211 CREATIVE WRITING

<i>Pre - requisites</i>	<i>Course Type</i>	<i>Credits</i>
<i>Nil</i>	<i>Workshop</i>	<i>2</i>

The aim of the course is to prepare students for careers in a workplace that is information-rich and that increasingly values communication skills and the ability to think creatively and critically. The class time will be devoted to writing workshop, innovation exercises, and the critical appreciation of write-ups. The Creative Writing course will focus on

Reading

Writing Creatively

Presentations

Thus the main objective is to breed a culture of learning where students learn a variety of approaches to creative writing in a cooperative learning environment.

COURSE OBJECTIVES

Develop thinking skills

Acquire basic skills and techniques to develop a suitable practice of creative writing in context

Use a constructive approach to critique his/her own work, as well as work by his/her peers

Organize, prepare and present spoken presentations clearly and expressively

COURSE OUTCOMES

Upon the Completion of the course, a student will

Create Blog/ Online Presence

Submit works for publication

Compose a variety of written responses for different purposes and audiences

Collaborate by sharing ideas, examples and insights, productively and respectfully in informal conversations and discussions.

Students will put into practice the learning into the personal, professional and technical sphere.

MODULE -I: WRITING CREATIVELY (12hrs)

Foundational activities

Introduction to Class Standards

(Workshops, peer conferencing, blogging, reading outside the classroom)

Collaborative Creation of Classroom Philosophy

Basics of Creative Writing

Different forms of expression

Memoirs/Writing the Personal Narratives

Situational Writing/ Writing for the Target Audience

Dialogues, Essay, Poetry Slam

Script Writing

Writing for Blogs

Cooking Up Interview Stories

Writing from visuals

Pictures, Graphs, Images, Diagrams and Designs, Cartoons

Brochures and Newsletters

(This module will be facilitated through creative writing and speaking activities)

MODULE-II: READING AND CRITICAL APPRECIATION (8hrs)

Book

(Independent Study: Two Master Piece)

Article

Movie

(Student Work: Free Choice, Discussion and Oral/ Written Critiquing, Editing/ Revision

Publication/ Sharing, Short Report on Two Authors

(This module will be facilitated through reading activities and critical appreciation)

MODULE-III: POWER OF LATERAL THINKING TO CREATE NEW IDEAS (7hrs)

General Concepts: Creativity and Lateral Thinking
 Using the Technique of Lateral Thinking in Writing
 Idea Generation Games and Activities
 Six Thinking Hats

(This module will be facilitated through idea generation activities and presentation)

TEXT BOOKS

Creative Writing: A Workbook with Readings- Linda Anderson

Creative Writing- By DevAnjanaNeira

REFERENCES

The Cambridge Companion to Creative Writing by David Morley, Philip Neilsen

Creative Writing- By Adele Ramet

The Creative Writing Mfa Handbook: A Guide for Prospective Graduate Students By Tom Kealey

EVALUATION SYSTEM (CONTINUOUS INTERNAL ASSESSMENT)

Methods	Memoirs	Essay/ Dialogue Writing	Slam Poetry	Script Writing	Writing for Blog	Presentation from Visuals	Cooking up Interview Stories	% of Marks 100(Best 5)
Total	20	20	20	20	20	20	20	100

**SESSION PLAN: CREATIVE WRITING
 MODULE-1 : WRITING CREATIVELY (12 hours)**

S. No.	Topics	Pedagogy	Details	Instructional Hrs			
				Th	Prac t	Vide o	Proj
1	Foundational activities Introduction to Class Standards (Workshops, peer conferencing, blogging, reading outside the classroom)	Conversatio nal practice, Role Plays	https://www.teachingchannel.org/videos/peer-conferencing https://blogging.org/	0	2	0	0
2	Collaborative Creation of Classroom Philosophy	Group tasks	http://writing-speech.dartmouth.edu/teaching/first-year-writing-pedagogies-methods-design/collaborative-learninglearning-peers	0	2	0	0
3	Basics of Creative Writing	Video links /Practice	https://www.earlham.edu/media/894432/creative_writing_rules.pdf http://www.idiotsguides.com/education/creative-writing/creative-writing-basics/ https://www.youtube.com/watch?v=syuuXYpV4zA	0	2	0	0
4	Different forms of expression Memoirs/Writing the Personal Narratives Situational Writing/ Writing for the Target Audience	Group work, writing, video links ,	http://classroom.synonym.com/creative-writing-between-memoir-personal-narrative/ https://www.youtube.com/watch?v=PLHkuSpJxPs	0	2	0	0

			toKkWas https://www.youtube.com/watch?v=zJGX2raiafU				
5	Dialogues, Essay, Poetry Slam	Role Plays, Written tasks	https://en.wikipedia.org/wiki/Poetry_slam Examples of poetry slams : http://www.poetrysoup.com/poems/best/slam https://www.writersstore.com/how-to-write-a-screenplay-a-guide-to-scriptwriting/	0	2	0	0
6	Script Writing Writing for Blogs	Writing tasks individual/pairs Video links Blog writing practice	https://www.youtube.com/watch?v=XZszextv6yE BLOGS https://www.youtube.com/watch?v=t21sKonfylk https://www.themuse.com/advice/6-types-of-stories-you-should-have-on-hand-for-job-interviews	0	2	0	0
7	Cooking Up Interview Stories		http://lifehaecker.com/prepare-these-15-stories-for-your-next-job-interview-1610270959 https://www.themuse.com/advice/the-interview-technique-you-should-be-using https://twp.duke.edu/uploads/assets/Using%20Visual%20Rhetoric%20in%20Academic%20Writing.pdf	0	1	0	0
8	Writing from visuals Pictures, Graphs, Images, Diagrams and Designs, Cartoons Brochures and Newsletters		https://www.youtube.com/watch?v=r6ZVGBQYNXE	0	1	0	0

MODULE-II: READING AND CRITICAL APPRECIATION (8 HOURS)

S. No.	Topics	Pedagogy	Details	Instructional Hrs			
				Th	Pract	Vide o	Proj
9	Book (Independent Study: Two Master Piece)		http://www.howtolearn.com/2012/08/different-reading-techniques-and-when-to-use-them/	0	2	0	0
10	Article writing			0	2	0	0
11	Movie Review (Student Work: Free Choice, Discussion and Oral/ Written Critiquing, Editing/ Revision)			0	1	1	0
12	Publication/ Sharing, Short Report on Two Authors		https://www.elsevier.com/authors/book-authors/science-and-technology-book-publishing/overview-of-the-publishing-process	0	2	0	0

MODULE-III: POWER OF LATERAL THINKING TO CREATE NEW IDEAS (7hrs)

S. No.	Topics	Pedagogy	Details	Instructional Hrs			
				Th	Prac t	Vide o	Proj
13	General Concepts: Creativity and Lateral Thinking	Role Plays/ Oral Presentations Practice	www.brainstorming.co.uk/tutorials/definitions.html http://www.trainingcoursematerial.com/free-training-articles/creativity-problem-solving-decision-making-and-lateral-thinking/defining-lateral-thinking-parallel-thinking-creativity-and-innovation Video https://www.youtube.com/watch?v=H7PyFNzPSVY	0	1	1	0
14	Idea Generation Games and Activities	Pair/group activities	http://study.com/academy/lesson/what-is-idea-generation-definition-process-techniques.html	0	1	1	0
15	Six Thinking Hats	Group task	http://www.debonogroup.com/six_thinking_hats.php	0	1	1	0

16 DOUBT CLEARING

0 1 0 0

FCHU1212ENGLISH FOR COMPETITION (GRE/GMAT/TOEFL/IELTS)

<i>Pre - requisites</i>	<i>Course Type</i>	<i>Credits</i>
<i>Nil</i>	<i>Workshop</i>	<i>2</i>

COURSE OBJECTIVE

Familiarize the learners with the pattern of the TOEFL/GMAT/IELTS/GRE examination and improve overall English skills to face the competitive exams confidently.

COURSE OUTCOME

Learners understand the pattern of the TOEFL, IELTS and GRE examination and apply test-taking strategies in exams.

A student is required to take up five laboratory tests of 100 marks.

LIST OF EXPERIMENTS

1: TOEFL Listening

Developing Listening Comprehension by taking notes after the short recorded conversations.

2: TOEFL Speaking

Developing test taking strategies to face speaking test of TOEFL exam through role play and Mock Interview.

3: TOEFL Reading

Practicing and improving student's confidence in completing the various sections of reading test in TOEFL examination.

4: TOEFL Writing

Learning and enhancing writing skills required for TOEFL writing test.

5: IELTS Listening

Practicing the listening comprehension of the students and handling questions while listening to the recorded conversations.

6: IELTS Speaking

Developing test taking strategies to face speaking test of IELTS examination through role plays and mock interviews.

7: IELTS Writing

Summarizing or explaining information presented in a graph, chart, table or diagram.

8: IELTS Reading

Understanding and interpreting the text in its particular use of language, ideas and style.

9: GRE Reading Comprehension

Taking GRE Reading Comprehension examination with confidence utilizing the methods and strategies.

10: GRE SENTENCE COMPLETION

Developing sentence completion strategies through logical thinking.

11: GRE SENTENCE EQUIVALENCE

Learning and developing strategies to deal with sentence equivalence questions.

12: GRE VOCABULARY

Understanding and using appropriate choice of vocabulary in GRE vocabulary section.

13. GRE Vocabulary & Verbal-Sentence Corrections

14. GMAT Verbal-Critical Reasoning

15. GMAT Verbal- Reading Comprehension

(The entire lab will be facilitated through online quizzes, and practice sets available in language lab))

TEXT BOOKS:

NorthStar Building Skills for the TOEFL iBT, High Intermediate Level (Pearson Education).

NorthStar Building Skills for the TOEFL iBT, Intermediate Level (Pearson Education).

McGraw-Hill's New GRE: 2011-2012 Edition

Princeton Review: Cracking the New GRE 2012

REFERENCES:

- Longman Preparation Course for the TOEFL Test – iBT Speaking (Pearson Education).
 Longman Preparation Course for the TOEFL Test – iBT Listening (Pearson Education).
 Longman Preparation Course for the TOEFL Test – iBT Writing (Pearson Education).
 Longman Preparation Course for the TOEFL Test – iBT Reading (Pearson Education).
 NorthStar Building Skills for the TOEFL iBT, Advanced Level (Pearson Education).
 Achieve IELTS Workbook: Intermediate to Upper Intermediate: English for International Education (Achieve IELTS Intermediate/Upper) (Paperback).
 Kaplan New GRE Premier 2011-2012
 Barron's New GRE 19th Edition Grade
 Manhattan GRE
 Gruber's Complete GRE Guide 2012
 Nova's GRE Prep Course Grade
 ETS's Official Guide to the GRE Revised General Test
 Barron's GRE Verbal Workbook
 Barron's IELTS with Audio CD: International English Language Testing System (Paperback)
 Achieve IELTS Teacher's Book: Intermediate to Upper Intermediate: English for International Education (Achieve IELTS Intermediate/Upper) (Paperback)
 Step Up to IELTS Self-study Student's Book [STUDENT EDITION] (Paperback)
 IELTS Collected Papers: Research in speaking and writing assessment (Studies in Language Testing) (Paperback)

EVALUATION SYSTEM (CONTINUOUS INTERNAL ASSESSMENT)

<i>M</i> <i>e</i> <i>t</i> <i>h</i> <i>o</i> <i>d</i> <i>s</i>	Listening & fill-up blanks, short answers, Multiple-choice	JAM/ Questions & Responses	Vocabulary Quiz, Sentence Completion & Re-order paragraphs	Reading Comprehension	Summarize /Data Comment	Essay Writing	Analytical Writing	% of Marks 100 (Best 5)
<i>T</i> <i>o</i> <i>t</i> <i>a</i> <i>l</i>	20	20	20	20	20	20	20	100

SESSION PLAN: ENGLISH FOR COMPETITION

<i>S.</i> <i>No</i> <i>.</i>	<i>Topic</i>	<i>Pedagogy</i>	<i>Details</i>	<i>Instructional Hrs</i>			
				<i>Th</i>	<i>Pract</i>	<i>video</i>	<i>Pro</i> <i>t</i>
1	TOEFL Listening	Listening Activity Based Learning	http://www.examenglish.com/TOEFL/toefl_listening.htm	0	1	1	0
2	TOEFL Speaking	Listening and speaking activity	http://www.examenglish.com/TOEFL/TOEFL_Speaking_part5.htm	0	1	1	0
3	TOEFL Reading & Writing	Reading and Writing Practice	http://www.examenglish.com/TOEFL/TOEFL_reading1.htm (Reading) https://www.englishclub.com/esl-exams/ets-toefl-practice-writing.htm .	0	2	0	0

			http://www.time4writing.com/toefl/ (Writing)				
4	IELTS Listening	Listening Practice	http://takeielts.britishcouncil.org/prepare-your-test/free-ielts-practice-tests/listening-practice-test-1	0	1	1	0
5	IELTS Speaking	Speaking Practice	http://takeielts.britishcouncil.org/prepare-your-test/free-practice-tests/speaking-practice-test-1	0	2	0	0
6	IELTS Writing & Reading	Writing & Reading Practice	http://takeielts.britishcouncil.org/prepare-your-test/free-practice-tests/writing-practice-test-1-ielts-academic http://takeielts.britishcouncil.org/sites/default/files/Writing_practice_test_1_1_IELTS_Academic_questions.pdf (writing) http://takeielts.britishcouncil.org/prepare-test/practice-tests/reading-practice-test-1-academic (Reading)	0	2	0	0
7	GRE Reading Comprehension	Reading Practice	http://gre.graduateshotline.com/reading_comprehension_practice.html#.V2kJDRITXCM https://www.ets.org/gre/revised_general/prepare/verbal_reasoning/reading_comprehension/sample_questions	0	2	0	0
8	GRE Sentence Completion & Sentence Equivalence	Online practice	http://gre.graduateshotline.com/gre_sentence_completion.pl https://www.ets.org/gre/revised_general/prepare/verbal_reasoning/text_completion/sample_questions http://www.examfocus.com/gre/pt/verbal/sentence-equivalence-1.html	0	2	0	0
9	GRE Vocabulary	Online practice	http://gre.graduateshotline.com/	0	2	0	0
10	GMA Verbal-Sentence Corrections	Online practice	http://freegmattest.net/Questions http://www.majortests.com/gmat/sentence_correction.php	0	2	0	0
11	GMAT Verbal-Critical Reasoning	Online practice	http://www.majortests.com/gmat/critical_reasoning_test01	0	2	0	0
12	GMAT Verbal-Reading Comprehension	Online practice	http://www.majortests.com/gmat/reading_comprehension_test01	0	2	0	0

FCHU1213BE A CONTRIBUTOR

<i>Pre - requisites</i>	<i>Course Type</i>	<i>Credits</i>
<i>Nil</i>	<i>Workshop</i>	<i>2</i>

PROGRAM OBJECTIVES:

1. Build consciousness of ‘contributor thinking’ in students systematically by exposing them to the essential building blocks of contributor thinking. [The 4 sets of the program represent the 4 fundamental building block of the program]
2. Through projects expose students to the ‘realness’ of contributor way of thinking in the world around them.

SESSION PLAN:

Semester 1 of program delivery	SET 1: CONTRIBUTOR BASICS	
	UNIT 1: Who is a Contributor?	~5hrs
	UNIT 2: Scope of Contribution (<i>Self, Organization, Society</i>)	~5hrs
	UNIT 3: Depth of Contribution (<i>From ‘opportunities to contribute’ to a ‘life of Purpose’</i>)	~5hrs
	SET 2: BASIC AXIOMS OF LIFE	
	UNIT 4: The Contributor’s Response (<i>From ‘victim’ to ‘creator of my destiny’</i>)	~5hrs
	UNIT 5: The Contributor’s Identity (<i>From ‘static identities’ to ‘dynamic identities’</i>)	~5hrs
Semester 2 of program delivery	UNIT 6: The Contributor’s Vision of Success & Career (<i>From an ‘acquisitive vision’ to a ‘contributive vision’</i>)	
	SET 3: CONTRIBUTOR EFFECTIVENESS	
	UNIT 7: Engage Deeply	~5hrs
	UNIT 8: Design Solutions	~5hrs
	UNIT 9: Create Value	~5hrs
	SET 4: CONTRIBUTOR CONDUCT	
	UNIT 10: Thinking Win-win (Enlightened Self-Interest)	~5hrs
UNIT 11: Thinking Human-impact (Imaginative Sympathy)	~5hrs	
UNIT 12: Building Trust-surplus (Trust Behaviors)	~5hrs	
Full program duration		~60hrs

1.0 | Faculty can utilise the 5 hours of classroom as follows –

<p>i. The Class Engagement Books (for each unit)</p>	
<p>ii. The Program App (Channel Illumine App)</p>	<p>~ 4hrs for Book and App engagement.</p>
<p>iii. Projects (for each unit)</p> <p>Students can do 1-2 projects in each semester. The project is done out of class. In-class time is only for student presentation.</p>	<p>~1hr for project presentations</p>

Source: This document is an abridged version of 'Overview of Become a Contributor Program' given in your Facilitator Guide. It is strongly recommended that faculty refer the detailed Facilitator Guide for more details.

EVALUATION PARAMETERS (Total-100 Marks)

A] ENGAGEMENT IN CLASS		40 marks
1	Regular attendance across classes	10 marks
2	Quality of class participation (<i>involvement in discussions, asking thoughtful questions, sharing examples, etc.</i>)	15 marks
3	In-class assignments <ul style="list-style-type: none"> · <i>Students can be asked to submit their filled books for specific in-class assignments (Illumine can provide a list of which class engagements in each book, can be checked for this)</i> · <i>Any 4 books (one from each set), can be considered for marking.</i> 	15 marks
B] PROJECT WORK <ul style="list-style-type: none"> · <i>Project assignments are provided by Illumine for the course.</i> · <i>Mark students on their best 3, from these project assignments.</i> 		30 marks
1	Completion & submission of assigned projects, with basic quality	10 marks
2	Design and execution of the project (Methodology of project work) (<i>students present how they went about the project – their approach, method, documentation of research work</i>)	10 marks
3	Project presentation & project output uploads (<i>assessed against the project goal</i>)	10 marks
C] PRE & POST TEST		20 marks
1	Completion of pre-test	5 marks
2	Completion of post-test	5 marks
3	Improvement (sent by Illumine, based on test results)	10 marks
D] APP USAGE (sent by Illumine, based on app usage pattern)		10 marks

FCHU0210 LIFE SKILLS DEVELOPMENT-I [English]

<i>Pre - requisites</i>	<i>Course Type</i>	<i>Credits</i>
<i>Nil</i>	<i>Practice</i>	<i>2</i>

OBJECTIVES

To provide ample opportunities for practice

To approach reading comprehension questions and improve your vocabulary

OUTCOME

To qualify competitive exams

MODULE I: (24 HOURS)

s No.	Topic	Pedagogy	Details	Instructional Hrs			
				Th	Pract	video	Pro j
1	Reading Comprehension-1 & 2	Workbook Practice	Passage Reading	0	2	0	0
2	Reading Comprehension-3 & 4	Workbook Practice	Passage Reading	0	2	0	0
3	Reading Comprehension-1, 2 & 3	Workbook Practice	Passage Reading	0	2	0	0
4	Reading Comprehension-4,5 & 6	Workbook Practice	Passage Reading	0	2	0	0
5	Vocabulary(10 New Words)	Workbook Practice	Learning 10 new words	0	2	0	0
6	Vocabulary(15 New Words)	Workbook Practice	Learning 15 new words	0	2	0	0
7	Vocabulary(15 New Words)	Workbook Practice	Learning 15 new words	0	2	0	0
8	Vocabulary(20 New Words)	Workbook Practice & Quiz	Learning 20 new words	0	2	0	0
9	Reading Comprehension-1 & 2	Workbook Practice	Passage Reading	0	2	0	0
10	Reading Comprehension-3 & 4	Workbook Practice	Passage Reading	0	2	0	0
11	Reading Comprehension-5 & 6	Workbook Practice	Passage Reading	0	2	0	0
12	Speaking Skills	ACTIVITY	JAM	0	2	0	0
MODULE II: (24 HOURS)							
1	Vocabulary	Workbook Practice	Learning new words	0	2	0	0
2	Vocabulary	Workbook Practice	Learning new words	0	2	0	0
3	Reading Practice	News Reading	Reading Comprehension	0	2	0	0
4	Reading Comprehension-1 & 2	Workbook Practice	Passage Reading	0	2	0	0
5	Reading Comprehension-3 & 4	Workbook Practice	Passage Reading	0	2	0	0

7	Vocabulary	Workbook Practice	Learning new words	0	2	0	0
8	Vocabulary	Quiz	Learning new words	0	2	0	0
9	Vocabulary	Workbook Practice	Learning new words	0	2	0	0
10	Speaking Skills	GD & Analysis	General Topics	0	2	0	0
11	Reading Comprehension-1 & 2	Workbook Practice	Passage Reading	0	2	0	0
12	Vocabulary-1	Quiz	Learning new words	0	2	0	0
MODULE-3 (24 HOURS)							
1	Reading Comprehension-1 & 2	Workbook Practice	Passage Reading	0	2	0	0
2	Vocabulary-1	Workbook Practice	Learning new words	0	2	0	0
3	Vocabulary-2	Surprise Quiz	Learning new words	0	2	0	0
4	Vocabulary-2	Workbook Practice	Learning new words	0	2	0	0
5	Vocabulary-3	Workbook Practice	Learning new words	0	2	0	0
6	Vocabulary-3	Asking Each Other	Learning new words	0	2	0	0
7	Vocabulary-4	Quiz	Learning new words	0	2	0	0
8	Reading Comprehension-1 & 2	Workbook Practice	Passage Reading	0	2	0	0
9	Reading Comprehension-3 & 4	Workbook Practice	Passage Reading	0	2	0	0
10	Speaking Practice	Activity Based Learning	Extempore/ Communication Game	0	2	0	0
11	Vocabulary-5	Workbook Practice	Learning new words	0	2	0	0
12	Vocabulary-5	Recap & Analysis	Vocabulary Exercises	0	2	0	0

EVALUATION SYSTEM: INTERNAL ASSESSMENT (50) + EXTERNAL ASSESSMENT (50)

Methods	Online Test-I	Online Test-I	Online Test-I	Attendance	Assignment	% of Marks 50
Total	10	10	10	10	10	100

FCHU0211LIFE SKILLS DEVELOPMENT-II [APTITUDE]

<i>Pre - requisites</i>	<i>Course Type</i>	<i>Credits</i>
<i>Nil</i>	<i>Practice</i>	<i>2</i>

OBJECTIVE

Aptitude and Reasoning Tests are designed to give an objective assessment of a Candidate's ability in numerical as well as analytical

OUTCOMES

Ability skills will be increased

Improved skills to qualify all competitive exams like Banking Exams, Company-based Exams, Railway Exams, GATE Exams

SESSION PLAN: APTITUDE MODULE I: (24 HOURS)

S. No.	Topic	Pedagogy	Details	Instructional Hrs			
				Th	Pract	video	Proj
1	Number System-01	Workbook Practice	Operation on Numbers, Classification of Numbers, Tests of Divisibility	0	2	0	0
2	Number System-01	Workbook Practice		0	2	0	0
3	Number System-02	Workbook Practice	Unit Digit Calculation, Remainder Calculation,	0	2	0	0
4	Number System-02	Workbook Practice		0	2	0	0
5	Practice Test - 01	Practice Test	Practice Test on Number System http://gradestack.com/blogs/short-quiz-on-number-system-for-ctet-2015/	0	2	0	0
6	Lcm & HCF	Workbook Practice	Basics of LCM & HCF	0	2	0	0
7	Lcm & HCF	Workbook Practice	Basics of LCM & HCF	0	2	0	0
8	Practice Test - 02	Practice Test	Practice Test on LCM & HCF	0	2	0	0
9	Average	Workbook Practice	Basics of Average	0	2	0	0
10	Average	Workbook Practice	Basics of Average	0	2	0	0
11	Practice Test - 03	Practice Test	Practice Test on Average	0	2	0	0
12	Practice Test - 04	Practice Test	Practice Test on Number System, LCM & HCF & Average	0	2	0	0

MODULE II: (24 HOURS)

S. No.	Topic	Pedagogy	Details	Instructional Hrs			
				Th	Pract	video	Proj
1	Percentage	Workbook Practice	Basics of Percentage	0	2	0	0
2	Percentage	Workbook Practice	Basics of Percentage	0	2	0	0
3	Practice Test – 05	Practice Test	Practice Test on Percentage	0	2	0	0
4	Ratio & Proportion	Workbook Practice	Basics of Ratio & Proportion	0	2	0	0
5	Practice Test-06	Practice Test	Practice Test on Ratio & Proportion	0	2	0	0
6	Time & Work	Workbook Practice	Basics of Time & Work, Chain Rule	0	2	0	0
7	Time & Work	Workbook Practice	Basics of Time & Work, Chain Rule	0	2	0	0
8	Practice Test – 07	Practice Test	Practice Test on Time & Work	0	2	0	0
9	Pipes & Cistern	Workbook Practice	Basics of Pipes & Cistern	0	2	0	0
10	Time & Distance, Trains	Workbook Practice	Basics of Time & Distance, Trains	0	2	0	0
11		Workbook Practice	Basics of Time & Distance, Trains	0	2	0	0
12	Practice Test – 08	Practice Test	Practice Test on Time & Distance, Trains	0	2	0	0

MODULE-3 (24 HOURS)

S. No.	Topic	Pedagogy	Details	Instructional Hrs			
				Th	Pract	video	Proj
1	Boats & Streams	Class Task	Basics of Boats & Streams	0	2	0	0
2	Profit & Loss	Class Task	Basics of Profit & Loss	0	2	0	0
3	Profit & Loss	Home Task	Basics of Profit & Loss	0	2	0	0
4	Practice Test - 09	Practice Test	Practice Test on Profit & Loss http://gradestack.com/ssc/quants-quiz-on-profit-and-loss-for-ssc-cgl-2015-exam/	0	2	0	0
5	Practice Test - 10	Practice Test	Practice Test on Boats & Streams	0	2	0	0
6	Practice Test -11	Practice Test	Practice Test on Average,Percentage,NumberSystem,LCM& HCF, Boats &Streams, Average,Profit&Loss,Trains,Time & Distance www.livetest.in	0	2	0	0
7	Practice Test - 12	Practice Test	Practice Test on Average,Percentage,NumberSystem,LCM& HCF, Boats & Streams, Average,Profit&Loss,Trains,Time & Distance https://www.wiziq.com/tests/aptitude-test	0	2	0	0
8	Practice Test - 13	Practice Test	Practice Test on Average,Percentage,NumberSystem,LCM& HCF, Boats & Streams, Average,Profit&Loss,Trains,Time & Distance	0	2	0	0
9	Practice Test -14	Practice Test	Practice Test on Average,Percentage,NumberSystem,LCM& HCF, Boats & Streams, Average,Profit&Loss,Trains,Time & Distance	0	2	0	0
10	Practice Test - 15	Practice Test	Practice Test on Average,Percentage,NumberSystem,LCM& HCF, Boats & Streams, Average,Profit&Loss,Trains,Time & Distance	0	2	0	0
11	Practice Test - 16	Practice Test	Practice Test on Average,Percentage,NumberSystem,LCM& HCF, Boats & Streams, Average,Profit&Loss,Trains,Time & Distance http://www.freeonlinetest.in	0	2	0	0
12	Practice Test -17	Practice Test	Practice Test on Average,Percentage,NumberSystem,LCM& HCF, Boats & Streams, Average,Profit&Loss,Trains,Time & Distance	0	2	0	0

			<i>References for online tests:</i> http://www.careerride.com/Online-practice-test.aspx http://www.freeonlinetest.in http://gradestack.com www.livetest.in https://www.wiziq.com/tests/aptitude-test				
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EVALUATION SYSTEM: INTERNAL ASSESSMENT (50) + EXTERNAL ASSESSMENT (50)

<i>Methods</i>	<i>Online Test-I</i>	<i>Online Test-I</i>	<i>Online Test-I</i>	<i>Attendance</i>	<i>Assignment</i>	<i>% of Marks</i>
Total	10	10	10	10	10	100

FCHU0212LIFE SKILLS DEVELOPMENT – III [REASONING]

<i>Pre - requisites</i>	<i>Course Type</i>	<i>Credits</i>
<i>Nil</i>	<i>Workshop</i>	<i>2</i>

SESSION PLAN: REASONING MODULE I: (24 HOURS)

S. No.	Topic	Pedagogy	Details	Instructional Hrs			
				Th	Pract	video	Proj
1	Number Series	Workbook Practice	BASICS	0	2	0	0
2	Number Series	Workbook Practice	BASICS	0	2	0	0
3	Practice Test - 01	Practice Test	Practice Test on Number Series http://gradestack.com/ssc/reasoning-quiz-on-number-series-for-ssc-exams-3/	0	2	0	0
4	Letter Series	Class Task	BASICS	0	2	0	0
5	Letter Series	Workbook Practice	BASICS	0	2	0	0
6	Practice Test - 02	Practice Test	Practice Test on Letter Series	0	2	0	0
7	Alpha Numeric Series	Workbook Practice	Basics	0	2	0	0
8	Alpha Numeric Series	Workbook Practice	Basics	0	2	0	0
9	Practice Test - 03	Practice Test	Practice Test on Alpha Numeric Series	0	2	0	0
10	Continuous Pattern Series	Workbook Practice	Basics	0	2	0	0
11	Continuous Pattern Series	Workbook Practice	Basics	0	2	0	0
12	Practice Test - 04	Practice Test	Practice Test on Number Series, Letter Series, Alpha Numeric Series & Continuous Pattern Series	0	2	0	0

MODULE II: (24 HOURS)

S. No.	Topic	Pedagogy	Details	Instructional Hrs			
				Th	Pract	video	Proj
1	Percentage	Workbook Practice	Basics of Percentage	0	2	0	0
2	Percentage	Workbook Practice	Basics of Percentage	0	2	0	0
3	Practice Test - 05	Practice Test	Practice Test on Percentage	0	2	0	0
4	Ratio & Proportion	Workbook Practice	Basics of Ratio & Proportion	0	2	0	0
5	Practice Test-06	Practice Test	Practice Test on Ratio &	0	2	0	0

			<i>Proportion</i>				
6	<i>Time & Work</i>	<i>Workbook Practice</i>	<i>Basics of Time & Work, Chain Rule</i>	0	2	0	0
7	<i>Time & Work</i>	<i>Workbook Practice</i>	<i>Basics of Time & Work, Chain Rule</i>	0	2	0	0
8	<i>Practice Test - 07</i>	<i>Practice Test</i>	<i>Practice Test on Time & Work</i>	0	2	0	0
9	<i>Pipes & Cistern</i>	<i>Workbook Practice</i>	<i>Basics of Pipes & Cistern</i>	0	2	0	0
10	<i>Time & Distance, Trains</i>	<i>Workbook Practice</i>	<i>Basics of Time & Distance, Trains</i>	0	2	0	0
11	<i>Time & Distance, Trains</i>	<i>Workbook Practice</i>	<i>Basics of Time & Distance, Trains</i>	0	2	0	0
12	<i>Practice Test - 08</i>	<i>Practice Test</i>	<i>Practice Test on Time & Distance, Trains</i>	0	2	0	0

MODULE-3 (24 HOURS)

<i>S. No.</i>	<i>Topic</i>	<i>Pedagogy</i>	<i>Details</i>	<i>Instructional Hrs</i>			
				<i>Th</i>	<i>Pract</i>	<i>video</i>	<i>Proj</i>
1	<i>Miscellaneous</i>	<i>Workbook Practice</i>	<i>Basics</i>	0	2	0	0
2	<i>Miscellaneous</i>	<i>Workbook Practice</i>	<i>Basics</i>	0	2	0	0
3	<i>Practice Test - 11</i>	<i>Practice Test</i>	<i>Practice Test on Syllogism, Puzzle, Letter & Number Series, Miscellaneous</i>	0	2	0	0
4	<i>Practice Test - 12</i>	<i>Practice Test</i>	<i>Practice Test on Syllogism, Puzzle, Letter & Number Series, Miscellaneous</i>	0	2	0	0
5	<i>Practice Test - 13</i>	<i>Practice Test</i>	<i>Practice Test on Syllogism, Puzzle, Letter & Number Series, Miscellaneous</i>	0	2	0	0
6	<i>Practice Test - 14</i>	<i>Practice Test</i>	<i>Practice Test on Syllogism, Puzzle, Letter & Number Series, Miscellaneous</i>	0	2	0	0
7	<i>Practice Test - 15</i>	<i>Practice Test</i>	<i>Practice Test on Syllogism, Puzzle, Letter & Number Series, Miscellaneous</i>	0	2	0	0
8	<i>Practice Test - 16</i>	<i>Practice Test</i>	<i>Practice Test on Syllogism, Puzzle, Letter & Number Series, Miscellaneous</i>	0	2	0	0
9	<i>Practice Test - 17</i>	<i>Practice Test</i>	<i>Practice Test on Syllogism, Puzzle, Letter & Number Series, Miscellaneous</i>	0	2	0	0
10	<i>Practice Test - 18</i>	<i>Practice Test</i>	<i>Practice Test on Syllogism, Puzzle, Letter & Number Series, Miscellaneous</i>	0	2	0	0
11	<i>Practice Test - 19</i>	<i>Practice Test</i>	<i>Practice Test on Syllogism, Puzzle, Letter & Number Series, Miscellaneous</i>	0	2	0	0
12	<i>Practice Test - 20</i>	<i>Practice Test</i>	<i>Practice Test on Syllogism, Puzzle, Letter & Number</i>	0	2	0	0

			<i>Series, Miscellaneous</i> http://gradestack.com http://www.freeonlinetest.in www.livetest.in				
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EVALUATION SYSTEM: INTERNAL ASSESSMENT (50) + EXTERNAL ASSESSMENT (50)

<i>Methods</i>	<i>Online Test-I</i>	<i>Online Test-I</i>	<i>Online Test-I</i>	<i>Attendance</i>	<i>Assignment</i>	<i>% of Marks</i>
Total	10	10	10	10	10	100

FCMG0114 ECONOMICS

<i>Pre - requisites</i>	<i>Course Type</i>	<i>Credits</i>
<i>Nil</i>	<i>Theory</i>	<i>2</i>

Course Objective:

In today's dynamic economic environment, effective managerial decision making requires timely and efficient use of information. The basic purpose of this course is to provide students with a basic understanding of the economic principles, methodologies and analytical tools that can be used in business decision making problems. It provides an understanding of the economic environment and its impact on strategy formulation. The course also focuses on the impact of economic policies on managerial decision-making by providing an understanding of fiscal policy, and national and global economic issues affecting business.

The language of science (and all analytical thinking) is mathematics. Since economics is a social science, use of some mathematical tools, basically the constrained and un-constrained optimization techniques will help in measuring and solving the basic economic problems and thus improves decision-making. It becomes difficult and totally un-practicable to solve business (economic) problems logically and systematically without use of mathematics. The basic objective is to solve problems mathematically and interpret the results economically.

Module-1: Micro Economics

Introduction to economics: Scarcity, Choice and Efficiency, Fundamental issues of what, how and for whom to produce to make the best use of economics. Demand for a commodity: Law of demand, Demand schedule and demand curve, Individual and market demand, Change in demand, Consumer behavior: Analysing law of demand through Marshallian utility analysis, Indifference curve technique and Consumer Surplus.

Elasticity of demand: Price Elasticity of demand: Estimation, Types, Elasticity and revenue, Factors affecting price elasticity of demand. Income elasticity, Cross elasticity, Uses of different concepts of elasticity in business decisions.

Analysis of Supply: Law of Supply, Supply schedule and supply curve, Change in supply, Price elasticity of supply, Equilibrium of demand and supply: Equilibrium with demand and supply curves, Effect of a shift of demand and supply curves.

Production Function: Production function with one variable input, Production function with two variable inputs, optimal combination of inputs, Returns to scale

Cost Theory: Types of costs, Production and cost, Short-run cost functions, Long-run cost functions, Economies of scale and scope, Cost-Volume-profit Analysis

Market: Meaning, types and characteristics of different market structure (Perfect competition, Monopoly, Monopolistic competition and Oligopoly)

Module: 2: Macro Economics

National Income Accounting: Circular flow of Income, National Income Concept, Eight variants of national product aggregates, Measurement (Income, Value Added and Expenditure), Real and Nominal GNP, Difficulties in measuring the national income, Uses of National income statistics,

Money and Inflation: Demand for and supply of money. Causes and consequences of Inflation.

Commercial and central banking: Role and functions of commercial banks and R.B.I., Monetary

Policy and Fiscal policy: Objectives and Instruments, Balance of Payment (BoP): Meaning, BoP

Account, Disequilibrium in BoP, Measures to correct disequilibrium in BoP, Foreign Exchange: Floating Exchange Rate and Fixed Exchange Rates

Books & Reference:

1. *Managerial Economics in a Global Economy*, by D. Salvatore, Sixth Edition, OUP, 2008
2. *Managerial Economics*, Truett & Truett, Wiley Publication.
3. *Managerial Economics*, by Petersen Craig H. Cris Lewis and S.K. Jain, Pearson, 2007
4. *Modern Micro Economics*, Koutsoyiannis, (1975), A, Macmillan Press
5. *Managerial Economics*, Mehta, P. L (1999), Sultan Chand & Sons

6. *Principles of Microeconomics, Mankiw, N. G (2006), Cengage Learning*
7. *Macroeconomics, Mankiw, N. G, (2009), Worth Publishers*
8. *Macroeconomics, Theory and Policy, Dwivedy, D.N (2007), Tata McGraw Hill*
9. *Macroeconomics, D'Souza, E (2008), Pearson Education*
10. *Macroeconomic Analysis, Shapiro, E (2003), Galgotia Publications*
11. *Environmental Economics in Theory and Practice – Hankey N, Shogren J F, and White B – 1999
– Macmillan Indian Limited*
12. *Indian Economy, Mishra &Puri (2011), Himalaya Publishing House*

FCMG0102 ACCOUNTING AND FINANCE

<i>Pre - requisites</i>	<i>Course Type</i>	<i>Credits</i>
<i>Nil</i>	<i>Theory</i>	<i>2</i>

Course Objective:

- To familiarise the students with basic terms of accounting, accounting principles, concepts and convention.*
- To equip the students with various concepts, tools and techniques of Cost accounting as well as Management accounting essential for managerial decision making process.*
- To aware students overview of Time Value of Money, Working Capital and Stock Market*

Course outcomes:

On the successful completion of this paper the students should be able composed the information about:

- Develop a basic understanding of accounting and financial ratio analysis.*
- Students will be able to create, balance and deliver a budget and use budget information for planning and decision purposes.*
- Undertake various costing techniques and information for planning and decision-making*
- Demonstrate time management by understand various financial funding options for project planning and working capital management of an organizations.*
- Know how financial markets as well as the global economy are impacting their organization today and how they will impact their organization into the future.*

Module 1:

Basic Accounting Concepts and Conventions, Basic Accounting Equation, Accounting Mechanism: Journals, Ledgers, Trial Balance, Basic Financial Statements: Analysis of Items found in Balance Sheet and Income Statement, Ratio Analysis

Module 2:

Cost Concepts and Cost Terms: Financial Accounting vrs. Cost Accounting, Direct and Indirect Costs, Fixed, Variable and Semi-variable Costs, Standard, Budgeted and Actual Costs, Controllable and Non-controllable costs, Preparation of Cost Sheet, Cost-Volume-Profit Analysis: Concept of Marginal Cost and Contribution, Concept of Break Even Analysis, Applications of Marginal Costing

Module 3:

Time Value of Money: Concept, Simple and Compound Interest, Present Value of a Single Amount, Present Value of an Uneven Series, Future Value of an Annuity, Present Value of an Annuity
Working Capital Management: Meaning and Components of Working Capital, Determinants of Working Capital, Profitability-Risk Trade-off, Types of Working Capital, Importance of Working Capital, Operating Cycle: Concept and Estimation
Stock Market: Types of Capital Issues: Initial Public Offer, Follow-on Public Offer, Rights Issues, Preferential Issues, Red-herring Prospectus, Free Pricing of Issues, Greenshoe Option, Lock-in Period, Safety Net, Listing of Securities on Stock Exchanges

Books Recommended:

- Accounting for Management—Ashok Sehegal, Taxxman*
- Financial Accounting -- A managerial Perspective, R. Narayanswamy, PHI*
- Khan & Jain – Management Accounting, TMH.*
- Horngren ,Datar, Foster- Cost Accounting, Pearson.*
- Financial Accounting, Jain/Narang/Agrawal, Kalyani.*
- Basic Financial Accounting for Management, Shah, Oxford.*
- Financial Management by I. M. Pandey*
- Financial Management – Theory and Practice by Chandra*
- Financial Management – Text and Problems by Khan & Jain*

FCMG0103 MANAGEMENT PROCESSES AND ORGANIZATIONAL BEHAVIOR

<i>Pre - requisites</i>	<i>Course Type</i>	<i>Credits</i>
<i>Nil</i>	<i>Theory</i>	<i>2</i>

Course Objectives:

Management as a subject of study has brought a new paradigm in managing organizations. The young professionals has to learn and reflect the basic principles of management. Along with it the knowledge of Individual and group behaviour and its impact at the workplace is vital.

Organizational Behavior (OB) is a field of study that investigates the impact that individuals, groups, and structure have on behavior within an organization. Then it applies that knowledge to make organizations work more effectively. This course will expose students to gain knowledge on the basic principles of management and organization behavior.

Course Introduction

Management as a subject of study has brought a new paradigm in managing organizations. The young professionals has to learn and reflect the basic principles of management. Along with it the knowledge of Individual and group behaviour and its impact at the workplace is vital. Organizational Behavior (OB) is a field of study that investigates the impact that individuals, groups, and structure have on behavior within an organization. Then it applies that knowledge to make organizations work more effectively. This course will expose students to gain knowledge on the basic principles of management and organization behavior.

Course Content

Unit: I

Emergence of Management as a discipline, Principles of management, (Planning, organizing, staffing and controlling) Contributions to management by Luther Gullick , Henri Fayol and Peter F. Drucker and Introduction: Concept and models of OB, Approaches to OB (Systems, Human resource and Contingency)

Unit: II

Individual System: Learning, Perception, Personality and Motivation,

Unit: III

Social System: Group Dynamics and Leadership.

Books Recommended:

1. Robins & Sanghii; Organizational Behavior, Pearson
2. Luthans ,F; Organizational Behavior-TMH
3. Udai Pareek ; Understanding Organizational Behavior, Oxford
4. Prasad,L.M; Organization behavior, S.Chand.
5. K. Aswathappa; Organization behaviour
6. Prasad.L.M ; Principles of Management,

FCMG0104 PRODUCTION AND OPERATION MANAGEMENT

<i>Pre - requisites</i>	<i>Course Type</i>	<i>Credits</i>
<i>Nil</i>	<i>Theory</i>	<i>2</i>

Course Objective:

The course is designed to acquaint the students with decision making in production and operation function of an organization.

Course Outcomes :

- Acquire a working understanding of the roles/functions of production management in the context of business enterprise.
- The learner will have a deep knowledge of the fundamental theory and mathematical principles involved in Production and Operation Management.
- They can use specialized knowledge in Operations Management to solve business processes.
- They will be capable of applying these principles to solve relevant production or service system problems.

Module 1:

Operations Management- An Introduction : Primary topics in Operations Management, Operations Function and Transformation process . Manufacturing Strategy and Mass customization, Product Development and Service Design , New Product design, Product life cycle, Process design, Process life cycle

Module 2:

Project scheduling Models: Project Network, Critical path Method (CPM), Programme Evaluation Review Technique (PERT).

Scheduling: Objective of Scheduling, Sequencing, Sequencing model: "n" jobs 1 machine, "n" jobs 2 machines.

Module 3:

Inventory Management: Concept of inventory with independent demand: Inventory cost structure, Deterministic inventory model - EOQ models, instantaneous receipt, Inventory model with discounts.

Module 4:

Quality Management: Concept of quality; Quality of design, Conformance & performance; Cost of poor process performance and quality. Statistical Quality Control - Process Control (X-bar, R & P chart, np chart).

Concept of TQM,Just in Time and Lean Production Basic element in JIT, Pull system, Push system

Books Recommended:

- 1) Chase, Jacobs, Aquilano, Agarwal, - "Operations Management", TMH
- 2) Krajewski,Ritzman,Kansal, - "Operations Management", Pearson
- 3) Everette. Adam Jr., Ronald J. Ebert, - "Production and Operations Management", PHI
- 4) Roberta S. Russell & Bernard W. Taylor III, - "Operations Management", Pearson/ PHI
- 5) Aswathappa& Sridhar Bhat, - "Production and Operations Management", HPH
- 6) Gaither, Frazier- Operations Management

FCMG0105MARKETING MANAGEMENT

<i>Pre - requisites</i>	<i>Course Type</i>	<i>Credits</i>
<i>Nil</i>	<i>Theory</i>	<i>2</i>

Course Objective:

- To familiarize the students with the concepts and theories and strategies of marketing.*
- To focus on the application of these concepts to various marketing contexts*
- To focus on the emerging areas of marketing*

Course outcomes :

- The students will understand the various marketing approach in today's competitive scenario.*
- The students will learn the application of various marketing tools for solving business problems*
- The students will acquire and develop the marketing skills to be a successful marketing person*

Module 1:

Introduction to marketing; What is marketing?, Importance of marketing function, Process of marketing, Concepts like need, want, value, satisfaction etc, Elementary idea of marketing mix. Understanding Marketing Environment; Factors affecting marketing environment (PESTEL), Porter's five forces model, Introduction to market research

Module 2:

Segmentation, Targeting & positioning (STP); What is market segmentation?, Criteria for effective segmentation, Targeting selected markets, Targeting strategies, Positioning, Effective positioning strategies, Positioning of brands and repositioning, introduction to consumer behavior.

Module 3:

Product Management; Classification of products, Product life cycle (PLC), Brand and branding. Pricing; Meaning & objective, steps in setting the price, pricing policies. Promotion; What is promotion, types of promotion, advertising, sales promotion, integrated marketing communication Place; Marketing channels, Channel conflict management, Distribution system. Introduction to services marketing, Emerging concepts like green marketing, e-marketing & social marketing.

Books Recommended:

- Marketing Management: A South Asian Perspective- Phillip Kotler, Kevin Lane Keller, Abraham Koshy and MithileshwarJha, 13th Edition Pearson, Education Publication*
- Marketing Mangement: Fourth edition- RajanSaxena*
- Positioning: The Battle for Your Mind- Al Ries& Jack Trout, Warner Books USA*

FCMG0108 INTRODUCTION TO RESEARCH

<i>Pre - requisites</i>	<i>Course Type</i>	<i>Credits</i>
<i>Nil</i>	<i>Theory</i>	<i>2</i>

Course Objectives:

- *To introduce the students about research, methods and techniques.*
- *To understand the process and apply in other areas.*

Course outcome:

- *Students will be able to understand the process of doing a research.*
- *Students will be able to write a research report.*

Course Contents:

Module: I Science and Social Science as Knowledge

Common sense view of Science, Seeing is believing?, Visual Experiences, Relevant Facts, Facts precede theory, Observation, Experiment as an adequate basis of Science, Deductive and inductive logic, falsification-A logical view,

Module: II Process of doing Research

Overview: Problem Definition, hypothesis and its function, Types of Research, Literature Review, Research Design, *Sampling:* Census and sample survey, different types of sample design, *Measurement:* Measurement and scaling techniques, *Methods of Data Collections:* Experimentation, observation, interview, Survey, case study; *Data Analysis and Interpretation:* Qualitative and quantitative data, data presentation, central tendency and dispersion, association, test of significance.

Module: III Report Writing and Presentation

Significance of report writing, different steps in report writing, layout of research report & Types of Report, Presentation, Ethics in Report Writing.

Books Recommended

1. *Ranjit Kumar, 2011, Research Methodology: A Step by Step Guide, Sage South Asia Publication.*

FCMG0113 INDIAN SOCIETY AND CULTURE

<i>Pre – requisites</i>	<i>Course Type</i>	<i>Credits</i>
<i>Nil</i>	<i>Theory</i>	<i>2</i>

Course Objectives:

- a) *Develop an understanding social environment*
- b) *Develop an understanding of cultural environment*
- c) *Understanding the linkages among social, cultural and business environment*

Course outcomes :

- *Students would develop an idea about the socio-cultural environment in which they would be working as scientists, researchers and entrepreneurs.*
- *More specifically, they would get an appreciation of how societal and cultural issues interface with technology and science in the context of overall development of the country.*
- *Attempt is also made to familiarise students with the science and technology policies that would benefit modern India.*

Course Contents:

Module 1: Introduction to Indian Society

Indian Society - Roots of Indian Society , Social Structure – Rural and Urban Contexts, Social Institutions in Indian Society, Caste, Tribe, Dalits and Other Excluded Groups, Power and Conflicts

Module 2: Introduction to Culture in Indian Society

Culture in Ancient, Medieval and Modern India, Languages and Literature in India, Culture Change and its Impact on Indian Society

Module 3: Social Movements

Reformers and Radicals – Rammohan Roy, Syed Ahmed Khan, JotiroPhule, Gopal Krishna Gokhale, BalGangadharTilak, TarabaiShinde, DayanandaSaraswatiand Vivekananda Nurturing a Nation – M. K. Gandhi, RabindraNath Tagore, B R Ambedkar, Mohammad Ali Jinnah, EV Ramaswami, Jawaharlal Nehru, RammanoharLohia, Jayaprakash Narayan, Verrier Elwin Peasant, Tribal, Women and Environment movement

Module 4: Social Issues in Modern India

Poverty, Gender Inequality, Disparity and Social Exclusion: SC, ST, Women, Child, Challenged

Module 5: Science, Technology and Society

Science, Technology and Development Linkage, Appropriate Technology, Science and Technology Policy

Books Recommended:

1. *Indian Society and Culture: Continuity and Change – by N. Hasnain*
2. *Social and Cultural History of India – O.M. Prakash*
3. *Makers of Modern India – RamachandraGuha*

Human Rights

Subject	Code	Type of course	Credit	Prerequisite
Human Rights	FCMG0115	Theory	1	Nil

Course Objective

The course is an introduction to human rights. Human beings are rational beings. They by virtue of their being human, possess certain basic and inalienable rights which are commonly known as human rights. Human Rights are defined as all those rights which are essential for the protection and maintenance of dignity of individuals and create conditions in which every human being can develop his or her personality to the fullest extent. The purpose of this course is for students to gain a holistic view of human rights and their implications.

Course outcome

Student would have an understanding of human rights, its history, characteristics, types, protection, violation and the legal framework for their protection, therefore, a fair knowledge of the Universal Declaration of Human Rights.

Evaluation Systems

<i>Methods</i>	<i>% of Marks</i>
<i>Internal(written exam/assignment/experiments/project/report writing etc.</i>	40
<i>Quiz, Presentations and Written exams</i>	
<i>External Exam</i>	60
<i>Total</i>	100

Course outline

Module I	Introduction to Human Rights
Topic	Meaning and Definition, History, Principles, Characteristics, Types
Pedagogy	Example: lecture (ppt), videos, etc
<i>Lab/Activity</i>	
<i>Assignment/practice</i>	
<i>No. of hours</i>	5
<i>Reference materials: Book/e- content/online source</i>	

Module 2	Human Rights Law
Topic	International Human Rights Law, Council of Human Rights, Universal Declaration of Human Rights, Legal Effects of the Declaration, International Humanitarian Law
Pedagogy	Example: lecture, videos, Case studies, etc
<i>Lab/Activity</i>	

Assignment/practice	
No. of hours	5
Reference materials: Book/e-content/online source	

Module 3	Conflicts of Rights and Future Challenges
Topic	Meaning and Definition, History, Principles, Characteristics, Types
Pedagogy	Example: lecture, videos, case studies, etc
Lab/Activity	
Assignment/practice	
No. of hours	5
Reference materials: Book/e-content/online source	

Reference

Text Books:

1. Arihants UGC NET Human Rights and Duties

2. Kapoor, S. K. Central Law Agency's Human Rights under International Law and National Law

Reference Books:

Clapham Andrew, 2015, Human Rights: A Very Short Introduction, Oxford University Press

Smith Rhona, 2015, Textbook on International Human Rights, Oxford University Press

Online Source:

8 Human Rights Study Books you can download for free

<https://www.humanrightscareers.com/.../10-human-rights-study-books-you-can-download>

<https://www.humanrightscareers.com/courses/>

Introduction to Ethics

Subject	Code	Type of course	Credit	Prerequisite
Introduction to Ethics	FCMG0116	Theory	1	Nil

Course Objective

<ul style="list-style-type: none"> · The course is an introduction to Ethics. This course will introduce the meaning of ethics and the historical development – utilitarianism, ethical relativism and virtue ethics. Will also examine some current ethical issues, especially in science and engineering. Questions which will be considered are: what is the good life? Do we have a moral duty to act in certain ways? Are there such things as natural human rights? Are some values more compelling than or better than others? · This course is designed to introduce undergraduate engineering students to the concepts, theory and practice of engineering ethics. It will allow students to explore the relationship between ethics and engineering and apply classical moral theory and decision making to engineering issues encountered in academic and professional careers.
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Course outcome

<p>By the end of the course, Student will be able to:</p> <ul style="list-style-type: none"> · Demonstrate knowledge of important ethical systems · Demonstrate their respect of different ethical perspectives · Critique some aspects of an ethical position · Clearly formulate their ethical position on an issue and develop arguments based on sound inferences and clear premises (through project) <p>The course will have three modules to cover the above expected learning outcomes.</p>

Evaluation Systems

<i>Methods</i>	<i>% of Marks</i>
<i>Internal(written exam/assignment/experiments/project/report writing etc.</i>	<i>20</i>
<i>Quiz, Group work, Presentations</i>	<i>20</i>
<i>Project</i>	<i>20</i>
<i>External Exam</i>	<i>40</i>
<i>Total</i>	<i>100</i>

Course outline

Module I	Introduction to Ethics
Topic	What is the study of ethics, Introduction to Indian and Western Ethics
Pedagogy	lecture (ppt),
<i>Lab/Activity</i>	
<i>Assignment/practice</i>	
<i>No. of hours</i>	2
<i>Reference materials: Book/e-content/ online source</i>	

Module 2	Different Ethical systems and Perspectives
Topic	Ethical relativism and its implications, utilitarianism, duty ethics and virtue ethics
Pedagogy	lecture, Case studies, small group work
<i>Lab/Activity</i>	
<i>Assignment/practice</i>	
<i>No. of hours</i>	6
<i>Reference materials: Book/e-content/ online source</i>	

Module 3	Critique of various aspects of ethical positions
Topic	Critique and development of the ability to formulate own ethical position on an issue
Pedagogy	lecture, small group work
<i>Lab/Activity</i>	
<i>Assignment/practice</i>	
<i>No. of hours</i>	3
<i>Reference materials: Book/e-content/ online source</i>	

Session Plan

Topic coverage and Internal Test	No. of Sessions (in hrs.)	Activity (lecture, tutorial, lab practice, field studies/field-trip, Workshop etc.)	Assignment (project, assignment, field study, seminar, etc.)	Suggested Reading (Book, Video, Online source, etc.)
Module 1				
Meaning and Definitions of Ethics Morals and Ethics Comparison of ethics and engineering ethics The importance of ethics in science and engineering	1	Lecture		Lecture Notes and reference in books, online resources
Introduction to Ethics in different cultures The importance of core values Moral/ethical dilemmas and hierarchy of moral values Factors affecting moral responsibility, and degrees of responsibility	1	Lecture		Lecture Notes and reference in books, online resources
Module 2				
Ethical Relativism and its implications	1	Lecture		Lecture Notes and Articles, online resources
Utilitarianism and its implications Engineers in organizations: Ethics in the workplace Fairness (personal and social) Engineering Professionalism and Ethics, Leadership,	1	Lecture		Lecture Notes and Articles, online resources

Specific case example – Challenger Incident Reliability, risk and safety Risk management Resource allocations				
Duty ethics and its implications Law and Ethics	2	Lecture		Lecture Notes and Articles, online resources
Virtue ethics and its implications Ethics in the workplace Fairness (personal and social)	2	Lecture		Lecture Notes and Articles, online resources
Module 3				
Critique of various aspects of ethical positions Ethics in the electronic and digital age Ethics and the environment Sustainable engineering Privacy and confidentiality issue	1	Lecture		Handouts and online resources
How to formulate an ethical position on an issue	2	Lecture		Handouts and online resources
<i>Project work and presentations</i>	4 hours			

FCMG1201 DISASTER MANAGEMENT

<i>Pre – requisites</i>	<i>Course Type</i>	<i>Credits</i>
<i>Nil</i>	<i>Theory</i>	<i>2</i>

Course Objective			
<p>The aim is to impart knowledge on</p> <ul style="list-style-type: none"> ✓ To provide students an exposure to disasters, their significance, types & Comprehensive understanding on the concurrence of Disasters and its management. ✓ To ensure that students begin to understand the relationship between vulnerability, disasters, disaster prevention, risk reduction and the basic understanding of the research methodology for risk reduction measures. ✓ Equipped with knowledge, concepts, and principles, skills pertaining to Planning, Organizing, Decision-making and Problem solving methods for Disaster Management. ✓ The course also facilitates students to globally share their views, ideas and information pertaining to Disaster Management on a common platform. ✓ To develop rudimentary ability to respond to their surroundings with potential disaster response in areas where they live, with due sensitivity. 			
GUIDELINES ON GRADING AND STANDARDS OF ASSESSMENT			
A continuous evaluation system will be adopted to evaluate the students. There will be an individual and group assignments, presentations and written test.			
COURSE CONTENT			
Module - 1			
UNIT I – Introduction to Disaster Management (2hrs)			
Session	Topic	Coverage	Reading/Reference
4hrs	Disaster & Emergencies : Concept & Fundamentals of Disaster Management	<ul style="list-style-type: none"> ✓ Introduction/ Brain storming/ Group formation ✓ History of Disasters ✓ Concepts and Definitions ✓ Hazard, Risk, Vulnerability, Capacity, Disaster & Equations of Disaster Management 	
		<ul style="list-style-type: none"> ✓ Types & Classification of Disasters ✓ Factors responsible for disasters like flood, cyclone and Earthquake. 	
UNIT II – Effect and Impact of Disaster (4 Hrs)			
1hr	Effect and Impacts of Disasters (Group work)	<ul style="list-style-type: none"> ✓ Disasters Impact – Social, Economic, Political, Environmental, Health, Psychosocial, etc. ✓ Differential impacts- in terms of Caste, Class, Gender, Age, Location, Disability. 	Disaster Mgmt. and India: Responding Internally and Simultaneously in Neighboring Countries Kailash Gupta, BE (Elec.), MBA(IIMA)

1 hr	Disaster vs Development	<ul style="list-style-type: none"> ✓ Disaster is the causes of destruction ✓ Disaster leads to development 	
2 hrs	Global warming and climate change	<ul style="list-style-type: none"> ✓ Concept and understanding of global warming and climate change ✓ Causes and factors ✓ Remedial measures 	
Module – II		✓	
UNIT III – Disaster Risk Management - (6 hours)			
2 hrs	Community Managed Disaster Risk Reduction And Village Contingency Plan (Group work) Role of Task force/ ODRAF/ NDRF for DRR at community level.	<ul style="list-style-type: none"> ✓ Hazard analysis and assessment ✓ Vulnerability analysis ✓ Resource capability assessment ✓ Mapping & Seasonality Calendar ✓ Structural and Non Structural assessment. ✓ Task forces with various roles for DRR. 	CBDRM for Local Authorities: PARTICIPANT'S WORKBOOK – adpc www.adpc.net
2 hours	Rapid Need Assessment Pre and Post Disaster (Group work and Practical demo)	<ul style="list-style-type: none"> ✓ Meaning and Importance ✓ Rapid Need Assessment in emergency and its significance ✓ Process and Methods 	
2 hrs	Stress Management	<ul style="list-style-type: none"> ✓ Causes and consequences of Stress ✓ What are the best ways to handle pressure ✓ Psychosocial Support 	
UNIT IV – Disaster Management (8 hrs)			
2 hrs	Disaster Management Cycle	<ul style="list-style-type: none"> ✓ Disaster Management Cycle ✓ Phases of Disasters ✓ Prevention, Mitigation, Preparedness, Warning, Response, Rehabilitation, Reconstruction 	
2 hrs	Fire safety (Practical)	<ul style="list-style-type: none"> ✓ Practical 	
2 hours	First Aid & Driving Learning (Theory and Practical)	<ul style="list-style-type: none"> ✓ ABCD of First Aid ✓ Dressing and Bandages Practical session ✓ Emerging need and importance of learning driving 	
2hrs	Building Rescue operation or Demonstration of ODRAF/NDRAF rescue	<ul style="list-style-type: none"> ✓ Practical 	

	materials		
Module – III		✓	
UNIT V – Humanitarian Charter and Minimum Standards in Humanitarian Response (4 hrs)			
2hrs	Sphere Standards (Group Work)	<ul style="list-style-type: none"> ✓ The Humanitarian Charter ✓ Protection Principles ✓ Core Standards 	
2hrs	Restoring Life Line Services (WASH) (Group work)	<ul style="list-style-type: none"> ✓ Water , Sanitation & Hygiene Promotion ✓ Food Security & Nutrition ✓ Health Services ✓ Health Services ✓ Shelter and Settlement 	The Sphere Project , Humanitarian Charter and Minimum Standards In Humanitarian Response
UNIT VI – Disaster Management Projects –(6 hours)			
6hrs	Seminars / Workshop	<ul style="list-style-type: none"> ✓ Adapting Climate Change ✓ Disaster Resilience Structures and Buildings ✓ IT in Disaster Management ✓ Inter-relationship between Disasters and Development ✓ Urban Disaster ✓ Rain Water Harvesting ✓ Inclusions – Disability, Aged, Social etc 	
		✓	
		✓	

- ✓ Team of 10 – 15 members would be formed
- ✓ Each Team would take up a project work in one of the topics above or related topics with prior approval : 2 Weeks
- ✓ Each Team would organize one Seminar / Workshop during the session

FCMG1202MS Excel

<i>Pre – requisites</i>	<i>Course Type</i>	<i>Credits</i>
<i>Nil</i>	<i>Workshop</i>	<i>2</i>

Course Objective		
<p>The aim is to impart knowledge on</p> <ul style="list-style-type: none"> ✓ Indicate the names and functions of the Excel interface components. ✓ Enter and edit data. ✓ Format data and cells. ✓ Construct formulas, including the use of built-in functions, and relative and absolute references. ✓ Create and modify charts. ✓ Preview and print worksheets. ✓ Use the Excel online Help feature. 		
Course Outcome		
<ul style="list-style-type: none"> ✓ Navigate your way around Microsoft Excel ✓ Work with data analysis and presentation ✓ Create and work with formulas and functions, understand and use formula cell ✓ Use Excel for Business application 		
GUIDELINES ON GRADING AND STANDARDS OF ASSESSMENT		
A continuous evaluation system will be adopted to evaluate the students. There will be an individual and group assignments and presentations.		

Course Contents:

Unit 1: Excel Introduction, direct right, The Excel Interface, direct right, Basic Navigation and Editing,

Unit 2: Getting Going, Orientation & efficiency, Editing, Viewing, Spreadsheet Structure, Cell References, Named Ranges, Basic Macros, Design

Unit 3: Administration, Customising Excel, Housekeeping, Connecting Workbooks Documentation, Protecting and Sharing, Google Docs, Excel Troubleshooting, Data Handling, Sorting and Filtering, Controlling User Input, - Working with Dates & Times

Unit 4: U- Working with Text, Lookup and Reference, Logical Functions, Data Analysis, Working with Numbers, Summarising Data, PivotTables 1 - Simple Summaries, PivotTables 2 - Manipulating Data,

Unit 5: PowerPivot: Handling Big Data, Formula Auditing, Advanced Macros and VBA, Modelling, Presentation, Cell Formatting, Number Formatting, Conditional Formatting, Graphs and Charts, Page and print setup

Gender Issues in Development

Subject Name	Code	Type of course	T-P-Pr (Credit)	Prerequisite
Gender Issues in Development	FCMG0401	Theory & Project	1-0-0 (1 credit)	None

1. Objective

- ✓ In the traditional social order women have been assigned a subordinate status in society for centuries. They have been deprived of many social privileges and suffered from discriminations that prevented them from contributing to the development process. They have remained marginalized in society. To remedy the prevailing situation, gender concerns have become increasingly important in the development agenda in the last few decades. In spite of special policies and programmes being implemented, gender based injustice continues to exist and hinder development

2. Course outcome

- i) Develop an understanding of perspectives on gender and development
- ii) Discuss in detail the gender question in selected development sectors and globalisation
- iii) Familiarise with the different tools and techniques for gender planning, analysis and evaluation in the development sector

The course has three modules covering these three aspects of gender and development.

3. Evaluation Systems

<i>Internal Examination</i>	<i>Component</i>	<i>% of Marks</i>	<i>Method of Assessment</i>
	Midterm Test	20	Written examination
	Assignment		Report and Presentation
	Experiments		Lab work, report
	Project	20	Report and presentation
	Quiz	20	Surprise/preannounced ones
<i>External Examination</i>		40	Written examination
<i>Total</i>		100	

4. Course outline

Module I

UNDERSTANDING AND CONCEPTUALISING GENDER RELATIONS

Module II

GENDER ISSUES IN DEVELOPMENT SECTORS

Module III

GENDER ANALYSIS, TOOLS, TECHNIQUES AND FRAMEWORKS

5. References

- a) “Why Gender is a Development Issue”, Handout 4, Oxfam Gender Training Manual (1994)
- b) Freedman, Jane. (2002), “Introduction: Feminism or Feminisms?” in *Feminism*, Viva Books, N. Delhi.
- c) Chafetz, J.S. (1990), “The Coercive Bases of Gender Inequality”, in *Gender Equity: An Integrated Theory of Stability and Change*, Sage.
- d) Kabeer, Naila. (1994), “Connecting, Extending, Reversing: Development from a Gender Perspective”, in *Reversed Realities*, Verso, London.

- e) Moser, C.O.N. (1991), “Gender Planning in the Third World: Meeting Practical and Strategic Gender Needs”, in T. Wallace & C. March (eds.) *Changing Perceptions: Writings on Gender and Development*, Oxfam.

- f) Boonsue, K. (1992), “Development Models of WID, WAD and GAD” in *Women’s Development Models and Gender Analysis: A Review*, Gender Studies (AIT, Bangkok).
- g) Agarwal, B. (1994), “Conceptualising Gender Relations” in *A Field of One’s Own: Gender and Land Rights in South Asia*, Cambridge University Press.
- h) “Women and the Economy” in *Human Development in South Asia 2000: The Gender Question*, MahbubUIHaq Development Centre/OUP, Islamabad.
- i) Rajagopal, S. (1999), “Closing the Gender Gap in Education: The Shikshakarmi Programme” in N. Kabeer & R. Subrahmanian (eds.), *Institutions, Relations and Outcomes*, Kali for Women, Delhi.
- j) Thakur, S.G. (1995), “Access to Health Care – A Gender Perspective” *The Administrator*, Vol 11, April-June, pp 169-181.
- k) Kusum, K & Barua, K. (2001), “Gender Equality and Women’s Health – A Human Rights Perspective”, *Indian Journal of Adult Education*, Jan-Mar, pp 44-49.
- l) Mohanty, B. (1995), “Panchayati raj, 73rd Constitutional Amendment and Women”, *Economic and Political Weekly*, Dec 30, 3346-3350.
- m) Kapoor, N. (2002), “Women and Governance”, *Participation & Governance*, Vol. 8, No.23, pp 11.
- n) Resurreccion, B.P. (2005), “Women in-between: Gender, Transnational and Rural-Urban Mobility in the Mekong Region”, *Gender, Technology and Development*, Vol.9, No.1, Jan-April, pp 31-51.
- o) Gender and Globalisation – A Note
- p) Overholt, C.A. et.al. (1991), “Gender Analysis Framework”, in A. Rao et.al. (eds.), *Gender Analysis in Development Planning*, Kumarian Press.
- q) Handouts to be given in the class on Gender Assessment Study.
- r) The Gender Analysis Matrix: A Teaching Note.
- s) March. C. et.al (1999), “Women’s Empowerment (Longwe) Framework”, in *A Guide to Gender Analysis Frameworks*, Oxfam: Oxford.
- t) Gender and Organisations – Handout in the class.

6. Session Plan

Topic coverage and Internal Test	No. of Sessions (in hrs.)	Activity (lecture, student/field-practice, field trip, Workshop etc.)	Assignment (project, assignment, field study, seminar,	Suggested Reading (Book, Video, Online source, etc.)
Module 1				

Difference between Sex and Gender	1	Lecture		Lecture Notes and Book chapters
Why gender is a development issue?	1	Lecture		Lecture Notes and Book chapters
Gender system and inequality	1	Lecture		Lecture Notes and Book chapters
Understanding gender relations	1	Lecture		Lecture Notes and Book chapters
Gender planning – practical and strategic gender needs	1	Lecture		Lecture Notes and Book
Approaches to address gender inequality – WID, GAD and GID	1	Lecture		Lecture Notes and Monograph
Module 2				
Gender issues in the economic sector	1	Quiz 1 and Lecture		Lecture Notes and Articles
Gender issues in the education sector	1	Lecture		Lecture Notes and Articles
Gender issues in the health sector	1	Lecture		Lecture Notes and Articles
Gender issues in the governance sector	1	Lecture		Lecture Notes and Articles
Gender issues in globalisation	1	Lecture		Lecture Notes and Articles
Module 3				
Harvard Analytical Framework	1	Lecture		Handouts and Book chapter
Gender Assessment Study and Gender Analysis Matrix	1	Lecture		Handouts and Book Chapters
Gender Empowerment Framework	1	Quiz 2 and Lecture		Handouts and Book Chapters
Gender and Organisations	1	Lecture		Handouts and Book Chapters
Student Presentations based on group projects	Extra classes			

<i>Total (hrs)</i>	15 hours +3 hours			
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Centurion University of Technology and Management Odisha

Choice Based Credit System

Course Structure & Syllabus

BASKET - III



CENTURION UNIVERSITY OF TECHNOLOGY AND MANAGEMENT

School of Engineering & Technology

2018-19

**Course Structure
Basket-III**

Course Code	Course Title	Course Type	Credits	Prerequisite	Remarks
ENFC0101	Engineering Mechanics	Theory	3	Nil	
ENFC0102	Material Sciences	Theory	3	Nil	
ENFC0103	Thermodynamics	Theory	3	Nil	
ENFC0104	Introduction to Communication Engineering	Theory	3	Nil	
ENFC0105	Introduction to Aerospace Engineering	Theory	3	Nil	
FCEN0120	Introduction to Computer Networks	Theory	3	Nil	CTIS
FCEN0118	Computer Fundamental and Organization	Theory	3	Nil	CTIS
FCEN0119	Operating System Building Blocks	Theory	3	Nil	CTIS
FCEN0115	Introduction To Biotechnology	Theory	3	Nil	
FCEN0116	Introduction to Biophysics	Theory	3	Nil	
FCEN0117	Biosafety, bioethics, IPR and Patents	Theory	2	Nil	
FCEN0111	Earth System Science	Theory	3		
FCEN0112	Introduction to Mining	Theory	3		
FCEN0113	Mine Development	Theory	3		
FCEN0114	Mine Surveying I	Theory	3		
ENFC0201	Workshop Practice	Practice	2	Nil	
ENFC0202	Geometric Modelling Lab	Practice	2	Nil	
ENFC0203	Introduction to Robotics	Practice	2	Nil	
ENFC0204	3D Modeling	Practice	2	Nil	
ENFC0205	Electrical Workshop Practice	Practice	2	Nil	
FCEN0214	Mine Surveying-I Lab	Practice	2		
ENFC0208	Aerodynamics Laboratory	Practice	2	Nil	

ENFC0401	Engineering Metrology and Measurements	Theory+ Practice	3	Nil	
ENFC0402	Basic Fluid Mechanics	Theory + Practice	3	Nil	
ENFC0403	Basic Surveying	Theory + Practice	3	Nil	
ENFC0404	Basic Electrical Engineering	Theory+ Practice	3	Nil	
ENFC0405	Electrical Machines	Theory+ Practice	3	Nil	
ENFC0406	Introduction to automation	Theory+ Practice	3	Nil	
ENFC0407	Introduction to Web Technology	Theory + Practice	3	Nil	CTIS
ENFC0408	Information Security I	Theory+ practice	3	Nil	CTIS
ENFC0409	Programming in C	Theory+ practice	3	Nil	CTIS
ENFC0410	Desktop Operating System (Windows 10)	Theory+ Practice	3	FCEN0119 Operating System Building Blocks	CTIS
FCEN0408	Principles of Biochemistry	Theory + Practice	5	Nil	
FCEN0409	Cell Biology	Theory + Practice	5	Nil	
ENFC0412	Programming for Problem Solving – Java	Theory + Practice	3	Nil	
ENFC0414	Data Base Management System	Theory + Practice	3	Nil	
ENFC0415	Electronics and Its Application	Theory & Practice	3	Nil	
ENFC0416	Electronic Devices	Theory & Practice	3	Nil	
ENFC0417	Sensors and IOT	Theory & Practice	3	Nil	
ENFC0418	Problem Solving & Programming	Theory & Practice	3	Nil	

ENFC0419	Data Structures and C Programming	Theory & Practice	3	Nil	
ENFC0420	Switching Theory and Logic Design	Theory + Practice	3	Nil	
ENFC0422	Operating System	Theory + Practice	3	Nil	
ENFC0423	Big Data Analytics	Theory + Practice	3	Nil	
ENFC0424	Block Chain and Smart Contracts	Theory + Practice	2	Nil	
ENFC0601	Product Development	Practice + Project	3	Nil	
ENFC0603	AI Tools, Techniques and applications	Practice + Project	3	Nil	
ENFC0602	Cloud Computing and its applications using Linux OS	Practice + Project	3	Nil	
ENFC0901	Problem Solving using Python	Theory + Practice	3	Nil	
ENFC0902	Object Oriented Programming through Java	Theory + Practice+ Project	3	Nil	
ENFC0903	Web Technologies	Theory & Practice+ Project	3	Nil	
ENFC0904	Software Engineering using Agile	Theory + Practice+ Project	3	Nil	
ENFC1407	Internet of Things	Workshop	2	Nil	
ENFC1402	Build your own Computer	Workshop	2	Nil	
ENFC1403	Cloud Computing Application	Workshop	2	Nil	
ENFC1405	Design thinking and Innovation	Workshop	2	Nil	
ENFC1406	Problem solving Technique	Workshop	2	Nil	

Syllabus

Engineering Mechanics

Course Title	Code	Type of course	T-P-PJ	Prerequisite
Engineering Mechanics	ENFC0101	Theory	3-0-0	Nil

Objective

- To provide the students with a clear and thorough understanding on theory and application of principles of mechanics as applied in engineering problems.

Course Outcome

- Students will acquire knowledge and skill to analyze the effect of force and motion on rigid bodies to solve engineering problems through application of basic laws of mechanics.

Evaluation Systems

	Component	% of Marks	Method of Assessment
Internal Examination	Internal Theory	30	Written examination
	Assignment	5	Report or Presentation + Learning Record
	Attendance	5	Based on class attended
External Examination	External Theory	60	Written examination
Total		100	

Course Outline

Module: 1 (9 Hrs)

Coplanar Forces : Principles of Statics, Law of Transmissibility of a Force, Composition and Resolution of Forces, Resultant and Equilibrant, Free Body Diagram, Equilibrium of Concurrent Coplanar Forces, Lami's Theorem (Case Studies : - Analysis of a Boom, Analysis of a Tripod Stand, Equilibrium Analysis of a Wall Bracket)

To Understand the Equilibrium of a Particle under the Action of Forces in a Plane using Gravesand's Apparatus or Coplanar Force Setup. (The theory can be taught in practice mode)

Module: II (6 Hrs)

Moment and Couple, Varignon's Principle of Moment, General Conditions of Equilibrium, Types of Supports and Support Reactions,

Friction :Equilibrium of Bodies on Rough Inclined Planes, Ladder Friction, Applications of Friction (Friction in Square Threaded Screw, Disc and Bearing Friction, Belt Friction)

To Determine the Coefficient of Static Friction between two given Material with the Help of an Inclined Plane. (The theory can be taught in practice mode)

Module : III (10 Hrs)

Center of Gravity : General Case of Parallel Forces in a Plane, Centre of Parallel Forces in a Plane, Centroid and Centre of Gravity, Axis of Symmetry, Centroid of Composite Plane Figures and Curves.

Moment of Inertia : Rectangular and Polar Moment of Inertia, Radius of Gyration, Parallel Axis Theorem and Perpendicular Axis Theorem, Moment of Inertia of Plane Composite Figures and Material Bodies. Determination of Moment of Inertia of a Flywheel. (The theory can be taught in practice mode)

Module : IV (6 Hrs)

Linear Motion : Motion under Gravity and Variable Acceleration, Principles of Dynamics such as Newton's Second Law, D'Alembert's Principle, Work-Energy Relation, Impulse-Momentum Relation, Law of Conservation of Momentum and Energy, Impact and its Types, Impact of a Body on a Fixed Plane.

Module : V (5 Hrs)

Concept of Stress and Strain :Types of Stresses and Strains, Hooke's Law, Stress-Strain Diagrams for Ductile and Brittle Materials, Analysis of Axially Loaded Bars. Stress Strain Curve of a Ductile Material (Mild Steel) using UTM.

Module: VI (5Hrs)

Bars of Varying Cross-section, Composite Bars, and Poisson's Ratio, Complimentary Shear Stress, Volumetric Strain, Elastic Constants and their Relationship. Longitudinal and Hoop Stress in Thin-walled Pressure Vessels Subjected to Internal Pressure.

Module : VII (4 Hrs)

Principal Stresses and Strains : Transformation of Stress and Strain, Principal Stresses, Principal Strains, Mohr's Circle for Stress and Strain.

Text Books :

Engineering Mechanics by D.S. Kumar, S.K. Kataria and Sons Strength of Materials by S.S. Rattan, Tata Mc-Graw Hill Publication. Reference Books : Engineering Mechanics by S. Timoshenko, D.H. Young and J.V. Rao, Tata McGraw Hill. Online Source : NPTEL, You tube

Session Plan

Topic coverage and Internal Test	No. of Sessions (in hrs.)	Activity (lecture, tutorial, lab practice, field studies/field-trip, Workshop)	Assignment (project, assignment, field study, seminar, etc.)	Suggested Reading (Book, Video, Online source, etc.)
Module I				
Principles of statics, law of transmissibility of a force, composition and resolution of forces	3	Lecture	Assignment	Engineering Mechanics by D.S. Kumar
Resultant and equilibrant, free body diagram	2	Lecture	Assignment	Engineering Mechanics by D.S. Kumar
Equilibrium of concurrent coplanar forces,	1	Lecture	Assignment	Engineering Mechanics by D.S. Kumar
Lami's theorem, (case studies : - analysis of a boom, analysis of a tripod stand, equilibrium analysis of a wall bracket)	1+2	Lecture + practice	Assignment	Engineering Mechanics by D.S. Kumar
Module II				
Moment and couple, Varignon's principle of moment, general conditions of equilibrium	2	Lecture	Assignment	Engineering Mechanics by D.S. Kumar
Types of supports and support reactions.	1	Lecture	Assignment	Engineering Mechanics by D.S. Kumar
Equilibrium of bodies on rough inclined planes, ladder friction	2	Lecture	Assignment	Engineering Mechanics by D.S. Kumar
Wedge friction, applications of friction (friction in square threaded screw, disc and	1	Lecture	Assignment	Engineering Mechanics by D.S. Kumar

bearing friction, belt friction				
Module III				
Center of Gravity : General case of parallel forces in a plane, centre of parallel forces in a plane, centroid and centre of gravity, axis of symmetry, centroid of composite plane figures and curves.	5	Lecture	Assignment	Engineering Mechanics by D.S. Kumar
Moment of Inertia : Rectangular and polar moment of inertia, radius of gyration, parallel axis theorem and perpendicular axis theorem, moment of inertia of plane composite figures and material bodies. Determination of moment of inertia of a flywheel.	5	Lecture	Assignment	Engineering Mechanics by D.S. Kumar
Module IV				
Linear Motion : Motion under gravity and variable acceleration, principles of dynamics such as Newton's second law, D'Alembert's principle, work-energy relation, impulse-momentum relation, law of conservation of momentum and energy, impact and its types, impact of a body on a fixed plane.	6	Lecture	Assignment	Engineering Mechanics by D.S. Kumar http://vlab.amrita.edu/?sub=1&brch=74&sim=189&cnt=4)
Module V				
Concept of stress and strain : Types of stresses	3	Lecture	Assignment	Strength of materials by

and strains, Hooke's law, stress-strain diagrams for ductile and brittle materials, analysis of axially loaded bars.				S.S. Rattan
Stress-strain curve of a ductile material (mild steel) using UTM	2	Practice		Strength of materials by S.S. Rattan
Module VI				
Mechanical properties of materials Rockwell and Brinell hardness tests	2	Practice		Strength of materials by S.S. Rattan
Bars of varying cross-section, composite bars, Poisson's ratio, complimentary shear stress, volumetric strain, Elastic constants and their relationship.	2	Lecture	Assignment	Strength of materials by S.S. Rattan
Longitudinal and hoop stress in thin-walled pressure vessels subjected to internal pressure.	1	Lecture	Assignment	Strength of materials by S.S. Rattan
Module VII				
Principal stresses and strains : Transformation of stress and strain, principal stresses, principal strains, Mohr's circle for stress and strain.	2+2	Lecture + Practice	Assignment	Strength of materials by S.S. Rattan
Total				45

Material Sciences

Course Title	Code	Type of course	T-P-PJ	Prerequisite
Material Sciences	ENFC0102	Theory	3-0-0	Nil

Objective

- To study classification and properties of materials used in day to day life
- To understand the material application and it's needed.

Course outcome

- Students will able to identify materials for engineering use.
- Students will able to select best materials for a specific design and production.

Evaluation Systems

	Component	% of Marks	Method of Assessment
Internal Examination	Internal Theory	30	Written examination
	Assignment	5	Report or Presentation + Learning Record
	Attendance	5	Based on class attended
External Examination	External Theory	60	Written examination
Total		100	

Course Outline

Module: I (8 Hrs)

Steel, Stainless Steel & Types, HSLA Steels, Dual Phase Steels, Tool and Die Steels. Nonferrous Alloys- Aluminum & Alloys, Copper & Alloys, Zinc & alloys, Nickel & Alloys , Magnesium Alloys, Titanium Alloys, Super Alloys.

Module: II (7 Hrs)

Polymer- Thermosetting, Thermoplastics; Elastomers- Natural & Synthetic Rubber; Composites Material- Classification Based on Matrix and Topology, Particle Reinforced Composites, Fiber Reinforced Composites. Structural Composites, Constituents of Composites, MMC, PMC and FRP. Ceramic Composites, Geosynthetics, Pre-stressed Hollow Concrete Panel, Carbon Composites Fullerenes, C64, Bucky Ball Structures, Graphene.

Module: III (5 Hrs)

Prefabricated Materials: Types and Applications, Autoclaved Aerated Concrete (AAC), Cellular Lightweight Concrete (CLC).

Module: IV (8 Hrs)

Electrical & Magnetic Materials: Classifications, Properties, Advantages & Applications, Photo Voltaic Material, Dielectric Materials.

Module: V (6 Hrs)

Solar Cell and Super Conductivity, Ferro Electricity, Electro-active Polymers, Piezoelectric Material, Magneto Electric Materials, Electrorheological Fluids.

Module: VI (6 Hrs)

Fiber Optic Sensors, Photoconductivity; Introduction to Nano-materials, CNTs Production Process and Uses, Fibers Production and Uses.

Module: VII (8Hrs)

Smart Material, Shape Memory Alloys, Piezoelectric Ceramics, Biomaterials, Bioactive Glass & Ceramic, Polymer & Composite, UHTC, Soft Materials, Energy Materials.

Text Books:

1. Materials Science and Engineering, W D Callister, 2014, 2nd Edition, Wiley India Private Limited, India.

Reference Books:

1. Material Science and Engineering, V Raghavan, 2013, 5th Edition, PHI publication, India.
2. Material Science and Engineering, S Chawla, 2011, 1st Edition, Dhanpat Rai & co Private Ltd., India.

Session Plan

Topic coverage and Internal Test	No. of Sessions (in hrs.)	Activity (lecture, tutorial, lab practice, field studies/field-trip, Workshop etc.)	Assignment (Project, assignment, field study, seminar, etc.)	Suggested Reading (Book, Video, Online source, etc.)
Module I				

Steel	01	Lecture	field study	<p>nptel.ac.in/courses/113104059/lecture_pdf/Lecture%201.pdf</p> <p>Materials Science and Engineering, W D Callister, 2014, 2nd Edition, Wiley India Private Limited, India.</p> <p>https : //www.youtube.com/watch?v=917JqonyoKA https : //www.youtube.com/watch?v=sc24cSZJQcg</p> <p>https : //www.youtube.com/watch?v=hTw9LVMBLns</p>
Stainless Steel & Types	01	Lecture	field study	<p>https : //en.wikipedia.org/wiki/Stainless_steel</p> <p>Materials Science and Engineering, W D Callister, 2014, 2nd Edition, Wiley India Private Limited, India.</p> <p>http : //nptel.ac.in/courses/113104059/</p>
HSLA Steels, Dual Phase steels	01	Lecture		<p>https : //www.metalsupermarkets.com/what-is-hsla-steel/</p> <p>https : //en.wikipedia.org/wiki/High-strength_low-alloy_steel</p> <p>https : //mme.iitm.ac.in/vsarma/mm5025/TRI-P-DP-TWP-Notes.pdf</p> <p>https : //www.worldautosteel.org/steel-basics/steel-types/dual-phase-dp-steels/</p>
Tool and Die Steels	01			<p>https : //www.hitachi-metals.co.jp/e/products/auto/ml/pdf/ys_s_tool_steels_d.pdf</p> <p>http : //www.substech.com/dokuwiki/doku.php?id=tool_and_die_steels</p>
Aluminium & Alloys	01	Lecture		<p>https : //materialsdata.nist.gov/.../Aluminum%20and%20Aluminum%20Alloys%20Davis</p> <p>nptel.ac.in/.../16%20-%20Properties%20and%20Applications%20of%20Materials.pdf</p> <p>nptel.ac.in/courses/112104203/12</p>

				Raghavan, V, Material science and Engineering, 2013, 5th Edition, PHI publication, India.
Copper & Alloys	02	Lecture		Material science and Engineering, V Raghavan, 2013, 5th Edition, PHI publication, India. nptel.ac.in/courses/103106109/.../Lecture%20%20Material%20of%20construction.pdf.
Magnesium Alloys, Titanium Alloys, Super Alloys	01	Lecture		W D Callister, Materials Science and Engineering, 2014, 2nd Edition, Wiley India Private Limited, India. https : //www.sciencedirect.com/topics/materials-science/aluminum-magnesium-alloys https : //uknowledge.uky.edu/cgi/viewcontent.cgi?article=1036&context=cme_etds nptel.ac.in/courses/113105057/25 http : //megamex.com/superalloys.html
Module II				
Polymer- Thermosetting, Thermoplastics	02	Lecture	field study	1.nptel.ac.in/courses/112107086/13 2.nptel.ac.in/courses/112104229/15 3. W D Callister. Materials Science and Engineering, 2014, 2nd Edition, Wiley India Private Limited, India.
Elastomers- Natural & Synthetic Rubber	01	Lecture		1.WD Callister, Materials Science and Engineering, 2014, 2nd Edition, Wiley India Private Limited, India.
Classification based on matrix and topology, Particle Reinforced Composites, Fiber Reinforced Composites	01	Lecture		1.W D Callister, Materials Science and Engineering 2014 2nd Edition Wiley India Private Limited, India. 2. https : //onlinecourses.nptel.ac.in/noc18_me03 3.nptel.ac.in/downloads/112104168

				4.http : //nptel.ac.in/courses/101104010
Structural Composites, Constituents of Composites	01	Lecture		1.nptel.ac.in/courses/112108150/pdf/PPTs/MTS_12_m.pdf
MMC, PMC and FRP	01	Lecture	field study	http : //nptel.ac.in/courses/112107086/22 http : //nptel.ac.in/courses/113105028/32
Ceramic Composites, Geosynthetics, Pre-stressed Hollow Concrete Panel, Carbon Composites Fullerenes, C64,Bucky ball Structures, Grapheme	01	Lecture	field study	nptel.ac.in/courses/112107085/module6/lecture6/lecture6.pdf nptel.ac.in/courses/112104122/22
Module –III				
Prefabricated Materials : Types and Applications	02	Lecture	field study	https : //www.youtube.com/watch?v=ixNre1dGyp0 2. http : //www.hollowcore.com.au/ 3. https : //en.wikipedia.org/wiki/Fullerene
Autoclaved Aerated Concrete (AAC), Cellular Lightweight Concrete (CLC).	03	Lecture	field study	https : //www.cogentoa.com/article/10.1080/23312009.2015.1026638.pdf www.understandingnano.com/what-is-buckyball-c60.html https : //en.wikipedia.org/wiki/Autoclaved_aerated_concrete textofvideo.nptel.ac.in/105102012/lec41.pdf nptel.ac.in/courses/105102088/27 https : //www.youtube.com/watch?v=uwbFxUXG2cM
Module IV				

Electrical & Magnetic Materials : Classifications, Properties, Advantages & Applications, Dielectric Materials	08	Lecture		1. nptel.ac.in/courses/115104088/42 2. V Raghavan, Material science and Engineering, 2013, 5th Edition, PHI publication, India.
Module V				
Photo Voltaic Material, Semi conductivity, Solar Cell and Super Conductivity	03	Lecture	field study	nptel.ac.in/courses/113106062/Lec19.pdf 2.nptel.ac.in/courses/113105025/40 3.nptel.ac.in/courses/113104012/34
Ferro electricity, Electro-active polymers	01	Lecture		https : //en.wikipedia.org/wiki/Electroactive_ polymers https : //www.azom.com/article.aspx?ArticleI D=13516
Piezoelectric Material , Magneto Electric Materials, Electrorheological Fluids	02	Lecture		1.nptel.ac.in/courses/113104005/69 2.nptel.ac.in/courses/112107088/module1/lecture28/lecture28.pdf
Module –VI				
Fiber optic Sensors, Photoconductivity	02	Lecture	field study	nptel.ac.in/courses/112104158/lecture 39.pdf https : //onlinecourses.nptel.ac.in/noc18_ph0 6
Introduction to Nano-Materials, CNTs Production Process and Uses	02	Lecture	field study	http : //www.nptel.ac.in/courses/103103033/ 38 2.nptel.ac.in/courses/118104008/ 3.nptel.ac.in/courses/103103026/42 4. https : //www.cheaptubes.com/carbon- nanotubes-history-and-production- methods-2/ https : //www.youtube.com/watch?v=CuqS8 GSpC-4

Fiber Production and Uses.	02	Lecture	field study	https : //www.youtube.com/watch?v=IIVveb58PCo
Module –VII				
Smart Material, Shape Memory Alloys	02	Lecture		npTEL.ac.in/courses/112104173/Mod_1_smart_mat_lec_5.pdf 2. W D Callister, Materials Science and Engineering, 2014, 2nd Edition, Wiley India Private Limited, India.
Piezoelectric Ceramics	02	Lecture		1.https : //www.youtube.com/watch?v=qXLStQQxHzU
Biomaterials, Bioactive glass & Ceramic, Polymer & Composite	02	Lecture		1.https : //www.youtube.com/watch?v=XqFS1G6WKO0 2.https : //www.youtube.com/watch?v=yZKdFVAJcrE 3.https : //www.youtube.com/watch?v=s5mDURF8YuQ
UHTC	01	Lecture		1.https : //www.youtube.com/watch?v=A-pd3ia8Y4g 2.https : //www.youtube.com/watch?v=XllkWh1nYQ 3.ceramics.org/wp-content/uploads/2011/08/applications-uhtc-johnson.pdf 4.https : //en.wikipedia.org/wiki/Ultra-high-temperature_ceramics
Soft Materials, Energy Materials	01	Lecture		https : //www.youtube.com/watch?v=HdwFkEV8dek https : //www.youtube.com/watch?v=Od4g5kcWsu0 https : //www.youtube.com/watch?v=IipCijIBHeQ https : //www.youtube.com/watch?v= f5RwX_plgw
Total				48 Hrs

Thermodynamics

Course Title	Code	Type of Course	T-P-PJ	Prerequisite
Thermodynamics	ENFC0103	Theory	3-0-0	Nil

Objective

- To know the Laws of Thermodynamics and Conditions for Energy Transformation.
- To get Familiar with Different Thermodynamic Properties of Pure Substances.

Course Outcome

- Students will be able to prepare Energy Balance Sheet.
- Students will be able to determine Efficiency of Various Thermal Devices.

Evaluation Systems

	Component	% of Marks	Method of Assessment
Internal Examination	Internal Theory	30	Written examination
	Assignment	5	Report or Presentation + Learning Record
	Attendance	5	Based on class attended
External Examination	External Theory	60	Written examination
Total		100	

Course outline

Module: I (6 Hours)

Introduction : Difference between Statistical Thermodynamics and Classical Thermodynamics, Concept of Continuum, Traceability of Thermodynamic Change, Concept of Reversibility, Concept of Equilibrium, Design of Thermometers with Three Different Liquids Having Different Coefficient of Thermal Expansion, To Explain Zeroth Law of Thermodynamics. Ideal Gas Temperature Scale and Calibration of Thermometers.

Module: II (9 Hours)

Work Transfer Calculations: Various Modes of Displacement Work. Calculation of Work for Various Processes & Cycles.

Application of First Law of Thermodynamics : Closed Systems & Open Systems. Concept of Internal Energy, Enthalpy & Its Calculation Using Specific Heats.

Module: III (3 Hours)

Energy Balance analysis: Sheet for Opens Systems and Closed Systems : Nozzle, Diffuser, Compressor, Turbine, Heat Exchanger, Throttling Devices, Boilers and Condensers.

Module: IV (10 Hours)

Second Law of Thermodynamics: Working of Refrigerator and Heat Pump. Kelvin Planck and Clausius Statement of Second Law, Corollaries, Clausius Inequality.

Entropy : Definition, Principle of Increase of Entropy. Change of Entropy of Perfect Gas in Various Processes.

Module: V (5 Hours)

Properties of Pure Substance :P-V, P-T, T-S, H-S Diagram for Steam, Triple Point of Water. Different Types of Steam.

Introduction to Steam Tables : Specific Volume, Pressure, Temperature, Enthalpy and Entropy.

Module: VI (6 Hours)

IC Engines : Working Of IC Engines. Classification of IC Engines : 2 Strokes & 4 Strokes Engine, Petrol & Diesel Engines. Engine Nomenclature.

Module: VII (6 Hours)

Gas Power Cycles : Carnot Cycle, Air Standard Cycles-Otto, Diesel, Dual Combustion.

Introduction to Gas Turbine Cycles : Open & Closed Cycle.

Text Books:

1. A Text Book of Engineering Thermodynamics: R K Rajput,4th Edition. Laxmi Publications
2. Thermodynamics an Engineering Approach, Y.A Cengel, M. A Boles, Tata Mcgraw Hill Companies

Reference Books:

1. Fundamentals of Thermodynamics, C. Borgnakke, R. E. Sonntag, Wiley Publication.

Session Plan

Topic coverage and Internal Test	No. of Sessions (in hrs.)	Activity (lecture, tutorial, lab practice, field studies/field-trip, Workshop etc.)	Assignment (project, assignment, field study, seminar, etc.)	Suggested Reading (Book, Video, Online source, etc.)
Module I (6 Hrs)				

Difference between statistical thermodynamics and classical thermodynamics.	1	CRT	Assignment-I	A text book of Engineering Thermodynamics : R K Rajput, 4 th edition. Laxmi publications. Thermodynamics Engineering. Approach, Y.A Cengel, M. A Boles, Tata McGraw Hill Companies.
Concept of continuum. Traceability of thermodynamic change : Concept of reversibility. Concept of equilibrium.	2	CRT	Assignment-I	A text book of Engineering Thermodynamics : R K Rajput, 4 th edition. Laxmi publications. Thermodynamics An Engineering. Approach, Y.A Cengel, M. A Boles, Tata McGraw Hill Companies
Design of thermometers with 3 different liquids having different coefficient of thermal expansion to explain zeroth law of thermodynamics.	2	CRT & Video presentation	Assignment-I	A text book of Engineering Thermodynamics : R K Rajput, 4 th edition. Laxmi publications Thermodynamics An Engineering. Approach, Y.A Cengel, M. A Boles, Tata McGraw Hill Companies <u>https : //www.youtube.com/watch?v=1nECy2s_qEo</u>
Ideal gas temperature scale and calibration of thermometers.	1	CRT	Assignment-I	A text book of Engineering Thermodynamics : R K Rajput, 4 th edition. Laxmi publications. Thermodynamics An Engineering. Approach, Y.A Cengel, M. A Boles, Tata McGraw Hill Companies.
Module II (9 Hrs)				
Work Transfer Calculations : Various modes of displacement work.	5	CRT	Assignment-I	A text book of Engineering Thermodynamics : R K Rajput, 4 th edition. Laxmi publications.

Calculation of work for various processes & cycles.				Thermodynamics An Engineering. Approach, Y.A Cengel, M. A Boles, Tata McGraw Hill Companies.
Application of first law of thermodynamics to closed systems & open systems. Concept of internal energy, enthalpy & its calculation using specific heats	4	CRT	Assignment-I	A text book of Engineering Thermodynamics : R K Rajput, 4 th edition. Laxmi publications. Thermodynamics An Engineering. Approach, Y.A Cengel, M. A Boles, Tata McGraw Hill Companies.
Module III (3 Hrs)				
Energy balance sheet for open systems and closed systems : Nozzle, Diffuser, compressor, turbine, heat exchanger, throttling devices, boilers and condensers.	3	CRT & Video presentation	Assignment-I	A text book of Engineering Thermodynamics : R K Rajput, 4 th edition. Laxmi publications. Thermodynamics An Engineering. Approach, Y.A Cengel, M. A Boles, Tata McGraw Hill Companies. <u>https : //www.youtube.com/watch? v=Nv2G8Dpruxc</u> <u>https : //www.youtube.com/watch? v=-CRjNmIOdZo</u>
Module IV (10 Hrs)				
Working of refrigerator and heat pump.	3	CRT	Assignment-II	A text book of Engineering Thermodynamics : R K Rajput, 4 th edition. Laxmi publications. Thermodynamics An Engineering. Approach, Y.A Cengel, M. A Boles, Tata McGraw Hill Companies.
Kelvin Planck and Clausius statement	2	CRT	Assignment-	A text book of Engineering Thermodynamics : R K

of second law, corollaries.			II	Rajput, 4 th edition. Laxmi publications. Thermodynamics An Engineering. Approach, Y.A Cengel, M. A Boles, Tata McGraw Hill Companies.
Clausius inequality.	1	CRT & Video Presentation	Assignment-II	A text book of Engineering Thermodynamics : R K Rajput, 4 th edition. Laxmi publications. Thermodynamics Engineering. Approach, Y.A Cengel, M. A Boles, Tata McGraw Hill Companies. <u>https : //www.youtube.com/watch?v=wd0Rghxmf3M</u> <u>https : //www.youtube.com/watch?v=MbyfTw5YFZs</u>
Entropy : Definition, principle of increase of entropy.	2	CRT	Assignment-II	A text book of Engineering Thermodynamics : R K Rajput, 4 th edition. Laxmi publications. Thermodynamics Engineering. Approach, Y.A Cengel, M. A Boles, Tata McGraw Hill Companies.
Change of entropy of perfect gas in various processes	2	CRT	Assignment-II	A text book of Engineering Thermodynamics : R K Rajput, 4 th edition. Laxmi publications. Thermodynamics An Engineering. Approach, Y.A Cengel, M. A Boles, Tata McGraw Hill Companies.
Module V (5 Hrs)				
Properties of pure substance : p-v, p-T, T-S, h-S	3	CRT & Video	Assignment-II	A text book of Engineering Thermodynamics : R K Rajput, 4 th edition. Laxmi

<p>diagram for steam, Triple point of water. Different types of steam.</p>		<p>presentation</p>		<p>publications. Thermodynamics Engineering. Approach, Y.A Cengel, M. A Boles, Tata McGraw Hill Companies. <u>https : //www.youtube.com/watch?v=pP2HuLPkrkY</u> <u>https : //www.youtube.com/watch?v=p.IM9Fh9Ep-I</u></p>
<p>Introduction to steam table with respect to specific volume, pressure, temperature, enthalpy and entropy</p>	<p>2</p>	<p>CRT</p>	<p>Assignment-II</p>	<p>A text book of Engineering Thermodynamics : R K Rajput,4th edition. Laxmi publications. Thermodynamics An Engineering. Approach, Y.A Cengel, M. A Boles, Tata McGraw Hill Companies.</p>
<p>Module VI (6 Hrs)</p>				
<p>IC Engines :Working of IC engines. Classification of IC engines.</p>	<p>2</p>	<p>CRT & Videopresentation</p>	<p>Assignment-III</p>	<p>A text book of Engineering Thermodynamics : R K Rajput, 4th edition. Laxmi publications. Thermodynamics Engineering. Approach, Y.A Cengel, M. A Boles, Tata McGraw Hill Companies. <u>https : //www.youtube.com/watch?v=emSXIJwGfOU</u> <u>https : //www.youtube.com/watch?v=Pu7g3uIG6Zo</u> <u>https : //www.youtube.com/watch?v=fD7GOrF7laY</u> <u>https : //www.youtube.com/watch?</u></p>

				<u>v=rhzgeNAXvfs</u>
2 strokes & 4 strokes engine, Petrol & diesel engines. Engine nomenclature.	4	PRA	Assignment-III	A text book of Engineering Thermodynamics : R K Rajput,4 th edition. Laxmi publications. Thermodynamics Engineering. Approach, Y.A Cengel, M. A Boles, Tata McGraw Hill Companies.
Module VII (6 Hrs)				
Gas Power Cycles : Carnot cycle, Air standard cycles- Otto, Diesel and Dual Combustion cycle.	4	CRT	Assignment-III	A text book of Engineering Thermodynamics : R K Rajput,4 th edition. Laxmi publications. Thermodynamics An Engineering. Approach, Y.A Cengel, M. A Boles, Tata McGraw Hill Companies.
Introduction to Gas Turbine Cycles : Open & Closed Cycle	2	Video	Assignment-III	<u>https : //www.youtube.com/watch? v=m4kvSLlxAaI</u> <u>https : //www.youtube.com/watch? v=eTJkz99Jix8</u> <u>https : //www.youtube.com/watch? v=zcWkEKNvqCA</u>
Total (hrs)				45

Introduction to Communication Engineering

Course Title	Code	Type of Course	T-P-PJ	Prerequisite
Introduction to Communication Engineering	ENFC0104	Theory	3-0-0	Nil

Objective

<ul style="list-style-type: none"> The objective of this subject is to impart the fundamentals of modern digital & analog communication systems.

Course Outcome

<ul style="list-style-type: none"> Upon successful completion of this subject students should be able to : understand important concepts in communication engineering and an insight into modern communication standards.
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Evaluation Systems

	Component	% of Marks	Method of Assessment
Internal Examination	Internal Theory	30	Written examination
	Assignment	5	Report or Presentation + Learning Record
	Attendance	5	Based on class attended
External Examination	External Theory	60	Written examination
Total		100	

Course Outline

Module: I (06 Hours)

Land Line Communication :

Evolution of telecommunications, simple telephone communication, basics of switching system, switching system parameters, signaling tones, electronic space division switching centralized and distributed SPC

Module : II (06 Hours)

Optical Communication:

Fiber-Optic Cable, Optical Principles, Optical Communication System, Fiber Optical Cables.

Module: III (07 Hours)

Elements of a Television System : Picture Transmission, Sound Transmission, Picture Reception, Sound Reception, Synchronization, Receiver Controls, Color Television.

Signal Transmission and Channel Bandwidth : Amplitude Modulation, Channel Bandwidth, Vestigial Sideband, Transmission, Transmission Efficiency Complete Channel Bandwidth, Reception of Vestigial Sideband Signals, Frequency Modulation, FM Channel Bandwidth, Channel Bandwidth for Colour Transmission, Allocation of Frequency Bands for Television Signal Transmission, Television Standards.

Module: IV (06 Hours)

Mobile Communication: Overview of Cellular Systems and Evolution of 2G/3G/4G/5G, Cellular Concepts – Cellular Systems, Hexagonal Cell Geometry, Frequency reuse, Co-channel and Adjacent channel Interference, Cell Splitting, Handoff, Blocking, GSM& CDMA Standards. WLAN, Bluetooth, Infrared Wireless, Wi-fi, Wi-Max.

Module: V (06 Hours)

Radar Communication : RADAR, Applications, Types, Frequency Bands, Basic Radar, RADAR range equation, Pulsed RADAR, CW RADAR, MTI RADAR, Tracking RADAR, Global Positioning System.

Module: VI (06 Hours)

Satellite Communication: Basic Satellite Systems, Indian Scenario, Satellite Orbits, Satellite Communication Systems, satellite link design,

Module: VII (08 Hours)

Internet Communication:

Data Communication Architecture, Link To Link Layers, End-To-End Layers, Switching Techniques for Data Transmission, LAN, MAN, ISDN, BISDN.

Text Books:

1. Telecommunication Switching Systems and Networks, Thiagarajan Vishwanathan PHI Publisher .
2. Fiber-Optic Communication Systems, 3ed Paperback – 2007 by Govind P. Agrawal.
3. Monochrome and colour television by R.R.Gulati
4. Satellite Communication by T. Pratt, C. Bostian and J. Allnutt. 2nd Edition, John Wiley Co.
5. Radar engineering by G. S. N. Raju

Session Plan

Topic Coverage and Internal Test	No. of Sessions (in hrs.)	Activity (lecture, tutorial, lab practice, field studies/field-trip, Workshop etc.)	Assignment (Project, assignment, field study, seminar, etc.)	Suggested Reading (Book, Video, Online source, etc.)
Module-I [06 hrs. Lecture]				
Evolution of telecommunications, simple telephone communication,	1	Lecture		Text Book-1
Basics of switching system,	1	Lecture		Text Book-1
switching system parameters,	1	Lecture		Text Book-1
signaling tones,	1	Lecture		Text Book-1
electronic space division switching	1	Lecture		Text Book-1
centralized and distributed SPC	1	Lecture		Text Book-1
Module-II [06 hrs. Lecture]				
Fiber-Optic Cable	1	Lecture		Text Book-2
Optical Principles	1	Lecture		Text Book-2
Optical Communication System	2	Lecture		Text Book-2
Fiber Optical Cables.	2	Lecture		Text Book-2
Module-III [07 hrs. Lecture]				
Elements of a Television System : Picture Transmission, Sound Transmission, Picture Reception	1	Lecture		Text Book-3
Sound Reception, Synchronization, Receiver Controls , Colour Television.	1	Lecture		Text Book-3

Signal Transmission and Channel Bandwidth : Amplitude Modulation , Channel Bandwidth	1	Lecture		Text Book-3
Vestigial Sideband ,Transmission , Transmission Efficiency	1	Lecture		Text Book-3
Complete Channel Bandwidth , Reception of Vestigial Sideband Signals , Frequency Modulation	1	Lecture		Text Book-3
FM Channel Bandwidth, Channel Bandwidth for Colour Transmission	1	Lecture		Text Book-3
Allocation of Frequency Bands for Television Signal Transmission, Television Standards.	1	Lecture		Text Book-3
Module-IV [06 hrs. Lecture]				
Overview of Cellular Systems and Evolution of 2G/3G/4G/5G	1	Lecture		Text Book-4
Cellular Concepts – Cellular Systems, Hexagonal Cell Geometry	1	Lecture		Text Book-4
Frequency reuse, Co-channel and Adjacent channel Interference	1	Lecture		Text Book-4
Cell Splitting, Handoff, Blocking, GSM & CDMA	1	Lecture		Text Book-4
Standards. WLAN, Bluetooth	1	Lecture		Text Book-4
Infrared Wireless, Wi-fi, Wi-Max	1	Lecture		Text Book-4
Module-V [06 hrs. Lecture]				
RADAR, Applications, Types, Frequency Bands	1	Lecture		Text Book-5
Basic Radar , RADAR range equation,	1	Lecture		Text Book-5
Pulsed RADAR,	1	Lecture		Text Book-5
CW RADAR,	1	Lecture		Text Book-5
MTI RADAR, Tracking RADAR	1	Lecture		Text Book-5
Global Positioning System.	1	Lecture		Text Book-5
Module-VI [06 hrs. Lecture]				

Basic Satellite Systems	1	Lecture		Text Book-4
Indian Scenario	1	Lecture		Text Book-4
Satellite Orbits	1	Lecture		Text Book-4
Satellite Communication Systems	2	Lecture		Text Book-4
Satellite link design	1	Lecture		Text Book-4
Module-VII [08hrs. Lecture]				
Data Communication Architecture	1	Lecture		Text Book-1
Link To Link Layers	1	Lecture		Text Book-1
End-To-End Layers	1	Lecture		Text Book-1
Switching Techniques for Data Transmission	2	Lecture		Text Book-1
LAN, MAN	1	Lecture		Text Book-1
ISDN	1	Lecture		Text Book-1
BISDN.	1	Lecture		Text Book-1
Total (hrs.)				45 hr.

Introduction to Aerospace Engineering

Course Title	Code	Type of course	T-P-PJ	Prerequisite
Introduction to Aerospace Engineering	ENFC0105	Theory	3-0-0	Nil

Objective

- To familiarize with the Basic Concepts of Flying, Aircraft Structures, Systems, Instruments and Power Plants used in Airplanes.

Course Outcome

- To Identify the Component of Flight and Suitable Materials for Aircraft Structure.
- To Perform Basic Calculation on Mechanics using Newton Law for Lift, Drag and Moment.

Evaluation Systems

	Component	% of Marks	Method of Assessment
Internal Examination	Internal Theory	30	Written examination
	Assignment	5	Report or Presentation + Learning Record
	Attendance	5	Based on class attended
External Examination	External Theory	60	Written examination
Total		100	

Course Outline

Module: I (08 Hrs)

History of Flight:

Early flying vehicles by Wright brothers, hot air balloons, Classification of flight vehicles, biplanes and monoplanes, developments in aerodynamics airplanes and Helicopters, Components of an airplane and their functions.

Module: II (06 Hrs)

Basics of Aeronautics: Physical properties and structure of the atmosphere, temperature, pressure and altitude relationships.

Module: III (08 Hrs)

Newton's law of motions applied to aeronautics - evolution of lift, drag and moment. aerofoils, mach number, subsonic, transonic, supersonic, hypersonic flows.

Module: IV (06 Hrs)

Airplane Structures and Materials :General types of construction, monocoque and semi-monocoque constructions, typical wing and fuselage structure.

Module: V (06 Hrs)

Airplane Structures and Materials:Materials used in aircraft metallic and non-metallic materials, use of aluminium alloy, titanium, stainless steel and composite materials.

Module: VI (06 Hrs)

Systems and Instruments:Conventional control, Powered controls, Basic instruments for flying, typical systems for control actuation.

Module: VII (08 Hrs)

Power Plants : Basic ideas about piston, turboprop and jet engines - use of propeller and jets for thrust production - comparative merits, principles of operation of rocket, types of rockets and typical applications, exploration into space.

References

Text Books :

J.D. Anderson, Introduction to Flight, McGraw Hill

A.C. Kermode, Mechanics of Flight, Himalayan Book

Reference Books :

E.H.J. Pallet, Aircraft Instruments & Principles, Pitman & Co

Online Source : NPTEL, You tube

Introduction to Computer Networks

Course Title	Code	Type of course	T-P-PJ	Prerequisite
Introduction to Computer Networks	FCEN0120	Theory	3-0-0	Nil

Objective

<ul style="list-style-type: none"> This course introduces the architecture, functions, and components of the Internet and computer networks, the principles and structure of IP addressing and sub netting, the fundamentals of Ethernet, the architecture, components and operations of routers, routing protocols and switches in a network. Topics include TCP/IP, Ethernet, IPv4, routers, switches.
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Course outcome

<ul style="list-style-type: none"> Upon successful completion of this course students will be able to define layers of the OSI model and identify the protocols, and services associated with each layer, identify the purpose, features, and functions of current common network hardware and the OSI layer with which each is associated Explain the operation principles of current common network hardware devices, describe current common protocols in terms of their function, routing, addressing schemes, interoperability, and naming conventions, justify information security issues in computer net works.

Evaluation Systems

	Component	% of Marks	Method of Assessment
Internal Examination	Internal Theory	30	Written examination
	Assignment	5	Report or Presentation + Learning Record
	Attendance	5	Based on class attended
External Examination	External Theory	60	Written examination
Total		100	

Course outline

Module I Computer Networking Fundamentals

(8Hrs.)

Networking fundamentals, Internet, Access Networks, Physical Media, Switching techniques, Layered Architecture, Introduction to the Seven layers of the OSI model, concept of the OSI model, TCP/IP model and comparison with OSI model, the Application Layer, the Presentation Layer, the Session Layer, the Transport Layer, the Network Layer, the Data Link Layer & the Physical layer.

Module II (Part-1) Security Protocols - Application Layer (5 Hrs.)

Introduction to Protocol concepts, Important Protocols, File Transfer Protocol, Socket Secure (OCS), Secure Shell (SSH), Remote Terminal Control Protocol (Telnet), HTTP.

Module III (Part -2) Security Protocols - Application Layer (2) (4 Hrs.)

Transport Layer Security/Secure Sockets Layer (TLS/SSL), Extensible Messaging & Presence Protocol (XMPP), Wireless Application Protocol (WAP) & Internet Relay Chat (IRC), SMTP.

Module IV (Part-1) Transport Layer (4 Hrs.)

Introduction to Transport Layer, TCP/IP, User Datagram Protocol (UDP), Real-time Transport Protocol (RTP)

Module V (Part-2) Transport Layer (4 Hrs)

Datagram Congestion Control Protocol (DCCP), Stream Control Transmission Protocol (SCTP), Resource reservation Protocol (RSVP)&Explicit Congestion Notification (ECN)

Module VI Network Layer (8Hrs.)

Introduction to Network Layer, Internet Protocol Version 4 (IPv4), Internet Protocol Version 6 (IPv6), internet Protocol Security (IPSEC), Internet Control Message Protocol (ICMP) & Internet Group Management Protocol (IGMP)

Module VII: Data Link Layer (8Hrs.)

Introduction to Data Link Layer, Error correction and detection, CRC, the Address Resolution Protocol (ARP), Tunneling Protocol (Tunnels) &the Point to Point Protocol (PPP), HDLC.

E-content: LMS Content

Reference Books/Text Books:

1. Information Systems Security: Security Management, Metrics, Frameworks and Best Practices by Nina Godbole
2. Network Security Bible by Eric Cole.
3. Computer Networking by Kurose, Ross

Online Source:

1. <https://www.lifewire.com/layers-of-the-osi-model-illustrated-818017>
2. https://www.webopedia.com/quick_ref/OSI_Layers.asp
3. https://www.tutorialspoint.com/network_security/network_security_application_layer.htm
4. https://www.tutorialspoint.com/data_communication_computer_network/transport_layer_introduction.htm
5. <https://www.studytonight.com/computer-networks/osi-model-network-layer>
6. https://www.tutorialspoint.com/data_communication_computer_network/data_link_layer_introduction.htm

Session Plan

Topic coverage and Internal Test	No. of Sessions (in hrs.)	Activity (lecture, tutorial, lab practice, field studies/field-trip, Workshop etc.)	Assignment (project, assignment, field work etc.)	Suggested Reading (Book, Video, Online source, etc.)
Module-1 Computer Networking Fundamentals (Total = 8hrs)				
Networking fundamentals, Internet,	2	Lecture + PPT	Assignment	Book, Online Sources, LMS
Access Networks, Physical Media	1	Lecture + PPT	Assignment	Book, Online Sources, LMS
Switching techniques, Layered Architecture,	1	Lecture + PPT	Assignment	Book, Online Sources, LMS
Introduction to the Seven layers of the OSI model, concept of the OSI model, TCP/IP model and comparison with OSI model,	2	Lecture + PPT	Assignment	Book, Online Sources, LMS
<ul style="list-style-type: none"> the Application Layer, the Presentation Layer, the Session Layer, 	1	Lecture + PPT	Assignment	Book, Online Sources, LMS
<ul style="list-style-type: none"> the Transport Layer, the Network Layer, the Data Link Layer & the Physical layer. 	1	Lecture + PPT	Assignment	Book, Online Sources, LMS
Module-2 (Part -1) Security Protocols - Application Layer (2) (Total = 5hrs)				
Introduction to Protocol concepts, Important Protocols	2	Lecture + PPT	Assignment	Book, Online Sources, LMS
,File Transfer Protocol, Socket Secure (SOCKS), Secure Shell (SSH), Remote Terminal Control Protocol (Telnet). HTTP	3	Lecture + PPT	Assignment	Book, Online Sources, LMS

Module-3 (Part -2) Security Protocols - Application Layer (2) (Total = 4 hrs)				
Transport Layer Security/Secure Sockets Layer (TLS/SSL),	2	Lecture + PPT	Assignment	Book,Online Sources,LMS
Extensible Messaging & Presence Protocol (XMPP), Wireless Application Protocol (WAP) & Internet Relay Chat (IRC), SMTP	2	Lecture + PPT	Assignment	Book,Online Sources,LMS
Module-4 (Part-1) Transport Layer (Total = 4 hrs)				
Introduction to Transport Layer, TCP/IP, User Datagram Protocol (UDP), Real-time Transport Protocol (RTP)	4	Lecture + PPT	Assignment	Book,Online Sources,LMS
Module-5 (Part-2) Transport Layer (Total = 4 hrs)				
Datagram Congestion Control Protocol (DCCP)	1	Lecture + PPT	Assignment	Book,Online Sources,LMS
Stream Control Transmission Protocol (SCTP),	1	Lecture + PPT	Assignment	Book,Online Sources,LMS
Resource reservation Protocol (RSVP)&Explicit Congestion Notification (ECN)	2	Lecture + PPT	Assignment	Book,Online Sources,LMS
Module-6 Network Layer (Total = 8hrs)				
Introduction to Network Layer, Internet Protocol Version 4 (IPv4), Internet Protocol Version 6 (IPv6),	4	Lecture + PPT	Assignment	Book,Online Sources,LMS
Internet Protocol Security (IPSEC), Internet Control Message Protocol (ICMP) & Internet Group Management Protocol (IGMP)	4	Lecture + PPT	Assignment	Book,Online Sources,LMS

Module-7 Data Link Layer (Total = 8hrs)				
Introduction to Data Link Layer, Error correction and Detection, CRC the Address Resolution Protocol (ARP), the Open Shortest Path First (OSPF), the Neighbor Discovery Protocol (NDP).	5	Lecture + PPT	Assignment	Book,Online Sources,LMS
The Tunneling Protocol (Tunnels) & the Point to Point Protocol (PPP), HDLC	3	Lecture + PPT	Assignment	Book,Online Sources,LMS
<i>Total (hrs)</i>	Total = 41 Hours (Theory)			

Computer Fundamental and Organization

Course Title	Code	Type of course	T-P-PJ	Prerequisite
Computer Fundamental and Organization	FCEN 0118	Theory	3-0-0	Nil

Objective

- To explore the organization of computer system and its working.
- To understand the basics of computer networks.
- To use office packages like MS Office.

Course outcome

- After completing the course students will able to
- Explain different components of computer system and their functions.
- Know the basics about computer networks.
- Use word processing, spreadsheet, and power point applications.

Evaluation Systems

	Component	% of Marks	Method of Assessment
Internal Examination	Internal Theory	30	Written examination
	Assignment	5	Report or Presentation + Learning Record
	Attendance	5	Based on class attended
External Examination	External Theory	60	Written examination
Total		100	

Course outline

Module: I (7 hrs)

General Features of a Computer: General features of a computer, Generation of computers, Personal computer, workstation, mainframe computer and super computers. Computer applications – data processing, information processing, commercial, office automation, industry and engineering, healthcare, education, graphics and multimedia.

Module: II (6 hrs)

Computer Organization: Computer organization, central processing unit, computer memory – primary memory and secondary memory. Secondary storage devices – Magnetic and optical media. Input and output units. OMR, OCR, MICR, scanner, mouse, modem.

Module: III (5 hrs)

Computer Hardware and Software Computer hardware and software. Machine language and high level language. Application software, computer program, operating system. Computer virus, antivirus and computer security. Elements of MS DOS and Windows OS.

Module IV: (5 hrs)

Computer Arithmetic and Number System :Computer arithmetic, Binary, octal and hexadecimal number systems.

Module V: (6 hrs)

Logic Gates: Algorithm and flowcharts, illustrations, elements of a database and its applications
Basic Gates (**De Morgan's** theorems, duality theorem, NOR, NAND, XOR, XNOR gates), Boolean expressions and logic diagrams, Types of Boolean expressions.

Module: VI: (5 hrs)

MS Office: Word processing and electronic spread sheet. An overview of MSWORD, MSEXCEL and MSPOWER POINT.

Module VII : (5 hrs)

Introduction to Networking: Network of computers. Types of networks, LAN, Intranet and Internet. Internet applications. World Wide Web, E-mail, browsing and searching, search engines, multimedia applications.

Reference

E-content : LMS

Reference Books:

Alexis Leon and Mathews Leon (1999) : Fundamentals of information Technology, Leon Techworld Pub.

Jain, S K (1999) : Information Technology “O” level made simple, BPB Pub

Jain V K (2000) “O” Level Personal Computer software, BPB Pub.

Rajaraman, V (1999) : Fundamentals of Computers, Prentice Hall India

Hamacher, Computer Organization McGrawhill

Alexis Leon : Computers for everyone. Vikas, UBS

Anil Madaan : Illustrated Computer Encyclopedia. Dreamland Pub

Sinha. Computer Fundamentals BPB Pub.

Online Source : Microsoft academy, Edx

Session Plan

Topic coverage and Internal Test	No. of Sessions (in hrs.)	Activity (lecture, tutorial, lab practice, field studies/field-trip, Workshop etc.)	Assignment (project, assignment, field study, seminar, etc.)	Suggested Reading (Book, Video, Online source, etc.)
Module I Lecture=7 Hrs.				
General features of a computer, Generation of computers, Personal computer, workstation mainframe computer and super computers	3	lecture	assignment	Book, Online Source, SLM
Mainframe computer and super computers	2	lecture	assignment	Book, Online Source, SLM
Computer applications – data processing, information processing, commercial, office automation, industry and engineering, healthcare, education, graphics and multimedia.	2	lecture	assignment	Book, Online Source, SLM
Module II Lecture=6 Hrs.				
Computer organization, central processing unit, computer memory – primary memory and secondary memory.	3	lecture	assignment	Book, Online Source, SLM
Secondary storage devices – Magnetic and optical media. Input and output units. OMR, OCR, MICR, scanner, mouse, modem.	3	lecture	assignment	Book, Online Source, SLM
Module III Lecture=5 Hrs.				

Computer hardware and software. Machine language and high level language.	2	lecture	assignment	Book, Online Source, SLM
Application software, computer program, operating system. Computer virus, antivirus and computer security. Elements of MS DOS and Windows OS.	3	lecture	seminar	Book, Online Source, SLM
Module IV Lecture=5 Hrs.				
Computer arithmetic, Binary, octal and hexadecimal number systems.	5	lecture	assignment	Book, Online Source, SLM
Module V Lecture=6 Hrs.				
Algorithm and flowcharts, illustrations, elements of a database and its applications.	3	lecture	assignment	Book, Online Source, SLM
Basic Gates (De Morgan's theorems, duality theorem, NOR, NAND, XOR, XNOR gates), Boolean expressions and logic diagrams, Types of Boolean expressions.	3	lecture	assignment	Book, Online Source, SLM
Module VI Lecture=5 Hrs.				
Word processing and electronic spread sheet. An overview of MS WORD, MS EXCEL and MS POWER POINT	5	lecture	assignment	Book, Online Source, SLM
Module VII Lecture=5 Hrs.				
Network of computers. Types of networks, LAN, Intranet and Internet.	2	lecture	assignment	Book, Online Source, SLM

Internet applications. World Wide Web, E-mail, browsing and searching, search engines, multimedia applications.	3	lecture	Assignment	Book, Online Source, SLM
Total (hrs)	39			

Operating System Building Blocks

Course Title	Code	Type of course	T-P-PJ	Prerequisite
Operating System Building Blocks	FCEN 0119	Theory	3-0-0	Nil

Objective

- The operating system is the most important program that runs on a computer. Every general-purpose computer must have an operating system to run other programs.
- Operating systems perform basic tasks, such as recognizing input from the keyboard, sending output to the display screen, keeping track of files and directories on the disk, and controlling peripheral devices such as disk drives and printers.
- This course covers the concept of operating system and its applications.

Course outcome

- After learning the fundamental concepts in Operating system including how OS has evolved over the years and different components of OS, students will continue to more significant functions of OS like Process management, storage and memory management etc.
- This will provide the necessary information for students to extract maximum benefits out of the OS while developing programs, working with applications etc.

Evaluation Systems

	Component	% of Marks	Method of Assessment
Internal Examination	Internal Theory	30	Written examination
	Assignment	5	Report or Presentation + Learning Record
	Attendance	5	Based on class attended
External Examination	External Theory	60	Written examination
Total		100	

Course outline

Module I: (5 Hrs.)

Introduction to Operating System: Objectives and Functions of OS, Evolution of OS, OS Structures, OS Components, OS Services, System calls, System programs, Virtual Machines.

Module II: (8 Hrs.)

Process Management – Processes and Threads

Processes: Process concept, Process scheduling, Co-operating processes, Operations on processes, Inter process communication, Communication in client-server systems. Threads : Introduction to Threads, Single and Multi-threaded processes and its benefits, User and Kernel threads, Multithreading models, threading issues. CPU Scheduling : Basic concepts, Scheduling criteria, Scheduling Algorithms, Multiple Processor Scheduling, Real-time Scheduling, Algorithm Evaluation, Process Scheduling Models.

Module III: (6 Hrs.)

Process Management – Synchronization : Process Synchronization : Mutual Exclusion, Critical – section problem, Synchronization hardware, Semaphores, Classic problems of synchronization, Critical Regions, Monitors, OSS Synchronization, Atomic Transactions.

Module IV: (4 Hrs)

Deadlock Handling Deadlocks: System Model, Deadlock characterization, Methods for handling Deadlocks, Deadlock prevention, Deadlock Avoidance, Deadlock, Detection, Recovery from Deadlock.

Module V: (8 Hrs.)

Memory Management: Memory Management: Logical and physical Address Space, Swapping, Contiguous Memory Allocation, Paging, Segmentation with Paging. Virtual Management : Demand paging, Process creation, Page Replacement Algorithms, Allocation of Frames, Thrashing, Operating System Examples, Page size and other considerations, Demand segmentation.

Module VI: (4 Hrs.)

Device and File Management File-System Interface : File concept, Access Methods, Directory structure, File- system Mounting, File sharing, Protection and consistency semantics. File-System Implementation: File-System structure, File-System Implementations, Directory Implementation, Allocation Methods, Free-space Management, Efficiency and Performance, Recovery. Disk Management Disk Structure, Disk Scheduling, Disk Management, Swap-Space Management, Disk Attachment, stable-storage Implementation.

Module VII : (4 Hrs.)

Protection and Security Protection : Goals of Protection, Domain of Protection, Access Matrix, Implementation of Access Matrix, Revocation of Access Rights, Capability- Based Systems, Language – Based Protection. Security : Security Problem, User Authentication, One – Time Password, Program Threats, System Threats, Cryptography, Computer – Security Classifications.

E-content: LMS Content

Text Books:

1. Operating System by Silberschatz / Galvin / Gagne, 6th Edition, WSE (WILEY Publication)
2. Operating System by Abraham Silberschatz and peter Baer Galvin, 8th Edition, Pearson Education 1989 (Chapter 1,3.1,3.2,3.3,3.4,3.6,4,5,6 (Except 6.8,6.9), 7, 8,9,10,11,13, (Except 13.6) 19 (Except 19.6),20(Except 20.8, 20.9), 22,23).

Reference Books:

1. Operating System Concepts and design by Milan Milonkovic, II Edition, McGraw Hill 1992.
2. Operation System Concepts by Tanenbaum, 2nd Edition, Pearson Education.
3. Operating System by William Stallings, 4th Edition, Pearson Education.
4. Operating System by H.M. Deitel , 2nd Edition Pearson Education.
5. Operating Systems by Nutt, 3/e Pearson Education 2004.

Online Source:

<http://www.sci.brooklyn.cuny.edu/~jniu/teaching/csc33200/files/0915-OperatingSystemsOverview.pdf>

<http://codex.cs.yale.edu/avi/os-book/OS8/os8c/slide-dir/PDF-dir/ch1.pdf>

<http://www.ddegjust.ac.in/studymaterial/mca-3/ms-08.pdf>

<http://www2.latech.edu/~box/os/ch06a.pdf>

<http://www.cs.ucsb.edu/~rich/class/cs170/notes/IntroThreads>

<http://codex.cs.yale.edu/avi/os-book/OS8/os8c/slide-dir/PDF-dir/ch5.pdf>

<https://www.kernel.org/doc/gorman/html/understand/understand014.html>

https://www.cs.uic.edu/~jbell/CourseNotes/OperatingSystems/14_Protection.html

<http://www.slideshare.net/Colin058/network-security-threats-and-solutions-1018888>

<http://www.openbsd.org/papers/crypt-service.pdf>

Session Plan

Topic coverage and Internal Test	No. of Sessions (in hrs.)	Activity (lecture, tutorial, lab practice, field studies/field-trip, Workshop etc.)	Assignment (project, assignment, field study, seminar, etc.)	Suggested Reading (Book, Video, Online source, etc.)
Module - I (5 Hrs.)				
Introduction to Operating System : Objectives and Functions of OS,	3	Lecture	Assignment	Book, Online Source

Evolution of OS				
OS Structures, OS Components, OS Services	1	Lecture	Assignment	Book, Online Source
System Calls	1	Lecture	Assignment	Book, Online Source
Module - II (8 Hrs.)				
Process Management – Processes and Threads : Processes : Process concept, Process scheduling, Co-operating processes, Operations on processes	2	Lecture	Assignment	Book, Online Source
Inter process communication, Communication in client-server systems.	2	Lecture	Assignment	Book, Online Source
Threads : Introduction to Threads, Single and Multi-threaded processes and its benefits, User and Kernel threads, Multithreading models, Threading issues.	1	Lecture	Assignment	Book, Online Source
CPU Scheduling : Basic concepts, Scheduling criteria, Scheduling Algorithms, Multiple Processor Scheduling, Real-time Scheduling, Algorithm Evaluation, Process Scheduling Models.	3	Lecture	Assignment	Book, Online Source

Module - III (6 Hrs.)				
Process Management – Synchronization Mutual Exclusion, Critical – section problem, Synchronization hardware, Semaphores	3	Lecture	Assignment	Book, Online Source
Classic problems of synchronization, Critical Regions.	3	Lecture	Assignment	Book, Online Source
Module - IV (4 Hrs.)				
Deadlock Handling : System Model, Deadlock characterization, Methods for handling Deadlocks, Deadlock prevention, Deadlock Avoidance.	2	Lecture	Assignment	Book, Online Source
Deadlock Detection, Recovery from Deadlock.	2	Lecture	Assignment	Book, Online Source
Module - V (8 Hrs.)				
Memory Management : Logical and physical Address Space, Swapping.	3	Lecture	Assignment	Book, Online Source
Contiguous Memory Allocation	2	Lecture	Assignment	Book, Online Source
Paging, Segmentation with Paging.	3	Lecture	Assignment	Book, Online Source
Module - VI (4 Hrs.)				
Device and File Management : File-System Interface: File concept, Access Methods, Directory structure, File- system Mounting, File sharing, Protection and	1	Lecture	Assignment	Book, Online Source

consistency semantics.				
File-System Implementation: File-System structure, File-System Implementations, Directory Implementation, Allocation Methods, Free-space Management, Efficiency and Performance, Recovery.	1	Lecture	Assignment	Book, Online Source
Disk Management: Disk Structure, Disk Scheduling, Disk Management, Swap-Space Management, Disk Attachment, stable-storage Implementation.	2	Lecture	Assignment	Book, Online Source
Module-VII (4 Hrs.)				
Protection and Security: Protection: Goals of Protection, Domain of Protection, Access Matrix, Implementation of Access Matrix, Revocation of Access Rights, Capability-Based Systems, Language – Based Protection.	2	Lecture	Assignment	Book, Online Source
Security : Security Problem, User Authentication, One – Time Password, Program Threats, System Threats, Cryptography, Computer – Security Classifications	2	Lecture	Assignment	Book, Online Source
Total (hrs)	39 Hrs.			

Introduction to Biotechnology

Course Title	Code	Type of course	T-P-PJ	Prerequisite
Introduction To Biotechnology	FCEN0115	Theory	3-0-0	Nil

Objective

- To introduce students basic knowledge about biotechnology

Course Outcome

- To impart a sound knowledge on the principles of Biotechnology involving the different application oriented topics required for all engineering branches.

Evaluation Systems

	Component	% of Marks	Method of Assessment
Internal Examination	Internal Theory	30	Written examination
	Assignment	5	Report or Presentation + Course Record
	Attendance	5	Based on class attended
External Examination	External Theory	60	Written examination
Total		100	

Course outline

Module: I

Biochemistry: Component of the cell, structure and biochemical functions,

Module: II

Biomolecules-Carbohydrates, lipids, proteins, Nucleic acids, Structure and classification of enzymes

Module: III

Cell Biology Eukaryotic, Prokaryotic cells, Cell cycle – Mitosis and Meiosis,

Module: IV

Cell fractionation and flow cytometry.

Module: V

Introduction to nucleic acids: Nucleic acids as genetic material, Structure and physicochemical properties of elements in DNA and RNA, Biological significance of differences in DNA and RNA.

Module: VI

Immunology: Cells of immune system, Development, maturation, activation and differentiation of Tcells and Bcells, Phagocytosis process

Module VII

Biotechnology Applications: Industrial production, Drug discovery and development

Text Books:

1. Lehninger A.L., Nelson D.L. and Cox M.M. Principles of Biochemistry. CBS publishers and distributors.
2. Murray R.K., Granner D.K., Mayes P.A. and Rodwell V.W. Harpers Biochemistry. Appleton and Lange ,Stanford ,Conneticut.

Reference Books:

1. Lodish, Harvey etal., “ Molecular Cell Biology,” 6th Edition. W.H.Freeman, 2008
2. Alberts, Bruce, “Molecular Biology of Cell”, 5th Edition, Garland Science, 2008.
3. Satyanarayana, U. “Biotechnology” Books & Allied (P) Ltd., 2005.
4. Friefelder, David. “Molecular Biology.” Narosa Publications, 199

Session Plan

Topic coverage and Internal Test	No. of Sessions (in hrs.)	Activity (lecture, tutorial, lab practice, field studies/field-trip, Workshop etc.)	Assignment (project, assignment, field study, seminar, etc.)	Suggested Reading (Book, Video, Online source, etc.)
Module I		lecture, tutorial	assignment	Book, Video, Notes
Component of the cell	1			
Cell structure	1			
biochemical functions	1			
Module II				
Carbohydrates	3			
lipids	3			
Proteins	3			

Nucleic Acids	3			
Structure of Enzymes	3			
Module III				
Eukaryotic, Prokaryotic cells	5	lecture, tutorial	assignment	Book, Video, Notes
Cell Cycle	5			
Nucleic acids as genetic material				
Cells of immune system	3	lecture, tutorial	assignment	Book, Video, Notes
activation and differentiation of Tcells and Bcells	3			
Drug discovery and development	2			
Module IV				
Cell fractionation and flow cytometry.	2	lecture, tutorial	assignment	Book, Video, Notes
Module V				
Nucleic acids as genetic material	1	lecture, tutorial	assignment	Book, Video, Notes
Structure and physicochemical properties of elements in DNA and RNA	2			
Biological significance of differences in DNA and RNA.	1			
Module VI				
Cells of immune system, Development, ,	1	lecture, tutorial	assignment	Book, Video, Notes
maturation, activation and differentiation of Tcells and Bcells	2			

Phagocytosis process	1			
Module VII		lecture, tutorial	assignment	Book, Video, Notes
Industrial production	1			
Drug discovery and development	2			
Total (hrs)	45			

Introduction to Biophysics

Course Title	Code	Type of course	T-P-PJ	Prerequisite
Introduction To Biophysics	FCEN0116	Theory	3-0-0	Nil

Objective

- Learn the structures of biological molecules
- To understand the concept of structural analysis
- Learn the techniques for analysis and determination of structure of biomolecules.

Course outcome

- To introduce the theories and concepts of biophysics of biomolecules which are considered important in biotechnology applications

Evaluation Systems

	Component	% of Marks	Method of Assessment
Internal Examination	Internal Theory	30	Written examination
	Assignment	5	Report or Presentation + Course Record
	Attendance	5	Based on class attended
External Examination	External Theory	60	Written examination
Total		100	

Course outline

Module: I

Structures of Biological macromolecules: Levels of structures in proteins, nucleic acids and polysaccharides - primary, secondary, tertiary and quaternary structures

Module: II

Conformational analysis of proteins: Polypeptide chain geometries, internal rotation angles, Ramachandran plot, potential energy calculations, forces that determine protein structure – hydrogen bonding

Module: III

Hydrophobic interactions, ionic interactions, disulphide bonds – prediction of protein structure.

Module: IV

Conformational analysis of Nucleic acid: General characteristics of nucleic acid structure – geometric Glycosidic bond – rotational isomers, ribose puckering–backbone rotation angles and steric hindrances – forces stabilizing ordered forms – base pairing and base stacking.

Module V

Techniques for the study of Biological structures, Electron Microscopy, Ultracentrifuge, Viscometry

Module VI

Molecular –sieve chromatography, electrophoresis, NMR and EPR. X-Ray crystallography

Module VII

X-ray fiber diffraction, light scattering, Neutron scattering

Text Books:

Biophysical Chemistry, Cantor and Schimmel, part I and II, W.H. Freeman and co 1997.

Reference Books:

1. Physical Biochemistry : David Friefelder, 5th Ed, PHI
2. Physical Biochemistry : Kensal E van Holde. PHI

Session Plan

Topic coverage and Internal Test	No. of Sessions (in hrs.)	Activity (lecture, tutorial, lab practice, field studies/field-trip, Workshop etc.)	Assignment (project, assignment, field study, seminar, etc.)	Suggested Reading (Book, Video, Online source, etc.)
Module I		lecture, tutorial	assignment	Book, Video, Notes
Levels of structures in proteins	2			
nucleic acids and polysaccharides	2			
primary, secondary, tertiary and quaternary structures	2			
Module II		lecture, tutorial	assignment	Book, Video, Notes
Polypeptide chain geometries,	2			
internal rotation angles, Ramachandran plot,	2			

potential energy calculations	2			
forces that determine protein structure – hydrogen bonding	2			
Module III				
Hydrophobic interactions,	2	lecture, tutorial	assignment	Book, Video, Notes
ionic interactions, disulphide bonds	2			
prediction of protein structure.	2			
Module IV				
General characteristics of nucleic acid structure – geometric	2	lecture, tutorial	assignment	Book, Video, Notes
Glycosidic bond – rotational isomers	2			
ribose puckering– backbone rotation angles and steric hindrances	2			
forces stabilizing ordered forms – base pairing and base stacking.	2			
Module V				
Techniques for the study of Biological structures	2	lecture, tutorial	assignment	Book, Video, Notes
ElectronMicroscopy, Ultracentrifuge	2			
Viscometry	1			
Module VI				
Molecular–sieve chromatography	2	lecture, tutorial	assignment	Book, Video, Notes
Electrophoresis	2			
NMR and EPR.	2			
X-Ray crystallography	1			

Module VII				
X-ray fiber diffraction	2	lecture, tutorial	assignment	Book, Video, Notes
light scattering	2			
Neutron scattering	1			
Total (hrs)	45			

Biosafety, Bioethics, IPR & Patents

Subject Name	Code	Type of course	T-P-PJ	Prerequisite
Biosafety, Bioethics, IPR & Patents	FCEN0117	Theory	2-0-0	Nil

Objective

- To introduce the biosafety regulations and ethical concepts in biotechnology
- To emphasize on IPR issues and need for knowledge in patents in biotechnology

Course outcome

- This course creates awareness on the Biosafety, bioethics, Intellectual property rights and patenting of biotechnological processes.

Evaluation Systems

	Component	% of Marks	Method of Assessment
Internal Examination	Internal Theory	30	Written examination
	Assignment	5	Report or Presentation + Course Record
	Attendance	5	Based on class attended
External Examination	External Theory	60	Written examination
Total		100	

Course outline

Module: I

Bioethics: Bioethics – Necessity of Bioethics, different paradigms of Bioethics – National & International. Ethical issues against the molecular technologies.

Module: II

Biosafety: Biosafety– Introduction to biosafety and health hazards concerning biotechnology.

Module: III

Good Laboratory Practices :Introduction to the concept of containment level and Good Laboratory Practices (GLP) and Good Manufacturing Practices (GMP).

Module IV

Introduction to Patent: Objectives of the patent system - Basic principles and general requirements of patent law biotechnological inventions.

Module V

Patent Laws:Introduction to Indian Patent Law. World Trade Organization and its related intellectual property provisions.

Module VI

Intellectual/Industrial property and its legal protection in research, design and development. Patenting in Biotechnology, economic, ethical and depository considerations.

Module VII

Intellectual Property Rights:Intellectual property rights-TRIP- GATT-International conventions patents and methods of application of patents Legal implications-Biodiversity and farmer rights.

Text Books:

1. Singh K, Intellectual Property rights on Biotechnology, BCIL, New Delhi
2. Regulatory Framework for GMOs in India (2006) Ministry of Environment and Forest, Government of India, New Delhi

Reference Books:

1. Beier, F.K., Crespi, R.S. and Straus, T. Biotechnology and Patent protection-Oxford and IBH Publishing Co. New Delhi.
2. Sasson A, Biotechnologies and Development, UNESCO Publications.

Session Plan

Topic coverage and Internal Test	No. of Sessions (in hrs.)	Activity (lecture, tutorial, lab practice, field studies/field-trip, Workshop etc.)	Assignment (project, assignment, field study, seminar, etc.)	Suggested Reading (Book, Video, Online source, etc.)
Module I		lecture, tutorial	assignment	Book, Video, Notes
Bioethics – Necessity of Bioethics,	1			
different paradigms of Bioethics – National & International	2			
Ethical issues against the molecular technologies	1			
Module II		lecture, tutorial	assignment	Book, Video, Notes
Biosafety– Introduction to biosafety	1			

health hazards concerning biotechnology.	2			
Module III		lecture, tutorial	assignment	Book, Video, Notes
Introduction to the concept of containment level	1			
Good Laboratory Practices (GLP) and Good Manufacturing Practices (GMP).	2			
Module IV		lecture, tutorial	assignment	Book, Video, Notes
Objectives of the patent system	2			
Basic principles and general requirements of patent law biotechnological inventions.	2			
Module V		lecture, tutorial	assignment	Book, Video, Notes
Introduction to Indian Patent Law	2			
World Trade Organization and its related intellectual property provisions	2			
Module VI		lecture, tutorial	assignment	Book, Video, Notes
Intellectual/Industrial property and its legal protection in research,	2			
design and development. Patenting in	2			
Biotechnology, economic, ethical and depository considerations	1			
Module VII		lecture, tutorial	assignment	Book, Video, Notes
Intellectual property rights-TRIP	1			
GATT-International conventions patents and methods of application of patents	2			
Legal implications-Biodiversity and farmer rights.	1			
Total (hrs)	30			

Earth System Science

Course Title	Code	Type of course	T-P-PJ	Prerequisite
Earth System Science	FCEN0111	Theory	3- 0 - 0	Nil

Objective:

<ul style="list-style-type: none"> ● To make the students have a clear knowledge on : ● Space Science ● Earth Dynamics ● Geological Oceanography ● Geological bodies and structure ● Hydrogeology ● Glaciology ● Earth's Atmosphere ● Biosphere ● Natural Resources

Course outcome:

<ul style="list-style-type: none"> ● Students will be able to understand the earth's interior, its composition, various dynamic processes, oceanography, hydrogeology, glaciology, structural geology earth's atmosphere, biosphere and the natural resources. ● A clear understanding of the basics of geology as a prerequisite for mining engineering.

Evaluation System

	Component	% of Marks	Method of Assessment
Internal Examination	Internal Theory	30	Written examination
	Assignment	5	Report or Presentation + Course Record
	Attendance	5	Based on class attended
External Examination	External Theory	60	Written examination
Total		100	

Course outline:

Module: I

Space Science: Solar System, Age of the Earth, Origin of Solar system. Meteors and Meteorites.

Earth Dynamics: Interior of the Earth, Composition of the Earth, Seismic waves, Seismograph, Plate Tectonics, Basics of Earthquake Engineering, Landslides, Volcanoes.

Module: II

Geological Oceanography: Sea waves, Tides, Ocean currents, Geological work of seas and oceans, Tsunami and its causes, Warning system and mitigation

Hydrogeology: Water table, Aquifer, Groundwater fluctuations and groundwater composition, Hydrologic cycle.

Module: III

Glaciology: Glacier types, Different type of glaciers, Landforms formed by glacier.

Geological bodies and their structures: Rock, mineral, batholiths, dyke, sill, fold, fault, joint, unconformity.

Module: IV

Earth's Atmosphere: Structure and composition of atmosphere, Atmospheric circulation, Geological work of wind, Greenhouse effect and global warming, Carbon dioxide sequestration.

Module: V

Steps to maintain clean and pollution free atmosphere with governing laws, precautionary measures against disasters.

Module: VI

Biosphere: Origin of life, Evolution of life through ages, Geological time scale, biodiversity and its conservation.

Module VII

Natural Resources: Renewable and non-renewable resources, Mineral and fossil fuel resources and their Geological setting, mining of minerals and conservation, effect of mining on surface environment.

Reference Book

1. W Kenneth Hamblin; Eric H Christiansen "Earth's dynamic systems" Publisher: Upper Saddle River, N.J. : Prentice Hall, Pearson Education
2. Jon P Davidson; Walter E Reed; Paul M Davis "Exploring earth: An introduction to physical geology" Upper Saddle River, NJ : Prentice Hall

Text Book:

1. Michael C Jacobson "Earth System Science: from biogeochemical cycles to global changes" London [England] ; San Diego, California : Academic Press

Session Plan:

Topic coverage and Internal Test	No. of Sessions (in hrs.)	Activity (lecture, tutorial, lab practice, field studies/field-trip, Workshop etc.)	Assignment (project, assignment, field study, seminar, etc.)	Suggested Reading (Book, Video, Online source, etc.)
Solar System, Age of the Earth	1	Lecture	assignment	book
Origin of Solar system. Meteors and Meteorites	1	lecture	assignment	book
Interior of the Earth, Composition of the Earth,	1	lecture	assignment	book
Seismic waves, Seismograph, Plate Tectonics,	1	Lecture	assignment	book
Basics of Earthquake Engineering,	1	lecture	assignment	book
Landslides, Volcanoes.	1	lecture	assignment	book
Sea waves, Tides, Ocean currents	2	lecture	assignment	book
Geological work of seas and oceans	1	lecture	assignment	book
Tsunami and its causes, Warning system and mitigation.	1	lecture	assignment	book
Water table, Aquifer,	1	lecture	assignment	book
Groundwater fluctuations and groundwater composition	1	lecture	assignment	book
Hydrologic cycle.	1	lecture	assignment	book
Glacier types, Different type of glaciers,	1	lecture	assignment	book
Landforms formed by glacier.	1	lecture	assignment	book
Rock, mineral	1	lecture	assignment	book
batholiths, dyke, sill,	1	lecture	assignment	book

fold, fault,	1	lecture	assignment	book
Structure and composition of atmosphere,	1	lecture	assignment	book
Atmospheric circulation	1	lecture	assignment	book
Geological work of wind,	1	lecture	assignment	book
Greenhouse effect and global warming	1	lecture	assignment	book
Carbon dioxide sequestration.	1	lecture	assignment	book
Steps to maintain clean and pollution free atmosphere with governing laws,	1	lecture	assignment	book
Precautionary measures against disasters.	1	lecture	assignment	book
Origin of life	1	lecture	assignment	book
Evolution of life through ages,	1	lecture	assignment	book
Geological time scale,	1	lecture	assignment	book
Biodiversity and its conservation.	1	lecture	assignment	book
Renewable and non-renewable resources,	1	lecture	assignment	book
Mineral and fossil fuel resources and their geological setting,	2	lecture	assignment	book
mining of minerals and conservation,	2	lecture	assignment	book
effect of mining on surface environment	1	lecture	assignment	book
Total (hrs)	35			

Introduction to Mining

Course Title	Code	Type of course	T-P-PJ	Prerequisite
Introduction to Mining	FCEN0112	Theory	3-0-0	Nil

Objective:

<ul style="list-style-type: none"> ● Mines ● Types of mining methods ● Mineral deposits ● Types of mineral deposits ● Mine life cycle ● Overview of surface mining ● Overview of underground mining ● Transport system in mines ● Ventilation in mines ● Illumination in mines ● Support system in mines

Course outcome

<ul style="list-style-type: none"> ● Students will be able to understand about mines, different types of mining methods and mineral deposits. ● A clear understanding of the basics of mining engineering.
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Evaluation System

	Component	% of Marks	Method of Assessment
Internal Examination	Internal Theory	30	Written examination
	Assignment	5	Report or Presentation + Course Record
	Attendance	5	Based on class attended
External Examination	External Theory	60	Written examination
Total		100	

Course outline

Module: I

Mining: Definition and economic importance; Mine – definition, different types and classification;
 Mine life cycle,

Module: II

Mineral deposit-different types and their classification, Modes of entry to a mine- shaft, incline, decline, adit and box-cut.

Module: III

Overview of surface mining: Types of surface mines, unit operations, basic bench geometry,

Module: IV

Applicability& limitations, advantages and disadvantage

Module: V

Overview of underground mining: Different coal mining methods and their applicability & limitations

Module VI

Different metal mining methods and their applicability & limitations;

Module VII

Basic concepts of transportation, ventilation, illumination and support in underground mines.

Text Book:

1. D J Deshmukh “Elements of mining technology” Publisher: Ramdaspath, Nagpur : Vidyasewa Prakashan,

Reference Book.

1. Howard L Hartman; Jan M Mutmansky “Introductory mining engineering” Publisher: New York : John Wiley & Sons, 2002

Session Plan

Topic coverage and Internal Test	No. of Sessions (in hrs)	Activity (lecture, tutorial, lab practice, field studies/field-trip, Workshop etc.)	Assignment (project, assignment, field study, etc.)	Suggested Reading (Book, Video, Online source, etc.)
Definition and economic importance of mining	1	lecture	assignment	book
Mine – definition, different types and classification	2	lecture	Assignment, field study	book

Mine life cycle	1	lecture	assignment	book
Mineral deposit – different types and their classification	2	lecture	Assignment, field study	book
Mineral resources of India	2	lecture	assignment	book
Modes of entry to a mine – shaft	1	lecture	Assignment, field study	book
	1	lecture	assignment	book
incline, decline, adit and box-cut.	1	lecture	assignment	book
Overview of surface mining : definition	1	lecture	assignment	book
Types of surface mines,	1	lecture	assignment	book
Unit operation	1	lecture	assignment	book
basic bench geometry	2	lecture	Assignment, field study	book
applicability & limitations	1	lecture	assignment	book
advantages & disadvantage	1	lecture	assignment	book
Overview of underground mining : definition	1	lecture	assignment	book
Different coal mining methods and their applicability & limitations	2	lecture	Assignment, field study	book
Different metal mining methods and their applicability & limitations	2	lecture	assignment	book
Basic concepts of transportation	1	lecture	Assignment, field study	book
ventilation	1	lecture	assignment	book
illumination and support in underground mines	2	lecture	assignment	book
Total	27Hrs.			

Mine Development

Course Title	Code	Type of course	T-P-PJ	Prerequisite
Mine Development	FCEN0113	Theory	3 0 0	Nil

Objective:

<ul style="list-style-type: none"> ● To make the students have knowledge on : ● Opening-up of Deposits ● Vertical and Inclined Shafts ● Shaft Sinking Operations ● Insets ● Mechanized Sinking ● Shaft Boring ● Special Attributes ● Main Haulage Drifts and Tunnels ● High Speed Drifting/Tunneling ● Recent Developments ● Layouts
--

Course Outcome:

<ul style="list-style-type: none"> ● Students will be able to understand the choice of mode of entry their applicability, Number and disposition. ● Students will be able to understand vertical and Inclined Shafts ● Students will be able to understand methods and equipment of shaft boring. ● Students will be able to understand main Haulage Drifts and Tunnels. ● Students will be able to understand layouts of pit-top and pit-bottom, coal Handling Plant, Bunkers and Railway Sidings

Evaluation System

	Component	% of Marks	Method of Assessment
Internal Examination	Internal Theory	30	Written examination
	Assignment	5	Report or Presentation + Learning Record
	Attendance	5	Based on class attended
External Examination	External Theory	60	Written examination
Total		100	

Course outline

Module: I

Opening-up of Deposits: Choice of mode of entry- adit, shaft, decline and combined mode, their applicability, number and disposition.

Vertical and Inclined Shafts: Location, shape, size, and organization of shaft sinking, construction of shaft collar, shaft fittings.

Module: II

Shaft Sinking Operations: Ground breaking and muck disposal- tools and equipment, lining; ventilation, lighting and dewatering; sinking in difficult and water-bearing ground.

Module III

Insets: Design, excavation and lining.

Mechanized Sinking: Simultaneous sinking and lining; slip - form method of lining; high speed sinking.

Module IV

Shaft Boring: Methods and equipment.

Special Attributes: Widening and deepening of inclined and vertical shafts; staple shafts, raised shafts.

Module V

Main Haulage Drifts and Tunnels : Purpose, shape, size and location; excavation ground breaking, muck disposal, ventilation and supporting.

Module VI

High Speed Drifting/Tunneling : Application of mechanized methods; road headers and tunnel boring machines.

Module VII

Recent Developments in shaft sinking and drifting/tunnelling. Layouts of pit-top and pit-bottom, Coal Handling Plant, Bunkers and Railway Sidings

Text Book

1. D J Deshmukh "Elements of mining technology" Publisher: Ramdaspath, Nagpur : Vidyasewa Prakashan,
2. R Agor "A text book of surveying and leveling" Author:, Publisher:Delhi : Khanna Publication

Reference Book

1. B C Punmia; Arun Kumar Jain; A K Jain "Surveying.Vol.I" , Author:, Publisher:New Delhi Laxmi Publications

Alak De "Plane surveying" Publisher: S. Chand & Co

Session Plan

Topic coverage and Internal Test	No. of Sessions (in hrs)	Activity (lecture, tutorial, lab practice, field studies/field-trip, Workshop etc.)	Assignment (project, assignment, field study, etc.)	Suggested Reading (Book, Video, Online source, etc.)
Choice of mode of entry-adit, shaft, decline and combined mode, their applicability, number and disposition.	3	lecture	Assignment, field study	book
Location, shape, size, and organization of shaft sinking, construction of shaft collar, shaft fittings.	4	lecture	assignment	book
Ground breaking and muck disposal- tools and equipment, lining; ventilation, lighting and dewatering; sinking in difficult and water-bearing ground.	4	lecture	assignment	book
Insets : Design, excavation and lining.	2	lecture	assignment	book
Simultaneous sinking and lining; slip - form method of lining; high speed sinking. Shaft Boring : Methods and equipment.	4	lecture	assignment	book
Main Haulage Drifts and Tunnels : Purpose, shape, size and location; excavation ground breaking, muck disposal, ventilation and supporting	4	lecture	assignment	book
Application of mechanized methods; road headers and tunnel boring machines.	3	lecture	Assignment, field studies	book

Recent Developments in shaft sinking and drifting/tunneling. Layouts of pit-top and pit-bottom, Coal Handling Plant, Bunkers and Railway Sidings	4	lecture	assignment	book
Total Hrs	28			

Mine Surveying - I

Course Title	Code	Type of course	T-P-PJ	Prerequisite
Mine Surveying - I	FCEN0114	Theory	3- 0- 0	Nil

Objective

<ul style="list-style-type: none"> ● To make the students have knowledge on : ● Surveying ● Angular Measurement ● Leveling ● Total Station ● Plane Table Surveying ● Contours
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Course outcome

<ul style="list-style-type: none"> ● Students will be able to understand the classification and principles of surveying ● Students will be able to understand linear measurement. ● Students will be able to understand angular measurement ● Students will be able to understand leveling instruments types, Leveling staves, Underground leveling

Evaluation System

	Component	% of Marks	Method of Assessment
Internal Examination	Internal Theory	30	Written examination
	Assignment	5	Report or Presentation + Course Record
	Attendance	5	Based on class attended
External Examination	External Theory	60	Written examination
Total		100	

Course outline

Module: I

Surveying: Definition, objective, classification and principles of surveying.

Module: II

Linear Measurement: Instruments for measuring distances; ranging and taping survey lines; Chain surveying – principle, field work, off-sets, booking and plotting, obstacles in taping.

Module: III

Angular Measurement: Bearing of lines; Rectangular coordinate system; Essentials of the micro-optic

Theodolite; Measurement of horizontal and vertical angles; Temporary and permanent adjustments;

Module: IV

Theodolite traversing; Computation of co-ordinates; Adjustment of traverse; Temporary and permanent adjustments.

Module: V

Leveling : Definition & terminology; Leveling instruments types - tilting, auto set and digital levels; Leveling staves; Different types of leveling - differential, profile, crosssectional and reciprocal leveling; Booking and reduction methods; Underground leveling; Temporary and permanent adjustments of levels.

Module: VI

Total Station: Principle of electronic measurement of distance and angles; construction and working with Total Station; Errors; Application and recent developments in Total Station.

Module VII

Plane Table Surveying: Methods Contours: Concepts; Characteristics of contour; Contour Interval; Methods of contouring and uses of contours.

Session Plan

Topic coverage and Internal Test	No. of Sessions (in hrs)	Activity (lecture, tutorial, lab practice field studies/field-trip, Workshop etc.)	Assignment (project, assignment, field study, etc.)	Suggested Reading (Book, Video, Online source, etc.)
Surveying : Definition, objective, classification and principles of surveying.	3	Lecture	Assignment, field studies	book
Linear Measurement: Instruments for measuring distances; ranging and taping survey lines; Chain surveying – principle, field work, off-sets, booking and plotting, obstacles in	4	Lecture	Assignment, field studies	book

taping.				
Angular Measurement : Bearing of lines; Rectangular coordinate system; Essentials of the micro-optic theodolite; Measurement of horizontal and vertical angles; Temporary and permanent adjustments; Theodolite traversing; Computation of co-ordinates; Adjustment of traverse; Temporary and permanent adjustments.	5	Lecture	Assignment, field studies	book
Leveling : Definition & terminology; Leveling instruments types - tilting, auto set and digital levels; Leveling staves; Different types of leveling - differential, profile, crosssectional and reciprocal leveling; Booking and reduction methods; Underground leveling; Temporary and permanent adjustments of levels.	6	Lecture	Assignment, field studies	book
Total Station : Principle of electronic measurement of distance and angles; construction and working with Total Station; Errors; Application and recent developments in Total Station.	5	Lecture	Assignment, field studies	book
Plane Table Surveying : Methods Contours : Concepts; Characteristics of contour; Contour Interval; Methods of Contouring and uses of contours.	4	Lecture	Assignment, field studies	book
Total Hrs	27			

Workshop Practice

Course Title	Code	Type of course	T-P-PJ	Prerequisite
Workshop Practice	ENFC0201	Practice	0-2-0	Nil

Objective

- To provide the students hands-on-experience on manufacturing processes like fitting, carpentry, plumbing, casting, turning, joining and machining.

Course Outcome

- Students will be able to choose manufacturing technique for a given product and can perform simple operations.

Evaluation Systems

Internal Examination	Component	% of Marks	Method of Assessment
	Internal Practice	50 (40+10)	Lab work + Course Record
External Examination	External Practice	50	Lab work
Total		100	

Course Outline

Experiment 1 : Workshop Safety Practice, Use of Personal Protective Equipment.

Fitting:

Experiment 2: Marking & Sizing of a 5mm thick Rectangular Plate with given dimensions using Scriber, Caliper, Steel Rule, Hack Saw & Holding Vice.

Experiment 3 : Preparing an Open V Fitting Joint.

Plumbing:

Experiment 4 : Use of Pipe Vice, Wrench, Tap and Die to make External Threads in ½”PVC Pipe for Basic Pipe Fittings and to do a Leak Test.

Experiment 5 : Fabrication of a Rectangular Loop using basic Pipe Fittings.

Experiment 6 : Fitting of Flow Measurement Water Meter.

Casting:

Experiment 7 : Sand Mold Preparation with Pattern for Casting Aluminum .

Experiment 8 : Casting of Aluminum Spur Gear.

Welding:

Experiment 9: Safety to Connect a Welding Transformer, Tools and SMAW Arcing.

Experiment 10: Oxy Acetylene 3 Types of Flames & Torch Brazing.

Experiment 11: Preparation of a Study Stool of Square Section. (4 student in a group)

Turning:

Experiment 12: Aligning a 20mm Cylindrical Job in Conventional Lathe, Use of Dial Gauge.

Experiment 13: Facing and Plain Turning of 20mm M.S Stock.

Electrical & Electronic:

Experiment 14: Domestic & Staircase Wiring Circuit Practice.

Experiment 15: PCB: Designing and Making of Simple Circuits.

Experiment 16: Measurement Power Consumption by Incandescent, CFL and LED Lamps.

Experiment 17: Use of Transducer and Sensors, Strain Gauge, Photovoltaic Cell.

Reference**Text Books:**

1. Elements of Workshop Technology, S.K. HazraChaudhary, A.K. HazraChaudhary, N. Roy, Vol. 1 & 2, 2007, 14th Edition, Media Promoters and Publishers Private Limited, India.
2. Workshop Technology, Volume 1 & 2, Chapman, W A J, Arnold, E, 2005, 4th Edition, CBS Publishers, India.

Reference Books:

1. Electrical Wiring & Estimating, S.L. Uppal, 2003, 5th Edition, Khanna Publishers.

.Session Plan

Topic coverage and Internal Test	No. of Sessions (in hrs.)	Activity (lecture, tutorial, lab practice, field studies/field-trip, Workshop etc.)	Assignment (project, assignment, field study, seminar, etc.)	Suggested Reading (Book, Video, Online source, etc.)
Demonstration of Various Safety Practice, Measuring Tools and Equipments used in Workshop.	3	Job Working in groups	Group Assignment and Evaluation.	HazraChaudhary, S K, HazraChaudhary and Chapman, W A J, Arnold, E, Workshop Technology

Preparing an Open V Fitting Joint	3	Job Working in groups	Group Assignment and Evaluation.	HazraChaudhary, Chapman, W A J, Arnold, E, Workshop Technology S K, HazraChaudhary
Use of Pipe Vice, Wrench, Tap and Die to make external threads in ½”PVC pipe for basic pipe fittings and to do a leak test	3	Job Working in groups	Group Assignment and Evaluation	HazraChaudhary, S K, HazraChaudhary and Chapman, W A J, Arnold, E, Workshop Technology
Fabrication of a Rectangular Loop using Basic Pipe Fittings	3	Job Working in groups	Group Assignment and Evaluation.	HazraChaudhary, S K, HazraChaudhary
Fitting of Flow Measurement Water Meter	3	Job Working in groups	Group Assignment and Evaluation.	HazraChaudhary, S K, HazraChaudhary
Sand Mold Preparation with Pattern for Casting Aluminum	3	Job Working in groups	Group Assignment and Evaluation.	HazraChaudhary, S K, HazraChaudhary
Casting of Aluminum Spur Gear	3	Job Working in groups	Group Assignment and Evaluation.	HazraChaudhary, S K, HazraChaudhary
Safety to Connect a Welding Transfer, Tools and SMAW Arcing	3	Job Working in groups	Group Assignment and Evaluation.	HazraChaudhary, S K, HazraChaudhary
Oxy Acetylene 3 Types of Flames & Torch Brazing	3	Job Working in groups	Group Assignment and Evaluation.	HazraChaudhary, S K, HazraChaudhary
Preparation of a Study Stool of Square Section	3	Job Working in groups	Group Assignment and Evaluation.	HazraChaudhary, S K, HazraChaudhary

Aligning a 20mm Cylindrical Job in Conventional Lathe, use of Dial Gauge	3	Job Working in groups	Group Assignment and Evaluation.	HazraChaudhary, S K, HazraChaudhary
Facing and Plain Turning of 20mm M.S Stock.	3	Job Working in groups	Group Assignment and Evaluation.	HazraChaudhary, S K, HazraChaudhary
Domestic & Staircase Wiring Circuit Practice	3	Job Working in groups	Group Assignment and Evaluation.	HazraChaudhary, S K, HazraChaudhary
PCB : Designing and Making of Simple Circuits	3	Job Working in groups	Group Assignment and Evaluation.	HazraChaudhary, S K, HazraChaudhary
Measurement Power Consumption by Incandescent, CFL and LED lamps	3	Job Working in groups	Group Assignment and Evaluation.	HazraChaudhary, S K, HazraChaudhary and Chapman, W A J, Arnold, E, Workshop Technology
Use of Transducer and Sensors, Strain Gauge, Photovoltaic Cell	3	Job Working in groups	Group Assignment and Evaluation.	HazraChaudhary, S K, HazraChaudhary
Total (hrs)	48			

Geometric Modeling Lab

Course Title	Code	Type of course	T-P-PJ	Prerequisite
Geometric Modeling Lab	ENFC0202	Practice	0-2-0	Nil

Objective

- To impart knowledge to students on conceptual design, 3D modeling, surface modeling and drafting through hands-on-practice mode using CATIA.
- To impart requisite knowledge and skills to the students on developing 3D assembly drawings and exploded views using CATIA.

Course Outcome

- Students will be able to study, understand and interpret engineering drawings used in industry
- Students will be able to use CATIA for creation of 3D models, assembly drawings and exploded view

Evaluation Systems

Internal Examination	Component	% of Marks	Method of Assessment
	Internal Practice	50 (40+10)	Lab work + Course Record
External Examination	External Practice	50	Lab work
Total		100	

Course outline

Module: I (20 Hrs)

Part Modeling: Creation of Simple Solids, Parametric Modeling, Booleans and Functional Modeling, Rendering

Module: II (20 Hrs)

Assembly Modeling: Simple Assembly, Constraints, Digital Mockup

Module: III (20 Hrs) :

Drafting & Surface Modeling: Creation of Layout, Conversion of Part drawing to projection views, detailed drawing. Creation of Surfaces, Simple Surface Models, Converting Surface Models to Part Drawing.

(**Note:** All of the topics will be through learn by doing and laboratory mode.
Platform is CATIA)

MECHANICAL/CIVIL/ ELECTRICAL BRANCH STUDENTS ARE REQUIRED TO DO PROJECTS RELATED TO THEIR OWN BRANCH

Text Books:

Geometrical Modelling, M.E. Morteson

Reference Books:

CAD CAM, M.P. Groover

Online Source:

Session Plan

(Total 12 experiments out of 17 to be conducted)

Sl. No.	Topic coverage and Internal Test	No. of Sessions (in hrs.)	Activity (lecture, tutorial, lab practice, field studies/field-trip, Workshop etc.)	Assignment (project, assignment, field study, seminar, etc.)	Suggested Reading (Book, Video, Online source, etc.)
1	Assembly of Quick Acting Hold Down Clamp	3	Lab practice		
2	Modeling parts of Quick Acting Hold Down Clamp Assembly	6	Lab practice		
3	Assembly of Pneumatic FRL	3	Lab practice		
4	Modeling parts of Pneumatic FRL Assembly	6	Lab practice		
5	Assembly of Roller Guide	3	Lab practice		
6	Modeling Parts of Roller Guide Assembly	6	Lab practice		
7	Assembly of Electrical Tower	3	Lab practice		
8	Modeling parts of Electrical Tower Assembly	6	Lab practice		
9	Assembly of Hitch Mount	3	Lab practice		
10	Modeling parts of Hitch mount Assembly	6	Lab practice		

11	Assembly of Trombon	3	Lab practice		
12	Modeling parts of Trombon Assembly	6	Lab practice		
13	Drafting all the parts of two Assemblies	6	Lab practice		
14	Production of Detailed Drawing of two Assemblies	6	Lab practice		
15	Surface Modeling of Automobile Tail Lamp	6	Lab practice		
16	Surface Modeling of Automobile Bonnet	6	Lab practice		
17	Conversion of Surface Model of Tail Lamp to Part Model	3	Lab practice		
Total (hrs)		60			

Introduction to Robotics

Course Title	Code	Type of course	T-P-PJ	Prerequisite
Introduction to Robotics	ENFC0203	Practice	0-2-0	Geometric Drawing

Objectives

<ul style="list-style-type: none"> ● To Provide An Overview To Students On Various Types of Industrial Robots and Their Configurations. ● To Educate The Students on Use Of DELMIA To Carryout Simulation Exercises of Various Types of Robotic Arms Suiting to Specific Applications.
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Course Outcome

<ul style="list-style-type: none"> ● Students Will Have Knowledge and Skill To Program Industrial Robots For Performing Various Tasks. ● Students Will Be Able To Undertake Simulation Exercises Of Various Types Of Robotic Arms As A Pre-Requisite Leading To A Safe, Cost Effective, Reliable And Optimum Design.
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Evaluation Systems

Internal Examination	Component	% of Marks	Method of Assessment
	Internal Practice	50 (40+10)	Lab work + Course Record
External Examination	External Practice	50	Lab work
Total		100	

List of Experiments (45 Hours)

DELMIA: Simulated Models of Various Types Industrial Robots & Its Architecture.

DELMIA: Simulation of Activities Like: Pick and Place, Coordinated Movement, Spot Welding and Arc Welding.

DELMIA: Designing Own Robotic Arm with Insight to Robot Kinematics.

- i) A Prismatic Robotic Arm.
- ii) A Revolute Joint Robotic Arm.
- iii) Articulated Robotic Arm
- iv) Spherical Robotic Arm

Robot Programming: Use of Brabofor Pick and Place Actions.

An Understanding of Different Sensors, Their Operation and Application. Demonstration of Use of Sensors for At Least 3 Applications of Robot.

Commanding A Robot To Achieve Tasks On The Basis Of Sensor Information, A Description Of Motors, And How Their Velocity Is Set, And Other Robotic Actuators.

Reference

Text Books :

M.P. Groover, Industrial Robotics, Second Edition, TMH Publishers.

S.R. Deb and S. Deb, Robotics Technology and Flexible Automation, Second Edition, TMH Publishers.

Reference Books :

Y Koren, Robotics for Engineers, TMH Publishers.

Online Source:

Session Plan

Sl. No	Topic coverage and Internal Test	No. of Sessions (in hr)	Activity	Assignment	Suggested Reading (Book, Video, Online source, etc.)
1	Demonstration of various robotic arms available in DELMIA	3	Lab Demonstration	Collection of tutorials related various Robotic Arms	DELMIA help file
2	Robotic architecture. Demonstration of prismatic, revolute and SCARA	6	Lab Demonstration	Development of Robotic Arm in DELMIA & Demonstration of Application.	DELMIA help file
3	Robotic architecture. Demonstration of articulated robotic arm and Spherical robotic arm	3	Lab Demonstration	Development of Robotic Arm in DELMIA & Demonstration of Application.	DELMIA help file

4	Demonstration of application in spot welding and arc welding	3	Lab Demonstration	Development of Robotic Arm in DELMIA & Demonstration of application.	DELMIA help file
5	Demonstration of application in assembly line operation.	3	Lab Demonstration	Development of robotic arm in DELMIA & Demonstration of application.	DELMIA help file
6	Robotic Programming practice to do pick and place action.	3	Lab practice	Development of programs to do other actions like writing on the white board, Erasing the same with wiper. At least 3 such Activities	Brabo Manual
7	Demonstration of assignment Exercises	3	Lab practice	Recording of all assignments	BraboManual
8	Demonstration of application of sensors, At least 3 sensor based applications	3	Lab practice	Identifying different types of sensors that can be used in robot arm application	
9	Demonstration of use of sensors	3	Lab practice		
10	Demonstration of sensors to actuate motors and its speed control	3	Lab Practice		
11	Demonstration of sensors to actuate motors and its speed control	6	Lab Practice	A Mini project of designing to making a movement to robotic arm	

12	A mini Project Demonstration	6			
	Total (hours)	45			

3D Modelling

Course Title	Code	Type of course	T-P-PJ	Prerequisite
3D Modelling	ENFC0204	Practice	0-2-0	Nil

Objective

- The course covers modeling conceptual design, 3D modeling, Views and documentation of building drawing

Course outcome

- 3D Solid Model and drawing
- 3D Building Model

Evaluation Systems

Internal Examination	Component	% of Marks	Method of Assessment
	Internal Practice	50 (40+10)	Lab work + Course Record
External Examination	External Practice	50	Lab work
Total		100	

Course outline

Module I (12 Hrs)

Elements of planning building, fundamentals of Building Information Modelling (BIM). Generation of 2D (plan, section and elevation) and 3D modelling with detailed specification and dimensioning of the following using AutoCAD, Revit Architecture and CATIA :

Practice Session 1 : Generation of 3D modelling with detailed specification and dimensioning of a (G+20) multi-storeyed building with same floor plans using Revit Architecture and CATIA.

Practice Session 2 : Generation of elevation for with detailed specification and dimensioning of a multi-storeyed building with same floor plans using AutoCAD for (practice session 1).

Practice Session 3 : Generation of section for with detailed specification and dimensioning of a multi-storeyed building with same floor plans using AutoCAD, Revit Architecture and CATIA (practice session 1).

Module II (36 Hrs)

Practice Session 4 : Generation of 3D modelling with detailed specification and dimensioning of a (G+20) multi-storeyed building with varying floor plans using Revit Architecture and CATIA.

Practice Session 5 : Generation of elevation for with detailed specification and dimensioning of a multi-storeyed building with varying floor plans using AutoCAD (practice session 4).

Practice Session 6 : Generation of section for with detailed specification and dimensioning of a multi-storeyed building with varying floor plans using AutoCAD, Revit Architecture and CATIA (practice session 4).

Practice Session 7 : Generation of 3D modelling with detailed specification and dimensioning of a (G+5) shopping complex using Revit Architecture and CATIA.

Practice Session 8 : Generation of elevation for with detailed specification and dimensioning of a (G+5) shopping complex using AutoCAD (practice session 7).

Practice Session 9 : Generation of section for with detailed specification and dimensioning of a (G+5) shopping complex using AutoCAD, Revit Architecture and CATIA (practice session 7).

Practice Session 10 : Generation of 3D modelling with detailed specification and dimensioning of a (G+4) hospital building using Revit Architecture and CATIA.

Practice Session 11 : Generation of elevation for with detailed specification and dimensioning of a (G+4) hospital building using AutoCAD (practice session 10).

Practice Session 12 : Generation of section for with detailed specification and dimensioning of a (G+4) hospital building using AutoCAD, Revit Architecture and CATIA (practice session 10).

Module III (12Hrs)

Practice Session 13 : Generation of 3D modelling with detailed specification and dimensioning of a (G+4) hostel building using Revit Architecture and CATIA.

Practice Session 14 : Generation of elevation for with detailed specification and dimensioning of a (G+4) hostel building using AutoCAD (practice session 13).

Practice Session 15 : Generation of section for with detailed specification and dimensioning of a (G+4) hostel building using AutoCAD, Revit Architecture and CATIA (practice session 13).

Reference

Drawing book A-series.

Drawing book B-series

Session Plan

Topic coverage and Internal Test	No. of Sessions (in hrs.)	Activity (lecture, tutorial, lab practice, field studies/field-trip, Workshop etc.)	Assignment (Project, assignment, field study, seminar, etc.)	Suggested Reading (Book, Video, Online source, etc.)
Module I				
Generation of 3D modelling with detailed				

specification and dimensioning of a (G+20) multi-storeyed building with same floor plans using Revit Architecture and CATIA.	4	practice	assignment	
Generation of elevation for with detailed specification and dimensioning of a multi-storeyed building with same floor plans using AutoCAD for (practice session 1).	4	practice	assignment	
Generation of section for with detailed specification and dimensioning of a multi-storeyed building with same floor plans using AutoCAD, Revit Architecture and CATIA (practice session 1).	4	practice	assignment	
Sub-Total (hrs)	12			
Module II				
Generation of 3D modelling with detailed specification and dimensioning of a (G+20) multi-storeyed building with varying floor plans using Revit Architecture and	4	practice	assignment	

CATIA.				
Generation of elevation for with detailed specification and dimensioning of a multi-storeyed building with varying floor plans using AutoCAD (practice session 4).	4	practice	assignment	
Generation of section for with detailed specification and dimensioning of a multi-storeyed building with varying floor plans using AutoCAD, Revit Architecture and CATIA (practice session 4).	4	practice	assignment	
Generation of 3D modelling with detailed specification and dimensioning of a (G+5) shopping complex using Revit Architecture and CATIA.	4	practice	assignment	
Generation of elevation for with detailed specification and dimensioning of a (G+5) shopping complex using AutoCAD (practice session 7).	4	practice	assignment	
Generation of section for with detailed specification and dimensioning of a (G+5)	4	practice	assignment	

shopping complex using AutoCAD, Revit Architecture and CATIA (practice session 7).				
Generation of 3D modelling with detailed specification and dimensioning of a (G+4) hospital building using Revit Architecture and CATIA.	4	practice	assignment	
Generation of elevation for with detailed specification and dimensioning of a (G+4) hospital building using AutoCAD (practice session 10).	4	practice	assignment	
Generation of section for with detailed specification and dimensioning of a (G+4) hospital building using AutoCAD, Revit Architecture and CATIA (practice session 10).	4	practice	assignment	
Sub-Total (hrs)	36			
Module III				
Generation of 3D modelling with detailed specification and dimensioning of a (G+4) hostel building using Revit Architecture and CATIA.	4	practice	assignment	
Generation of elevation for with detailed specification and dimensioning of a (G+4) hostel building using	4	practice	assignment	

AutoCAD (practice session 13).				
Generation of section for with detailed specification and dimensioning of a (G+4) hostel building using AutoCAD, Revit Architecture and CATIA (practice session 13).	4	practice	assignment	
Sub-Total (hrs)	12			
Total (hrs)	60			

Electrical Workshop Practice

Course Title	Code	Type of course	T-P-PJ	Prerequisite
Electrical Workshop Practice	ENFC0205	Practice	0-2-0	Nil

Objective

- To develop skills for troubleshooting of electrical wiring and appliances at household level

Course outcome

- Operation of instruments, hand tools and power tools.
- Comprehend the safety measures required to be taken while using the tools.
- Solving Electrical Problems at domestic level.

Evaluation Systems

Internal Examination	Component	% of Marks	Method of Assessment
	Internal Practice	50 (40+10)	Lab work + Course Record
External Examination	External Practice	50	Lab work
Total		100	

Course outline

Lists of Experiments

1. To study safety precautions for electrical engineering, draw the electrical symbol and general electrical house wiring.
2. To study the various types of accessories and tools. Working of fuse and circuit breaker.
3. To setup a series, parallel and staircase wiring using the given lamps.
4. To study Earth-wire connection and Earth-wire measurement in electrical wiring.
5. To set-up residential house wiring using switches, socket, fuse, junction box, energy meter etc.
6. Study of Multimeter, voltmeter, ammeter, wattmeter (both AC&DC)
7. Connection & fault analysis in Domestic appliances (Fan, electric iron)
8. Connection & fault analysis in Domestic appliances (Air Condition)
9. Connection & fault analysis in Domestic appliances (fluorescent tube)
10. Study of Industrial wiring in the workshop and study of bimetallic relay.
11. Study of a 11/4 KV transformer substation
12. Concept of efficiency (Star rating) of electrical appliances

Session Plan

Topic coverage and Internal Test	No. of Sessions (in hrs.)	Activity (lecture, tutorial, lab practice, field studies/field-trip, Workshop etc.)	Assignment (project, assignment, field study, seminar, etc.)	Suggested Reading (Book, Video, Online source, etc.)
To study safety precautions for electrical engineering, draw the electrical symbol and general electrical house wiring.	4	Lab Practice	Experiment Result & Viva	
To study the various types of accessories and tools. Working of fuse and circuit breaker.	4	Lab Practice	Experiment Result & Viva	
To setup a series, parallel and staircase wiring using the given lamps.	4	Lab Practice	Experiment Result & Viva	
To study Earth-wire connection and Earth-wire measurement in electrical wiring.	4	Lab Practice	Experiment Result & Viva	
To set-up residential house wiring using switches, socket, fuse, junction box, energy meter etc.	8	Lab Practice	Experiment Result & Viva	
Study of Multimeter, voltmeter, ammeter, wattmeter (both AC&DC)	4	Lab Practice	Experiment Result & Viva	
Connection & fault analysis in Domestic appliances (Fan, electric iron)	4	Lab Practice	Experiment Result & Viva	
Connection & fault analysis in Domestic appliances (Air Condition)	4	Lab Practice	Experiment Result & Viva	
Connection & fault analysis in Domestic appliances (fluorescent tube)	4	Lab Practice	Experiment Result & Viva	
Study of Industrial wiring in the workshop and study of bimetallic relay.	4	Field Studies	Viva	
Study of a 11/4 KV transformer substation	4	Field Studies	Viva	
Concept of Star rating of electrical appliances	4	Lab Practice	Experiment Result & Viva	
Total : 52 Hours				

Mine Surveying –I Lab

Course Title	Code	Type of course	T-P-PJ	Prerequisite
Mine Surveying - Lab	FCEN0214	Practice	0-2-0	Nil

Objective :

- To make the students have practical knowledge on :
- Linear measuring instruments & carrying out Chain Surveying
- Carrying out Compass Traversing
- Vernier theodolite
- Tilting level & carrying out Fly Leveling
- Auto level & carrying out Profile Leveling

Course Outcome:

- Students will be able to have practical knowledge on linear measuring instruments & carrying out Chain Surveying, carrying out Compass Traversing, Vernier theodolite, Tilting level & carrying out Fly Leveling, Auto level & carrying out Profile Leveling and Total Station

Evaluation System

Internal Examination	Component	% of Marks	Method of Assessment
	Internal Practice	50 (40+10)	Lab work + Course Record
External Examination	External Practice	50	Lab work
Total		100	

Course outline

Module I

Study and sketch the linear measuring instruments & carrying out Chain Surveying Prismatic Compass and carrying out Compass Traversing; Vernier theodolite & angle measurement by Repetition Method; Angle measurement by Reiteration Method using Micro-optic theodolite; Study and sketch of a Tilting level & carrying out Fly Leveling; Study and sketch of Auto level & carrying out Profile Leveling; Study and sketch of 1" Theodolite and angle measurement; Plane Table Surveying by Radiation Method and Contouring; Study and sketch of Total Station and measurement of angles, distance and determination of coordinates and RL using Total Station; Preparation of grid and plotting the field data.

Session Plan

Topic coverage and Internal Test	No. of Sessions (in hrs.)	Activity (lecture, tutorial, lab practice, field studies/field-trip, Workshop etc.)	Assignment (project, assignment, field study, seminar, etc.)	Suggested Reading (Book, Video, Online source, etc.)
Study and sketch the linear measuring instruments & carrying out Chain Surveying	3	lab practice	assignment, field study	book
Prismatic Compass and carrying out Compass Traversing	3	lab practice	assignment, field study	book
Vernier theodolite & angle measurement by Repetition Method; Angle measurement by Reiteration Method using Micro-optic theodolite;	6	lab practice	assignment, field study	book
Study and sketch of a Tilting level & carrying out Fly Leveling; Study and sketch of Auto level & carrying out Profile Leveling;	6	lab practice	assignment, field study	book
Study and sketch of 1" Theodolite and angle measurement; Plane Table Surveying by Radiation Method and Contouring	6	lab practice	assignment, field study	book
Study and sketch of Total Station and measurement of angles, distance and determination of coordinates and RL using Total Station; Preparation of grid and plotting the field data.	6	lab practice	assignment, field study	book
Total Hrs	30			

Aerodynamics Laboratory

Course Title	Code	Type of course	T-P-PJ	Prerequisite
Aerodynamics Laboratory	ENFC0208	Practice	0-2-0	Nil

Objective

- To Predict Different Aerodynamic Propulsion in Aero Applications

Course Outcome

- Ability to Use the Fundamental Dynamics Principles in Aircraft Applications.

Evaluation Systems

Internal Examination	Component	% of Marks	Method of Assessment
	Internal Practice	50 (40+10)	Lab work + Course Record
External Examination	External Practice	50	Lab work
Total		100	

1. List of Experiments

1. Application of Bernoulli's Equation – venturimeter and orifice meter.
2. Frictional loss in laminar flow through pipes.
3. Frictional loss in turbulent flow through pipes.
4. Calibration of a subsonic Wind tunnel.
5. Determination of lift for the given airfoil section.
6. Pressure distribution over a smooth circular cylinder.
7. Pressure distribution over a rough circular cylinder.
8. Pressure distribution over a symmetric aerofoil.
9. Pressure distribution over a cambered aerofoil.
10. Flow visualization studies in subsonic flows.
11. Calculation of drag over smooth cylinder
12. Calculation of drag over rough cylinder

List of Equipment for a Batch of 30 Students

S.N	Name of Equipment	Quantity	Experiment No.
1	Venturimeter	1	1
2	Orificemeter	1	1
3	Pipe friction apparatus	1	2, 3
4	Subsonic Wind tunnel	1	4, 5, 6, 7, 8, 9, 10, 11, 12

5	Models (aerofoil, rough and smooth cylinder, flat plate)	1	5, 6, 7, 8, 9
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Engineering Metrology and Measurements

Course Title	Code	Type of course	T-P-PJ	Prerequisite
Engineering Metrology and Measurements	ENFC0401	Theory + Practice	1-2-0	Nil

Course Objective

- To Make Students Familiar with the Measuring Systems, and the Standard of Measurements. Learns about Basic Measurement Devices.
- Understanding the Basic Measurement Systems in the Real Time Engineering Applications.
- Enables Students to Work in Quality Control and Quality Assurances Divisions Industries.

Course Outcomes

- Selecting Suitable Measuring Instruments for Basic and Typical Applications in the Industries.
- Analyze Measurement Requirement.
- Can Choose Transducer & Sensors for Products.

Evaluation System

Internal Examination	Component	% of Marks	Method of Assessment
	Internal Theory	20	Written examination
	Internal Practice	30(20+10)	Lab work + Course Record
External Examination	External Theory	30	Written examination
	External Practice	20	Lab work
Total		100	

Course Outline

Module: I (6 Hours)

Introduction to Metrology; Importance and Need for Measurements and Metrology; Need for Inspection; Precision & Accuracy; Errors in Measurement.

Practice : (Laboratory Mode- Learn by Doing)

Calibration of Measuring Instruments Using Slip Gauge Blocks.

Module: II (9 Hours)

Limit System; Limits Fits & Tolerances; Allowances; Hole Basis & Shaft Basis Systems; Interchangeability; Gauge Design. (Class room Teaching and videos)

Practice : (Laboratory Mode- Learn by Doing)

1. Introduction to Metrology Laboratory (Steel Rule, Tape, Right Angle, Protractor, Surface Plate).
2. Gauges- Filler, Radius, Thread, Wire, Snap & GO-NOGO.

Module: III (9 Hours)

Standards of Measurement; Dial Indicators; Vernier Apparatus; Micrometers; Comparators (Mechanical, Electrical, Pneumatic).

Practice : (Laboratory Mode- learn by Doing)

3. Vernier Caliper- Inside, Outside, Depth Measurement & Height Gauge.
4. Micrometers, Outside, Inside Micrometer & Depth Micrometer.
5. Three Points Bore Micrometer

Module: IV (10 Hours)

Measurement of Angles & Tapers using Bevel Protractor; Angle Gauges; Sine Bars; Flatness Spirit Level & Surface Plate.

Practice: (Laboratory Mode- learn by Doing)

6. Sine Bar/Bevel Protractor-Measurement of Angles.
7. Flatness Test Using Sprit Level.
8. Use of Dial Indicators-in-lathe.

Module: V (9 Hours)

Gear Tooth Metrology; Inspection & Alignment Tests. Transducers; Variable Resistance Transducer; LVDT; Comparative Transducer; Piezoelectric Transducer; Photo Voltaic Cells; Devices for Pressure Measurement- Dead Weight Tester; Bourdon Tube Pressure Gauge; Diaphragm and Bellow Gauges.(Topics will be covered by explaining and fallowed by practice mode)

Practice: (Laboratory Mode- Learn by Doing)

9. Gear Tooth Metrology, Inspection & Alignment Tests.

Module: VI (10 Hours)

Low Pressure Measurements; Force Measuring Using Proving Rings; Torque Measuring Using Dynamometers; Strain Measurements; Profile Projector; Tool Maker's Microscope; Optical Flats; Laser Interferometers; Autocollimators.

Practice: (Laboratory Mode- Learn by Doing)

10. Optical Flat Use & Surface Plate Test Using Spirit Level & Dial Gauge.
11. Measurement of Template Using Profile Projector.

Module: VII (12 Hours)

Assessment of Surface Roughness; Machining Symbols for Surface Finish; Measuring Instruments; Tally-Surf; Screw Thread Measurement- Terminology; Precision Instruments Based on Laser Principles- Laser Interferometer Application; Coordinate Measuring Machine (CMM).

Practice: (Laboratory Mode- Learn by Doing)

12. Surface Finish by Taylor's Apparatus –LVDT.
13. Measurement of Tool angle in Tool Maker's Microscope.
14. Repeat Laboratory-1 or Test.

(50% of the topics will be covered by “Learn by Doing” principle and few video presentations)

Reference:

Text books :

1. Gupta, I C, A Text Book of ENGINEERING METROLOGY.2016. 8th Edition, Reprint, Dhanpat Rai Publication, New Dehi-110002
2. Narayana, K L, Engineering Metrology.2014. Third Edition, Scitech Publication(India) Privet Limited

Reference Books:

3. Mahajan, M, A Text Book of Metrology. 2010. DhanpatRai& Co (P) Ltd,ISBN 13 : 978-817700051

Session Plan

Topic coverage and Internal Test	No. of Sessions (in hrs.)	Activity (lecture, tutorial, lab practice, field studies/field-trip, Workshop etc.)	Assignment (Project, assignment, field study, seminar, etc.)	Suggested Reading (Book, Video, Online source, etc.)
Module I				
Introduction to metrology Importance and need for measurements and metrology	1	lecture	Assignment	https : //www.youtube.com/watch?v=xcvNl1HHY9o https : //www.youtube.com/watch?v=qXhOWXShH1w Mahajan, M, A Text Book of Metrology. 2010. DhanpatRai& Co (P) Ltd,ISBN 13 : 978-817700051
Need for Inspection	1	lecture	Assignment	https : //www.youtube.com/watch?v=YYrnjEo90fs Mahajan, M, A Text Book of Metrology. 2010. DhanpatRai& Co (P) Ltd,ISBN 13 : 978-817700051

Precision & Accuracy	1	lecture	Assignment	https : //www.youtube.com/watch?v=b38hFWvEjwI Mahajan, M, A Text Book of Metrology. 2010. DhanpatRai& Co (P) Ltd,ISBN 13 : 978-817700051
Errors in Measurement	1	lecture	Assignment	https : //www.youtube.com/watch?v=cGdbQeRSYTc Mahajan, M, A Text Book of Metrology. 2010. DhanpatRai& Co (P) Ltd,ISBN 13 : 978-817700051
Practice				
1. Calibration of measuring Instruments using slip gauge blocks	2	practice		
Module II				
Limit System, Limits Fits & Tolerances	2	lecture	Assignment	https : //www.youtube.com/watch?v=zxyERl8KnnM&list=PL0uwpDY0Y8Q2aoPhDuEZLIIPVuKKUGb90 https : //www.youtube.com/watch?v=zxyERl8KnnM&list=PL0uwpDY0Y8Q2aoPhDuEZLIIPVuKKUGb90&index=1 Mahajan, M, A Text Book of Metrology. 2010. DhanpatRai& Co (P) Ltd,ISBN 13 : 978-817700051
Allowances, Hole Basis & Shaft Basis Systems, Interchangeability	1	lecture	Assignment	https : //www.youtube.com/watch?v=AP_T7hf5Wv0&list=PL0uwpDY0Y8Q2aoPhDuEZLIIPVuKKUGb90&index=4 Mahajan, M, A Text Book of Metrology. 2010. DhanpatRai& Co (P) Ltd,ISBN 13 : 978-817700051

Design of Gauges- GO, NOGO	2	lecture	Assignment	https : //www.youtube.com/watch?v=uN0Z TmhsH1w https : //www.youtube.com/watch?v=mZH Hdim3hOY Mahajan, M, A Text Book of Metrology. 2010. DhanpatRai& Co (P) Ltd,ISBN 13 : 978-817700051
Practice				
2.Introduction to Metrology Laboratory(1hr) + Steel Rule, Tape, Right Angle Protractor, Surface Plate	2	Practice	field study	
3.Gauges- Filler ,Radius, Thread, Wire, Snap, GO- NOGO	2	Practice	field study	
Module III				
Standards of Measurement	1	lecture	Assignment	Mahajan, M, A Text Book of Metrology. 2010. DhanpatRai& Co (P) Ltd,ISBN 13 : 978-817700051
Dial Indicators, Vernier caliper &Micrometer	1	lecture	Assignment	https : //www.youtube.com/watch?v=FqSJh Y_lctc https : //www.youtube.com/watch?v=vkPlz malvN4 https : //www.youtube.com/watch?v=StBc5 6ZifMs Mahajan, M, A Text Book of Metrology. 2010. DhanpatRai& Co (P) Ltd,ISBN 13 : 978-817700051

Comparators Mechanical, Electrical, Pneumatic	1	lecture	Assignment	Mahajan, M, A Text Book of Metrology. 2010. Dhanpat Rai & Co (P) Ltd, ISBN 13 : 978-817700051
Practice				
ier Caliper- inside, outside, depth measurement, Height Gauge	2	Practice	Field Study	
5.Micrometers, Outside & Inside Micrometer, Depth Micrometer	2	Practice	Field Study	
6.Three point Bore Micrometer	2	Practice	Field Study	
Module IV				
Angular Measurements Measurement of Angles & Tapers using Bevel Protractor Angle Gauges, Sine Bars	3	lecture	Assignment	https : //www.youtube.com/watch?v=oJFUI _FHlio https : //www.youtube.com/watch?v=F7uC EeipdCw https : //www.youtube.com/watch?v=u- PLC3uKICM
Spirit Level, Surface Plate	1	lecture	Assignment	https : //www.youtube.com/watch?v=H- F2C5F78aw
Practice				
7.Sine Bar/Bevel Protractor- Measurement of Angles	2	Practice		

8.Flatness test using Sprit Level	2	Practice		
9.Use of Dial Indicators-in –Lathe.	2	Practice		
Module V				
Gear Tooth Metrology	2	lecture	Assignment	https : //www.youtube.com/watch?v=fb278 VIHICU
Inspection &Alignment Tests	1	lecture	Assignment	https : //www.youtube.com/watch?v=utZVv 7QvRt8
Transducers, Variable Resistance Transducer, LVDT, comparative transducer, piezoelectric transducer, photo voltaic cells.	2	lecture	Assignment	https : //youtu.be/vuVFbKxsds
Devices for pressure measurement- dead weight tester, bourdon tube pressure gauge, diaphragm and bellow gauges.	1	lecture	Assignment	
Practice				
ar Tooth Metrology, Inspection & Alignment tests	3	Practice		
Module VI				
Low Pressure Measurements	1	lecture	Assignment	
Force Measuring Using Proving	2	lecture	Assignment	

Rings. Torque Measuring Using Dynamometers, Strain Measurements				
Profile Projector, Tool Maker's Microscope, Optical Flats, application.	1	lecture	Assignment	https : //www.youtube.com/watch?v=HGO9GXaeZFc https : //www.youtube.com/watch?v=hqsVXA5S2xM https : //www.youtube.com/watch?v=5JE7BV-XkSk
Laser Interferometers	1	lecture	Assignment	https : //www.youtube.com/watch?v=UA1qG7Fjc2A
Autocollimators	1	lecture	Assignment	https : //www.youtube.com/watch?v=XHEywuzl9sA
Practice				
Optical Flat Use & Surface Plate test using Spirit Level & Dial Gauge	2	Pratice	Field study	
12.Measurement of template using Profile Projector	2	Practice	Field Study	
Module VII				
Assessment of Surface Roughness, Machining Symbols for	1	lecture	Assignment	https : //www.youtube.com/watch?v=omhoWIs2d-M

Surface Finish, Measuring Instruments, Tally-Surf,				https : //www.youtube.com/watch?v=VyePASErr5Q
Screw Thread Measurement-Terminology, Determination of Effective Diameter Using Two. three Wire Method	2	lecture	Assignment	https : //www.youtube.com/watch?v=N4pigJMmk3A nttps : //www.youtube.com/watch?v=LjQf6ISFISg
Coordinate measuring machine (CMM)	1	lecture	Assignment	https : //www.youtube.com/watch?v=844UiRBVx1Y
Practice				
11.Surface Finish by Taylor's Apparatus	2	Practice	field study	
13.Measurement of Tool angle in Tool Maker's Microscope	2	Practice	Field Study	
14.Repeat Laboratory-1	2	Practice	field study	
15. Repeat Laboratory-2	2	Practice	field study	
Total Hours	65			

Basic Fluid Mechanics

Course Title	Code	Type of course	T-P-PJ	Prerequisite
Basic Fluid Mechanics	ENFC0402	Theory + Practice	2-1-0	Nil

Objective

- To make students understand flow characteristics and different types of flow and application of dimensional analysis, different flow and velocity measuring device.

Course outcome

- Understand flow characteristics and different types of flow
- Understand kinematics and dynamics of flow
- Understand about application of dimensional analysis

Evaluation Systems

Internal Examination	Component	% of Marks	Method of Assessment
	Internal Theory	20	Written examination
	Internal Practice	30(20+10)	Lab work + Course Record
External Examination	External Theory	30	Written examination
	External Practice	20	Lab work
Total		100	

Course outline

Module I Fluid kinematics (9 Hours)

Types of flow, Continuity equation (in one, two & three dimension), velocity and acceleration, streamline, streakline, path line, velocity potential function and stream function, types of motion (Linear Translation and all deformations, rotation and vorticity, vortex flow).

Experiments:

1. Demonstration of different types of flow
2. Pressure Measurement

Module II Fluid Dynamics (7 Hours)

Rate of Flow Or Discharge, Euler's equation of motion along a stream line for ideal flow - Principle of conservation of energy Integration of Euler's equation along a stream line - Bernoulli's equation (**Derivation not to be included for external Examination**) - Practical applications of Bernoulli's Principle - Kinematics of free jets.

Experiments:

3. Bernoulli's experiment
4. Characteristics of free jet

Module III Principle of conservation of momentum (5 Hours)

Impulse momentum equation. Application of momentum principle for force on pipe bends and reducers. Angular momentum principle and its applications (Numerical problems on angular momentum principle not included. Only fundamental concepts.)

Experiments :

5. Impact of jet

Module IV Laminar Flow and Turbulent Flow : (6 Hours)

Reynolds's Experiment, Laws of Laminar and Turbulent Friction, Hagen-Poiseuille Equation for laminar flow through pipe (**Derivation not to be included for external Examination**), Darcy-Weisbach Equation for Turbulent flow through pipe (**Derivation not to be included for external Examination**)

Experiments :

6. Pipe friction
7. Reynolds's no calculation and identification of laminar and turbulent flow

Module V Flow through Pipes (8 Hours)

Loss of Energy-Friction loss & Minor losses, HGL & TEL, Pipes in series and Parallel, Equivalent Length of pipe, Power transmission through pipes and nozzle, Hydro dynamically smooth & rough boundaries, Moody's Diagram.

Experiments :

8. HGL & TEL through simulation
9. Hardy Cross Method

Module VI Dimensional Analysis and Similitude : (5 Hours)

Fundamental and derived units, Dimensional formulae for various geometric, kinematic and dynamic parameters. Rayleigh and Buckingham's methods for arriving group of dimensionless parameters. Similarity laws - Reynolds, Froude, Mach Laws. Geometric, Kinematic and Dynamic similarities. Distorted Models.

Module VI Flow Measurement (18 Hours)

Flow through small orifice, Mouthpiece, Time of Emptying tanks. Velocity Measurement using Pitot tube, Prandtl tube, Flow measurement in pipes-Flow Meters-orifice Plate-Flow Nozzle Meter, Venturi Meter, Flow rate Measurement in channel- Weir and Notches.

Experiments :

10. Flow Measurement through V-Notch
11. Flow Measurement through Venturi Meter
12. Flow Measurement through Small Orifice
13. Flow Measurement through Orifice Meter
14. Flow Measurement through Rota meter
15. Flow Measurement through Pitot Tube

LIST OF THE EXPERIMENT THROUGH SIMULATION : -

1. Bernoulli's Equation
2. Venturi Meter
3. Orifice Meter
4. Reynolds's Experiment
5. Impact Of Jet
6. Discharge through Weir.
7. Mouth Piece

All this Experiment can be done using the link given below

<http://eerc03-iiith.virtual-labs.ac.in/index.php?section=Introduction>

http://vlab.co.in/ba_labs_all.php?id=7

E-content:

Text Books:

1. Fluid mechanics : A.K.JAIN, Khanna publishers

Reference Books:

1. Hydraulics and Fluid mechanics : P.N.MODI & S.M.SETH
2. Fluid Mechanics and Hydraulic Machines by R. K. Bansal,

Online Source:

Video Links : -

Bernoulli Equation : <https://www.youtube.com/watch?v=brN9citH0RA>

<https://www.youtube.com/watch?v=bC8v6hlXnSk> <https://www.youtube.com/watch?v=UJ3-Zm1wbIQ>

<https://www.youtube.com/watch?v=oUd4WxjoHKY> <http://www.efm.leeds.ac.uk/CIVE/FluidsLevel1/Unit03/T4.html>

<http://www.efm.leeds.ac.uk/CIVE/FluidsLevel1/Unit03/T4.html>

Flow Measurement : Venturi Meter Fabrication : <https://www.youtube.com/watch?v=Zpux9MvvDmw>

Venturi Effect : <https://www.youtube.com/watch?v=H3TcLoapJBo>

<https://www.youtube.com/watch?v=H3TcLoapJBo> <http://www.wermac.org/specials/venturiflowmeter.html>

Flow over Weirs : <https://www.youtube.com/watch?v=oXYHe-DGyVE>

<https://www.youtube.com/watch?v=oXYHe-DGyVE> **Flume demo** : <https://www.youtube.com/watch?v=awsnbnljy78>

<https://www.youtube.com/watch?v=awsnbnljy78> **Weirs** : https://www.youtube.com/watch?v=Ax38XN_XqCU

https://www.youtube.com/watch?v=Ax38XN_XqCU

V-Notch : <https://www.youtube.com/watch?v=2dZtIn7CUos>

Reynolds Experiment :

<https://www.youtube.com/watch?v=1wNmtle6qkE>

https://www.youtube.com/watch?v=0ThQ_nD97hY

Laminar Flow in a Pipe

[youtube=<http://www.youtube.com/watch?v=KqqtOb30jWs&NR=1>]

Turbulent Flow in a Pipe

[youtube=<http://www.youtube.com/watch?v=NplrDarMDF8&NR=1>]

Session Plan

Topic coverage and Internal Test	No. of Sessions (in hrs.)	Activity (lecture, tutorial, lab practice, field studies/field-trip, Workshop etc.)	Assignment (Project, assignment, field study, seminar, etc.)	Suggested Reading (Book, Video, Online source, etc.)
MODULE-1 FLUID KINEMATICS				
Types of flow, Continuity equation (in one, two & three dimension) video on types of flow	2	Lecture		
velocity and acceleration, streamline, streakline, path line	1	Lecture		
Velocity potential function and stream function, types of motion (Linear Translation and all deformations) rotation and vorticity, vortex flow.	2	Lecture		Video
Demonstration of different types of flow	2	Practice		
Pressure Measurement	2	Practice		
MODULE-2 FLUID DYNAMICS				
Rate of Flow Or Discharge, Euler's equation of motion along a stream line for ideal flow - Principle of conservation of energy Integration of Euler's equation along a stream line - Bernoulli's equation	1+2	Lecture+ Practice		
Practical applications of Bernoulli's Principle - Kinematics of free jets. Bernoulli's Principle	2+2	Lecture+ Practice		Video

MODULE-3 PRINCIPLE OF CONSERVATION OF MOMENTUM				
Impulse momentum equation. Application of momentum principle for force on pipe bends and reducers	2+2	Lecture+ Practice		
Angular momentum principle and its applications (Numerical problems on angular momentum principle not included. Only fundamental concepts.)	1	Lecture		
MODULE-4 LAMINAR FLOW & TURBULENT FLOW				
Reynolds's Experiment, Laws of Laminar and Turbulent Friction	1+2	Practice		Video
Hagen Poiseulle Equation for laminar flow through pipe, Darcy-Weisbach Equation for Turbulent flow through pipe	1+2	Lecture+ Practice		
MODULE-5 FLOW THROUGH PIPES				
Loss of Energy-Friction loss & Minor losses, HGL&TEL	1+2	Lecture+ Practice		
Pipes in series and Parallel, Equivalent Length of pipe	1+2	Lecture+ Practice		
Power transmission through pipes and nozzle	1	Lecture		
Hydrodynamically smooth & rough boundaries,	1	Lecture		

Moody's Diagram.				
MODULE-6 DIMENSIONAL ANALYSIS				
Fundamental and derived units, Dimensional formulae for various geometric, kinematic and dynamic parameters.	1	Lecture		
Rayleigh and Buckingham' methods for arriving group of dimensionless parameters.	2	Lecture		
Similarity laws - Reynolds, Froude, Mach Laws.Geometric, Kinematic and Dynamic similarities.Distorted Models.	2	Lecture		
MODULE-7 FLOW MEASUREMENT IN PIPES AND CHANNELS				
Flow through small orifice,MouthPiece,Time of Emptying tanks.	2+4	Lecture+ Practice		
Velocity Measurement using pitottube ,Prandtl tube	2+2	Lecture+ Practice		
Flow measurement in pipes-Flow Meters-orifice Plate-Flow Nozzle Meter,Venturimeter	2+4	Lecture+ Practice		
Flow rate Measurement in channel- Weir and Notches.	2+2	Lecture+ Practice		
Total (hrs.)	60			

Basic Surveying

Subject Name	Code	Type of course	T-P-PJ	Prerequisite
Basic Surveying	ENFC0403	Theory & Practice	2-1-0	Nil

Objective

- To make students able to understand the measurement techniques, equipment used in land surveying using Dumpy level, Theodolite and Total station.

Course outcome

- Apply math, science, and technology in surveying activities.
- Measure horizontal distances across clear landscape and across obstacles.
- Prepare contour maps using Theodolite and Total station for projects (Road, Railway and water shade)

Evaluation Systems

Internal Examination	Component	% of Marks	Method of Assessment
	Internal Theory	20	Written examination
	Internal Practice	30(20+10)	Lab work + Course Record
External Examination	External Theory	30	Written examination
	External Practice	20	Lab work
Total		100	

Module-I (2HRS)

Historical survey practice : Introduction to surveying : Classification, Basic Principle, List of Instruments used in surveying.

Module-II (8HRS)

Leveling: Use of dumpy level and leveling staff. Temporary and Permanent adjustment of dumpy level, Curvature and refraction error, types of leveling, reciprocal leveling, leveling difficulties and common errors.

Experiments:

- Calculation of RL using HI and Rise and fall method.
- Longitudinal and cross sectional Leveling
- Check Leveling

Module-III (11HRS)

Theodolite: Use of theodolite, description, uses and adjustments – temporary and permanent, measurement of horizontal and vertical angles.

Experiments :

- Theodolite traversing, checks and closing errors, balancing a traverse, adjustment of bearings, computation of area of closed traverse.
- Measurement of Inaccessible points.

Module--IV (13Hrs)

Total station: Introduction to Total station, Functions, working principles of total station applications, Use of all parts and all options inside the machines.

Experiments:

6. Basic operation, setting up the instrument
7. Measurement of angle and Measurement of Distance
8. Setting up instrument station, Co-ordinate system
9. Traverse adjustment (With help of software)
10. Area calculation using Total station

Module--V (6Hrs)

Contouring: Characteristics, methods and types of contouring.

Experiments:

11. Preparation of contour map using total station and surfer software.

Module--VI (10HRS)

Curves: Types of curves, Properties– simple, compound, reverse and transition curve.

Experiments:

12. Setting out of different curves (simple, compound, reverse and transition) using Total Station.

Module -VI (10HRS)

Setting out of work using Total station.

Experiments:

13. Setting out of Building
14. Setting out of culvert.

Text Books:

1. Surveying Vol I & II, III B C Purnima, Laxmi Publication.
2. Surveying, volume 1&2 BY S.K.Duggal, TMH publisher.

Reference Books:

1. Surveying & Levelling by T.P Kanitkar& V S Kulkarni

Online Source :

<https://www.youtube.com/watch?v=-JgCfsooiu0>

<https://www.youtube.com/watch?v=grvdEYmjSPc>

https://www.youtube.com/watch?v=A-kf1oX_xJ0&t=796s, <https://www.youtube.com/watch?v=XsxJD79MR0s>

<https://www.youtube.com/watch?v=XsxJD79MR0s>

<https://www.youtube.com/watch?v=eRiSShpm3U>

<https://www.youtube.com/watch?v=hISmKTEfgXc>

<https://www.youtube.com/watch?v=zZL9MNsSmSWo> <https://www.youtube.com/watch?v=aqN8uDJoXFA&t=2s> <https://www.youtube.com/watch?v=50jrYYKKUCA> <https://www.youtube.com/watch?v=Yy-8e3sCr0U>

<https://www.youtube.com/watch?v=50jrYYKKUCA> <https://www.youtube.com/watch?v=Yy-8e3sCr0U>

<https://www.youtube.com/watch?v=50jrYYKKUCA> <https://www.youtube.com/watch?v=Yy-8e3sCr0U>

https://www.youtube.com/watch?v=pVgDyh_YBcI, https://www.youtube.com/watch?v=rCLKEYD0_KA,

https://www.youtube.com/watch?v=rCLKEYD0_KA,

<https://www.youtube.com/watch?v=PZ7oUmD5DnU>

Online Source :

<https://www.youtube.com/watch?v=-JgCfsooiu0>

<https://www.youtube.com/watch?v=grvdEYmjSPc>

https://www.youtube.com/watch?v=A-kf1oX_xJ0&t=796s, <https://www.youtube.com/watch?v=XsxJD79MR0s>

<https://www.youtube.com/watch?v=eRiSShpm3U>

<https://www.youtube.com/watch?v=hISmKTEfgXc> <https://www.youtube.com/watch?v=zZL9MNsMSWo> <https://www.youtube.com/watch?v=aqN8uDJoXFA&t=2s> <https://www.youtube.com/watch?v=50jrYYKKUCA>

<https://www.youtube.com/watch?v=50jrYYKKUCA>

<https://www.youtube.com/watch?v=Yy-8e3sCr0U>

https://www.youtube.com/watch?v=pVgDyh_YBcI, https://www.youtube.com/watch?v=rCLKEYD0_KA, <https://www.youtube.com/watch?v=PZ7oUmD5DnU>

https://www.youtube.com/watch?v=rCLKEYD0_KA, <https://www.youtube.com/watch?v=PZ7oUmD5DnU>

https://www.youtube.com/watch?v=rCLKEYD0_KA, <https://www.youtube.com/watch?v=PZ7oUmD5DnU>

https://www.youtube.com/watch?v=rCLKEYD0_KA, <https://www.youtube.com/watch?v=PZ7oUmD5DnU>

Lesson Plan

Module I

Topic coverage and Internal Test	No. of Sessions (in hrs.)	Activity (lecture, tutorial, lab practice, field studies/field-trip, Workshop etc.)	Assignment (Project, assignment, field study, seminar, etc.)	Suggested Reading (Book, Video, Online source, etc.)
Historical survey practice : Introduction to surveying : Classification, Basic Principle, List of Instruments used in surveying.	2	Lecture	Assignment	https://www.youtube.com/watch?v=-JgCfsooiu0
Total (hrs.)	2			

Module-II

Topic coverage and Internal Test	No. of Sessions (in hrs.)	Activity (lecture, tutorial, lab practice, field studies/field-trip,	Assignment (Project, assignment, field study, seminar,	Suggested Reading (Book, Video, Online source, etc.)

		Workshop etc.)	etc.)	
Levelling : Use of dumpy level and levelling staff. Temporary and Permanent adjustment of dumpy level, Calculation of RL by HI and rise and fall method. Curvature and refraction error, types of levelling, reciprocal levelling, levelling difficulties and common errors.	2	lecture	Assignm ent	https : //www.youtube.com/watch?v=grvdEYmjSPc
Experiments : Calculation of RL using HI and Rise and fall method.	2	practice, field studies	field study	https : //www.youtube.com/watch?v=grvdEYmjSPc
Longitudinal and cross sectional levelling Check Levelling	4	practice, field studies	field study	https : //www.youtube.com/watch?v=grvdEYmjSPc
Total (hrs.)	8			

Module III

Topic coverage and Internal Test	No. of Sessions (in hrs.)	Activity (lecture, tutorial, lab practice, field studies/field-trip, Workshop etc.)	Assignm ent (Project, assignme nt, field study, seminar, etc.)	Suggested Reading (Book, Video, Online source, etc.)

Theodolite : Use of theodolite, description, uses and adjustments – temporary and permanent, measurement of horizontal and vertical angles.	2	(lecture, lab practice, field studies)	Assignment	<a href="https://www.youtube.com/watch?v=A-
kf1oX_xJ0&t=796s">https : //www.youtube.com/watch?v=A- kf1oX_xJ0&t=796s . <a href="https :
//www.youtube.com/watch?v=XsxJD79MR
0s">https : //www.youtube.com/watch?v=XsxJD79MR 0s)
Theodolite traversing, checks and closing errors, balancing a traverse, adjustment of bearings, computation of area of closed traverse. Experiments : Theodolite traversing, checks and closing errors, balancing a traverse, adjustment of bearings, computation of area of closed traverse.	3+2	Lecture ,lab practice, field studies)	Field study	<a href="https://www.youtube.com/watch?v=A-
kf1oX_xJ0&t=796s">https : //www.youtube.com/watch?v=A- kf1oX_xJ0&t=796s . <a href="https :
//www.youtube.com/watch?v=XsxJD79MR
0s">https : //www.youtube.com/watch?v=XsxJD79MR 0s)
Measurement of Inaccessible points using theodolite. Experiments : Measurement of Inaccessible points.	2+2	(lab practice, field studies)	Field study	<a href="https :
//www.youtube.com/watch?v=eRiSShpqm3
U">https : //www.youtube.com/watch?v=eRiSShpqm3 U)
Total (hrs.)	11			

Module IV

Topic coverage and Internal Test	No. of Sessions (in hrs.)	Activity (lecture, tutorial, lab practice, field studies/field-trip, Workshop etc.)	Assignment (Project, assignment, field study, seminar, etc.)	Suggested Reading (Book, Video, Online source, etc.)
Total station : Introduction to Total station, Functions, working principles of total station applications, Use of all parts and all options inside the machines. Electronic data recording & total station operation	3	Lecture	Assignment	<u>https : //www.youtube.com/watch?v=hISmKTEfgXc</u>
Experiments : 6. Basic operation, setting up the instrument 7. Measurement of angle and Measurement of Distance 8. Setting up instrument station, Co-ordinate system 9. Traverse adjustment (With help of software) 10. Area calculation using Total station	10	practice, field studies	field study	<u>https : //www.youtube.com/watch?v=hISmKTEfgXc</u> <u>https : //www.youtube.com/watch?v=zZL9MNsmSWo</u> <u>https : //www.youtube.com/watch?v=zZL9MNsmSWo</u>
Total (hrs.)	13			

Module V

Topic coverage and Internal Test	No. of Sessions (in hrs.)	Activity (lecture, tutorial, lab practice, field studies/field-trip, Workshop etc.)	Assignment (Project, assignment, field study, seminar, etc.)	Suggested Reading (Book, Video, Online source, etc.)
Contouring : Characteristics, methods and types of contouring	1	lecture	assignment	<u>https : //www.youtube.com/watch?v=50jrYYKKUCA</u>
Preparation of contour map using total station and surfer software Experiments : 11. Preparation of contour map using total station and surfer software.	5	lecture, lab practice, field studies	assignment, field study	<u>https : //www.youtube.com/watch?v=50jrYYKKUCA</u>
Total (hrs.)	6			

Module V

Topic coverage and Internal Test	No. of Sessions (in hrs.)	Activity (lecture, tutorial, lab practice, field studies/field-trip, Workshop etc.)	Assignment (Project, assignment, field study, seminar, etc.)	Suggested Reading (Book, Video, Online source, etc.)

Curves : Types of curves, Properties—simple, compound, reverse and transition curve. Experiments : 12. Setting out of different curves (simple, compound, reverse and transition) using Total Station.	10	lecture, tutorial, field studies	assignment, field study	https : //www.youtube.com/watch?v=aqN8uDJoXFA&t=2s https : //www.youtube.com/watch?v=HhSmKTEP2xc
Total (hrs.)	10			

Module VI

Topic coverage and Internal Test	No. of Sessions (in hrs.)	Activity (lecture, tutorial, lab practice, field studies/field-trip, Workshop etc.)	Assignment (Project, assignment, field study, seminar, etc.)	Suggested Reading (Book, Video, Online source, etc.)
Setting out of work using Total station. Experiments : 13. Setting out of Building 14. Setting out of culvert.	10	lecture, tutorial, field studies	assignment, field study	https : //www.youtube.com/watch?v=XPbWIp56zxY
Total (hrs.)	10			

Basic Electrical Engineering

Course Title	Code	Type of course	T-P-PJ	Prerequisite
Basic Electrical Engineering	ENFC0404	Theory & Practice	2-1-0	Nil

Objective

- Impart a basic knowledge of electrical quantities such as current, voltage, power, energy and frequency in the analysis of basic D.C. and A.C.
- Develop selection skill to identify the type of generators or motors required for particular application and highlight the importance of transformers in transmission and distribution of electric power.

Course outcome

- Understand concept of electrical circuit and magnetic circuit configurations
- Understand fundamentals of single and three phase A.C circuits,
- Understand wiring schedule for residential, office and industrial loads, concept of earthing and will be acquainted with Distribution Transformer and LT lines to understand the fundamentals of distribution system.

Evaluation Systems

Internal Examination	Component	% of Marks	Method of Assessment
	Internal Theory	20	Written examination
	Internal Practice	30(20+10)	Lab work + Learning Record
External Examination	External Theory	30	Written examination
	External Practice	20	Lab work
Total		<i>100</i>	

Module I

Introduction to Electrical Engineering : Essence of electricity, Electric field; electric current, potential and potential difference, E.M.F, electric power, ohm's law, basic circuit components, Ideal and Practical Sources, Source Conversion, Induced EMF, Energy Stored in Inductor & Capacitor.

Practice:

1. Understanding working principle of DC potential (Lead-Acid battery). Specific gravity of electrolyte. Charging process of battery. Modern DC cells.
2. Plotting the V-I Characteristics of Incandescent lamp.

Module II

DC Networks : Laws and Theorems applicable to DC networks (KCL & KVL, Node voltage & Mesh current analysis, Delta-Star & Star-Delta conversion, Superposition principle, Thevenin's & Norton theorem), Transients in R-L and R-C circuits with DC excitation, Simple problems.

Practice:

3. Verification of Thevenin's theorem, Superposition and Nodal analysis (by experimental setup)
4. Verification of KCL and KVL in series and parallel circuits.
Observing current rise/fall due to transience in DC circuits in Oscilloscope.

Module III

Introduction to Electromagnetism : Magnetic Circuits, B-H curve, Permeability, Reluctance, Solution of simple magnetic circuits, Hysteresis and Eddy current loss. Methods of preventing such losses. Solenoids and field coils. Application of solenoids in different circuits in Automobiles in electrical protection. Working principle of MCBs. Use of field coils in machines and instruments. Galvanometer.

Module IV**Practice:**

5. Study of operation of solenoids.
6. Study of operation of MCBs
7. Study of operation of field coils in machines.
8. Observation of generation of magnetic flux for different input current in a coil and plotting BH Curve.

Practice: Applications of electromagnetism.

9. Observing working of a coil, a Galvanometer.
10. Measurement of iron loss in a core from BH curve by using CRO
11. Observing Induction of Electro Motive Force in a DC generator with D.C Shunt Generator.

Module V

Single-Phase AC Circuits : Single-phase EMF Generation, Waveform and Phasor Representation, Average and Effective value of sinusoids, Peak factor & Form factor, Complex Impedance and Power using j-operator, Power factor.

Practice:

12. Connection & Measurement of power consumption of a fluorescent lamp/LED.
13. Calculation of current, voltage, power & power factor of series RLC circuit excited by 1- \emptyset A.C Supply.

Module VI

Three-Phase AC Circuits: Comparison between single-phase and three-phase systems, Three-phase EMF Generation, Line and Phase quantities in star and delta networks, Power and its measurement in three-phase balanced circuits.

Practice:

15. Measurement of power and power factor in a 3- \emptyset AC circuit by two wattmeter
16. Single-Phase Transformers : Construction and principle of operation, EMF Equation, Transformation ratio, Practical and Ideal transformers
Calculation of No-Load losses of a 1- \emptyset Transformer.

Module VII

Only Practice

17. Domestic Wiring; Switch Boards, Distribution boxes
18. Workshop wiring : Study of the wiring of electrical machine lab.
19. Concept of Earthing.

Reference

Text Books:

1. D C Kulshrestha, “Basic Electrical Engineering”, Tata Mc-Graw Hill Education
2. P K Sathpathy “Basic Electrical Engineering” Oxford

Reference Books :

1. Hughes, “Electrical & Electronic Technology”, Ninth Edition (Revised by J Hiley, K Brown, and I Smith), Pearson Education,

Session Plan

Topic coverage and Internal Test	No. of Sessions (in hrs.)	Activity (lecture, tutorial, lab practice, field studies/field-trip, Workshop etc.)	Assignment (project, assignment, field study, seminar, etc.)	Suggested Reading (Book, Video, Online source, etc.)
Introduction to Electrical Engineering : Essence of electricity, Electric field; electric current, potential and potential difference.	1	Lecture	Assignment	Book
Emf, electric power, ohm’s law	1	Lecture	Assignment	Video
basic circuit components, Ideal and Practical Sources	1	Lecture	Assignment	Book
Source Conversion	1	Lecture	Assignment	Book
Induced EMF	1	Lecture	Assignment	Book
Energy Stored in Inductor & Capacitor	1	Lecture	Assignment	Book
DC Networks : Laws and Theorems applicable to DC networks (KCL & KVL)	4	Practice	Experiments	Book
Node voltage	1	Lecture	Assignment	Book
Mesh current analysis	1	Lecture	Assignment	Book
Delta-Star & Star-Delta conversion	1	Lecture	Assignment	Book

Superposition principle	2	Practice	Experiments	Book
Thevenin's & Norton theorem	4	Practice	Experiments	Book
Transients in R-L and R-C circuits with DC excitation	2	Lecture	Assignment	Book
Simple problems	1	Tutorial	Assignment	Book
Magnetic Circuits : Introduction to Electromagnetism, B-H curve	1	Lecture	Assignment	Book
Permeability, Reluctance, Solution of simple magnetic circuits	1	Lecture	Assignment	Book
Hysteresis and Eddy current loss	1	Lecture	Assignment	Book
D.C. Machines : Construction	2	Practice	Experiments	Book
Classification and Principle of operation of DC machines, EMF equation of DC generator	1	Lecture	Assignment	Video
Speed Equation of DC Motor	4	Practice	Experiments	Book
Single-Phase AC Circuits : Single-phase EMF Generation, Waveform and Phasor Representation	2+1	Lecture (using videos) and Practice	Experiments	Video
Average and Effective value of sinusoids, Peak factor & Form factor	2	Lecture	Assignment	Video
Complex Impedance and Power using j-operator, Power factor.	2	Lecture	Assignment	Video
Three-Phase AC Circuits : Comparison between single phase and three-phase systems, Three-phase EMF Generation	2	Lecture	Assignment	Video
Line and Phase quantities in star and delta networks, Power and its measurement in three-phase balanced circuits.	1	Lecture	Assignment	Book
Single-Phase Transformers : Construction and principle of operation.	1+2	Lecture and Practice	Experiments	Book
EMF Equation, Transformation ratio	2	Lecture	Assignment	Book
Practical and Ideal transformers	1+2	Practice	Experiments	Book

Induction Motors : Introduction to Three-phase and Single-phase Induction Motors, Concept of Slip	2+2	Lecture and Practice	Experiments	Book
Concept of Slip, Slip-Torque characteristics	1	Lecture	Assignment	Book
Measuring Instruments : Introduction, PMMC Ammeters and Voltmeters with extension of range	2	Lecture	Assignment	Book
Moving-Iron Ammeters and Voltmeters	1	Lecture	Assignment	Book
Dynamometer type Wattmeter, Energy meter	4	Practice	Experiments	Book
Domestic Wiring; Switch Boards, Distribution boxes	2	Practice	Experiments	
Workshop wiring : Study of the wiring of electrical machine lab.	2	Practice	Experiments	
Concept of Earthing.	2	Practice	Experiments	
Total- 68 Hours (Theory- 35 hours, Practice- 33hours)				

Electrical Machines

Course Title	Code	Type of course	T-P-PJ	Prerequisite
Electrical Machines	ENFC0405	Theory & Practice	2-1-0	Nil

Objective

- To introduce the students about principles of electromagnetism applied to AC & DC Machines and its importance.

Course outcome

- Able to distinguish the constructional similarity and dissimilarity between various machines.
- Able to test and certify the machines as per BIS
- Able to select appropriate transformer and electrical machines
- Able to develop selection skill to identify the type of generators or motors required for particular application.

Evaluation Systems

Internal Examination	Component	% of Marks	Method of Assessment
	Internal Theory	20	Written examination
	Internal Practice	30(20+10)	Lab work + Learning Record
External Examination	External Theory	30	Written examination
	External Practice	20	Lab work
Total		100	

Course outline

Module: I

D.C. Machines: Construction, Classification and Principle of operation of DC machines, EMF equation of DC generator, Dc Motor Characteristics, Speed Equation of DC Motor. Characteristic for Speed Armature Current, Torque Armature Current and Speed Torque of (i) Separately Excited DC Motor, (ii) DC Shunt Motor, (iii) DC Series Motor, and (iv) DC Compound Motor, Comparison between Different types of DC Motors and their Application. (Lecture & practice)

Practice:

1. Determination of OCC (Open Circuit Characteristics) of D.C Shunt Generator.
2. Starting & Speed Control of D.C Shunt motor by (i) Field flux control method & (ii) armature voltage control method.

Module: II

Single-Phase Transformers: Construction and principle of operation, EMF Equation, Transformation ratio, Practical and Ideal transformers, Transformer losses, Brief idea on Transformer Phasor diagram and transformer rating

Practice:

3. Calculation of No-Load losses of a 1- \emptyset Transformer.

Module: III

Three Phase Transformers: Three-phase transformer connections- Star-star, Two Single-Phase Transformers connected in Open Delta (V-Connection) and their rating, T-Connection (Scott

Connection) of Two Single-Phase Transformers to convert Three-Phase balanced supply to Two-Phase balanced supply. Delta-delta, Star-delta, Delta-star, Zig-zag connections. Scott connection, Open delta connection. Auto Transformers

Module IV

Three Phase Induction Machines

Constructional Features of Squirrel Cage Rotor type and Slip Ring/Wound Rotor type of Induction Motors, Principle of Operation, and Slip Speed.

Practice:

4. Determination of Efficiency, Plotting of Torque-Slip Characteristics of Three Phase Induction motor by Brake Test.

Module: V

Three Phase Synchronous Generators: Synchronous Generator Construction (both Cylindrical Rotor and Salient Pole type), The Speed of Rotation of a Synchronous Generator, Induced voltage in A.C. Machines

Module: VI

Three Phase Synchronous Motors : Basic Principles of Motor operation, Construction, Starting Synchronous Motors, induction motor and Synchronous Motors, Synchronous Motor Ratings, Applications of synchronous motors(Class room teaching)

Module: VII

Single Phase Induction Motors: Starting of Single Phase Induction Motors, Speed Control of Single Phase Induction Motors, Circuit Model. Other types of Motors : Reluctance Motors.(Class room teaching)

Practice:

5. Determination of parameter of a single phase induction motor and study of

(a)Capacitor start induction motor

(b)Capacitor start and capacitor run induction motor

Text Books:

1. Electrical Machines – D P Kothari and I J Nagrath – Tata McGraw Hill.

Reference Books:

1. Electrical Machinery – P S Bimbhra – Khanna Publishers.

2. Electrical Machines - P. K. Mukherjee, S. Chakravarti, Dhanpat Rai & Sons

Session Plan

Topic coverage and Internal Test	No. of Sessions (in hrs.)	Activity (lecture, tutorial, lab practice, field studies/field-trip, Workshop etc.)	Assignment (project, assignment, field study, seminar, etc.)	Suggested Reading (Book, Video, Online source, etc.)
D.C. Machines : Construction	2	Lecture	Assignment	Book
Classification and Principle of operation of DC machines, EMF equation of DC generator	3	Lecture	Assignment	Video
Speed Equation of DC Motor	2	Practice	Experiments	Book
Characteristic for Speed Armature Current, Torque Armature Current	2	Lecture	Assignment	Book
Comparison between Different types of DC Motors and their Application.	1	Lecture	Assignment	Book
Speed Torque of (i) Separately Excited DC Motor, (ii) DC Shunt Motor, (iii) DC Series Motor, and (iv) DC Compound Motor	2	Lecture	Assignment	Book
Determination of OCC (Open Circuit Characteristics) of D.C Shunt Generator.	2	Practice	Experiments	Book
Starting & Speed Control of D.C Shunt motor by (i) Field flux control method & (ii) armature voltage control method.	2	Practice	Experiments	Book
Single-Phase Transformers : Construction and principle of operation, EMF Equation, Transformation ratio, Practical and Ideal transformers, Transformer losses, Brief idea on Transformer Phasor diagram and transformer rating	2	Lecture	Assignment	Book
Calculation of No-Load losses of a 1- \emptyset Transformer.	3	Practice	Experiments	Book
Three Phase Transformers : Three-phase transformer connections- Star-star	1+2	Lecture (using videos) and Practice	Experiments	Video

Two Single-Phase Transformers connected in Open Delta (V-Connection) and their rating,	2	Lecture	Assignment	Video
T-Connection (Scott Connection) of Two Single-Phase Transformers to convert Three-Phase balanced supply to Two-Phase balanced supply.	2	Lecture	Assignment	Video
Delta-delta, Star-delta, Delta-star, Zig-zag connections.	2	Lecture	Assignment	Video
Scott connection, Open delta connection.	5	Practice	Experiments	Book
Auto Transformers.	1	Lecture	Experiments	Book
THREE PHASE INDUCTION MACHINES : Constructional Features of Squirrel Cage Rotor type and Slip Ring/Wound Rotor type of Induction Motors,	2	Lecture	Assignment	Book
Principle of Operation, Slip Speed	1	Lecture	Assignment	Video
THREE PHASE SYNCHRONOUS GENERATORS : Synchronous Generator Construction (both Cylindrical Rotor and Salient Pole type),	2+2	Lecture + Practice	Experiments	Book
The Speed of Rotation of a Synchronous Generator, Induced voltage in A.C. Machines	3	Lecture	Assignment	Book
THREE PHASE SYNCHRONOUS MOTORS Basic Principles of Motor operation, Construction	2+1	Lecture & Practice	Assignment	Book
Starting Synchronous Motors, induction motor and Synchronous Motors, Synchronous Motor Ratings, Applications of synchronous motors(Class room teaching)	2	Lecture	Assignment	Book
SINGLE PHASE INDUCTION MOTORS : Starting of Single Phase Induction Motors, Speed Control of Single Phase Induction Motors, Circuit Model. Other types of Motors : Reluctance	3+6	Lecture and Practice	Experiments	Book

<p>Motors. Determination of parameter of a single phase induction motor and study of (a)Capacitor start induction motor (b) Capacitor start and capacitor run induction motor</p>				
Total : 57 Hours (Theory- 35 hours, Practice- 25 hours)				

Introduction to Automation

Course Title	Code	Type of course	T-P-PJ	Prerequisite
Introduction to Automation	ENFC0406	Theory & Practice	2-1-0	Nil

Objective

- To provide knowledge levels needed for PLC programming and operating.
- To train the students to develop a relay based control circuit.

Course outcome

- Gain knowledge on Programmable Logic Controllers
- Understand different types of Devices to which PLC input and output modules are connected
- Provide the knowledge about understand various types of PLC registers

Evaluation Systems

Internal Examination	Component	% of Marks	Method of Assessment
	Internal Theory	20	Written examination
	Internal Practice	30(20+10)	Lab work + Learning Record
External Examination	External Theory	30	Written examination
	External Practice	20	Lab work
Total		100	

Module -: I (5 Hours)

Introduction to Automation

What is Automation, Brief history of Automation, Automation Uses, Automation - PLC Basics, Mechanical relays versus PLC, PLC Architecture, Functions of various blocks, and working principle of PLC?

Module: II (8 Hours)

PLC Hardware & Terminology

Various Types of Addressing Used within a PLC, PLC Programming input instructions

Practice:

Study of hardware of PLC.

Module: III (9Hours)

Programming PLC's

Differences between Types of Programming, construction of PLC ladder diagrams, Controlling Program Flow in a Ladder Logic Program.

Practice:

Basic programming using ladder logic program

Module: IV (11 Hours)

Timers and Counters

What is timers & Counters, Use of timers and counters within a ladder logic program, Basic concepts of function blocks.

Practice:

Study of latching and unlatching of motor.

Module: V (7 Hours)

PLC Communication

What are the common types of data communications and their characteristics and use of Ethernet TCP/IP protocol.

Practice:

Sequential operation.

Module: VI (5 Hours)

Introduction to SCADA

Introduction and SCADA Basics. Importance of SCADA in Industrial Automation.

Module: VII (15 Hours)

Basic operation of SCADA

Basic operations related to SCADA. How to work on windows property.

Practice:

Basic window property concepts of SCADA.

Session Plan

Topic coverage and Internal Test	No. of Sessions (in hrs.)	Activity (lecture, tutorial, lab practice, field studies/field-trip, Workshop etc.)	Assignment (project, assignment, field study, seminar, etc.)	Suggested Reading (Book, Video, Online source, etc.)
MODULE I (Introduction To Automation) (Theory- 5 hours)				
What is Automation, Brief history of Automation	1	Lecture	Assignment	Text Book 1
Automation Uses, Automation - PLC Basics	1	Lecture	Assignment	Text Book 1
Mechanical relays versus PLC, PLC Architecture	1	Lecture	Assignment	Text Book 1
Functions of various blocks, working principle of PLC.	2	Lecture	Assignment	Text Book 1
MODULE II (PLC Hardware & Terminology) (Theory- 04 hours, Practice - 04 hours)				
Various Types of Addressing Used within a PLC	2	Lecture	Assignment	Text Book 1
PLC Programming input instructions	2	Lecture	Assignment	Text Book 1
Study of hardware of PLC.	4	Practice	Result of Experiments and Viva	Text Book 1
MODULE III (Programming PLC's) (Theory- 4 hours, Practice –05 hours)				
Differences between Types of Programming	2	Lecture	Assignment	Text Book 1
Construction of PLC ladder diagrams. Controlling Program Flow in a Ladder Logic Program.	2	Lecture	Assignment	Text Book 1
Basic programming using ladder logic program	5	Practice	Result of Experiments and Viva	Text Book 1

MODULE IV(Timers and Counters) (Theory- 06 hours, Practice –05 hours)				
What is timers & Counters,	4	Lecture	Assignment	Text Book 1
Use of timers and counters within a ladder logic program, Basic concepts of function blocks.	2	Lecture	Assignment	Text Book 1
Study of latching and unlatching of motor.	5	Practice	Result of Experiments and Viva	Text Book 1
MODULE V(PLC Communication) (Theory- 02 hours, Practice –05 hours)				
What are the common types of data communications and their characteristic sand use of Ethernet TCP/IP protocol.	2	Lecture	Assignment	Text Book 1
Sequential operation	5	Practice	Result of Experiments and Viva	Text Book 1
MODULE VI(Introduction To SCADA) (Theory- 5 hours)				
Introduction and SCADA Basics	3	Lecture	Assignment	Text Book 1
How to work on windows property	2	Lecture		Text Book 1
MODULE VII(Basic operation of SCADA) Theory- 04 hours, Practice –11 hours)				
Basic operations related to SCADA	2	Lecture	Assignment	Text Book 1
How to work on windows property	2	Lecture	Assignment	Text Book 1
Basic window property concepts of SCADA.	11	Practice	Result of Experiments and Viva	Text Book 1
Total- 60 Hours (Theory- 30 hours Practice-30 hours)				

Introduction to Web Technology

Course Title	Code	Type of course	T-P-PJ	Prerequisite
Introduction to Web Technology	ENFC0407	Theory & Practice	2-1-0	Nil

Objective

- This course is intended to teach the basics involved in publishing content on the World Wide Web. This includes the fundamentals of how the Internet and the Web function, a basic understanding of graphic production with a specific stress on creating graphics for the Web and general grounding introduction to more advanced topics such as programming scripting. This will also explore expose students to the basic tools and applications used in Web publishing.

Course outcome

- Students may also create web pages using XHTML and Cascading Style Sheets. Build dynamic web pages using JavaScript (Client side programming).
- Create XML documents and Schemas. Build interactive web applications using AJAX.

Evaluation Systems

Internal Examination	Component	% of Marks	Method of Assessment
	Internal Theory	20	Written examination
	Internal Practice	30(20+10)	Lab work + Learning Record
External Examination	External Theory	30	Written examination
	External Practice	20	Lab work
Total		100	

Module : I (5 hrs)

What is Web? What is WWW, Web site - Static and Dynamic web site, Web application - Client-server, Web development Technologies- Html, CSS, Js, XML, Servlet & JSP, PHP and Ajax.

Module : II (7 hrs)

Introduction to Html, Html structure, Html Editors, Html element/tag & attributes, Designing simple page - Html tag, Head tag, Body tag; More Html tags - Anchor tag, Image tag, Table tag, List tag, Frame tag, Div. tag, Html forms - Input type, Text area, Select, Button.

Module : III (5 hrs)

Introduction to CSS, Syntax, Selectors, Embedding CSS to Html, Formatting fonts, Text & background color, Borders & boxing

Module : IV (6 hrs)

Introduction to JS, Embedding JS into Html, Variables, Data types, Operators, Conditional statements, Looping statements, Strings, Arrays, Math Object, Date Object, Functions, Objects, Event Handling.

Module : V (3 hrs)

Introduction to XML, Difference b/w Html & XML, XML editors

Module : VI (3 hrs)

XML Elements & Attributes XML DTD, XML Schema

Module : VII (4 hrs)

XML Schema, XML DOM

E-content : LMS Content

Reference Books :

1. HTML, XHTML & CSS Bible, Brian Pfaffenberger, Steven M.Schafer, Charles White, Bill Karow- Wiley Publishing Inc, 2010 .
2. HTML Black Book by Steven Holzner 2011
3. Web Design with HTML, CSS, JavaScript and jQuery Set by Jon Duckett.
4. Beginning Java Script with DOM scripting and Ajax By Christian Heilmann- Apress Publisher, 2010.
5. Learning PHP & My SQL, Michele Davis, Jon Philips- O'Reilly Publisher, 2009.
6. PHP Cook book By : David Sklar, Adam Trachtenberg- O'Reilly Publisher, 2008

Introduction to Web Technology Lab List of Programs :

1. Create a simple web page using HTML
2. Create and HTML page with a table and a set of ordered and unordered list.
3. Use CSS in the above web page
4. Design a web page for a company XYZ
5. Develop a static web page that shows basic animation
6. Develop a web page for an audio company
7. Develop a dynamic web page
8. Develop a dynamic web page using DHTML and CSS
9. Consider a company ABC which is into selling movie CDs. Develop a web page for the company.
10. Create a web site in which you can navigate from one page to another
11. Create a dynamic web page for a college
12. Organize a set of data using XML

Session Plan

Topic coverage and Internal Test	No. of Sessions (in hrs.)	Activity (lecture, tutorial, lab practice, field studies/field-trip, Workshop	Assignment (project, assignment, field study, seminar, etc.)	Suggested Reading (Book, Video, Online source, etc.)

		etc.)		
Module-I (Total Theory = 5 Hours)				
What is Web?, What is WWW, Web site - Static and Dynamic web site,	2	Class Room Teaching+ PPT	Assignment	Book,Online Sources,SLM
Web application - Client-server, Web development Technologies- Html, CSS, Js, XML, Servlet & JSP, PHP and Ajax.	3	Class Room Teaching+ PPT	Assignment	Book,Online Sources,SLM
Module II (Total Theory = 7 Hour /Practical= 8 Hour)				
Introduction to Html, Html structure, Html, Editors, Html element/tag & attributes, Designing simple page - Html tag, Head tag, Body tag; More Html tags - Anchor tag, Image tag, Table tag, List tag	3+4	Class Room Teaching+ PPT+Practical	Assignment	Book,Online Sources,SLM
Frame tag, Div tag ; Html forms - Input type, Text area, Select , Button.	3+4	Class Room Teaching+ PPT+Practical	Assignment	Book,Online Sources,SLM
Module III (Total Theory = 5 Hours / Practical= 7 Hours)				
Introduction to CSS, Syntax, Selectors	2+3	Class Room Teaching+ PPT+Practical	Assignment	Book,Online Sources,SLM
Embedding CSS to Html, Formatting fonts, Text & background colour, Borders & boxing.	3+4	Class Room Teaching+ PPT+Practical	Assignment	Book,Online Sources,SLM
Module-IV (Total Theory= 6 hour / Practical = 7 Hour)				
Introduction to JS, Embedding JS into Html, Variables, Data types	2	Class Room Teaching+ PPT+Practical	Assignment	Book,Online Sources,SLM

Operators, Conditional statements, Looping statements, Strings, Arrays, Math Object, Date Object, Functions, Objects	2+5	Class Room Teaching+ PPT+Practical	Assignment	Book,Online Sources,SLM
Event Handling	2+2	Class Room Teaching+ PPT	Assignment	Book,Online Sources,SLM
Module-V (Total Theory= 3 Hour/ Practical = 1 Hour)				
Introduction to XML, Difference b/w Html & XML	3+1	Lecture	Assignment	Book,Online Sources,SLM
Module-VI (Total Theory= 3 Hour/ Practical = 1 Hour)				
XML editors, XML Elements. XML Schema	3+1	Class Room Teaching+ PPT+Practical	Assignment	Book,Online Sources,SLM
Module-VII (Total Theory = 4 Hour/ Practical = 0 Hour)				
XML Schema, XML DOM	4	Class Room Teaching + PPT + Practical	Assignment	Book, Online Sources, SLM
Total (hrs)	Total = 57 Hours (Theory 33 Hours + Practical 24 Hours)			

Information Security-I

Course Title	Code	Type of course	T-P-PJ	Prerequisite
Information Security-I	FCEN 0408	Theory & Lab	2-1-0	Nil

Objective

- Get a clear understanding of Types of Threats, Vulnerabilities, Risks and various terminologies in Information Security.
- Understand C I A of Security and Ease of Use Triangle in Information Security
- Understand Access Controls and Physical security measures to safeguard the Assets
- Understand System And Server Security And Internet Security
- Understand Cyber Law and its need

Course Outcome

- Students will understand the importance of CIA Traid (Confidentiality, Integrity and Availability) and advantage of Security
- The student will be able to safeguard their Assets

Evaluation Systems

Internal Examination	Component	% of Marks	Method of Assessment
	Internal Theory	20	Written examination
	Internal Practice	30(20+10)	Lab work + Learning Record
External Examination	External Theory	30	Written examination
	External Practice	20	Lab work
Total		100	

Module: I INTRODUCTION (7 Hours)

Security Definition, Why Security, Security and its need, Current Trends and Statistics, Basic Terminology, The C I A of Security the Relation : Security functionality and Ease of Use Triangle

Module : II USER IDENTITY AND ACCESS MANAGEMENT (4 Hours)

User identity and Access Management : Authentication, Account Authorization, Validation, Access Control and Privilege management.

Module : III HASHING AND CRYPTOGRAPHY (6 Hours)

Hashing and Cryptography- Encryption and Decryption

Module : IV SYSTEM AND SERVER SECURITY (9 Hours)

System Security, Desktop & Server Security, Firewalls, Password cracking Techniques, Key-logger, viruses and worms, Malwares & Spy wares, Windows Registry

Module : V INTERNET SECURITY (5 Hours)

Internet Security : LAN Security, Email Security, Hacking attacks, preventive measures

Module : VI RISK ASSESSMENT (6 Hours)

Vulnerability Assessment, Penetration Testing, Risk Assessment, Threat, Vulnerability

Module : VII CYBER LAWS (3 Hours)

Cyber Laws – India Context

E-content : LMS Content

Text Books :

Information Systems Security : Security Management, Metrics, Frameworks And Best Practices - Nina Godbole, ISC2 Press, 2010

Mark Stamp's Information Security : Principles and Practice (WIND) Paperback – 2009 by Deven N. Shah, Wiley (2009)

Information Security Risk Analysis - Thomas R. Peltier, Third Edition, Pub : Auerbach, 2012

Information Security : The Complete Reference by Mark Rhodes-Ousley, McGraw Hill Education; Second edition (1 May 2013)

Cyber Security by Nina Godbole, Sunit Belapure, Wiley, 2011

Online Sources :

[http : //www.cengage.com/resource_uploads/downloads/1111138214_259146.pdf](http://www.cengage.com/resource_uploads/downloads/1111138214_259146.pdf)

[http : //www.eecs.yorku.ca/course_archive/2013-4/F/4482/CSE4482_01_Introduction_2013_posted.pdf](http://www.eecs.yorku.ca/course_archive/2013-4/F/4482/CSE4482_01_Introduction_2013_posted.pdf)

[http : //iso-27001-2013.blogspot.in/2015/05/information-security-professionals.html](http://iso-27001-2013.blogspot.in/2015/05/information-security-professionals.html)

[https : //www.sans.org/reading-room/whitepapers/services/identity-access-management-solution-1640](https://www.sans.org/reading-room/whitepapers/services/identity-access-management-solution-1640)

[http : //searchsecurity.techtarget.com/definition/access-control](http://searchsecurity.techtarget.com/definition/access-control)

[http : //searchsecurity.techtarget.com/definition/access-control](http://searchsecurity.techtarget.com/definition/access-control)

[http : //www.slideshare.net/ColMukteshwarPrasad/cyber-law-crime-m](http://www.slideshare.net/ColMukteshwarPrasad/cyber-law-crime-m)

ftp://mail.im.tku.edu.tw/Prof_Liang/IRM/10%20An%20Introduction%20to%20Factor%20Analysis%20of%20Information%20Risk.pdf

[http : //www.wciapool.org/pdf/Tab_5_10_Immutable_Laws_of_Security.pdf](http://www.wciapool.org/pdf/Tab_5_10_Immutable_Laws_of_Security.pdf)

[https : //www.sans.org/reading-room/whitepapers/basics/vulnerability-assessment-421](https://www.sans.org/reading-room/whitepapers/basics/vulnerability-assessment-421)

Session Plan

Topic coverage and Internal Test	No. of Sessions (in hrs)	Activity (lecture, tutorial, lab practice, field studies/field-trin Workshop etc.)	Assignment (project, assignment, field study, seminar, etc.)	Suggested Reading (Book, Video, Online source, etc.)
MODULE 1 : Introduction (Theory- 7 hours, Practice- 8 hours)				
Security Definition, Why Security, Security and its need	2	Lecture	Assignment	Book, Online source, SLM
Current Trends and Statistics, Basic Terminology	2	Lecture	Assignment	Book, Online source, SLM
The C I A of Security the Relation : Security functionality and Ease of Use Triangle	3	Lecture	Assignment	Book, Online source, SLM
System Security Configuration in Windows 7 I & II	2	Practice	Experiments	Online source, Video
DOS attacks and its prevention	2	Practice	Experiments	Online source, Video
Password Based Authentication Process	2	Practice	Experiments	Online source, Video
Service Management of Windows 7 for prevention of attacks.	2	Practice	Experiments	Online source, Video
MODULE II USER IDENTITY AND ACCESS MANAGEMENT (Theory- 4 hours)				
User identity and Access Management : Authentication, Account Authorization	2	Lecture	Assignment	Book, Online source

Validation, Access Control and Privilege management.	2	Lecture	Assignment	Book, Online source
MODULE II I HASHING AND CRYPTOGRAPHY(Theory- 6 hours, Practice- 3 hours)				
Hashing	2 + 1	Lecture + Practice	Experiment	Book, Online source
Cryptography- Encryption and Decryption	4	Lecture	Assignment	Book, Online source
Event logger analysis	2	Practice	Experiment	Book, Online source
Module IV SYSTEM AND SERVER SECURITY (Theory- 9 hours, Practice- 7 hours)				
System Security, Desktop & Server Security	2	Lecture	Assignment	Book,Online ,SLM
Firewalls	2+2	Lecture + Practice	Experiment	Book,Online ,SLM
Password cracking Techniques	2+2	Lecture + Practice	Experiment	Book,Online ,SLM
Key-logger	1+2	Lecture + Practice	Experiment	Book,Online ,SLM
viruses and worms, Malwares & Spy wares	1	Lecture	Assignment	Book,Online ,SLM
Windows Registry	1+1	Lecture + Practice	Experiment	Book,Online ,SLM
Module V INTERNET SECURITY (Theory- 5 hours, Practice- 0 hours)				
LAN Security	2	Lecture	Assignment	Book,Online,SLM
Hacking attacks, preventive measures	2	Lecture	Assignment	Book,Online,SLM
Security on E-mail	1	Lecture	Assignment	Book,Online,SLM
Module VI INTERNET SECURITY (Theory- 6 hours, Practice-2 hours)				
Vulnerability Assessment	2 +2	Lecture + Practice	Experiment	Book,Online ,SLM
Penetration Testing	2	Lecture	Assignment	Book,Online,SLM

Risk Assessment	1	Lecture	Assignment	Book,Online,SLM
Threat, Vulnerability	1	Lecture	Assignment	Book,Online,SLM
Module VII Cyber Law (Theory- 3 hours)				
Cyber Laws – Indian Context.	2	Lecture	Assignment	Book,Online,SLM
Importance of Cyber Law	1	Lecture	Assignment	Book,Online,SLM
Total (hrs) : 60 Hours (Theory- 40 hours, Practice- 20 hours)				

Programming in C

Course Title	Code	Type of course	T-P-PJ	Prerequisite
Programming in C	ENFC0409	Theory & Practice	2-1-0	Nil

Objective

- To provide basic knowledge of programming tools and techniques.
- To familiarize the programming environment and syntax of C programming.
- To understand the working of basic programming constructs.

Course outcome

- The students will able to apply programming skills to problem solving.
- The student will able to write 150 to 200 line programs without any error.

Evaluation Systems

Internal Examination	Component	% of Marks	Method of Assessment
	Internal Theory	20	Written Examination
	Internal Practice	30 (20+10)	Lab Work + Learning Record
External Examination	External Theory	30	Written Examination
	External Practice	20	Lab Work
Total		<i>100</i>	

Course outline

Module I : Problem Solving Techniques (10Hours)

Problem solving techniques : Algorithm, flow chart; Structure of C program, Character set, Identifiers, Keywords, Data Types, Constants and Variables, Input-output statements, relational and logical operators, increment and decrement operators, conditional operator, bit-wise operators, assignment operators, expressions, type conversions, conditional expressions, precedence and order of evaluation.

Module II : Control Structures (7Hours)

Statements and blocks, if and switch statements, loops : -while, do-while and for statements, break, continue, goto.

Module III : Array(7Hours)

Arrays-concepts, declaration, definition, accessing elements, two-dimensional and multi-dimensional arrays, applications of arrays.

Module IV : Functions(15 Hours)

Designing structured programs Functions, parameter passing, user defined functions, recursive functions, storage classes- extern, auto, register, static, scope rules.

Module V : Pointern (15 Hours)

Pointers- concepts, initialization of pointer variables, pointers and function arguments, address arithmetic, Character pointers and functions, pointers to pointers, pointers and multidimensional arrays, dynamic memory management functions, command line arguments.

Module VI : Structures(11Hours)

Derived types-structures-declaration, definition and initialization of structures, accessing structures, nested structures, arrays of structures, structures and functions, pointers to structures, self referential structures, unions,

Module VII : Files (10Hours)

Typedef, bit fields, C program examples. Input and output–concept of a file, text files and binary files, streams, standard I/O, Formatted I/O, file I/O operations.

Text Books :

1. E. Balaguruswamy “Programming in C”, Tata McGraw Hill 3rd Edition
2. Y. Kanetkar, “Let us C”, BPB Publications-9th edition.

Reference Books :

1. H. Scheldt, “C The Complete Reference”, Tata McGraw Hill
2. B.W. Kernighan & D.M. Ritchie, "C Programming Language", PHI.
3. Gotterfried, Schaum Series-“C Programming”.

Session Plan

Topic coverage and Internal Test	No. of Sessions (in hrs)	Activity (lecture, tutorial, lab practice, field studies/field-trip, Workshop etc.)	Assignment (project, assignment, field study, seminar etc.)	Suggested Reading (Book, Video, Online source, etc.)
Module I 5 hrs lectures + 3 hrs practice				
Problem solving techniques : Algorithm Problem solving techniques : flow chart	1	lecture	assignment	Book
Structure of C program Character set, Identifiers Keywords, Data Types, Constants and Variables,	1+1	lecture, quiz	assignment	Book

Input-output statements				
Relational and logical operators, increment and decrement operators	1	lecture	assignment	Book
Conditional operator, bit-wise operators, assignment operators	1+2	lecture, practice	assignment	Book
Expressions, type conversions Conditional expressions, precedence and order of evaluation	1	lecture		Book
Module II 4 hrs lectures + 5 hrs practice				
Statements and blocks, if and switch statements	2+1	lecture, practice	assignment	Book
loops : -while, do-while	1+2	lecture, practice	assignment	Book
for statements, break, continue, goto	1+2	lecture, practice	assignment	Book
Module III 5 hrs lectures + 5 hrs practice				
Arrays-concepts Declaration, definition, accessing elements, programs	1+2	lecture, practice, quiz	assignment	Book
two-dimensional arrays multi-dimensional arrays	2+2	lecture, practice	assignment	Book
applications of arrays	2+1	lecture, practice	assignment	Book
Module IV 5 hrs lectures + 4 hrs practice				
Designing structured programs : -Functions	1	lecture, practice	assignment	Book
parameter passing, user defined functions	2+2	lecture, practice	assignment	Book

recursive functions	1+1	lecture, practice	assignment	Book
storage classes-extern, auto, register, static, scope rules	1+1	lecture, practice	assignment	Book
Module V 5 hrs lectures + 4 hrs practice				
pointers-concepts, initialization of pointer variables	1	lecture	assignment	Book
pointers and function arguments, address arithmetic, Character pointers and functions	2+2	lecture, practice	assignment	Book
pointers to pointers, pointers and multidimensional arrays	1+1	lecture, practice	assignment	Book
dynamic memory management functions, command line arguments	1+1	lecture, practice	assignment	Book
Module VI 6 hrs lectures + 5 hrs practice				
Derived types-structures- declaration, definition and initialization of structures, accessing structures	2+2	lecture, practice	assignment	Book
nested structures, arrays of structures	2+1	lecture, practice	assignment	Book
pointers to structures, self referential structures	1+1	lecture, practice	assignment	Book
unions	1+1	lecture, practice	assignment	Book
Module VII 4 hrs lectures + 6 hrs practice				
Typedef, bit fields Input	2+2	lecture,	assignment	Book

and output–concept of a file, text files and binary files, streams		practice		
standard I/O, Formatted I/O	1+2	lecture, practice	assignment	Book
file I/O operations	1+2	lecture, practice	assignment	Book
Total (hrs)	34+32			

Desktop Operating System (Windows 10)

Course Title	Code	Type of course	T-P-PJ	Prerequisite
Desktop Operating System (Windows 10)	ENFC0410	Theory & Practice	2-1-0	FCEN0119 Operating System Building Blocks

Objective

- To install and configure Windows 10 enterprise.
- Configure networks, security settings in Windows 10 enterprise.

Course outcome

- Student will able to install windows 10 enterprise.
- Student will able to configure devices, security settings, firewall in Windows 10 enterprise.

Evaluation Systems

Internal Examination	Component	% of Marks	Method of Assessment
	Internal Theory	20	Written examination
	Internal Practice	30(20+10)	Lab work + Learning Record
External Examination	External Theory	30	Written examination
	External Practice	20	Lab work
Total		100	

Module : I Installing, upgrading and managing Windows (4 Hrs.)

Gathering hardware devices, preparing to install windows, upgrading and migrating, Clean and Image based installation, Configuring Application Compatibility

Module : II Windows Features ,device drivers and disk managemnt (4 Hrs.)

Administrating windows features, Disk management, and installing and configuring device drivers.

Module : III File Access, Printers with Windows (4 Hrs.)

Introduction to Authentication and Authorization, Managing file access, Shared Folders, File compression, file archiving, managing printers

Module : IV Network connectivity with Windows (4 Hrs.)

Connecting windows client with server, configuring ipv4 & ipv6 connectivity, Implementing APIPA, Introduction to Name resolution, troubleshooting network issues, Overview of wireless network, configuring wireless network.

Module : V Securing, Optimizing and maintaining windows Client (5 Hrs.)

Overview of local security management, local security policy settings, EFS and Bitlocker, Application restrictions, UAC, Windows Firewall, Windows Defender.

Module : VI Configuring Browser and Mobile Computing in Windows (3 Hrs)

Administrating IE8, Configure Mobile computer and device settings

Module : VII Configuring Remote Access in windows (4 Hrs.)

Remote desktop, remote assistance, direct access, branch cache.

LAB EXERCISES : ANY TEN LABS

Navigating and Customizing the User Interface

Navigating the Windows 10 User Interface

Configuring Start

Configuring the Desktop

Installing Windows 10

Upgrading Windows 7 to Windows 10

Migrating User Settings

3 .Configuring Windows 10

Using the Settings App

Using Control Panel

Using Windows Power Shell

Using GPOs

Synchronizing Settings with One Drive

Connecting a Microsoft Account

Synchronizing Settings between Devices

Configuring Network Connectivity

Verifying and Testing IPv4 Settings

Configuring Automatic IPv4 Settings

Configuring and Testing Name Resolution

Managing Storage

Adding a Disk

Creating a Simple Volume

Compressing a Folder

Enabling Disk Quotas

Creating a Storage Space

Configuring and Managing Permissions and Shares

Creating, Managing, and Sharing a Folder

Using Conditions to Control Access and Effective Permissions

Installing and Managing a Printer

Managing and Using a Printer

Configuring Windows 10 Web Browsers

Configuring and Using Microsoft Edge

Configuring and Using Internet Explorer

Data Security

Using EFS

Using Bit Locker

Device Security

Creating Security Policies Testing

Security Policies Configuring UAC

Prompts Configuring and Testing

AppLocker

Network Security
 Creating and Testing Inbound Rules
 Creating and Testing Outbound Rules
 Creating and Testing Connection Security Rules
 Configuring Windows Defender
 Troubleshooting and Recovery
 Managing Device Drivers
 Using File History to Recover Files
 Using Previous Versions to Recover Files
 Recovering a Device with a Restore Point
 Using the Advanced Start-up Options to Recover a Device

Reference

E-content : www.krackin.com

Text Books :

1. Milan Milenkovic, “Operating Systems”, TATA McGraw Hill, 2009
2. Andrew Bettany, Andrew Warren, “Installing and Configuring Windows 10” , Microsoft Press, 2016D. Irtegov, “Operating Systems Fundamentals”, Charles River Media, 2002
1. Microsoft Official Academic Course, “Installing and Configuring Windows 10 Lab Manual”, Microsoft Press, 2017

Online Source : Microsoft academy, [http : //technet.microsoft.com](http://technet.microsoft.com)

Session Plan

Topic coverage and Internal Test	No. of Sessions (in hrs.)	Activity (lecture, tutorial, lab practice, field studies/field-trip, Workshop etc.)	Assignment (project, assignment, field study, etc.)	Suggested Reading (Book, Video, Online source, etc.)
Module : I Lecture=4 Lab Practice=2				
Installing, upgrading and managing Windows 10 : Gathering hardware devices, preparing to install windows.Up grading and migrating, Clean and Image based installation.Configuring Application Compatibility,	4+2	Lecture, lab practice	experiment	Book, Online source
Module : II Lecture=4 Lab Practice=4				

Configuring Application Compatibility, administrating windows features, Disk management, and installing and configuring device drivers.	4+4	Lecture, lab practice	experiment	Book, Online source
Module : III Lecture=4 Lab Practice=3				
Introduction to Authentication and Authorization, Managing file access, Shared Folders, File compression, file archiving, managing printers	2+1	Lecture, lab practice	Experiment	Book, Online source
File compression, file archiving, managing printers.	2+2	Lecture, lab practice	Experiment	Book, Online source
Module : IV Lecture=4 Lab Practice=2				
Connecting windows client with server, configuring ipv4 & ipv6 connectivity, Implementing APIPA.	2+1	Lecture, lab practice	Experiment	Book, Online source
Introduction to Name resolution, troubleshooting network issues, Overview of wireless network, configuring wireless network.	2+1	Lecture, lab practice	Experiment	Book, Online source
Module : V Lecture=5 Lab Practice=3				
Securing, Optimizing and maintaining windows 10 Client : Overview of local security management	1	Lecture		Book, Online source
local security policy settings.	1+1	Lecture, lab practice	Experiment	Book, Online source
EFS and Bit locker, Application restrictions. UAC,.	2+1	Lecture, lab practice	Experiment	Book, Online source

Windows Firewall. Windows Defender	1+1	Lecture, lab practice	Experiment	Book, Online source
Module : VI Lecture=3 Lab Practice=2				
Configuring Mobile Computing and Remote Access in windows 10 : Configure Mobile computer and device settings.	3+2	Lecture, lab practice	Experiment	Book, Online source
Module : VII Lecture=3 Lab Practice=2				
Remote desktop, remote assistance, direct access, branch cache.	3+2	Lecture, lab practice	Experiment	Book, Online source
Total (hrs)	46			

Principles of Biochemistry

Course Title	Code	Type of course	T-P-PJ	Prerequisite
Principles Of Biochemistry	FCEN0408	Theory & Practice	3-2-0	Nil

Objective

- To study the structure and properties of carbohydrates.
- Discuss the structure, properties and reactions of proteins and amino acids
- Discuss the structure, properties of fats and lipids
- To study the composition, structure and functions of nucleic acids

Course outcome

- Aims at providing an elementary knowledge of bio molecules and its application

Evaluation Systems

Internal Examination	Component	% of Marks	Method of Assessment
	Internal Theory	20	Written examination
	Internal Practice	30(20+10)	Lab work + Learning Record
External Examination	External Theory	30	Written examination
	External Practice	20	Lab work
Total		100	

Course outline

Module : I

Biochemical Organization

Scope of clinical biochemistry, component of the cell, structure and biochemical functions, membrane structure and functions, transport through biological cell membrane

Module : II

Bioenergetics

Concept of free energy, determination of change in free energy from equilibrium constant and reduction potential, bioenergetics and biological oxidation – general concept of oxidation and reduction

Module : III

Electron transport chain, oxidative phosphorylation, uncouplers and theories of biological oxidation and oxidative phosphorylation.

Module : IV

Carbohydrates :

Classification, properties. Starch, glycogen, dextrin, inulin, cellulose, metabolism of carbohydrates, gluconeogenesis, glycogenolysis, glycolysis. citric acid cycle and its biological significance, role of sugar in nucleotide biosynthesis and pentose phosphate pathway.

Module : V

Lipids :

Classification, properties. sterols, essential fatty acids, eicosanoids, phospholipids, sphingolipids, metabolism of lipids, oxidation of fatty acids, α, β - oxidation and biosynthesis of ketone bodies, cholesterol, porphyrin biosynthesis, metabolism of bile pigments.

Module : VI

Amino acids and nucleic acids :

Classification, properties, biosynthesis of amino acids and proteins, essential amino acids, metabolism of amino acids and proteins, Nitrogen balance, genetic code, nucleic acids, and structure of DNA and RNA, purine biosynthesis and pyrimidine biosynthesis.

Module : VII

Macromolecules, Vitamins, Hormones, Enzymes

Physical and chemical properties, structure of haemoglobin, immunoglobulins and nucleoprotein, classification and their properties, occurrence, functions, requirements, deficiency manifestations and role of vitamins as coenzyme, chemical nature and properties, hormones, Nomenclature, enzyme kinetics, Michelles-Menten equation, classification and their properties, mechanism of action, enzyme inhibition, coenzyme significance and enzymes of clinical importance.

LIST OF EXPERIMENTS (Any 8)

1. pH measurements and preparation of buffers.
2. Qualitative tests for Carbohydrates.
3. Estimation of sugars.
4. Estimation of proteins by Lowry's method / Biuret method.
5. Estimation of cholesterol by Zak's method.
6. Determination of saponification number of lipids.
7. Estimation of Amino acids.
8. Separation of amino acids - Thin layer chromatography.
9. Separation of sugars - Paper chromatography
10. Biochemical estimation of DNA /RNA using Spectrophotometer

Text Books :

1. Biochemistry by Jeremy M.Berg, John L.Tymozko, Lubert Stryer, Fifth edition, W.H.Freeman and Company, 1514 pages.
2. Thomas M. Devlin.Textbook of Biochemistry with clinical correlations. Wiley Liss Publishers

Reference Books :

1. Burtis & Ashwood W.B. Tietz Textbook of Clinical chemistry. Saunders Company
2. Lubert Stryer W.H. Biochemistry. Freeman and company, New york.
3. Donald Voet & Judith G. Voet. Biochemistry. John Wiley and Sons, Inc.

Session Plan

Topic coverage and Internal Test	No. of Sessions (in hrs.)	Activity (lecture, tutorial, lab practice, field studies/field-trip, Workshop etc.)	Assignment (project, assignment, field study, seminar, etc.)	Suggested Reading (Book, Video, Online source, etc.)
Module I		lecture, tutorial, lab practice	assignment	Book, Video, Online source
Scope of clinical biochemistry	2			
component of the cell,	1			
membrane structure and functions, transport through biological cell membrane	2			
structure and biochemical functions	1			
Module II		lecture, tutorial. lab practice	assignment	Book, Video, Online source
Concept of free energy,	1			
determination of change in free energy from equilibrium constant and reduction potential,	2			
bioenergetics and biological oxidation	2			
general concept of oxidation and reduction	2			
Module III		lecture, tutorial. lab practice	assignment	Book, Video, Online source
Electron transport chain,	1			
oxidative phosphorylation, uncouplers	1			
theories of biological oxidation	1			
oxidative phosphorylation.	2			
Module IV		lecture,	assignment	Book, Video,

classification, properties. starch, glycogen, dextrin, inulin, cellulose	2	tutorial, lab practice		Online source
metabolism of carbohydrates, gluconeogenesis, glycogenolysis,	1			
glycolysis. citric acid cycle and its biological significance	1			
role of sugar in nucleotide biosynthesis and pentose phosphate pathway	2			
Module V		lecture, tutorial, lab practice	assignment	Book, Video, Online source
Classification, properties. sterols, essential fatty acids, eicosanoids	1			
phospholipids, sphingolipids	1			
metabolism of lipids, oxidation of fatty acids	2			
α, β - oxidation and biosynthesis of ketone bodies	1			
cholesterol, porphyrin biosynthesis	1			
metabolism of bile pigments.	1			
Module VI		lecture, tutorial, lab practice	assignment	Book, Video, Online source
Classification, properties, biosynthesis of amino acids and proteins,	2			
essential amino acids, metabolism of amino acids and proteins,	2			
Nitrogen balance, genetic code, nucleic acids, and structure of DNA and RNA,	1			
purine biosynthesis and pyrimidine biosynthesis.	2			

Module VII		lecture, tutorial, lab practice	assignment	Book, Video, Online source
Physical and chemical properties, structure of haemoglobin, immunoglobulins and nucleoprotein	2			
classification and their properties, occurrence, functions, importance	2			
requirements, deficiency manifestations and role of vitamins as coenzyme, chemical nature and properties,	1			
hormones, Nomenclature, enzyme kinetics,	1			
Michelles-Menten equation, classification and their properties,	2			
mechanism of action, enzyme inhibition, coenzyme significance and enzymes of clinical	1			
Total (hrs)	45+20			

Cell Biology

Course Title	Code	Type of course	T-P-PJ	Prerequisite
Cell Biology	FCEN0409	Theory & Practice	3-2-0	Nil

Objective

- To study cell structure and functions of organelle functions
- Exposure on transportations through cell membrane
- To focus on different receptors and model of signaling
- To introduce the concept of cell signaling

Course outcome

- The course is aimed to make the student understand the basic concept of cell structure, membrane, cellular functions of different types of cell, modes of cellular signaling and signal amplification

Evaluation Systems

Internal Examination	Component	% of Marks	Method of Assessment
	Internal Theory	20	Written examination
	Internal Practice	30(20+10)	Lab work + Learning Record
External Examination	External Theory	30	Written examination
	External Practice	20	Lab work
Total		100	

Course outline

Module : I

Cell Structure and function

Origin and evolution of cells, molecular composition of cells, central role of enzymes, metabolic energy, biosynthesis of cell constituents, cell membrane

Module : II

Nucleus, Endoplasmic reticulum, Golgi apparatus and Lysosomes, Bioenergetics and Metabolism – Mitochondria, chloroplasts, Peroxisomes.

Module : III

Cell Division

Cell cycle – Mitosis, Meiosis, Molecules controlling cell cycle

Module : IV

Extra cellular matrix, role of matrix in cell enthore : Gap junctions, Tight junctions, Plasmodesmata.

Module : V**Transport across cell membrane**

Passive and Active Transport, Permeases, Ion channels, ATP pumps. Na⁺ / K⁺ / Ca²⁺ pumps uniport, symport antiporter system. Ligand gated / voltage gated channels, Agonists and Antagonists.

Module : VI**Signal Transductions**

Receptors – extracellular signaling, Cell surface / cytosolic receptors and examples, Different classes of receptors autocrine / paracrine / endocrine models, Secondary messengers molecules.

Module : VII

The Development and causes of cancer, tumour viruses, oncogenes, prevention and treatment

LIST OF EXPERIMENTS (Any 8)

1. Microscopic study of cell and cell organelles
2. Cell fractionation
3. Fixation, Dehydration, embedding and sectioning of tissues
4. Histology of extracellular matrix
5. Quantitative analysis of lipid classes by TLC
6. Isolation of microtubules
7. Isolation of actin and Myosin filaments
8. Isolation of Mitochondria
9. Nuclear staining
10. Stages of cell cycle.

Text Books :

1. The Cell : A molecular approach by Geoffrey M. Cooper. ASM Press, Pages : 673

Reference Books :

1. Molecular Biology of the Cell Edition 4, Roberts, Keith Alberts, Bruce Johnson, Alexander Raff, Martin Walter, Peter Lewis, Julian, Garland
2. Molecular Cell Biology, Lodish, Harvey Krieger, Monty Kaiser, Chris A. Berk, Arnold, W H Freeman & Co

Session Plan

Topic coverage and Internal Test	No. of Sessions (in hrs.)	Activity (lecture, tutorial, lab practice, field studies/field-trip, Workshop etc.)	Assignment (project, assignment, field study, seminar, etc.)	Suggested Reading (Book, Video, Online source, etc.)
Module I		lecture, tutorial, lab practice,	assignment	Book, Video, Notes
Origin and evolution of cells	2			
molecular composition of cells, cell membrane	1			
central role of enzymes, metabolic energy, biosynthesis of cell constituents	2			
Module II		lecture, tutorial, lab practice,	assignment	Book, Video, Notes
Nucleus, Endoplasmic reticulum	2			
Golgi apparatus and Lysosomes	2			
Bioenergetics and Metabolism	2			
Mitochondria chloroplasts	1			
Peroxisomes	1			
Module III		lecture, tutorial, lab practice,	assignment	Book, Video, Notes
Cell cycle – Mitosis	2			
Meiosis	2			
Molecules controlling cell cycle	1			
Module IV		lecture, tutorial, lab	assignment	Book, Video, Notes
Extra cellular matrix, role of matrix in cell enthore	2			

Gap junctions	1	practice,		
Tight junctions, Plasmodesmata.	1			
Module V		lecture, tutorial, lab practice,	assignment	Book, Video, Notes
Passive and Active Transport,.	2			
Permeases, Ion channels,	2			
ATP pumps. Na ⁺ / K ⁺ / Ca ²⁺ T pumps uniport,	2			
Symport antiporter system	1			
Ligand gated / voltage gated channels	1			
Agonists and Antagonists	1			
Module VI		lecture, tutorial, lab practice,	assignment	Book, Video, Notes
Receptors – extracellular signaling	2			
Cell surface / cytosolic receptors and examples,	2			
Different classes of receptors antocrine / paracrine / endocrine models	1			
Secondary messengers molecules	2			
Module VII		lecture, tutorial, lab practice,	assignment	Book, Video, Notes
The Development and causes of cancer	2			
tumour viruses, oncogenes,	1			
prevention and treatment	2			
Total (hrs)	45+20			

Programming for Problem Solving- Java

Course Title	Code	Type of course	T-P-PJ	Prerequisite
Programming for Problem solving- Java	ENFC0412	heory + Practice	1-2-0	Nil

Objective

- Learn problem solving using object-oriented concepts
- Implement object oriented programming using Java
- Analyze several alternative solutions to determine the best approach

Course outcome

- Able to use object oriented concept to solve problems
- Write an error free program of minimum 200 lines of code

Evaluation Systems

	Component	% of Marks	Method of Assessment
Internal Examination	Internal Theory	20	Written examination
	Internal Practice	30(20+10)	Lab work + Learning Record
External Examination	External Theory	30	Written examination
	External Practice	20	Lab work
Total		100	

Projects :

1. Simple Currency Converter
2. Designing a Calculator
3. Generating the mark sheet of a student
4. Create a phone directory and search a number
5. Create a tic tac toe game
6. Developing a library maintenance system
7. Desktop applications
8. Exam System (Without Database)
9. Create Country MAP and Different banners

Course outline

Module: I (10Hrs) :

Problem Solving Techniques: Ask Questions, Look for things that are familiar, solve by analogy, Means-Ends Analysis, Divide and Conquer, The building block approach, Merging solutions, Mental Block : The Fear of Starting, Object Oriented Problem Solving, and Case Study.

Programming: Programming Language, Skeleton, Compilation, Interpretation, and Execution of Program.

Object-Oriented Programming : Object Oriented Concepts, Java Programming Environment, Feature of Java, Elements of Java Program : Identifier, Naming Conventions, Build-in Type, Variable, Operators, Control Statements, Loops, Typecasting, Arrays,

Module : II(15 Hrs)

Classes : Concept of Objects and Classes, Using Methods, Local Variables, Instance Variables, Constructor, Overloading Constructor, Overloading Methods, Garbage Collection, The Finalize Method, Static, Final and this Keyword.

Inheritance and Polymorphism: Basics, Access Modifier, The super Keyword, Method Overriding, Dynamic Method Dispatch, Abstract Classes, Inner Classes.

Module :III (10 Hrs) :

Packages : Packages, Access Protection, Importing Package

Interfaces : Interface, Implementing Interfaces.

Module :IV (10 Hrs) :

String Handling : String, String Buffer, String Builder.

Exception Handling : Fundamentals, Checked and Unchecked Exceptions, Using Try, Catch, Multiple Catches, Throw, Throws, Finally, Java's Built-In Exceptions, User-Defined Exception.

Module :V (10 Hrs) :

Multi-Threading : Java Thread Lifecycle Model, Thread Priorities, Synchronization, Creating Threads, Using Different Thread Methods, Wrapper Classes, Clone (java.lang), Collection API, Vectors (java.util).

Module-VI (10 Hrs) :

Java.IO : I/O Streams, Serialization

AWT : AWT Classes, Window Fundamental, Component, Container, Panel, Window, Frame, Canvas, Control Fundamentals, Layout Managers.

Module :VII (10 Hrs) :

Event Handling : Delegation Event Model, Event Classes, Event Listener Interfaces, and Adapter Classes, Handling Events by Extending AWT Components.

Text Books:

1. Mark Lassoﬀ, Java Programming for Beginners, Packt Publishing Limited, October 2017
2. Walter Savitch, “Java-An Introduction to Problem Solving & Programming”, 8th edition, Pearson, 2017
3. Herbert Schildt, “Java Complete Reference”, 10th edition, in McGraw-Hill Education, 2017

Reference Books:

1. Dr. Edward Lavieri, Peter Verhas, Mastering Java 9, Packt Publishing Limited, October 2017
2. Nell Dale, Chip Weems, “Programming and problem solving with Java”, in Jones and Bartlett, 2008
3. Bhave & Patekar, “Programming with Java” in Pearson Education, 2008
4. H.M. Deitel & Paul J. Deitel, “Java How to Program” in PHI, 9th Edition, 2012

Online Source :

javatpoint.com,

[http : //www.corejavaguru.com](http://www.corejavaguru.com)

[https : //www.w3schools.in/java-tutorial/](https://www.w3schools.in/java-tutorial/)

Session Plan

Topic coverage and Internal Test	No. of Sessions (in hrs.)	Activity (lecture, tutorial, lab practice, field studies/field-trip, Workshop etc.)	Assignment (project, assignment, field study, seminar, etc.)	Suggested Reading (Book, Video, Online source, etc.)
Problem Solving Techniques : Ask Questions, Look for things that are familiar,	4	Lecture		Book

solve by analogy, Means-Ends Analysis, Divide and Conquer, The building block approach, Merging solutions, Mental Block : The Fear of Starting, Object Oriented Problem Solving, and Case Study				
Installation of JDK,Configure runtime environment and Visualizing Java programming Environment (architecture)	1+1	Practice		
What is Programming, Programming Language, Skeleton, Compilation, Interpretation, and Execution of Program	1	Lecture	Assignment	Book
Constructing skeleton of Java Program, Object Oriented Concepts, Java Programming Environment, Feature of Java	2+2	Lecture, Practice	Assignment	Book
Share and execute India Map & CUTM Banner Sharing and Execute Calculator program	2	Practice	Assignment	

Elements of Java Program : Identifier, Naming Conventions, Build-in Type, Variable, Operators, more example	2	Practice	Assignment	Book
Conditional statement, looping statement,	2	Practice	Assignment	Book
Sharing and Execute calculate grade of students	2	Practice		
Concept of Objects and Classes, Using Methods, Local Variables, Instance Variables, Constructor, Overloading Constructor With Examples	2+2	Lecture, Practice	Assignment	Book
Overloading Methods, Garbage Collection, The Finalize Method, Static, Final and this Keyword	2	Practice	Assignment	Book
Sharing and Execute area of shapes	1	Practice		
Inheritance and Polymorphism : Basics, Access Modifier, The super Keyword, Method Overriding, Dynamic Method Dispatch	1+2	Lecture, Practice	Assignment	Book
Abstract Classes, Inner Classes	1+2	Lecture, Practice	Assignment	Book

ToDo list where you can calculate the completed task vs. pending tasks.	1	Practice		
Packages, Access Protection, Importing Package, Interface, Implementing Interfaces	1+4	Lecture, Practice	Assignment	Book
StringHandling : String, StringBuffer, StringBuilder	1+2	Lecture, Practice	Assignment	Book
Create a phone directory and search for a number.	1	Practice		
Excepting Handling : Fundamentals, Checked and Unchecked Exceptions, Using Try, Catch, Multiple Catches, Throw, Throws, Finally, Java's Built-In Exceptions, User-Defined Exception	1+4	Lecture, Practice	Assignment	Book
Create a tic tac toe game	1	Practice		

java.io : I/O streams, Serialization	1+4	Lecture, Practice	Assignment	Book
Producer/Consumer Problem	1	Practice		
Multi-Threading : Java Thread Lifecycle Model, Thread Priorities, Synchronization, Creating Threads, using Different Thread Methods	1+2	Lecture, Practice	Assignment	Book
Wrapper Classes, Clone (java.lang), Collection API, Vectors (java.util)	1+2	Lecture, Practice	Assignment	Book
Developing a library maintenance system.	1	Practice		
Event Handling : Delegation Event Model, Event Classes, Event Listener Interfaces, and Adapter Classes, Handling Events by Extending AWT Components	1+2	Lecture, Practice	Assignment	Book
AWT : AWT Classes, Window Fundamental, Component, Container, Panel, Window, Frame, Canvas, Control Fundamentals, Layout Managers	2+6	Lecture, Practice	Assignment	Book
Total (Hrs)	75	(Theory -24 hrs + Practice -51 hrs =75)		

Database Management System

Course Title	Code	Type of course	T-P-PJ	Prerequisite
Database Management System	ENFC0414	Theory + Practice	1-2-0	Nil

Objective

- Introduce the fundamental concepts of database systems & their importance in practical life and the basic concepts necessary for designing, using and implementing database systems & applications
- Make the students understand the principles behind relational database management systems, including the database environment, the relational model, relational languages, develop simple SQL queries

Course outcome

- Demonstrate the underlying concepts of database technology, identify the appropriate data model for the given problem
- Write SQL queries for performing database operations
- Design, implement and normalize a relational model for a given problem domain

Evaluation Systems

Internal Examination	Component	% of Marks	Method of Assessment
	Internal Theory	20	Written examination
	Internal Practice	30(20+10)	Lab work + Learning Record
External Examination	External Theory	30	Written examination
	External Practice	20	Lab work
Total		100	

Module: I

General introduction to database systems; Database - DBMS distinction, approaches to building a database, data models, database management system, three-schema architecture of a database, challenges in building a DBMS, various components of a DBMS.

File Based Systems and Database Systems : File Based Approach, Database Systems, File-oriented Systems vs. Database Systems Database Approach : Database, Database Management System (DBMS), Components of DBMS Environment, Advantages and Disadvantages of DBMS Roles in Database Environment : Database Users, Database Administrators(DBA)

Module: II

Database System Architecture: Three Level Architecture, External Level, Conceptual Level, Internal Level, Schemas, Mappings, Instances, Data Independence, Data Abstraction

E/R Model - Conceptual data modeling - motivation, entities, entity types, various types of attributes, relationships, relationship types, E/R diagram notation, examples.

Module: III

Relational Data Model: Concept of relations, schema-instance distinction, keys, referential integrity and foreign keys, relational algebra operators : selection, projection, cross product, various types of joins, division, example queries, tuple relation calculus, domain relational calculus, converting the database specification in E/R notation to the relational schema.

Module: IV

Database installation procedure: Database table creation & insertion of values Database Languages : SQL - DDL, DML, TCL, DCL

SQL - Introduction, data definition in SQL, table, key and foreign key definitions, update behaviors. Querying in SQL - basic select-from-where block and its semantics, nested queries - correlated and uncorrelated, notion of aggregation, aggregation functions group by and having clauses, embedded SQL.

Data Definition Language : Creating a Database, Table Operations (Create, Alter, Drop, Truncate, Comment and Rename), Creating and Removing an Index

Data Manipulation Language : Using different DML commands (Insert, Delete, Update, and Select), Sorting Results (Order By), Aggregate Functions, Join, Grouping Results (Group By)

Data Control Language & Transaction Control Language : Using different DCL commands (Grant, Revoke) & using different TCL commands (Commit, Rollback and Savepoint).

Module: V

Dependencies and Normal forms - Importance of a good schema design, problems encountered with bad schema designs, motivation for normal forms, dependency theory - functional dependencies, Armstrong's axioms for FD's, closure of a set of FD's, minimal covers, definitions of 1NF, 2NF, 3NF and BCNF, decompositions and desirable properties of them, algorithms for 3NF and BCNF normalization, multi-valued dependencies and 4NF, join dependencies and definition of 5NF.

Module :VI

Data Storage and Indexes - file organizations, primary, secondary index structures, various index structures - hash-based, dynamic hashing techniques, multi-level indexes, B+ trees.

Terminologies of Relational Model : Relational Data Structure, Relational Keys, Representing Relational Database Schema Integrity Constrains and Views : Nulls, Entity Integrity, Referential Integrity, General Constraints, Views, Purpose of Views

Module: VII

Transaction processing and Error recovery - concepts of transaction processing, ACID properties, concurrency control, locking based protocols for CC, error recovery and logging, undo, redo, undo-redo logging and recovery methods.

PL/SQL : SQL vs PL/SQL, Practice different basic PL/SQL programs

Text Book:

1. Raghuram Ramakrishnan, Johames Gerkhe “ Data Base Management Systems, Mc Graw Hill
2. Gaurav Gupta, Sarika Gupta “ Data Base Management Systems” Khanna Book Publisher

Electronics and its Application

Course Title	Code	Type of course	T-P-PJ	Prerequisite
Electronics and Its Application	ENFC0415	Theory & Practice	2-1-0	Nil

Objective

- The objective of this course is to provide a good understanding on the components used in today's electronics circuits and systems.

Course Outcome

- Student will able to Identify Electronic Components.
- Learn the functionality and application of the components.
- Assemble components to implement circuits and systems.

Evaluation Systems

Internal Examination	Component	% of Marks	Method of Assessment
	Internal Theory	20	Written Examination
	Internal Practice	30(20+10)	Lab Work + Learning Record
External Examination	External Theory	30	Written Examination
	External Practice	20	Lab Work
Total		100	

Course Outline

Module I: RECENT TRENDS IN ELECTRONIC APPLICATION

(9 Hours)

Theory

a. Smart Electronics : Few Case Studies

- Wearable Electronic Devices / Wearable Technology
- Home Automation
- Driverless Car / Self-driving Car
- Inside a Smart Phone

b. Electronics in Transdisciplinary Applications

- Automotive
- Space
- Underwater
- Medical
- Mining
- Manufacturing
- Industrial Automation

- Robotics
- Agriculture
- Entertainment
- c. **New Trends**
- Green Electronics
- Organic Electronics
- Bio-Electronics
- Nano Electronics
- Polymer Electronics
- Molecular Electronics

Practice

1. Familiarization with different components inside a smart phone

Module II: ELECTRONIC MANUFACTURING

(11 Hours)

Theory

Electronic Manufacturing:

- a. Semiconductor devices
- b. Integrated Circuits (IC)
- c. System-on-Chip (SoC)
- d. System-in-Package (SiP)
- e. Network on Chip (NoC)
- f. Printed Circuit Board (PCB)
- g. Single layer PCB, Double layer PCB, Multi-Layer PCB
- h. Aluminum Backed PCB
- i. 3D Printed PCB

Practice

2. Familiarization with different ICs.
3. Familiarization with PCB design software.
4. Familiarization with 3-D printer.

Module III: COMPONENTS FOR ELECTRONIC CIRCUITS

(12 Hours)

Theory

a. Passive Components :

Resistor, potentiometer, capacitor, inductor, connectors, switches and relays.

b.Active Components :

PN junction diode, Zener diode, Photo diode, Light Emitting Diode (LED), Bipolar Junction Transistor (BJT) and Field Effect Transistor (FET)

Practice:

5. Familiarization with different Components - Resistor, Potentiometer, Capacitor, Inductor, Connectors, switches & Relays. Measurement of Resistance and Capacitance.
6. Application of PN junction diode, Zener Diode
7. Application of LED and photodiode
8. Application of BJT and FET

Module IV: SENSOR & ACTUATOR**(4 Hours)****Theory****a. Sensors : Types and Applications**

- Analog Sensors
- Digital Sensors
- Special Sensors

b. Actuators

- Types of Actuators
- Applications

Practice

9. Familiarization with all types of available sensors.

Module V:SENSOR APPLICATION**(8 Hours)****Theory**

- a. Sensors and Smart Sensors
- b. Reading Sensor Input
- c. Sensor Wiring
- d. Understanding sensors and its application
 - **Infrared Reflectance Sensor.**
 - **Resistance Temperature Detectors**
 - **Temperature Sensor (LM35, Thermistor)**
 - **Motion Sensor**
 - **Limit Switch/Sensor**
 - Touch Sensor Circuit

Practice:

10. Sensor Wiring
11. Application of any of the above sensors.

Module VI:VOLTAGE REGULATOR & AMPLIFIER**(8 Hours)****Theory**

Assembling and Testing (Hardware/Multisim) for Different Circuits (Any one from each category by different groups)

a. Voltage Regulator

- Linear Regulators (LM723,78XX,79XX)
- Switching Regulators (LM2676)
- SMPS
- Hybrid Regulators

b.Amplifier

- Voltage Amplifier
- Current Amplifier
- Power Amplifier

Practice

12. Design of a voltage divider circuit
13. Design of an amplifier

Module VII: SWITCH & OSCILLATOR

(8 Hours)

Theory

Assembling and Testing (Hardware/Multisim) for Different Circuits (Any one from each category by different groups)

Switch

- Relay
- Diode as a Switch
- Transistor as a Switch

Oscillator

- Harmonic Oscillator
- Voltage Controlled Oscillator

Practice

12. Design of a switch
13. Design of an oscillator circuit

Practice will be through hardware implementation and software simulation using Multisim / OrCad PSpice/ Matlab.

Reference : -

Text Books :

- 1.Ian Sinclair and John Dunton,“ Practical Electronics Handbook”, 6th Edition, Elsevier.
- 2.J. Hughes, “Practical Electronics : Components and Techniques”, O'Reilly Media, 2015.
- 3.Basic Principle, Donald A. Neamen,“Semiconductor Physics and Devices”, TMH publication

Reference Books :

- 1.Principles of electronics, V K Meheta, Rohit Meheta, S Chand publication

Session Plan

Topics	No. of Sessions (in hrs.)	Activity	Assignment	Suggested Reading
Module-I [7 hrs. Lecture + 2 hrs. Practice]				
Smart Electronics : Few Case Studies Wearable Electronic Devices Wearable Tech Home Automation Driverless Car / Self-driving Car	2	Lecture		Online source
Inside a Smart Phone [Familiarization with different components inside a smart phone]	2	Practice		Online source
Electronics in Transdisciplinary Applications : Automotive Space Underwater	1	Lecture		Online source
Medical Mining Manufacturing	1	Lecture		Online source
Industrial Automation Robotics Agriculture	1	Lecture		Online source
Green Electronics Organic Electronics Bio-Electronics	1	Lecture		Reference Book-1 + Online reference
Nano Electronics Polymer Electronics Molecular Electronics	1	Lecture		Reference Book-1 + Online reference
Module-II [5 hrs. Lecture+6 hrs. Practice]				
Electronic Manufacturing				
Semiconductor devices [Overview only]	1	Lecture		Text Book-3
Integrated Circuits (IC) [Familiarization with all	2	Practice		Text Book-3

available ICs in Lab]			
System on Chip (SoC), System on Package, Network on Chip [Overview and advantage]	1	Lecture	
Single layer PCB, Double layer PCB, Multi-Layer PCB, Aluminum Backed PCB [Overview of design software and application]	4	2hr. Lecture+ 2 hrs. Practice	
3D Printed PCB	3	1hr. Lecture +2hrs. Practice	Te Cl
Module-III [4hrs. Lecture+8 hrs. Practice]			
Passive Components : Resistor, Potentiometer, capacitor, Inductor, Connectors, switches & Relays. [Definition, Function and Application]	4	2hrs. Lecture+ 2hrs. Practice	Te Cl Te Cl
Active Components : PN junction diode, Zener diode, Photo diode, LED, BJT & FET [Function and application]	8	2hrs. Lecture+ 6 hrs. Practice	Te Cl Te Cl
Module-IV [2hrs. Lecture+2 hrs. Practice]			
Sensors : - Types and Applications Analog Sensors Digital Sensors Special Sensors [Overview, Types and Applications]	3	1 hr. Lecture+ 2 hrs. Practice	Te Cl
Actuators : - Types of Actuators Applications	1	Lecture	Te or re
Module-V [4hrs. Lecture+4 hrs. Practice]			
Sensors and Smart Sensors [overview]	1	Lecture	Te or re
Reading Sensor Input, Sensor Wiring	3	1hr. Lecture + 2 hrs. Practice	Te or re
• Infrared Reflectance Sensor	4	2hrs. Lecture +	Te

<ul style="list-style-type: none"> • Resistance Temperature Detectors • Temperature Sensor (LM35, Thermistor) • Motion Sensor • Limit Switch/Sensor • Touch Sensor Circuit <p>[Each group will practice any one of the above]</p>		2 hrs. Practice		online reference
Module-VI [4hrs. Lecture+4 hrs. Practice]				
Voltage Regulator Linear Regulators (LM723, 78XX, 79XX) Switching Regulators (LM2676) SMPS, Hybrid Regulators	4	2hrs. Lecture + 2hrs. Practice		Reference Book-1 + Online reference
Amplifier : Voltage Amplifier, Current Amplifier, Power Amplifier	4	2hrs. Lecture + 2hrs. Practice		Reference Book-1 + Online reference
Module-VII [4hrs. Lecture+4 hrs. Practice]				
Switch Relay, Diode as a Switch, Transistor as a Switch	4	2hrs. Lecture + 2hrs. Practice		Reference Book-1 + Online reference
Oscillator Harmonic Oscillator Voltage Controlled Oscillator	4	2hrs. Lecture + 2hrs. Practice		Reference Book-1 + Online reference
Total (hrs.)	60	29 hr. Lecture + 31 hrs. Practice		

Electronic Devices

Course Title	Code	Type of course	T-P-PJ	Prerequisite
Electronic Devices	ENFC0416	Theory + Practice	2-1-0	Nil

Objective

- The objective of this subject is to provide in-depth understanding on construction and characteristics of three major components of electronics-diode, BJT, FET.

Course Outcome

- Learn construction and characteristics of different semiconductor devices.
- Design different rectifier and voltage regulator circuits using diodes.
- Design and analyze different amplifier circuits using BJT and FET.

Evaluation Systems

Internal Examination	Component	% of Marks	Method of Assessment
	Internal Theory	20	Written examination
	Internal Practice	30(20+10)	Lab work + Learning Record
External Examination	External Theory	30	Written examination
	External Practice	20	Lab work
Total		100	

Course Outline

Module I: INTRODUCTION

(4 Hours)

Theory

Various properties of conductor, semiconductor and insulator, n-type and p-type semiconductors. Formation of PN junction, depletion region, drift and diffusion.

Module II: SEMICONDUCTOR DIODE

(8 Hours)

Theory

Open-circuited, forward bias and reverse bias of p-n junction diode, Diode equation, Volt-ampere characteristics of p-n junction diode (forward and reverse bias), Temperature dependence of VI characteristic, Transition and Diffusion capacitances.

Practice

- Volt-Ampere characteristics of a Forward bias PN Diode.
- Volt-Ampere characteristics of a Reverse bias PN Diode.

**Module III: SEMICONDUCTOR DIODE
Hours)**

(5

Theory

Breakdown mechanisms in semiconductor (Avalanche and Zener breakdown), Zener diode characteristics, LED and photo diode.

Practice

3. Volt-Ampere characteristics of a Zener Diode

Module IV: RECTIFIERS, FILTERS AND REGULATORS

(11 Hours)

Theory

Half wave rectifier, full wave rectifier and ripple factor. Application of p-n diode as clipper and clamper. Simple circuit of a regulator using Zener diode, series and shunt voltage regulators.

Practice

4. Implementation of half wave rectifier. Tracing of waveforms, measurement of DC load voltage, AC load voltage and ripple factor values
5. Implementation of full wave rectifier. Tracing of waveforms, measurement of DC load voltage, AC load voltage and ripple factor values
6. Implementation of clipper circuits using PN-junction diode. Tracing of waveforms at the clipper circuits output.

Module V: TYPES OF FILTER

(10 Hours)

Theory

Inductor filter, Capacitor filter, L- section filter, PI- section filter, Multiple L- section and Multiple PI-section filter.

Practice

7. Implementation of clamper circuits using PN-junction diode. Tracing of waveforms at the clamper circuits output.
8. Design and implementation of a capacitor Filter.
9. Design and implementation of Voltage Regulator using Zener diode

Module VI: BJT CONSTRUCTION AND CHARACTERISTICS

(12 Hours)

Theory

Bipolar Junction Transistor (BJT), Types, Construction and it's working principle., Transistor as an amplifier, Detailed study of currents in a Transistor, VI characteristics of transistor in

Common Base (CB), Common Emitter (CE) and Common collector (CC) configurations; Comparison of CE, CB and CC transistor configuration. Relation between Alpha, Beta & Gamma.

Practice

- 10. Plot and verify VI Characteristics of BJT in CB configuration.
- 11. Plot and verify VI Characteristics of BJT in CC configuration.
- 12. Plot and verify VI Characteristics of BJT in CE configuration.

Module VII: MOSFET CONSTRUCTION & CHARACTERISTICS (10 Hours)

Theory

MOSFET –Types, Construction, working Principle, characteristics (Enhancement and depletion mode), Symbols of MOSFET, VI characteristics of CS, CD and CG configuration; Introduction to SCR and UJT; Thermal run away and thermal stability

Practice

- 13. Plot and verify VI Characteristics of FET in CS configuration.
- 14. Plot and verify VI Characteristics of FET in CD configuration.
- 15. Plot and verify VI Characteristics of FET in CG configuration.

Practice will be done through hardware implementation and software simulation using OrCAD PSpice/ Multisim/ LTspice.

Text Book

- 1. R.L. Boylestad and Louis Nashelsky, “Electronic Devices and Circuits”, Pearson/Prentice Hall, 11th Edition, 2013.

Reference Books

- 1. J. Millman, C. C. Halkias, and Satyabrata Jit, “Electronic Devices and Circuits” ,Tata McGraw Hill, 4th Edition, 2015.
- 2. Prof G S N Raju, “Electronic Devices and Circuits”, I K International Publishing House Pvt. Ltd, 2008.

Session Plan

Topics	No. of Sessions (in hrs.)	Activity	Assignment	Suggested Reading
Module I [4 hrs. Lecture]				
Various properties of Conductor, Semiconductor & Insulator, n and p – type semiconductors, Formation of PN junction	2	Lecture	Assignment- 1.1	Text Book-1

Depletion region, Drift and diffusion	1	Lecture	Assignment-1.2	Text Book-1
Diode equation	1	Lecture	Assignment-1.3	Text Book-1
Module II [4 hrs. Lecture + 4 hrs. Practice]				
Volt-ampere characteristics of p-n diode (Forward and Reverse bias)	4	Practice		Text Book-1 and Lab Manual
Temperature dependence of VI characteristic, Transition and Diffusion capacitances,	2	Lecture	Assignment-2.1	Text Book-1
Breakdown Mechanisms in Semiconductor (Avalanche and Zener breakdown)	2	Lecture	Assignment-2.2	Text Book-1
Module III [3 hrs. Lecture + 2 hrs. Practice]				
Zener diode characteristics	2	Practice		Text Book-1 and Lab Manual
LED and photo diode	3	Lecture	Assignment-3.1	Text Book-1
Module IV [5 hrs. Lecture + 6 hrs. Practice]				
Half wave rectifier	1	Lecture	Assignment-4.1	Text Book-1
Implementation of half wave rectifier. Tracing of waveforms, measurement of DC load voltage, AC load voltage and ripple factor values	2	Practice		Lab Manual
Full wave rectifier	1	Lecture	Assignment-4.2	Text Book-1
Ripple factor	1	Lecture	Assignment-4.3	Text Book-1
Implementation of full wave rectifier. Tracing of waveforms, measurement of DC load voltage, AC load voltage and ripple factor values	2	Practice		Lab Manual
Application of p-n diode as clipper	2	Lecture	Assignment-4.4	Text Book-1

Implementation of clipper circuits using PN-junction diode. Tracing of waveforms at the clipper circuits output.	2	Practice		Lab Manual
Module V [4 hrs. Lecture + 6 hrs. Practice]				
Clamper	1	Lecture	Assignment-5.1	Text Book-1
Implementation of clamper circuits using PN-junction diode. Tracing of waveforms at the clamper circuits output.	2	Practice		Lab Manual
Types of filter, Inductor filter, Capacitor filter, L- section filter, PI- section filter, Multiple L- section and Multiple PI-section filter.	1	Lecture	Assignment-5.2	Text Book-1
Design and implementation of a capacitor Filter.	2	Practice		Lab Manual
Simple circuit of a regulator using Zener diode	1	Lecture	Assignment-5.3	Text Book-1
Design and implementation of Voltage Regulator using Zener diode	2	Practice		Lab Manual
Series and shunt voltage regulators	1	Lecture	Assignment-5.4	Text Book-1
Module-VI [6 hrs. Lecture + 6 hrs. Practice]				
Bipolar Junction Transistor, Types, Construction & it's working principle	2	Lecture	Assignment-6.1	Text Book-1
Transistor as an amplifier, Detailed study of currents in a Transistor	2	Lecture	Assignment-6.2	Text Book-1
VI Characteristics of transistor in Common Base (CB) configurations	2	Practice		Text Book-1
VI Characteristics of transistor Common collector (CC) configurations	2	Practice		Text Book-1
VI Characteristics of transistor Common Emitter (CE) configurations	2	Practice		Text Book-1
Comparison of CE, CB and CC transistor configuration. Relation between Alpha, Beta & Gamma	2	Lecture	Assignment-6.3	Text Book-1

Module VII [4 hrs. Lecture + 6 hrs. Practice]				
MOSFET –Types, construction, working principle	2	Lecture	Assignment-7.1	Text Book-1
Characteristics of MOSFET (enhancement and depletion mode), Symbols of MOSFET,	1	Lecture	Assignment-7.2	Text Book-1
VI Characteristics of CS, configuration	2	Practice		Text Book-1
VI Characteristics of CD configuration	2	Practice		Text Book-1
VI Characteristics of CG configuration	2	Practice		Text Book-1
Introduction to SCR and UJT. Thermal run away and thermal stability	1	Lecture	Assignment-7.3	Text Book-1
Total (hrs.)	60	30hrs. Lecture + 30hrs. Practice		

Sensors and IOT

Course Title	Code	Type of Course	T-P-PJ	Prerequisite
Sensors and IOT	ENFC0417	Theory & Practice	2-1-0	NIL

Objective

- To teach how 'Internet of Things' works, how the Protocols Function, familiarization with different Sensors and their Working, how a Hardware Communicates with Internet and the way it Exchange Necessary Data Through Internet.

Course Outcome

- Students will gain knowledge on how 'Internet of Things' can be utilized and how different Sensors can help in making the System to Operate Effectively and Smartly.
- Students will develop skill in Designing Portable, Ease of Access, Smart, Effective and Efficient Systems to meet the need of Modern Society by using IOT and various Sensors.

Evaluation Systems

	Component	% of Marks	Method of Assessment
Internal Examination	Internal Theory	20	Written Examination
	Internal Practice	30(20+10)	Lab Work + Learning Record
External Examination	External Theory	30	Written Examination
	External Practice	20	Lab Work
Total		100	

Course Outline

Module I : SENSORS & IOT

(15 Hours)

Theory

What is Sensor? Types of Sensors, URM 37 Sensor (Ultrasonic Sensor), Electro-Mechanical Switches, IR, PIR, Laser, Accelerometers, MQ2, MQ3, Temperature and Humidity Sensors (DHT-11), Stress Sensors, LoadSensors, Force Sensors, Wi-Fi modules

What is IOT, What Device makes it to IOT, IOT Platforms, What IOT means for the Developer, Challenges of IOT

Practice

- Interfacing and Testing the Ultrasonic Module, Relay and Infra-Red Module
- Interfacing and Testing PIR, Laser LED, and Accelerometer
- Interface the LPG Sensor, Monoxide Sensor, Temperature and Humidity Sensor
- Interfacing and Testing Stress Sensor, Load Sensor, Force Sensor, Wi-Fi Modules

Module II: ARDUINO ENVIRONMENT, WEB CONNECTIVITY (12 Hours)

Theory

Introduction to Arduino, setting up the Arduino Development Environment, Options for Internet Connectivity with Arduino, Interacting with Basic Sensors, Interacting with Basic Actuators, Configuring your Arduino Board for the IOT

Practice

5. Installing the Arduino IDE
6. Learning the steps to Interface the Controller Board to the System through the Interface
7. Connecting the Arduino to the Internet
8. Interacting of various Sensors to the Internet through the Controller Board
9. Interfacing Actuators to the Controller Board and Control through the Internet

Module III: DATA EXTRACTION (5 Hours)

Theory

Grabbing the Content from a Web Page, Sending Data to the Web, Troubleshooting Basic Arduino Issues

Practice

10. Extracting Data from a Web Page
11. Sending Data to a Web Page

Module IV: INTERNET DATA MONITORING (10 Hours)

Theory

Introduction, Internet of Things Platforms for Arduino, Posting the Sensor Data Online, Retrieving your Online Data, Securing your Online Data, Monitoring Sensor Data from a Web based Dashboard, Monitoring several Arduino Boards at once, Troubleshooting Issues with Web Data Monitoring

Practice

12. Posting the data to the Internet through Internet on-line
13. Monitor the Sensor output from a remote computer through Internet
14. Parallel Monitoring multiple Controller Boards connected to the Internet

Module V:WEB SERVICES

(7 Hours)

Theory

Introduction, Discovering the Temboo Platform, Tweeting from an Arduino Board, Posting updates on Facebook, Automation with IFTTT, Sending Push Notifications

Practice

15. Posting an update to Facebook
16. Sending a Push notification through the Controller by Internet

Module VI: INTERACTING WITH WEB SERVICES

(15 Hours)

Theory

Sending Text Message Notifications, Storing data on Google Drive, Troubleshooting issues with Web Services

Practice

17. Sending a Text Notification through Internet
18. Control Light and Fan via Internet. (prototyped as LEDs)
19. Operate a DC Motor and Servo Motor to Simulate the opening and closing of door

Module VII:MACHINE-TO-MACHINE INTERACTIONS

(11 Hours)

Theory

Introduction, Types of IoT Interaction, Basic local M2M Interactions, Cloud M2M with IFTTT, M2M Alarm System, Automated Light Controller, Automated Sprinkler Controller, Troubleshooting basic M2M Issues

Practice

20. Operate the Smoke Detector from Internet
21. Extract the reading of Temperature, Humidity and Monitoring through Internet
22. Automating the Control of Light, Sprinkler
23. Operate the Robot through Internet which has facility of Communication to and fro through Web and the Sensor Data

Text Books :

1. Marco Schwartz,“Internet of Things with Arduino Cookbook”, Packt Publishing Ltd, 2016,ISBN 978-1-78528-658-2.
2. Arshdeep Bahga, Vijay Madisetti, “Internet of Things- A Hands on Approach”, Universities Press, 2015.

Reference :

1. Neil Cameron, “Arduino Applied: Comprehensive Projects for Everyday Electronics”, Apress Publication, 2019, ISBN-13(pbk):978-1-4842-3959-9, ISBN-13(electronic):978-1-4842-3960-5
2. Marco Schwartz, “Internet of Things with Arduino Yun: Projects to help you build a world of smarter things”, Packt Publishing Ltd, 2014, ISBN:978-1-78328-800-7

Online Resource

1. <https://www.arduino.cc/reference/en>. [Viewed on 14-06-2019]

Session Plan :

Topics	No. of Sessions (in hrs.)	Activity	Assignment	Suggested Reading
Module I [3 hrs. Lecture + 12 hrs. Practice]				
What is Sensor? Types of Sensors	1	Lecture	Assignment 1.1	Text Book(TB)-1, Reference Book(RB)-1
URM 37 Sensor (Ultrasonic Sensor), Electro-Mechanical Switches, IR	1	Lecture	Assignment 1.2	TB-1, RB-1
Interfacing and Testing the URM 37, Relay, IR Module	4	Practice		TB-1
PIR, Laser, Accelerometers, MQ2, MQ3, Temperature and Humidity Sensors (DHT-11)	1	Lecture	Assignment 1.3	TB-1, RB-1
Interfacing and Testing PIR, Laser, Accelerometer, MQ2, MQ3, DHT-11	4	Practice		RB-1
Stress Sensors, LoadSensors, Force Sensors, Wi-Fi Modules	1	Lecture	Assignment 1.4	TB-1, RB-1
Interfacing and Testing stress Sensor, Load Sensor, force Sensor, Wi-Fi modules	4	Practice		TB-1
Background, What is IOT, What device makes it to IOT, IOT platforms, What IOT means for the Developer.	1	Lecture	Assignment 1.5	TB-1,
Module II [2 hrs. Lecture + 10 hrs. Practice]				
Introduction, Setting up the Arduino Development Environment.	2	Practice		TB-1

Interacting of various Sensors to the Internet through the Controller Board.	4	Practice		TB-1
Interacting with basic actuators, Configuring your Arduino Board for the IoT.	4	Practice		
Module III [1 hrs. Lecture + 4 hrs. Practice]				
Grabbing the content from a Web page, sending data to the Web, Troubleshooting basic Arduino issues.	1	Lecture	Assignment 3.1	TB-2 RB-1,2
Extracting data from a Web page.	2	Practice		TB-2
Sending data to a Web page.	2	Practice		
Module IV [2 hrs. Lecture + 8 hrs. Practice]				
Introduction, Internet of Things platforms for Arduino	1	Lecture	Assignment 4.1	TB-2 RB-1,2
Posting the Sensor data online, retrieving your online data, and Securing your online data, Monitoring Sensor data from a Web-based dashboard.	4	Practice		TB-2 RB-1,2
Monitoring several Arduino Boards at once, Troubleshooting issues with Web data Monitoring.	1	Lecture	Assignment 4.2	TB-2 RB-1,2
Parallel Monitoring multiple Controller Boards connected to the Internet.	4	Practice		TB-2 RB-1,2
Module V [3 hrs. Lecture + 4 hrs. Practice]				
Introduction, Discovering the Temboo platform, Tweeting from an Arduino Board. Tweeting from an Arduino Board	2	Lecture	Assignment 5.1	TB-2
Posting updates on Facebook, Automation with IFTTT, Sending push notifications.	1	Lecture	Assignment 5.2	TB-2
Posting updates on Facebook, Sending push notifications	4	Practice		TB-2
Module VI [1 hrs. Lecture +14 hrs. Practice]				
Sending text message notifications, Storing data on Google Drive.	2	Practice		

Troubleshooting issues with Web services.	1	Lecture	Assignment 6.1	Text Book-1, Reference Book-1,2
Control Light & Fan from the Internet.	4	Practice		
Remote Controlled door (opening & closing) using servo Motor.	4	Practice		
Smoke detector and Remote Control room temperature from Internet.	2	Practice		
Extract the reading of Temperature, Humidity and Monitoring through Internet.	2	Practice		
Module VII [3 hrs. Lecture + 8 hrs. Practice]				
Introduction, Types of IoT interaction, Basic local M2M interactions.	1	Lecture	Assignment 7.1	Text Book-1, Reference Book-1,2
Cloud M2M with IFTTT, M2M alarm system, Troubleshooting basic M2M issues.	1	Lecture	Assignment 7.2	Text Book-1, Reference Book-1,2
Automated light Controller, Automated sprinkler Controller,	4	Practice		
Introduction, choosing a robotic platform, Building a mobile robot, Configuring your mobile robot, Basic robot Control, Using distance Sensors, Controlling your robot from anywhere, Troubleshooting basic robotic issues.	1	Lecture	Assignment 7.3	Text Book-1, Reference Book-1,2
Operate the robot through Internet which has facility of communication to and fro through Web and the Sensor data.	4	Practice		
Total (hrs.)	75	15 hrs. Lecture + 60 hrs. Practice		

Problem Solving and Programming

Course Title	Code	Type of course	T-P-PJ	Prerequisite
Problem Solving and Programming	ENFC0418	Theory +Practice	1-2-0	Nil

Objective:

- To introduce programming through Visual programming tool - SCRATCH
- To teach problem solving through Flow charting tool - RAPTOR
- To elucidate problem solving through python programming language
- To introduce function-oriented programming paradigm through PYTHON
- To train in development of solutions using modular concepts
- To teach practical Python solution patterns

Course Outcome:

- Develop a program controlled by a loop.
- Experiment with “costumes” to change the appearance of sprites
- Perform Input, Output Operations using scratch
- Perform computation using common mathematical formulas.
- Develop programs by passing messages between sprites.
- Build Mobile apps using App Inventor
- Select flowchart symbols for solving problems.
- Develop basic flowcharts for performing Input, Output and Computations
- Solve numerical problems using Raptor

Evaluation Systems

	Component	% of Marks	Method of Assessment
Internal Examination	Internal Theory	20	Written Examination
	Internal Practice	30 (20+10)	Lab Work + Learning Record
External Examination	External Theory	30	Written Examination
	External Practice	20	Lab Work
Total		100	

Course Outline

Module I : SCRATCH (10 Hours)

Introduction to programming concepts with scratch, Scratch environment, sprites looks and motion, Angles and directions, repetition and variation, changing costumes, adding background, Input/Output, variables and operators. Working with sounds and sprite communication and creating stories, App Generation.

Module II : RAPTOR (10 Hours)

RAPTOR: Flow chart symbols, Input/Output, Assignment, operators, conditional if, repetition, function and sub charts.

Module III : Programming Languages (9 Hours)

Various types of Programming Languages(PL), Types of PL, Characteristics of PL, Syntax, Semantics, Pragmatics Analysis Procedure based languages : General features, Data types, Abstract Data Types (ADT), Structuring, Syntax, Semantics, RAM model of computation, Example : C language

Module IV : Object Oriented Concepts (10 Hours)

Object based languages: Concepts of objects, Class vs ADT, control structures, methods, General features-inheritance, polymorphism, derived classes & information hiding, Example : C++ and Java, Difference with C.

Module V : Programming Concepts (12 Hours)

Logic programming: Predicate calculus- Logical operators, Propositional forms, Rules of inference, Logical equivalence, Quantification, Wellformed formula, Disproofs; Prolog- Syntax, Lists, Operators and arithmetic, Control, i/o, data structures. Functional programming : Lisp- Control constructs, List processing, Files and i/o, Generic functions, Objects,Exceptions.

Module VI : PYTHON Basic concepts (12 Hours)

Python – Numbers, Strings, Variables, operators, expressions, statements, String operations, Math function calls, Input/Output statements, Conditional If, while and for loops, User defined Functions, parameters to functions, recursive functions, Turtle Graphics.

ModuleVII : PYTHON Data Structures (12 Hours)

Lists, Tuples, Dictionaries, Strings, Files and their libraries.Beautiful Idiomatic approach to solve Turtle Bar Chart, Event Driven programming. Key press events, Mouse events, timer events.

Online Resources

- 1.<https://www.cse.msu.edu/~stockman/ITEC/Scratch/BGC2011Scratch-Rev1.pdf>
<https://nostarch.com/scratchplayground> [Viewed on Dt- 13-06-2019]
- 2.<https://raptor.martincarlisle.com/>[Viewed on Dt- 13-06-2019]
3. <http://www.ict.ru.ac.za/Resources/cspw/thinkcspy3/thinkcspy3.pdf>[Viewed on Dt- 13-06-2019]
- 4.https://zhanxw.com/blog/wp-content/uploads/2013/03/BeautifulCode_2.pdf [Viewed on Dt- 13-06-2019]

Data Structure and C Programming

Course Title	Code	Type of course	T-P-PJ	Prerequisite
Data Structure and C Programming	ENFC0419	Theory +Practice	1-2-0	Nil

Course Objective:

- To impart the basic concepts of data structures and algorithms
- To understand concepts about searching and sorting techniques
- To understand basic concepts about stacks, queues, lists, trees and graphs

Course Outcome:

- Student will be able to choose appropriate data structure as applied to specified problem definition
- Ability to analyze algorithms and algorithm correctness.

Evaluation Systems

	Component	% of Marks	Method of Assessment
Internal Examination	Internal Theory	20	Written Examination
	Internal Practice	30 (20+10)	Lab Work + Learning Record
External Examination	External Theory	30	Written Examination
	External Practice	20	Lab Work
Total		100	

Course Outline

Module I : Introduction to Algorithm and Control Structures (15 Hours)

Algorithm / pseudo code, flowchart, structure of C program, identifiers, keywords, data types, variables, Constants and operators, Input-output statements, expressions, type conversions, conditional expressions, operator precedence and order of evaluation

Control flow statements - if and switch statements, loops- while, do-while and for statements, break, continue, go to and Nested loops (Patterns).

ModuleII : Functions and Storage Classes (10 Hours)

Designing structured programs, Functions, user defined functions, standard library functions, parameter passing, storage classes- extern, auto, register, static, scope rules, recursive functions.

ModuleIII : Arrays and Pointers (15 Hours)

Arrays- concepts, declaration, definition, accessing elements, storing elements, arrays and functions, two-dimensional and multi-dimensional arrays, applications of arrays. Pointers- initialization of pointer variables, address arithmetic, pointers to pointers, pointers and functions, pointers and arrays, dynamic memory managements functions.

Module IV : Structures (08 Hours)

Derived types- structures- declaration, definition and initialization of structures, accessing

structures, nested structures, arrays of structures, structures and functions, pointers to structures, self-referential structures, unions, typedef, bitfields, Enumeration, C pre-processor, command line arguments.

Module V : Files Data Structures (08 Hours)

Input and output - concept of a file, text files and binary files, streams, standard I/o, Formatted I/o, file I/o operations, error handling, C program examples.

Module VI : Data Structures (15 Hours)

Data Structures : Introduction to data structures, Array and Linked List (singly linked lists, doubly linked lists, circular list).Module - VI

STACK & QUEUE : Representing stacks and queues in C using arrays and linked lists, infix to post fix conversion, postfix expression evaluation.

TREES- Binary trees, terminology, representation, traversals, BST, AVL and HEAP tree.

Module VII : Graphs(12 Hours)

GRAPHS- terminology, representation, graph traversals (dfs & bfs)

Searching - Linear and binary search methods, sorting - Bubble sort, selection sort, Insertion sort, Quick sort, merge sort.

Text Books

1. Kanetkar, Yashavant, B P B Publications, Let Us C, 15th Edition
2. Lipschutz, Seymour, Schaum Series, 4th Edition

Switching Theory & Logic Design

Course Title	Code	Type of course	T-P-PJ	Prerequisite
Switching Theory & Logic Design	ENFC0420	Theory + Practice	2-1-0	Nil

Objective:

- The Objective of this Subject is to Provide Good Understanding on Digital Logic and Different Combinational and Sequential Circuits Design and their Implementations.

Course Outcome:

- Student will able to Develop, Analyze, Design and Implement Combinational and Sequential Logic Circuits.
- Students will be able to Design Various Logic Gates Starting From Simple Ordinary Gates to Complex Programmable Logic Devices & Arrays.

Evaluation Systems:

Internal Examination	Component	% of Marks	Method of Assessment
	Internal Theory	20	Written Examination
	Internal Practice	30(20+10)	Lab Work + Learning Record
External Examination	External Theory	30	Written Examination
	External Practice	20	Lab Work
Total		100	

Course Outline

Module I: NUMBER SYSTEMS AND CODES (3 Hours)

Number Systems, Base Conversion Methods, Complements of Numbers, Codes- Binary Codes, Binary Coded Decimal Code and its Properties, Module Distance Codes, Alphanumeric Codes, Error Detecting and Correcting Codes.

Module II: BOOLEAN ALGEBRA AND LOGIC MINIMIZATION (9 Hours)

Basic Theorems and Properties, Switching Functions, Canonical and Standard Form, Algebraic Simplification of Digital Logic Gates, Properties of XOR Gates, Universal Gates, Multilevel NAND/NOR realizations

Module III: LOGIC MINIMIZATION AND COMBINATIONAL CIRCUIT DESIGN (13 Hours)

Introduction, The Minimization with theorem, The Karnaugh Map Method, Five and Six Variable Maps, Prime and Essential Implications, Don't Care Map Entries, Using the Maps for Simplifying, Tabular Method Partially Specified Expressions, Multi-output Minimization, Minimization and Combinational Design, Arithmetic Circuits, Comparator, Multiplexers, Code Converters, Wired Logic, Tristate Bus System, Practical Aspects related to Combinational

Logic Design, Hazards and Hazard Free Relations.

Module IV: SEQUENTIAL CIRCUIT DESIGN

(9 Hours)

Introduction, Basic Architectural Distinctions Between Combinational and Sequential Circuits, The Binary Cell, Fundamentals of Sequential Machine Operation, The Flip-Flop, The D-Latch & Flip-Flop, The “Clocked T” Flip-Flop, The “Clocked J-K” Flip-Flop, Design of a Clocked Flip-Flop, Conversion From One Type of Flip-Flop to Another, Timing and Triggering Consideration, Clock Skew

Module V: REGISTER AND COUNTER

(10 Hours)

Introduction, State Diagram, Analysis of Synchronous Sequential Circuits, Approaches to the Design of Synchronous Sequential Finite State Machines, Design Aspects, State Reduction, Design Steps, Realization Using Flip-Flops Counters – Design of Single Mode Counter, Ripple Counter, Ring Counter, Shift Register, Shift Register Sequences, Ring Counter Using Shift Register.

Module VI: FINITE STATE MACHINE

(8 Hours)

Finite State Machine-Capabilities and Limitations, Mealy and Moore Models-Minimization of Completely Specified and Incompletely Specified Sequential Machines, Partition Techniques, and Merger Chart Methods-Concept of Minimal Cover Table.

Module VII: ALGORITHMIC STATE MACHINES

(8 Hours)

Salient Features of the ASM Chart-Simple Examples-System Design Using Data Path and Control Subsystems-Control Implementations-Examples of Weighing Machine and Binary Multiplier.

Text Book

1. M.Morris Mano., “Digital Design”, Pearson Education, 4th Edition.
2. Zvi Kohavi & Niraj K. Jha, “Switching and Finite Automata Theory”, 3rd Edition, Cambridge.

Reference Book

1. Kumar, A.A., Fundamentals of digital circuits. PHI Learning Pvt. Ltd,2014.
2. Jain, R.P. and Floyd, T.L., Digital fundamentals, Dorling Kindersley Pvt Ltd, 2009.
3. Donald, P.L., Albert, P.M., Goutam. Saha, Malvino, A.P. and Saha, G.K., Digital Principles & Applications. Tata McGraw-Hill, 2010.

Operating Systems

Course Title	Code	Type of course	T-P-PJ	Prerequisite
Operating Systems	ENFC0422	Theory + Practice	1-2-0	Nil

Course Objective

- Provide knowledge about the services rendered by operating systems
- Present details discussion on processes, threads and scheduling algorithms
- Discuss various file-system design and implementation issues
- Provide good insight on various memory management techniques
- Expose the students with different techniques of handling deadlocks
- Familiarize students with the basics of linux operating system and perform administrative tasks on Linux servers

Course Outcome:

- Understand operating system structure and functions, services and system calls
- Differentiate between preemptive, non-preemptive and real time CPU scheduling
- Understand how to achieve mutual exclusion in uniprocessor systems
- IPC outcome
- Demonstrate the ability to implement various memory management techniques
- Illustrate various demand paging techniques.
- Understand file systems in various operating systems
- Analyse different disk scheduling algorithms
- Understand various schemes available for achieving system protection and system security

Evaluation Systems

	Component	% of Marks	Method of Assessment
Internal Examination	Internal Theory	20	Written examination
	Internal Practice	30(20+10)	Lab work + Learning Record
External Examination	External Theory	30	Written examination
	External Practice	20	Lab work
Total		100	

Course Outline

Module :I

Introduction: (8hrs)

Architecture, Goals & Structures of O.S, Basic functions, Interaction of O. S. & hardware architecture, System calls, Batch, multiprogramming. Multitasking, time sharing, parallel, distributed & real -time O.S.

Module: II

Process Management: (13hrs)

Process Concept, Process states, Process control, Threads, Uni- processor Scheduling: Types of scheduling : Preemptive, Non preemptive, Scheduling algorithms : FCFS, SJF, RR, Priority, Thread Scheduling, Real Time Scheduling. System calls like ps, fork, join, exec family, wait.

Module :III(12hrs)

Concurrency control :

Concurrency : Principles of Concurrency, Mutual Exclusion : S/W approaches, H/W Support, Semaphores, pipes, Message Passing, signals, Monitors, Classical Problems of Synchronization : Readers-Writers, Producer Consumer, and Dining Philosopher problem. Deadlock :Principles of deadlock, Deadlock Prevention, Deadlock Avoidance, Deadlock Detection, System calls like signal,kill.

Module :IV

Memory Management : (12hrs)

Memory Management requirements, Memory partitioning : Fixed and Variable Partitioning, Memory Allocation : Allocation Strategies (First Fit, Best Fit, and Worst Fit), Fragmentation, Swapping, and Paging. Segmentation, Demand paging

Module V

Virtual Memory : (8hrs)

Concepts, management of VM, Page Replacement Policies (FIFO, LRU, Optimal, Other Strategies), Thrashing.

Module :VI

I/O management & Disk scheduling : (8hrs)

I/O Devices, Organization of I/O functions, Operating System Design issues, I/O Buffering, Disk Scheduling (FCFS, SCAN, C-SCAN, SSTF), RAID, Disk Cache.

Module :VII

Inter Process Communication :(10hrs)

Basic Concepts of Concurrency, Cooperating process, Advantage of Cooperating process, Bounded- Buffer - Shared-Memory Solution, Inter- process Communication (IPC), Basic Concepts of Inter-process Communication and Synchronization.

Text Book:

Operating System Conceptsby Abraham Silberschatz , Peter B. Galvin , Wiley Publication

Big Data Analytics

Course Title	Code	Type of course	T-P-PJ	Prerequisite
Big Data Analytics	ENFC0423	Theory +Practice	1-2-0	Nil

Course Objective

- Learn understand and practice big data analytics approaches with the study of modern computing big data technologies and focus on industry application
- Conceptualize and summarize big data computing technologies machine learning, trivial data vs big data and scale of the approaches

Course Outcome:

- Identify the characteristics of data set and compare trivial data and big data for various applications
- Recognize and implement different ways of selecting parameters and integrate with the mathematical and statistical tools

Evaluation Systems

	Component	% of Marks	Method of Assessment
Internal Examination	Internal Theory	20	Written examination
	Internal Practice	30(20+10)	Lab work + Learning Record
External Examination	External Theory	30	Written examination
	External Practice	20	Lab work
Total		100	

Course Outline

Module: 1 Introduction to Big Data (10 hrs)

Big Data-definition, Characteristics of Big Data (Volume, Variety, Velocity, Veracity, Validity), Importance of Big Data, Patterns for Big Data Development, Data in the Warehouse and Data in Hadoop.

Module: II Introduction to Hadoop (10 hrs)

Hadoop- definition, Understanding distributed systems and Hadoop, Comparing SQL databases and Hadoop, Understanding MapReduce, Counting words with Hadoop—running your first program, History of Hadoop, Starting Hadoop - The building blocks of Hadoop, NameNode, DataNode, Secondary NameNode, JobTracker and Task Tracker.

Module: III MapReduce (10 hrs)

A Weather Dataset, Analyzing the Data with Unix Tools, Analyzing the Data with Hadoop, Scaling Out, Hadoop Streaming, Hadoop Pipes, Developing a MapReduce Application - The Configuration API, Configuring the Development Environment, Running Locally on Test Data, Running on a Cluster, Tuning a Job, MapReduce Workflows.

Module: IVHDFS (13 hrs)

Components of Hadoop -Working with files in HDFS, Anatomy of a MapReduce program, Reading and writing the Hadoop Distributed File system -The Design of HDFS, HDFS Concepts, The Command-Line Interface, Hadoop Filesystem, The Java Interface, Data Flow, Parallel Copying with distcp, Hadoop Archives

Module: V MapReduce Programming (12 hrs)

Writing basic Map Reduce programs - Getting the patent data set, constructing the basic template of a Map Reduce program, Counting things, Adapting for Hadoop's API changes, Streaming in Hadoop, Improving performance with combiners.

Module : VI MapReduce Advanced Programming (10 hrs)

Advanced MapReduce - Chaining MapReduce jobs, joining data from different sources, creating a Bloom filter, Passing job-specific parameters to your tasks, probing for task-specific information, Partitioning into multiple output files, Inputting from and outputting to a database, keeping all output in sorted order.

Module: VII Graph Representation in MapReduce (10 hrs)

Modeling data and solving problems with graphs, Shortest Path Algorithm, Friends-of-Friends Algorithm, PageRank Algorithm, Bloom Filter, Parallelized Bloom filter creation in MapReduce, Map-Reduce semi-join with Bloom filters.

Text Books:

1. Anil Maheswari, “ Big Data” TMH Publication
2. Thomas Erl, Wajid Khattak, Paul Buchler “ Big Data Fundamentals: Concepts, Drivers & Techniques Prentice Hall

Block Chain & Smart Contracts

Course Title	Code	Type of course	T-P-PJ	Prerequisite
Block Chain & Smart Contracts	EN FC0424	Theory +Practice	1-1-0	Nil

Course Objective

- This course aims to provide conceptual understanding of the function of Block chains as a method of securing distributed ledgers, how consensus on their contents is achieved, and the new applications that they enable
- It covers the technological underpinnings of block chain operations as distributed data structures and decision making systems, their functionality and different architecture types

Course Outcome :

- Understand the structure of a block chain and why/when it is better than a simple distributed database
- Analyze the incentive structure in a block chain based system and critically assess its functions, benefits and vulnerabilities
- Evaluate the setting where a block chain based structure may be applied, its potential and its limitations
- Analyze to what extent smart and self-executing contracts can benefit automation, governance, transparency and the Internet of Things (IOT)
- Attain awareness of the new challenges that exist in monetizing businesses around block chains and smart contracts

Evaluation Systems

	Component	% of Marks	Method of Assessment
Internal Examination	Internal Theory	20	Written examination
	Internal Practice	30(20+10)	Lab work + Learning Record
External Examination	External Theory	30	Written examination
	External Practice	20	Lab work
Total		100	

Course Outline

Module I

Introduction to Distributed system, Challenges in Centralized networks. Fundamentals of cryptography, Introduction to Hashing Algorithms, Family of SHA Algorithms and its applications. Course overview and logistics Bitcoin The big picture of the industry – size, growth, structure, players. The key terms that are used. Bitcoin versus Cryptocurrencies versus Block chain, Distributed Ledger Technology (DLT). Strategic analysis of the space – who are the major players (Block chain platforms, regulators, application providers, etc.) Bitcoin,

HyperLedger, Ethereum, Litecoin, Zcash. Etc. The major application : currency, identity, chain of custody.

Module: II

Introduction to blockchain, Blockchain eco system, Introduction to consensus algorithms and its importance, Proof of work, Proof of stake. Mining, Rewards, Forking – hard and soft .Types of blockchain – Public, private, permissioned, permissionless.

Module: III

Smart contract – Writing a simple smart contract – deploying a contract. Applications of smart contracts – real time use cases in Banking & Insurance, Supplychain management.

Module: IV

Cryptocurrency, Introduction to tokens – Security Token, Utility token and payment tokens, ERC 20 and ERC 721. Case study on token usage in gaming and e-commerce industry. Creating our own virtual currency using smart contracts. Scaling Blockchain – reading and writing data. Differentiate nodes, sparse data and Merkle trees. Fixing on the fly – fixes to current implementations : Layer 2 solutions (Lightning and Ethereum state channels.) Bitcoin scaling debate (Segwit2x etc.). The realities of hard forks for scaling, and bugs.

Module: V

Case study on Blockchains – Ethereum, Hyperledger and EOS. Blockchain Dynamics, Public and private blockchains, Hard and soft forks, Sharding Side chains, Distributed Virtual Machines, Smart Contracts, Oracles

Module: VI

Basics of contract law. Smartcontracts and their potential Trust in Algorithms, the impact on society. How existing legal systems could be integrated? OpenZeplin, OpenLaw.

Module: VII

Assets (fiat currencies, property, equity, securities). Supply and demand. Inflation and deflation Valuations and bubbles. Cyrptoconomics – moving beyond its use in verifying the blockchain– motivating participants, creating investment funds, storing value Creating and using tokens and coins.

Text Book:

1. Melanie Swan “ Block Chain Blue Print for new economy” Keilly Publication
2. Tiana Laurence “ Block Chain for Dummies” Wiley Publication
3. Debajani Mohanty “ Block Chain” BPB Publication

Product Development

Course Title	Code	Type of course	T-P-PJ	Prerequisite
Product Development	ENFC0601	Practice + Project	0-2-1	Nil

Objectives

- To educate the students on various stages of development of design of a product beginning from intent-to-actual design.
- Educate the students on usage of design software like ENOVIA, SIMULIA.

Course Outcome

- Students will have knowledge and skills to undertake design projects through making design decisions and evolve design of a product using the theoretical knowledge and hands-on-experience provided on design software.

Evaluation Systems

	Component	% of Marks	Method of Assessment
Internal Examination	Internal Practice	50(40+10)	Lab Work + Learning Record
	Internal Project	50	Project Work
External Examination	External Practice	50	Lab Work
	External Project	50	Project Work + Report
Total		200	

Course Outline

Module : I (08 Hours)

Intent, Impact, Import & Use of Core Mechanical Principles for Concept Design, Engineering Design, Problems Engineering can Solve, How to Identify Opportunities for Design, Needs Assessment & Problem Definition.

Module : II (10 Hours)

Defining Requirements & Problem Definition, Analytical Process Hierarchical Analysis, Developing Possible Design Solutions, Making Design Decisions.

Module : III (08 Hours)

Introduction to CAD Process through 3D Experience Free Modeling, Modeling & Managing Subassemblies in the Robot

Module : IV PLM through ENOVIA(09 Hours)

Modeling a Lathe Machine. Introduction to PLM through ENOVIA, Steps Involved in Controlling the Product Updates in ENOVIA.

Module : V (20 Hours)

Introduction to FEA in Industry, Pre-Processing Using SIMULIA.

Module : VI (15 Hours)

Understanding the Mathematical Modeling for Product in Physical Behavior

Module :VII (15 Hours)

Introduction to Design of Experiments, How to Use SIMULIA to Make an Incremental Design Decision. Type of Engineering Analysis.

E-content: Peer Learning Experience by Dassault Systemes.

Text Books:

1. Chitale, A K, Product Design & Manufacturing, 2013, 6th Edition, PHI publication, India.
2. Ulrich, K T, Eppinger, S D, Product Design & Development, 2016, 5th edition, Tata McGraw-Hill Companies, Inc.

Reference Books:

1. Kumar, P, Product Design - Creativity, Concepts & Usability, 2011, 2nd Edition, PHI publication, India.

Session Plan

Topic coverage and Internal Test	No. of Sessions (in hours.)	Activity (lecture, tutorial, lab practice, field studies/field-trip, Workshop etc.)	Assignment (project, assignment, field study, seminar, etc.)	Suggested Reading (Book, Video, Online source, etc.)
Module-I				
Intent, Impact, Import, Use of core Mechanical Principles for concept Design, What is Engineering Design, Problems Engineering can solve, How to	08	Tutorial	Project	

identify opportunities for design, Needs Assessment & Problem Definition,				
Module-II				
Defining requirements & Problem Definition, Analytical Process Hierarchical Analysis, Developing a possible design Solutions, Making Design Decisions.	10	Tutorial	Project	
Module-III				
Introduction to CAD Process through 3D Experience free modeling, Modeling & managing subassemblies in the Robot,	08	Tutorial , Practice	Project	
Module-IV				
Modeling a Lathe Machine. Introduction to PLM through ENOVIA, Steps involved in controlling the product updates in ENOVIA. Module-V	09	Tutorial , Practice	Project	
Introduction to FEA in Industry, Pre-processing using SIMULIA, Understanding the Mathematical modeling for Product in physical behavior, Introduction to design of experiments, How to use SIMULIA to make a incremental design decision. Type of Engineering analysis. Projects such as Disc Brake analysis by DOE, Door trim Substrate by DOE, MBD of Suspension by DOE.	20	Practice, tutorial	Project	
Module-VI				
Consumer Sentimental Analysis, Behavior Loyalty Metric, Emotional Loyalty Metric, Understanding decision making dashboards in NetVibes,	15	Lecture, Practice	Project	
Interpreting the Real time social data, Creation of different metric for business condition in Net Vibes, Automate Business logic to respond.	15	Lecture, Practice	Project	
Total (hours)	85			

Artificial Intelligence Tools, Techniques and Application

Course Title	Code	Type of course	T-P-PJ	Prerequisite
Artificial intelligence Tools, Techniques and Application	ENFC0603	Practice + Project	0-2-1	Nil

Objective

- Introduce fundamental concepts in AI
- Demonstrate the capability to create simple AI applications using Natural Language Processing, Audio engineering & Speech, Computer Vision, pattern recognition and machine learning.
- Present various modeling and formulation techniques to solve problems using AI techniques.
- Introduce state-of-art AI tools and techniques to solve various problems faced by Engineers in design and analysis.

Course Outcome:

- Understand the importance of AI.
- Explain the concepts of Natural Language Processing.
- Understand concepts of Machine Learning algorithms and their limitations.
- Compare different Machine Learning Algorithms
- Summarize applications of Speech Recognition and Synthesis.
- Explain the applications of, Computer Vision and Image Processing.

Evaluation Systems

	Component	% of Marks	Method of Assessment
Internal Examination	Internal Practice	50(40+10)	Lab Work + Learning Record
	Internal Project	50	Project Work
External Examination	External Practice	50	Lab Work
	External Project	50	Project Work + Report
Total		200	

Course Outline

Module :I Introduction to Artificial Intelligence (10 hrs)

Basics of AI. Applications of AI. Advanced search, Constraint satisfaction problems, Knowledge representation & reasoning, Non-standard logics, Uncertain and probabilistic reasoning

Conceptual introduction to **Machine Learning: Introduction** to Neural Networks, Supervised, Unsupervised, and Semi-Supervised Learning, Deep Learning, Reinforcement Learning, Linear Regression.

Module :II Conceptual introduction to Natural Language Processing : (10 hrs)

Natural language Understanding, Sentiment Analysis, Segmentation and recognition. Conceptual introduction to **Speech Recognition & Synthesis: Speech** Fundamentals, Speech Analysis, Speech Modeling, Speech Recognition, Speech Synthesis, Text-to-Speech

Module : III Conceptual introduction to Image Processing & Computer Vision : (10 hrs)

Introduction to Image processing, Image Noise, Removal of Noise from Images, Color Enhancement, Segmentation, Edge Detection, Optical Character Recognition, Feature Detection & Recognition

Module :IV BOT Technologies and Virtual Assistants : (10 hrs)

Chatbots: Introduction to a Chatbot, Architecture of a Chatbot. NLP in the cloud, NL Interface, How to Build a Chatbot, Transformative user experience of chatbots, Designing elements of a chatbot, Best practices for chatbot development. NLP components. NLP wrapper to chatbots. Audiobots and Musicbots.

Virtual Assistants :Architecture of a Virtual Assistant.

Module :V Image Processing & Computer Vision : (10 hrs)

Image - Definition and Tagging. Classification of images. Tagging. Image formation, Deep Learning algorithms for Object detection & Recognition. Face recognition, Instance recognition, Feature detection and matching, Segmentation, Recognition Databases and test sets Applications -- Feature extraction, Shape identification. Face detection,.

Applications :Automation, Agriculture[Crop and Soil Monitoring, Grading farm produce, Predictive Analytics], Retail and Retail Security[Amazon Go], Autonomous vehicles,

Module: VI Reinforcement Learning(10 hrs)

Introduction to Reinforcement Learning, Game Playing [Deep Blue in Chess, IBM Watson in Jeopardy, Google's DeepMind in AlphaGo], Agents and Environment, Action-Value Function, Deep Reinforced Learning

Module :VII Smart Applications (10 hrs)

Smart Manufacturing, Smart Agriculture, Smart Healthcare, Smart Education, Smart Grids, Smart Transportation and Autonomous Vehicles, Smart Homes, Smart Cities

Text Books:

2. Prateek Joshi, Artificial Intelligence with Python, 1st Edition, Packt Publishing Limited, January 2017.
3. Stuart J.Russell, Peter Norving, Artificial Intelligence, Pearson Publishing, 2015

Note: 14 hrs will be assigned for Project.

Cloud Computing and its Applications Using Linux OS

Course Title	Code	Type of course	T-P-PJ	Prerequisite
Cloud Computing and its Applications using Linux	ENFC0602	Practice + Project	0-2-1	Nil

Course Objective

- To learn how to use Cloud Services.
- To implement Virtualization
- Apply Map-Reduce concept to applications.
- To build Private Cloud.
- Broadly educate to know the impact of engineering on legal and societal issues involved.

Course Outcome

- Analyze the Cloud computing setup with it's vulnerabilities and applications using different architectures.
- Design different workflows according to requirements and apply map reduce programming model.
- Apply and design suitable Virtualization concept, Cloud Resource Management and design scheduling algorithms.
- Access cloud Storage systems and Cloud security, the risks involved, its impact and develop cloud application

Evaluation Systems

Internal Examination	Component	% of Marks	Method of Assessment
	Internal Practice	50(40+10)	Lab Work + Learning Record
	Internal Project	50	Project Work
External Examination	External Practice	50	Lab Work
	External Project	50	Project Work + Report
Total		200	

Course Outline

Module: I Introduction to User Permissions

(10 Hours)

Users, Groups and Permissions, Using the bash Shell, Std. I/O and Pipes, Text Editor, Basic System Configuration Tools, Investigating and Managing Processes, Configuring the Bash Shell, Finding and Processing Files, Network Clients.

Module: II Basics Commands of OS

(15 Hours)

Basic Commands & OS Basics, browsing root and various directories, ext3 and ext4 file system, chmod, chgrp, bash, set, shell basics, less, more, tail, head, sort, cut, grep, awk, sed, tr, etc., vi, ps, kill, top, jobs, shell scripting – branching, looping, find, locate and advanced find, network related scripts, cron, tar, and additional tools

Module: III File System Management

(10 Hours)

Package Management, Kernel Services, and System Services, File system Management, User Administration, Network Configuration, Installation, and Troubleshooting, Minor Project for develop a file system, System Performance and Security, Web Service and website configuration,

Module: IV Commands of Linux

(10 Hours)

Rpm , yum, apt-get, lspci, lsmod, systemctl services, chkconfig, creating partition, format and mount, LVM useradd, userdel, groupadd, groupdel, passwd,chage, acl, raid, iscsi etc, Basic Installation and Configuration Breaking SU passwd, services check Electronic Mail Services, Account Management, Design and develop a network using packet tracer. Cloud Computing

Module: V Introduction to Cloud

(10 Hours)

Introduction to Cloud, Amazon EC2 and EBS, Amazon S3, RRS, Auto Scaling and load distribution in AWS, Route53, AWS VPC, IAM. Services and resources life cycle, AWS Architecture and Design, Cloud Migration and Implementation

Module: VI Introduction to Kali Linux

(15 Hours)

Using Kali Linux - Footprinting and Reconnaissance - FP Terminology, What is FP, Why FP, Objectives of FP, Types of Threats, FP through Search Engines, Competitive Intelligence Gathering, Footprinting using google hacking WHOIS Lookup, DNS Information, Network FP, Traceroute, FP through Social Engineering, Pen Testing, FP Countermeasures. DN Analyzer Pro, Web Data Extractor.

Social Engineering : What is SE, Types of SE, Human-based, Computer-based and Mobile based SE, SE Countermeasures.

Module: VII Networking Concepts**(15 Hours)**

Scanning Networks : Identifying hosts, ports and services, Scanning Methodology, Checking Live Systems, Ping Sweep, Check for Open Ports, Scanning Techniques, scanning beyond IDS, Banner Grabbing, Scan for Vulnerability, Draw Network Diagrams, Prepare Proxies, Pen Testing. Sniffing: Wiretapping, Packet Sniffing, CAM Table, MAC Flooding Tool : macof -i eth0, Yersinia, DHCP Packet Format, Starvation Attack Tool. Rogue DHCP Server Attack ARP, ARP Spoofing Techniques, ARP Spoofing Attack, and Wireshark.

Online Resources

<https://www.aws.training/>

<https://www.aws.educate/>

Problem Solving Using Python

Course Title	Code	Type of course	T-P-PJ	Prerequisite
Problem Solving Using Python	ENFC0901	Theory +Practice	1-2-0	Nil

Objective:

- Learn core Python scripting elements such as variables and flow control structures.
- Understand the concepts of file I/O.
- Plot data using appropriate Python visualization libraries such as Numpy, Matplotlib and SciPy etc.

Course Outcome:

- Able to use object oriented concept to solve problems.
- To quickly and easily draw plot or visualize the information through visualization technique.
- Write an error free program of minimum 200 lines of code.

Evaluation Systems

Internal Examination	Component	% of Marks	Method of Assessment
	Internal Theory	20	Written examination
	Internal Practice	30(20+10)	Lab work + Learning Record
External Examination	External Theory	30	Written examination
	External Practice	20	Lab work
Total		100	

Course Outline

Module I : Familiarization of Python (12 Hours)

Features and Installation, Setting up Path, Working with Python Basic Syntax, Variable and Data types, Basic operators, Numbers, Array, Tuples, Dictionary, Date and Time. **String Manipulation** :Accessing Strings, Basic Operations, String slices.

List :Accessing lists, Operations, Working with lists List (Functions).

Decision Making Statement :Boolean Expressions, if-else Statement, Nested if Else Statement, elif Statement, Switch Statement. **Iteration Statement** :The while Statement, for Statement, Nested Loops, Break and Continue statement.

Module II : Functions Operation (10 Hours)

Types of Function, Function Arguments, Passby reference vs value, Recursion Function. Files Operation : Create Text & Binary Files, Different modes of opening a file, Reading and Writing into Files, FilePositions.

Module III : NumPy (10 Hours)

Arrays, Array indexing, Data types, Array math operation, Sequences, Repetitions and Random number, Broadcasting, Polynomial, unique items and the counts.

Module IV : Functional Programming (12 Hours)

Lists, Tuples, Dictionaries, Strings, stacks, queues, lambda function, Standard library functions, multithreading.

Module V : SciPy (12 Hours)

Numpy VS SciPy, File input/output, Special Function, Linear Algebra, Operation, Interpolation, Optimization and fit, Statistics and random numbers, Numerical Integration, Fast Fourier transforms, Image manipulation.

Module VI : GUI Programming (08 Hours)

Example GUI Program, Environment Variables, Label, Message Widget, Text Area, Button, Radio Button, CheckBox, Listbox/ DropDown Box, Frames, Menu Widget, Menu Button Widget, Scrollbar, Forms, Sliders, Database access, Sending email.

Module VII: Data Visualization (11 Hours)

Visualization Libraries, Data frame : Data types, Attributes, methods (mean(), median(), std(), var(), cor(), min()/ max(), describe()), groupby method, Selecting Column, Filtering, Selecting row and column, Missing values, Data read from excel, CSV and txt file. **Plotting using Matplotlib** :Basic plot(), Histogram, Bar Plot, Box Plots, Area Plot, Scatter Plot, PieChart.

Text Books:

1. Fabrizio Romano, Learn Python Programming - Second Edition, Packt Publishing Limited, June 2018
2. Mark Lutz , Learning Python, O'Reilly 5th edition
3. Robert Johansson, Numerical Python, Apress 2nd edition
4. Kirthi Raman, Mastering Python Data Visualization, PACKT publishing 2015

Reference Books:

1. Wes McKinney , "Python for Data Analysis, O'Reilly 2nd edition 2017
5. SciPy and NumPy , Eli Bressert,O'Reilly 1st edition

Online Source:

1. Michael Dawson, Python Programming for the Absolute Beginner, Premier Press (ebook)
2. J.R. Johansson, Introduction to scientific computing with Python (<http://www-star.st-and.ac.uk/~pw31/CompAstro/IntroToPython.pdf>)

Object Oriented Programming Using Java

Course Title	Code	Type of course	T-P-PJ	Prerequisite
Object Oriented Programming using Java	ENFC0902	Theory + Practice + Project	1-1-1	Nil

Objective:

- To learn why Java is useful for the design of desktop and web applications.
- To learn how to implement object-oriented designs with Java.
- To identify Java language components and how they work together in applications.
- To design and program stand-alone Java applications.
- To learn how to design a graphical user interface (GUI) with Java Swing.
- To understand how to use Java APIs for program development.

Course Outcome:

- Able to understand the use of OOPs concepts.
- Able to solve real world problems using OOP techniques.
- Able to understand the use of abstraction.
- Able to understand the use of Packages and Interface in java.
- Able to develop and understand exception handling, multithreaded applications with synchronization.

Able to **design** GUI based applications and **develop** applets for web applications.

Evaluation Systems

Internal Examination	Component	% of Marks	Method of Assessment
	Internal Theory	40 (30+5+5)	Written examination + Assignment + Attendance
	Internal Practice	50 (40+10)	Lab Work
	Internal Project	50	Project Work
External Examination	External Theory	60	Written examination
	External Practice	50	Lab Work
	External Project	50	Project Work + Report
Total		300	

Course Outline

Module: I Problem Solving Techniques & OOP (10 hrs)

Problem Solving Techniques: Ask Questions, Look for things that are familiar, solve by analogy, Means Ends Analysis, Divide and Conquer, The building block approach, Merging solutions, Mental Block : The Fear of Starting, Object Oriented Problem Solving, and Case Study. Programming: Programming Language, Skeleton, Compilation, Interpretation, and Execution of Program.

Object-Oriented Programming: Object Oriented Concepts, Java Programming Environment,

Feature of Java, Elements of Java Program : Identifier, Naming Conventions, Build-in Type, Variable, Operators, Control Statements, Loops, Typecasting, Arrays,

Module : II Class & Characteristics of OOPs (12 hrs)

Classes : Concept of Objects and Classes, Using Methods, Local Variables, Instance Variables, Constructor, Overloading Constructor, Overloading Methods, Garbage Collection, The Finalize Method, Static, Final and this Keyword. Inheritance and Polymorphism : Basics, Access Modifier, The super Keyword, Method Overriding, Dynamic Method Dispatch, Abstract Classes, Inner Classes.

Module :III Package and Interface (12 hrs)

Packages : Packages, Access Protection, Importing Package Interfaces : Interface, Implementing Interfaces.

Module :IV String Handling and Exception Handling (10 hrs)

StringHandling : String, String Buffer, String Builder. Excepting Handling :Fundamentals, Checked and Unchecked Exceptions, Using Try, Catch, MultipleCatches, Throw, Throws, Finally, Java's Built-In Exceptions, User-Defined Exception.

Module-V : Multi-Threading (10 hrs)

Multi-Threading : Java Thread Lifecycle Model, Thread Priorities, Synchronization, Creating Threads, Using Different Thread Methods, Wrapper Classes, Clone (java.lang), Collection API, Vectors(java.util).

Module-VI:Java.IO and AWT (10 hrs)

Java.IO : I/O Streams, Serialization AWT : AWT Classes, Window Fundamental, Component, Container, Panel, Window, Frame, Canvas, Control Fundamentals, Layout Managers.

Module: VIIEvent Handling (10 hrs)

Event Handling : Delegation Event Model, Event Classes, Event Listener Interfaces, and Adapter Classes, Handling Events by Extending AWT Components

Text Books:

1. Walter Savitch, "Java-An Introduction to Problem Solving& Programming", 8th edition, in Pearson, 2017.
2. Herbert Schildt, "Java Complete Reference", 10th edition, in McGraw-Hill Education, 2017.

Reference Books:

1. Bhavé & Patekar, “Programming with Java” in Pearson Education, 2008.
2. H.M. Deitel & Paul J. Deitel, “Java How to Program” in PHI, 9th Edition, 2012.

Online Source: javatpoint.com,

<http://www.corejavaguru.com>

<https://www.w3schools.in/java-tutorial/>

Web Technologies

Course Title	Code	Type of course	T-P-PJ	Prerequisite
Web Technologies	ENFC0903	Theory + Practice + Project	1-1-1	Nil

Objective:

- Understand client server architecture and able to use the skills for web project development

Course Outcome:

- Develop a static, interactive and well-formed webpage using JavaScript, CSS3 and HTML5
- Use PHP7 to improve accessibility of a web document

Evaluation Systems

Internal Examination	Component	% of Marks	Method of Assessment
	Internal Theory	40 (30+5+5)	Written examination + Assignment + Attendance
	Internal Practice	50 (40+10)	Lab Work
	Internal Project	50	Project Work
External Examination	External Theory	60	Written examination
	External Practice	50	Lab Work
	External Project	50	Project Work + Report
Total		300	

Course Outcome

Module: I HTML5: (10 hrs)

Editors, Attributes, Head, Meta, Body, Style, Paragraphs, Headings, Bold, Line Breaks, Horizontal Rule, Upload, Textarea, Charset, URL Encoding, XHTML, Semantics, Migration, Syntax, Canvas, SVG, Audio, Video, API's, Geolocation, Drag/Drop, Local Storage, Web Workers, App Cache

Module: II CSS3 (10 hrs)

Introducing CSS3, What is CSS3?, The History of CSS, Browser Support, Selectors and Pseudo Classes, Attribute Selectors, The Target Pseudo-Class, UI Element States Pseudo-Classes, Negation Pseudo-Class, Structural Pseudo-Classes, Fonts and Text Effects, Fonts on the Web, Font Services, Gradients, Rounded Corners, Box Shadow, Transitions, Transforms, and Animations, Transitions and Transforms, Transitions.

Module: III Java Script, XML (12 hrs)

Basics, Functional programming, Object oriented programming, Client-side applications, Server-side applications, Design patterns and Idioms, Popular frameworks.
XML Basics, SAX, DOM, Xpath, Digester, XUL, SOAP, WSDL

Module: IV PHP (12 hrs)

Introduction to PHP, Installation of PHP and mySql, PHP configuration in IIS & Apache Web Server and features of PHP, Writing PHP, How PHP code is parsed, Embedding PHP and HTML, Executing PHP and viewing in Browser, Data types, Operators, PHP variables : static and global variables, Comments in PHP, Control Structures, Condition statements, If...Else Switch, ? Operator, Loops, While, Break Statement, Continue, Do... While, For, For each, Exit, Die, Return, Arrays in PHP

Module: V Advanced PHP(10 hrs)

Working With Data Form Element, Input Elements, Validating The User Input, Passing Variables Between Pages, Passing Variables Through A Get, Passing Variables Through A Post, Passing Variables Through A Request, Functions, Handling Sessions And Cookies, Concept Of Session, Starting Session, Modifying Session Variables, Unregistering And Deleting Session Variable, Concept Of Cookies, Handling Of Cookies, Introduction Of MySQL, Types Of Tables In Mysql, Query In Mysql : Select, Insert, Update, Delete, Truncate, Alias, Order By, Database Connectivity Of Php With Mysql

Module: VI Mysqli (10 hrs)

Data Definition Statements, Data Manipulation Statements, Transactional and Locking Statements, Replication Statements, Prepared SQL Statement Syntax, Compound-Statement Syntax, Database Administration Statements, Utility Statements, Connection with PHP and Mysql using PDOs

Module: VII CMS (10 hrs)

BootStrap, Joomla, Wordpress, Drupal with project implementation

Text Books

1. HTML 5 Black Book (Covers CSS3, JavaScript, XML, XHTML, AJAX, PHP, jQuery) 2Ed By DT Editorial Services.
2. [Web Technologies: HTML, JAVASCRIPT, PHP, JAVA, JSP, ASP.NET, XML and Ajax, Black Book: HTML...](#) by Kogent Course Solutions Inc.
3. MySQL(TM): The Complete Reference, Vikram Vaswani
4. PHP: The Complete Reference, Steven Holzner
5. Beginning HTML5 and CSS 3, Copyright © 2012 by Richard Clark, Oli Studholme, Christopher Murphy and Divya Manian.

Software Engineering using Agile

Course Title	Code	Type of course	T-P-PJ	Prerequisite
Software Engineering using Agile	ENFC0904	Theory + Practice + Project	1-1-1	Nil

Objective

- Explain the phases of Software Development.
- Teach the customer requirement gathering techniques.
- Familiarize with Agile software development methods.
- Demonstrate the testing techniques.
- Teach Software Design techniques

Course Outcome:

- List the steps involved in software development.
 - Interpret the myths of software.
 - Analyze various software process models
 - Explain agile software development model
 - Identify the functional and non-functional requirements for software development
 - Analyse user requirements for a software
- Apply agile software development model (L3)
 Identify different requirement modeling strategies (L2)
 Design UML Diagrams for the given problem (L6)

Evaluation Systems

	Component	% of Marks	Method of Assessment
Internal Examination	Internal Theory	40 (30+5+5)	Written examination + Assignment + Attendance
	Internal Practice	50 (40+10)	Lab Work
	Internal Project	50	Project Work
External Examination	External Theory	60	Written examination
	External Practice	50	Lab Work
	External Project	50	Project Work + Report
Total		300	

Course Outline

Module: I Software Engineering Process: (10 hrs)

The Nature of Software, The Unique Nature of WebApps, Software Engineering, The Software Process, Software Engineering Practice, Software Myths, How It All Starts. A Generic Process Model, Process Assessment and Improvement, Prescriptive Process Models, Specialized Process Models, The Unified Process, Personal and Team Process Models, Process Technology.

Module: II Agility (10 hrs)

What Is Agility?, Agility and the Cost of Change, What Is an Agile Process?, Extreme Programming (XP), Other Agile Process Models, A Tool Set for the Agile Process, Software Engineering Knowledge , Core Principles, Principles That Guide Each Framework Activity, Requirements Engineering, Establishing the Groundwork, Eliciting Requirements, Developing Use Cases, Building the Requirements Model, Negotiating Requirements, Validating Requirements.

Module: III UML Models (12 hrs)

Requirements Analysis, Scenario-Based Modeling, UML Models That Supplement the Use Case, Data Modeling Concepts, Class-Based Modeling, Requirements Modeling Strategies, Flow-Oriented Modeling, Creating a Behavioral Model, Patterns for Requirements Modeling, Requirements Modeling for WebApps.

Module: IV Software Design (12 hrs)

Design within the Context of Software Engineering, The Design Process, Design Concepts, The Design Model, Software Architecture, Architectural Genres, Architectural Styles, Assessing Alternative Architectural Designs, Architectural Mapping Using Data Flow.

Module: V Software Design

What Is a Component?, Designing Class-Based Components, Conducting Component-Level Design, Component-Level Design for WebApps, Designing Traditional Components, Component-Based Development.

Module: VI Software Interface (10 hrs)

The Golden Rules, User Interface Analysis and Design, Interface Analysis, Interface Design Steps, WebApp Interface Design, Design Evaluation, A Strategic Approach to Software Testing, Strategic Issues, Test Strategies for Conventional Software, Test Strategies for Object-Oriented Software, Test Strategies for WebApps, Validation Testing, System Testing.

Module: VII Software Testing (10 hrs)

The Art of Debugging, Software Testing Fundamentals, Internal and External Views of Testing, White-Box Testing, Basis Path Testing

Internet of Things

Course Title	Code	Type of course	T-P-PJ	Prerequisite
Internet of Things	ENFC1407	Workshop	0-2-0	Nil

Objective

- Introduce the fundamental concepts of IoT and physical computing
- Expose the student to a variety of embedded boards and IoT Platforms
- Create a basic understanding of the communication protocols in IoT communications.

Course Outcome:

- Explain IOT architecture.
- Interpret the design principles that govern connected devices
- Summarize the roles of various organizations for IOT
- Explain the basics of microcontrollers
- Outline the architecture of Arduino
- Develop simple applications using Arduino

Evaluation Systems

	Component	% of Marks	Method of Assessment
Internal Examination	Internal Practice	100	Workshop
	Total	100	

Course Outline

Module: I

The Internet of Things : An Overview; The Flavour of the Internet of Things; The “Internet” of “Things”; The Technology of the Internet of Things; Enchanted Objects; Who is Making the Internet of Things?; Design Principles for Connected Devices; Calm and Ambient Technology; Privacy; Keeping Secrets; Whose Data Is It Anyway?; Web Thinking for Connected Devices; Small Pieces, Loosely Joined; First-Class Citizens On The Internet; Graceful Degradation ; Affordances

Module: II

Embedded Computing Basics; Microcontrollers; System-on-Chips; Choosing Your Platform; Arduino; Developing on the Arduino; Some Notes on the Hardware; Openness;

Module: III

Raspberry Pi ; Cases and Extension Boards; Developing on the Raspberry Pi; Some Notes on the Hardware; Openness; Other notable platforms; Mobile phones and tablets; Plug Computing : Always-on Internet of Things

Module: IV

Internet Principles; Internet Communications : An Overview IP; TCP; The IP Protocol Suite (TCP/IP); UDP ; IP Addresses; DNS ; Static IP Address Assignment ; Dynamic IP

Module: V

Address Assignment; IPv6 ; MAC Addresses ; TCP and UDP Ports An Example : HTTP Ports ; Other Common Ports; Application Layer Protocols- HTTP; HTTPS : Encrypted HTTP ; Other Application Layer Protocols

Module: VI

Getting Started with an API; Mashing Up APIs; Scraping; Legalities; Writing a New API; Clockodillo; Security; Implementing the API; Using Curl to Test; Going Further;

Module: VII

Real-Time Reactions; Polling; Comet; Other Protocols ; MQ Telemetry Transport; Extensible Messaging and Presence Protocol; Constrained Application Protocol

Build Your Own Computer

Course Title	Code	Type of course	T-P-PJ	Prerequisite
Build your Own Computer	ENFC1402	Workshop	0-2-0	Nil

Objective:

- Develop ability to understand the internals of Computer and peripherals
- To have an overall idea about networking concepts and devices
- To have an overall idea about secure computing

Course Outcome:

- Build your computing device
- Troubleshoot various faults in a computer system and network
- Construct small LAN for resource sharing

Evaluation Systems

	Component	% of Marks	Method of Assessment
Internal Examination	Internal Practice	100	Workshop
	Total	100	

Course Outline

Module: I

Firmware upgrades/flash BIOS, BIOS component information, BIOS configurations, Built-in diagnostics, Monitoring. Sizes of cabinet, Expansion slots, RAM slots, CPU sockets, Chipsets, CMOS battery, Power connections and types, Fan connectors, Front/top panel connectors, Bus speeds, Resetbutton.

Module :II

Types of RAM, Single channel vs. dual channel vs. triple channel, RAM compatibility. Sound cards, Video cards, Network cards, USB cards, Firewire cards, Thunderbolt cards, Storage cards, Modem cards, Wireless/cellular cards, TV tuner cards, Video capture cards, Risercards.

Module :III

Display types, Refresh/frame rates, Resolution, Native resolution, Brightness/lumens, Analog vs. digital, Privacy/antiglare filters, Multiple displays, Aspect ratios. Display cable and connector types.

Module :IV

Drives, Magnetic hard disk drives, Hot swappable drives, Solid state/flash drives, RAID

types, Tape drive, Media capacity.

Module :V

Socket types – Intel and AMD, Characteristics, Cooling – Heat sink, fans, thermal paste.
Connector type, characteristics and their voltages

Module :VI

Input and Output devices, network cable and connectors, crimping of network cable. Hardware and network troubleshooting. Assembling and disassembling of computer and laptop

Module :VII

Installation of DOS and Non-DOS operating system – Automatic and Manual Configurations

Cloud Computing Application

Course Title	Code	Type of course	T-P-PJ	Prerequisite
Cloud Computing Application	ENFC1403	Workshop	0-2-0	Nil

Objective

- Learn fundamentals of cloud computing
- Learn to build distributed applications and micro services with AWS Step Functions
- Learn step-by-step to setup up AWS platform

Course outcome

- Setup AWS Account and AWS infrastructure
- Deploying serverless micro services
- Implementing scalability and implementing high availability

Evaluation Systems

	Component	% of Marks	Method of Assessment
Internal Examination	Internal Practice	100	Workshop
	Total	100	

Course outline

Module: I (8 Hrs)

UNDERSTANDING CLOUD BASICS

Defining cloud computing, Introducing public, private, and hybrid clouds, Introducing cloud service models – IaaS, PaaS, and SaaS, Introducing multi-tenancy models, Compare cloud value proposition with conventional models. Understand Global Infrastructure – Region, Availability Zones, Edge Locations; Setting up AWS account, Getting Familiarity with AWS Management Console; Understanding cloud-based workloads

Module: II (10 Hrs)

DESIGNING CLOUD APPLICATIONS

Introducing cloud-based multitier architecture, Designing for multi-tenancy, Understanding cloud applications design principles, Understanding emerging cloud-based application architectures, Estimating your cloud computing costs, A typical e-commerce web application

Module: III (8 Hrs)

INTRODUCING AWS COMPONENTS

AWS components, managing costs on AWS cloud, Application development environments
Setting up the AWS infrastructure

Module: IV (8 Hrs)**DESIGNING FOR AND IMPLEMENTING SCALABILITY**

Defining scalability objectives, Designing scalable application architectures, Leveraging AWS infrastructure services for scalability, Evolving architecture against increasing loads, Event handling at scale, setting up Auto Scaling

Module: V (8 Hrs)**DESIGNING FOR AND IMPLEMENTING HIGH AVAILABILITY**

Defining availability objectives, Nature of failures, Setting up high availability

Module: VI (8 Hrs)**DESIGNING FOR AND IMPLEMENTING SECURITY**

Defining security objectives, Understanding the security responsibilities, Best practices in implementing AWS security, Setting up security

Module: VII (10 Hrs)**DEPLOYING TO PRODUCTION AND GOING LIVE**

Managing infrastructure, deployments, and support at scale, Creating and managing AWS environments using CloudFormation, Using CloudWatch for monitoring, Using AWS solutions for backup and archiving, Planning for production go-live activities, Setting up for production

E-content : www.awseducate.com

https://aws.amazon.com/getting-started/use-cases/?awsf.getting-started-content=*default

Text Books :

Aurobindo Sarkar, Amit Shah, Learning AWS - Second Edition, Packt Publishing Limited, February 2018, ISBN 9781787281066

Reference Books:

Vipul Tankariya, AWS Certified SysOps Administrator - Associate Guide, Packt Publishing Limited August 2018, ISBN 9781788990776

John Stamper, Sean Senior, Kevin E. Kelly, Biff Gaut, Tim Bixler, Hisham Baz, Joe Baron, AWS Certified Solutions Architect Official Study Guide, John Wiley & Sons, October 2016, ISBN : 9781119138556

Online Source :

<https://aws.amazon.com/>

<https://www.awseducate.com/faqs?app=3>

Session Plan

Topic coverage and Internal Test	No. of Sessions (in hrs.)	Activity (lecture, tutorial, lab practice, field studies/field-trip, Workshop etc.)	Assignment (project, assignment, field study, seminar,	Suggested Reading (Book, Video, Online source,

Defining cloud computing, Introducing public, private, and hybrid clouds	2	Lecture	Assignment	Text Book -1
Introducing cloud Service models – IaaS, PaaS, and SaaS, Introducing multi-tenancy models	2	Lecture	Assignment	T.B-1
Understanding cloud-based workloads, Setting up AWS account	2	Lab Practice	Experiment	T.B-1
Introducing cloud-based multitier architecture, Designing for multi-tenancy	2	Lab Practice	Experiment	T.B-1
Understanding cloud applications design principles, Understanding emerging cloud-based application architectures	2	Lab Practice	Experiment	T.B-1
Estimating your cloud computing costs, A typical e-commerce web application	2	Lab Practice	Experiment	T.B-1
AWS components, Managing costs on AWS cloud	2	Lab Practice	Experiment	T.B-1
Application development environments	2	Lab Practice	Experiment	T.B-1
Setting up the AWS infrastructure	2	Lab Practice	Experiment	T.B-1
Defining scalability objectives, Designing scalable application architectures	4	Lab Practice	Experiment	T.B-1
Leveraging AWS infrastructure services for scalability	4	Lab Practice	Experiment	T.B-1
Evolving architecture against increasing loads	2	Lab Practice	Experiment	T.B-1
Event handling at scale , Setting up Auto Scaling	4	Lab Practice	Experiment	T.B-1
Defining availability objectives, Nature of failures, Setting up high availability	6	Presentation, Lab Practice	Assignment, Experiment	T.B-1

Defining security objectives, Understanding the security responsibilities	3	Lab Practice	Experiment	T.B-1
Best practices in implementing AWS security, Setting up security	4	Lab Practice	Experiment	T.B-1
Managing infrastructure, deployments, and support at scale	3	Lab Practice	Experiment	T.B-1
Creating and managing AWS environments using CloudFormation	3	Lab Practice	Experiment	T.B-1
Using CloudWatch for monitoring	2	Lab Practice	Experiment	T.B-1
Using AWS solutions for backup and archiving	2	Lab Practice	Experiment	T.B-1
Planning for production go-live activities, Setting up for production	3	Lab Practice	Experiment	T.B-1
Total (hrs)	60			

Centurion University of Technology and Management Odisha

Choice Based Credit System

Course Structure & Syllabus

BASKET - IV



CENTURION UNIVERSITY OF TECHNOLOGY AND MANAGEMENT

School of Engineering & Technology

2018

**Course Structure
Basket-IV Civil
Engineering**

Course Code	Course Title	Course Type	Credit	Prerequisite
CECC0103	Hydraulics & Hydraulic Machines	Theory	2	Basic fluid mechanics
CECC0102	Disaster Preparedness & Planning Management	Theory	2	Nil
CECC0201	Estimation & Quantity Surveying	Practice	2	Nil
CECC0202	Pre-Fabricated Structures	Practice	2	Nil
CECC0412	Concrete Technology	Theory+Practice	2	Nil
CECC0401	Soil Mechanics	Theory + Practice	3	Nil
CECC0402	Foundation Engineering	Theory + Practice	3	Soil Mechanics
CECC0403	Transportation Engineering	Theory + Practice	4	Nil
CECC0415	Water supply & Waste water Management	Theory + Practice	3	Nil
CECC0416	Hydrology & Water Resources Engineering	Theory + Practice	3	Nil
CECC0414	Quality Control and Risk Management in Construction	Theory + Practice	3	Nil
CECC0407	Computer Aided Design of Steel Structure	Theory + Practice	3	Nil
CECC0408	Computer Aided Design of Concrete Structures	Theory + Practice	3	Nil
CECC0413	GIS and Digital Cartography	Theory + Practice	4	Nil
CECC0411	Strength of Material	Theory + Practice	3	Engineering Mechanics
CECC0501	Functional planning and DPR	Theory + Project	3	Nil
	Total		45	

Hydraulics & Hydraulic Machine

Course Title	Code	Type of course	T-P-PJ	Prerequisite
Hydraulics & Hydraulic machines	CECC0103	Theory	2-0-0	Basic Fluid Mechanics

Objective

<ul style="list-style-type: none"> To teach the common manifestations of boundary layer concepts and its effect upon any immersed and moving object and providing students the necessary background in real open channel flow
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Course outcome

<ul style="list-style-type: none"> The students will gain knowledge of basic fluid properties in real flow engineering contexts of uniform and non-uniform flow in open channels of best economic section and channels flowing at uniform depth with transition and under the hydraulic jump and open channel Hydraulics with basics of Hydraulic machines such as pumps and turbines. Students shall develop skill on operation procedure of hydraulic machines and pumps.

Evaluation Systems

	Component	% of Marks	Method of Assessment
Internal Examination	Internal Theory	30	Written Examination
	Assignment	5	Report or Presentation + Learning Record
	Attendance	5	Based on class Attended
External Examination	External Theory	60	Written Examination
Total		100	

Course outline

Module I: BOUNDARY LAYER THEORY (6 Hrs.)

Basic Concepts of Boundary Layer; Development of Boundary Layers on a flat plate; Laminar & Turbulent Boundary Layers; Velocity Distribution with in Boundary Layer; Thickness of Boundary Layer; Viscous Drag; Displacement Thickness; Momentum thickness and Energy Thickness; Integral Momentum Equation; Drag Coefficients .

Module II: FLOW PAST IMMERSED BODIES , (4 hours)

; Drag and Lift on bodies ; Various types of Drag; Drag Coefficient; Variation of drag with Reynolds number for flow around cylinder; sphere; Flow around rotating cylinder; Magnus Effect; Stagnation Points; Lift and Drag on Rotating Cylinder.

Module III: PRINCIPLES OF OPEN CHANNEL FLOW (4hrs.)

Introduction & Classification of Open Channel Flow; difference between pipe and open channel flow; definition of terms; Wetted Perimeter; Hydraulic Mean Depth; Hydraulic Radius; Prismatic Channel; Velocity and Pressure Distribution in Open Channels; Basic Equations; Chezy's Equation; Manning's Equation; Uniform Flow; Normal Depth; Concept of Most Efficient Sections; Most Efficient Rectangular and Trapezoidal Sections.

Module IV: ENERGY PRINCIPLES (All discussions w.r.t. to Rectangular and Trapezoidal channels) (4 hrs)

Continuity and Energy equations in Open Channel Flows; Specific Energy; Specific Energy Diagram; Critical Flow; Froude Number; Critical Depth; Subcritical and Supercritical Flows Specific Energy.

Module V: RAPIDLY VARIED FLOW (All discussions w.r.t. to Rectangular channels) (4 hrs)

Momentum Principle in Open Channels; Specific Force; Conjugate Depths; Hydraulic Jump ; Gradually Varied Flow in Open Channels (All discussions w.r.t. to Rectangular channels); Introduction to Varied Flow; Gradually Varied Flow and rapidly Varied Flow; Governing Equation for GVF.

Module VI: HYDRAULIC MACHINES (PUMPS) (4Hrs)

Functions and general working principles of Turbines; Types of pumps; Centrifugal and Reciprocating pumps; relative Advantages; Selection of type of pump; centrifugal Pumps; component Parts of a Centrifugal Pump working principles; priming work done by impeller Classification of centrifugal pumps; Minimum starting speed of centrifugal Pumps Reciprocating Pumps; Component parts and working of reciprocating pumps; Slip and cavitation in pumps.

Module VII: HYDRAULIC MACHINES (TURBINES) (4Hrs)

(Numerical problems on velocity triangles; computations of work done and efficiencies of turbines not to be included in the university examination)

Basics of hydropower plants; Classification of Turbines; Impulse and Reaction Turbines; Selection of type of turbine; Working principle of Impulse turbines; Pelton wheel; component parts; Work done by Pelton wheel; Definitions of heads and efficiencies; Gross head & Net head; Mechanical; volumetric & overall efficiencies; Reaction turbines; Working principles of reaction

turbines; Francis and Kaplan turbine; Efficiency of turbines; mechanical; hydraulic and overall efficiency; (Numerical problems on Kaplan & Propeller turbines not to be part of external examination)

Reference Text Books:

1. Jain A. K., 2004, Fluid Mechanics including hydraulic machines, Khanna Publishers, New Delhi
2. Subramanya K., Open Channel Hydraulics, McGraw Hill Education; 3 edition (1 December 2008), pp- 576 pages
3. Rajput R. K., 1996, A Textbook of Fluid Mechanics, S. Chand Publishing, pp-1051
4. Bansal R. K., A text book of fluid mechanics and hydraulic machines, Laxmi Publishers New Delhi, PP 0-1102

Session plan:

PEDAGOGY

<i>Topic coverage and Internal Test</i>	<i>No. of Sessions (in hrs.)</i>	<i>Activity</i>	<i>Assignment (Assignment /Project)</i>	<i>Suggested Reading (Book, Video, Online source, etc.)</i>
Module I				
MODULE I- Basic Concepts of Boundary Layer, Development of Boundary Layers on a flat plate - Laminar & Turbulent Boundary Layers, Velocity Distribution with in Boundary Layer - Thickness of Boundary Layer, Viscous Drag - Displacement Thickness, Momentum thickness and Energy Thickness. Integral Momentum Equation - Drag Coefficients for different velocity distributions in Laminar and Turbulent Boundary Layers. Boundary Layer Separation - Effect of Adverse Pressure Gradient - Control of Boundary Layer Separation(basics only).	6	Theory (PPT mode), class room practice	1	TB4, Chapter 13 http://www.youtube.com/watch?v=cUTkqZeiMow
Module II: (Basic Concept only) Flow past immersed bodies - Pressure distribution around bodies - Circular Disc, Plate held normal to flow, Cylinder and Sphere. Drag and Lift on bodies - Various types of Drag - Drag Coefficient - Variation of drag with Reynolds number for flow around cylinder, sphere, disc and plate held normal to flow. Circulation - Circulation around an inclined Plate - Flow about a Rotating Cylinder - Magnus Effect- Stagnation Points - Lift and Drag on Rotating Cylinder.	4	Theory (PPT mode), class room practice	2	TB4, Chapter 14

<p>MODULE- III: Introduction & Classification of Open Channel Flow, difference between pipe and open channel flow, definition of terms - Wetted Perimeter -Hydraulic Mean Depth - Hydraulic Radius - Prismatic Channel - Velocity and Pressure Distribution in Open Channels- Basic Equations- Chezy's Equation - Manning's Equation- Manning's Coefficient for different Bed Roughness. Uniform Flow -Normal Depth - Concept of Most Efficient Sections - Most Efficient Triangular, Rectangular and Trapezoidal Sections</p>	4	Theory (PPT mode), class room practice	3	TB2, Chapter-8
<p>Module IV:Continuity and Energy equations in Open Channel Flows - Specific Energy - Specific Energy Diagram - Critical Flow - Froude Number - Critical Depth - Subcritical and Supercritical Flows - Canal Transitions - change in Bed width and Bed level - Minimum Specific Energy - Relationship between Critical Depth and Minimum Specific Energy.</p>	4	Theory PPT mode, Class room Practice	4	
<p>MODULE- V: Momentum Principle in Open Channels - Specific Force - Conjugate Depths - Hydraulic Jump - Gradually Varied Flow in Open Channels (All discussions w.r.t. to Rectangular channels), Introduction to Varied Flow - Gradually Varied Flow and rapidly Varied Flow - Governing Equation for GVF-Classification of GVF Profiles - Critical, Mild and Steep Slopes - M1, M2, M3, S1, S2 and S3 only (basics only).</p>	4	Theory PPT mode, Class room Practice	5	TB4, Chapter 16 https://sites.google.com/a/vt.edu/moglen/home/animations-open-channel-flow
<p>MODULE- VI: Introduction to Turbo machinery, Functions and general working principles of Turbines, Types of pumps - Centrifugal and Reciprocating pumps - Relative Advantages, Selection of type of pump, Centrifugal Pumps, component Parts of a Centrifugal Pump working principles - Priming. Work done by impeller – Classification of centrifugal pumps - Minimum starting speed of centrifugal Pumps - Multi stage pumps, Specific Speed of Centrifugal Pumps - Reciprocating Pumps, Component parts and working of reciprocating pumps - Different types.</p>	4	Theory PPT mode, Class room Practice	6	TB4, Chapter 19 and chapter 20

Theoretical Discharge – Coefficient of Discharge and Slip				
MODULE- VII: (Basics only): Basics of HPP, Classification of Turbines - Impulse and Reaction Turbines - Selection of type of turbine, Working principle of Impulse turbines - Pelton wheel - component parts, Work done by Pelton wheel - Definitions of heads and efficiencies, Reaction turbines - Working principles- Francis turbine - Component parts - mechanical, hydraulic and overall efficiency, Types of Draft tubes, surge tank – water hammer, cavitation in draft tubes, working principles of Kaplan turbine.	4	Theory PPT mode, Class room Practice	7	TB4, Chapter 18
Total (hrs.)	30	THEOR Y		

Disaster Preparedness & Planning Management

Course Title	Code	Type of course	T-P-PJ	Prerequisite
Disaster preparedness & Planning Management	CECC0102	Theory	2-0-0	Nil

Objective

- ✓ To teach the Challenges and Impacts posed by Disasters

Course outcome

- ✓ Having successfully completed this course to make the students capable to know various natural hazards that can pose risk to property, lives, and livestock and understanding of the social responsibility towards preparedness for mitigating the damages.

Evaluation Systems

	Component	% of Marks	Method of Assessment
Internal Examination	Internal Theory	30	Written Examination
	Assignment	5	Report or Presentation + Learning Record
	Attendance	5	Based On Class Attended
External Examination	External Theory	60	Written Examination
Total		100	

Course Outline

Module-I: Introduction (3Hrs)

Concepts and definitions: disaster; hazard; vulnerability; risks severity; frequency and details, capacity; impact; prevention and mitigation

Module-II: Disaster(4Hrs)

Classification: Natural disasters floods; draught; cyclones; volcanoes; earthquakes; tsunami; landslides; coastal erosion; soil erosion; forest fires and manmade disasters

Module-III: Industrial Pollution

(4Hrs)

Artificial flooding in urban areas; nuclear radiation; chemical spills; transportation accidents; terrorist strikes; hazard and vulnerability profile of India; mountain ;coastal areas and ecological fragility

Module -IV: Disaster Impacts (5Hrs)

Disaster impacts (environmental, physical, social, ecological, economic, political, etc.); health, psycho-social issues; demographic aspects (gender, age, special needs); hazard locations; global and national disaster trends; climate change and urban disasters

Module-V: Disaster risk Reduction (6Hrs) (DRR) Disaster management cycle its phases; prevention, mitigation; preparedness, relief and recovery; structural and non-structural measures; risk analysis; vulnerability and capacity assessment; early warning systems; Post disaster environmental response water; sanitation; food safety; waste management; disease control; security and communications

Module-VI: Roles and Responsible of Government(3Hrs)

community; local institutions; NGOs and other stakeholders; Policies and legislation for disaster risk reduction; DRR programmes in India and the activities of National Disaster Management Authority

Module-VII: Environment and Development of Disaster(5Hrs) Factors affecting vulnerability such as impact of developmental projects and environmental modifications including of dams; land use changes; urbanization etc. sustainable and environmental friendly recovery reconstruction and development methods

Reference

E-content: NPTEL

Text Books:

1. Pradeep Sahni, 2004, Disaster Risk Reduction in South Asia, Prentice Hall.
2. Singh B.K., 2008, Handbook of Disaster Management: Techniques & Guidelines, Rajat
3. Publication.
4. Ghosh G.K., 2006, Disaster Management, APH Publishing Corporation

Online Source: NPTEL

Session Plan

Topic coverage and Internal Test	No. of Sessions (in hrs.) Theory +Practice	Activity (lecture, tutorial, lab practice, field studies/field -trip, Workshop etc.)	Assignment (Project, Assignment, field study, seminar, etc.)	suggested Reading (Book, Video, Online source, etc.)
Module I				

Concepts and definitions: disaster, hazard	1	Lecture	1.1	Text Book(TB) Chapter(CH)
Vulnerability, risks severity, frequency and details	1	Lecture	1.2	TB ₁ CH ₂
Capacity, impact, prevention, mitigation	1	Lecture	1.3	TB ₁ CH ₂
Sub-Total (hrs)	3			
Module II				
Classification; natural disasters floods	1	Lecture	2.1	TB ₂ CH ₃
Draught, cyclones, volcanoes, earthquakes,	1	Lecture	2.2	TB ₁ CH ₃
Tsunami,landslides, coastal erosion, soil erosion	1	Lecture	2.3	
forest fires etc. manmade disasters	1	Lecture+ Practice	2.4	
Sub-Total (hrs)	4			
Module III				
Artificial flooding in urban areas Nuclear radiation, chemical spills,	1		3.1	TB ₁ CH ₄ ,TB ₂ CH ₄
Transportation accidents, terrorist strikes	1		3.2	TB ₂ CH ₅
Hazard and vulnerability profile of India	1		3.3	TB ₂ CH ₅
Mountain and coastal areas, ecological fragility	1		3.4	TB ₂ CH ₅
Sub-Total (hrs)	4			
Module IV				
Disaster impacts (environmental, physical, social, ecological, economic, political, etc.)	1	Lecture	4.1	TB ₂ CH ₆
Health, psycho-social issues demographic aspects (gender, age, special needs)	2	Lecture	4.2	TB ₂ CH ₆
Hazard locations; global and national disaster trends	1	Lecture	4.3	TB ₂ CH ₆
climate change and urban disasters	1	Lecture	4.4	TB ₂ CH ₇
Sub-Total (hrs)	5			

Module V				
Disaster management cycle its phases; prevention, mitigation, preparedness, relief and recovery	1	Lecture	5.1	TB ₂ CH8
Structural and non-structural measures	1	Lecture	5.2	TB ₂ CH8
Risk analysis, vulnerability and capacity assessment	1	Lecture	5.3	TB ₂ CH8
Early warning systems, Post disaster environmental response	1	Lecture	5.3	TB ₂ CH9
Water, sanitation, food safety, waste management	1	Lecture	5.4	TB ₂ CH9
Disease control, security, communications	1	Lecture	5.5	TB ₂ CH10
Sub-Total (hrs)	6			
Module VI				
Community, local institutions, NGOs and other stakeholders;	1	Lecture	6.1	TB ₃ CH9
Policies and legislation for disaster risk reduction	1	Lecture	6.2	TB ₃ CH9
DRR programmes in India and the activities of National Disaster Management Authority	1	Lecture	6.3	TB ₃ CH11
Sub-Total (hrs)	3			
Module VII				
Factors affecting vulnerability	1	Lecture	7.1	TB ₄ CH8
Impact of developmental projects and environmental modifications	1	Lecture	7.2	TB ₂ CH8
Including of dams, landuse changes, urbanization	1	Lecture	7.3	TB ₂ CH9
Sustainable and environmental friendly recovery	1	Lecture	7.4	TB ₂ CH10
Reconstruction and development methods.	1	Lecture	7.5	TB ₂ CH10
Sub-Total (hrs)	5			
Total (hrs)	30	THEORY		

Course Title: Disaster Preparedness & Planning Management Code: Credit:

The overall aim of this course is to provide broad understanding about the basic concepts of Disaster Management with preparedness as a Civil Engineer. Further, the course introduces the various natural hazards that can pose risk to property, lives, and livestock, etc. and understanding of the social responsibility as an engineer towards preparedness as well as mitigating the damages.

The objectives of the course are i) To Understand basic concepts in Disaster Management ii) To Understand Definitions and Terminologies used in Disaster Management iii) To Understand Types and Categories of Disasters iv). To Understand the Challenges posed by Disasters vi) To understand Impacts of Disasters Key Skills

Outcomes: The student will develop competencies in → the application of Disaster Concepts to Management →Analyzing Relationship between Development and Disasters. → Ability to understand Categories of Disasters and → realization of the responsibilities to society

Proposed Syllabus

Module 1:Introduction - Concepts and definitions: disaster, hazard, vulnerability, risksseverity, frequency and details, capacity, impact, prevention, mitigation).

Module 2:Disasters - Disasters classification; natural disasters (floods, draught, cyclones, volcanoes, earthquakes, tsunami, landslides, coastal erosion, soil erosion, forest fires etc.); manmade disasters (industrial pollution, artificial flooding in urban areas, nuclear radiation, chemical spills, transportation accidents, terrorist strikes, etc.); hazard and vulnerability profile of India, mountain and coastal areas, ecological fragility.

Module 3:Disaster Impacts - Disaster impacts (environmental, physical, social, ecological, economic, political, etc.); health, psycho-social issues; demographic aspects (gender, age, special needs); hazard locations; global and national disaster trends; climate change and urban disasters.

Module 4:Disaster Risk Reduction (DRR) - Disaster management cycle – its phases; prevention, mitigation, preparedness, relief and recovery; structural and non-structural measures; risk analysis, vulnerability and capacity assessment; early warning systems, Postdisaster environmental response (water, sanitation, food safety, waste management, disease control, security, communications); Roles and responsibilities of government, community, local institutions, NGOs and other stakeholders; Policies and legislation for disaster risk reduction, DRR programmes in India and the activities of National Disaster Management Authority.

Module 5:Disasters, Environment and Development - Factors affecting vulnerability such as impact of developmental projects and environmental modifications (including of dams, landuse changes, urbanization etc.), sustainable and environmental friendly recovery; reconstruction and development methods.

Text/Reference Books:

1. <http://ndma.gov.in/> (Home page of National Disaster Management Authority)
2. <http://www.ndmindia.nic.in/> (National Disaster management in India, Ministry of Home Affairs).
3. Pradeep Sahni, 2004, Disaster Risk Reduction in South Asia, Prentice Hall.
4. Singh B.K., 2008, Handbook of Disaster Management: Techniques & Guidelines, Rajat Publication.
5. Ghosh G.K., 2006, Disaster Management, APH Publishing Corporation
6. Disaster Medical Systems Guidelines. Emergency Medical Services Authority, State of California, EMSA no.214, June 2003
7. Inter Agency Standing Committee (IASC) (Feb. 2007). IASC Guidelines on Mental Health and Psychosocial Support in Emergency Settings. Geneva: IASC

Estimation & Quantity Surveying

Course Title	Code	Type of course	T-P-PJ	Prerequisite
Estimation & Quantity Surveying	CECC0201	Practice	0-2-0	Nil

Objective

· To make familiar with calculation of quantities for different item of works & provide knowledge about estimation of buildings through Estimator-2.0 software
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Course outcome

Gain knowledge about how to schedule & estimate different construction works both manually and using software

Evaluation Systems

Internal Examination	Component	% of Marks	Method of Assessment
	Internal Practice	50 (40+10)	Lab work + Learning Record
External Examination	External Practice	50	Lab work
Total		100	

COURSE OUTLINE

Module - I: BUILDING

(16hrs)

Estimations and Quantity Surveying: Reading of Plans, Sections and detailed Drawings Related to buildings; preparation of Quantities and Units.

Practice Sessions:

1. Study of construction drawings and preparation of WBS.
2. Detailed estimates for a Shopping Complex using Estimator-2.0 software.
3. Detailed estimates for a hostel Building using Estimator-2.0 software.
4. Detailed estimates for a hospital using Estimator-2.0 software.

Module -II : CULVERT

(10hrs)

Estimations and Quantity Surveying: Reading of Plans, Sections and detailed Drawings Related to irrigation structures; preparation of Quantities and Units.

5. Detailed estimates (Manual) for a Slab culvert with right angled/ Splayed wing wall.

6. Detailed estimates (Manual) for a box culvert.
7. Detailed estimates (Manual) for a Hume pipe Culvert.

Module -III:ROAD

(6hrs)

Estimations and Quantity Surveying: Reading of Plans, Sections and detailed Drawings Related to Roads structures; preparation of Quantities and Units.

8. Detailed estimates (Manual) for a road.

Module -IV :SLOPED ROOF

(6hrs)

Estimations and Quantity Surveying: Reading of Plans, Sections and detailed Drawings Related to Sloping roof/Roof truss structures; preparation of Quantities and Units.

9. Detailed estimate (Manual) for a timber roof truss.
10. Detailed estimate (Manual) for a roof cover of GI sheets.

Module -V:QUANTITY SURVEY

(06hrs)

Estimations and Quantity Surveying; Preparation of Quantity of materials per unit rate of work; Estimating labour.

11. Quantity of materials required for different items of works in buildings (Manual).
12. Quantity of different types of labor required for different items of works (Manual).

Module-VI: RATE ANALYSIS OF BUILDING

(10hrs)

Specifications; Rate Analysis as per State Govt. and CPWD Standards

13. Development of Excel Sheet for Rates, Specifications and Cost Estimates.
14. Rate Analysis and Cost Estimates for a Shopping Complex using Estimator-2.0 software.
15. Rate Analysis and Cost Estimates for a hostel Building and a hospital, using Estimator-2.0 software.

Module-VII:RATE ANALYSIS OF CULVERT & ROAD (6hrs)

Specifications; Rate Analysis as per State Govt. and CPWD Standards

16. Rate Analysis and Cost Estimates for a Slab culvert with right angled wing wall using Estimator-2.0 software.
17. Rate Analysis and Cost Estimates for an arch culvert using Estimator-2.0 software.
18. Rate Analysis and Cost Estimates for a road using Estimator-2.0 software.

Text Books:

1. Estimating and Costing in Civil Engineering- By B.N.Dutta

Reference Books:

1. Estimating, Costing, Specification & Valuation in Civil Engineering-By M.Chakraborti

Session Plan

Topic coverage and Internal Test	No. of Sessions (in hrs.)	Activity (lecture, tutorial, lab practice, field studies/field-trip, Workshop etc.)	(project, Assignment, field study, seminar, etc.)	Suggested Reading (Book, Video, Online source, etc.)
Module I				
Estimations and Quantity Surveying; Reading of Plans, Sections and detailed Drawings Related to buildings, irrigation structures and Roads; preparation of Quantities and Units. Study of construction drawings and preparation of WBS.	2	lecture	1	RB ₁ ;chapter I & II
Detailed estimates for a Shopping Complex using Estimator-2.0 software.	6	Practice	2	http://estimator.in/tutorial/index.htm https://www.youtube.com/watch?v=d-EP7UM4AZS&list=PLuX_PtBw-QK1-c-B5D8SijfOttjxmHf6 Seen on 11 th Jun, 2019
Detailed estimates for hostel Building using Estimator-2.0 software.	4	Practice		
Detailed estimates for a hospital using Estimator-2.0 software.	4	Practice		
Sub-total (hrs)	16			
Module II				
Detailed estimates (Manual) for a Slab culvert with right angled/Splayed wing wall.	6	Practice	3	TB ₁ ;chapter no-8 page-373 to 414
Detailed estimates (Manual) for a box culvert.	2	Practice		

Detailed estimates (Manual) for a Hume pipe Culvert.	2	Practice		
Sub-total (hrs)	Practice 10			
Module III				
Detailed estimates (Manual) for a road.	6	Practice	4	TB ₁ ; chapter no-7, page-328 to 372
Sub-total (hrs)	Practice 06			
Module IV				
Detailed estimate (Manual) for a timber roof truss	4	Practice	5	RB ₁ ; chapter VII, page-215-299
Detailed estimate (Manual) for a roof cover of GI sheets	2	Practice		
Sub-total (hrs)	Practice 06			
Module V				
Quantity of materials required for different items of works in buildings (Manual).	04	Practice	6	RB ₁ ;chapter XIII, page-415-528
Quantity of different types of labour required for different items of works (Manual).	02	Practice		
Sub-total (hrs)	Practice 06			
Module VI				

Specifications; Rate Analysis as per State Govt. and CPWD Standards. Development of Excel Sheet for Rates, Specifications and Cost	2	Practice	7	TB ₁ ;chapter no-13
Rate Analysis and Cost Estimates for a Shopping Complex using Estimator-2.0 software.	4	Practice		https://www.youtube.com/watch?v=NQIHnHWTRQc&list=PLuX_PtBw-QK1-c-B5D8SiJjfOttjxmHf6&index=10
Rate Analysis and Cost Estimates for a hostel Building and a hospital, using Estimator-2.0 software.	4	Practice		Seen on 12 th Jun, 2019
Sub-total (hrs)	Practice 10			
Module VII				
Rate Analysis and Cost Estimates for a Slab culvert with right angled wing wall using Estimator-2.0 software.	2	Practice	8	https://www.youtube.com/watch?v=NW8ODPKgtFw&list=PLuX_PtBw-QK1-c-B5D8SiJjfOttjxmHf6&index=15
Rate Analysis and Cost Estimates for a arch culvert using Estimator-2.0 software.	2	Practice		Seen on 12 th Jun, 2019
Rate Analysis and Cost Estimates for a road using Estimator-2.0 software.	2	Practice		
Sub-total (hrs)	PRACTICE 06			
Total (hrs)	60	PRACTICE		

Pre-Fabricated Structures

Course Title	Course Code	Type of Course	T-P-PJ	Pre-Requisite
Pre-Fabricated Structures	CECC0202	Practice	0-2-0	Nil

Objective

- To teach the student with emerging technology of prefabrication in construction industry including various processes involved there upon

Course Outcome

- After completion of the courses the students will gain knowledge of the processes of planning, production, storage, transportation and site installation of various prefabricated units pertaining to a civil engineering construction project
- Students will develop innovative ideas about prefabricated structures

Evaluation Systems

Internal Examination	Component	% of Marks	Method of Assessment
	Internal Practice	50 (40+10)	Lab work + Learning Record
External Examination	External Practice	50	Lab work
Total		100	

Course Outline

Module I: INTRODUCTION

(8hrs)

Practice

- Basic knowledge of PEB
- Generation of elevation and section for a utility using AutoCAD, Revit and CATIA .

Module II: TRUSS

(8hrs)

Practice

- Design of the truss through STAAD PRO
- Report on materials mix and Pre tensioning

Module III: PANEL AND BEAM**(8hrs)**

- 5: Estimation of panel and beam lengths and number.
- 6: Estimation of the structure through ESTIMATOR 2.0.

Module IV: SLAB & INTRODUCTION OF MS-PROJECCT**(10hrs)**

- 7: Project scheduling through MS Project
- 8: Casting of slab panels as per the requirement of the proposed structure.

Module V: SITE CLEARANCE**(12hrs)**

- 9: Casting of beam panels as per the requirement of the proposed structure.
- 10: Site clearance and marking.
- 10: Fixing of slab panels

Module VI: FABRICATION**(6hrs)**

- 11: Fabrication & Finishing of roof panels
- 12: Erection of roof panels & beams

Module VII: CONSTRUCTION EQUIPMENT**(8 hrs)**

- 13: Fining of work
- 14: Equipment safety and operation & Report on Maintenance work

References

IS.15916.2011code book.

Online Resources

1. NPTEL

Session Plan

Topics	No. of Sessions (in hrs)	Activity	Assignment	Suggested Reading
Module I[6 Hours Practice]				
INTRODUCTION Basic knowledge of PEB	2	Practice	1.1-1.2	Online Source
Generation of elevation and section for a utility using AutoCAD, Revit and CATIA	6	Practice		Online Source
Module II[8 Hours Practice]				

TRUSS				
Design of the truss through STAAD PRO	4	Practice	2.1-2.2	Online Source
Report on materials mix and Pre tensioning	4	Practice		Online Source
Module III[8 Hours Practice]				
PANEL AND BEAM				
Estimation of panel and beam lengths and nos.	4	Practice	3.1-3.2	Online Source
Estimation of the structure through ESTIMATOR 2.0.	4	Practice		Online Source
Module IV[10 Hours Practice]				
SLAB & INTRODUCTION OF MS-PROJECT				
Project scheduling through MS Project	4	Practice	4.1-4.2	Online Source
Casting of slab panels as per the requirement of the proposed structure.	6	Practice	Field study	Online Source
Module V[12 Hours Practice]				
SITE CLEARANCE				
Casting of beam panels as per the requirement of the proposed structure.	4	Practice	Field Study	Online Source
Site clearance and marking.	2	Practice	Field Study	Online Source
Fixing of slab panels	6	Practice	Field Study	Online Source
Module VI[12 Hours Practice]				
FABRICATION				
Fabrication of roof panels	4	Practice	Field Study	
Erection of roof panels	2	Practice	Field Study	
Sub total	8			
Module VII[8 hours practice]				
Finishing work	4	Practice	Field Study	
CONSTRUCTION	2	Practice	Field Study	

EQUIPMENT Equipment safety and operation				
Report on Maintenance work	2	Practice	Field Study	
Total(Hours)	(64 Hours Practice)			

Concrete Technology

Course Title	Code	Type of course	T-P-PJ	Prerequisite
Concrete Technology	CECC0412	Theory+ Practice	1-1-0	Nil

Objective

- To teach the student about different property of concrete and its use in different work.

Course outcome

- Students will able to apply core concepts of Concrete technology to solve engineering problems.

Evaluation Systems

Internal Examination	Component	% of Marks	Method of Assessment
	Internal Theory	20	Written Examination
	Internal Practice	30(20+10)	Lab work + Learning Record
External Examination	External Theory	30	Written Examination
	External Practice	20	Lab Work
Total		100	

COURSE OUTLINE

Module I :Properties of Cement (6Hrs)

Cement-Different types Chemical composition and Properties Tests on cement-IS Specifications; Portland cement chemical composition Hydration; Setting of cement Structure of hydrate cement Test on physical properties for Different grades of cement

Practice 1

1. XRF analysis of cement
2. Specific gravity of cement (comparison study)

Practice 2

3. Compressive strength of cement(comparison study)
4. Soundness test of cement (comparison study)
5. Setting time(comparison study)

Module II: Aggregates(5Hrs)

Classification; Mechanical properties and tests as per BIS Grading requirements Classification of aggregate Particle shape & texture strength & other mechanical properties of aggregate Specific gravity; Bulk density; porosity; adsorption& moisture content of aggregate Bulking of sand

Practice 3

6. Specific gravity of coarse aggregate
7. Specific gravity of fine aggregate

8. Zoning of aggregates
9. Water absorption of coarse aggregate

Module III :PROPERTIES OF CONCRETE (4Hrs)

Workability- Factors affecting workability; Measurement of workability by different tests Setting times of concrete; Effect of time and temperature on workability Segregation & bleeding Mixing and vibration of concrete

Practice 4 Workability test of Fresh Concrete by

10. Slump cone method
11. Compaction factor method
12. Flow table method
13. Preparation of cube mould for durability test

Module IV : CHEMICAL AND MINERAL ADMIXTURES(6 Hrs)

Accelerators; Retarders; Plasticizers- Super plasticizers; Water proofers ;Mineral Admixtures like Fly; Ash, Silica Fume; Ground Granulated Blast Furnace Slag and Metakaoline Their effects on concrete properties

Practice 14. Preparation of Design Mix of concrete

Practice 15.: Prepare the design mix using Retarder and Accelerator

Module V :SPECIAL CONCRETE(10Hrs)

Special Concretes: Introduction to light weight concrete ;Cellular concrete no-fines concrete high density concrete fiber reinforced concrete

Practice 16: Preparation of Fiber reinforced concrete

Practice 17:Preparation of Light weight concrete mix and reactive Powder concrete

Practice 18: Preparation of concrete with plastic aggregates

Practice 19: Design of concrete using construction demolition waste

Module VI :PROPERTIES OF HARDENED CONCRETE (11Hrs)

Properties of Hardened concrete Determination of Compressive and Flexural strength by Destructive tests and non-destructive tests.

Practice 20: Splitting tensile strength of cylinder and Flexural strength of beam

Practice 21: Compressive strength of cube and cylinder specimen

Practice 22: Stress-strain curve for concrete Determination of Young's Modulus.

Practice 23:

- (a) Non-destructive tests by Rebound hammer.
- (b) Destructive tests by core cutter.

Module VII :Durability of Concrete (3 Hrs)

Factors affecting durability; Tests for durability of concrete

Practice 24:

- (a) Carbonation test for concrete.
- (b) Resistance to chemical attack (Sulphate attack, chloride attack)

Text Books:

- 1. M.S Shety, S. CHAND Publication

Reference Books:

- 1. Indian standards for tests on concrete materials and mix design.

Session Plan

Topic coverage and Internal Test	No. of Sessions (in hrs.) Theory +Practice	Activity (lecture, tutorial, lab practice, field studies/field -trip, Workshop etc.)	A (Project, A, field study, seminar, etc.)	Suggested Reading (Book, Video, Online source, etc.)
Module I [2hrs.Lecture+4hrs.Practice]				
Cement-Different types Chemical composition and Properties -Tests on cement-IS Specifications- Portland cement – chemical composition	1+0=1	Lecture	1.1	Text Book(TB) Chapter(CH)- 1&2
Hydration, Setting of cements Structure of hydrate cement. Test on physical properties for Different grades of cement	1+0=1	Lecture	1.2	TB CH-2
XRF analysis of cement Specific gravity of cement (comparison study)	0+2=2	Practice		TB CH-2

Compressive strength of cement(comparison study) Soundness test of cement (comparison study)	0+2=2	Practice		TB CH-2
Module II [3 hrs.Lecture+2 hrs. Practice]				
Aggregates-Classification-Mechanical properties and tests as per BIS Grading requirements-	1+0=1	Lecture	2.1	TB CH-3
Classification of aggregate Particle shape & texture strength & other mechanical properties of aggregate	1+0=1	Lecture	2.2	
Specific gravity, Bulk density, porosity, adsorption & moisture content of aggregate Bulking of sand	1+0=1	Lecture	2.3	
(a) Specific gravity of coarse aggregate (b) Specific gravity of fine aggregate (c) Zoning of aggregates (d) Water absorption of coarse aggregate	0+2=2	Practice		
Module III [2 hrs.Lecture+2 hrs. Practice]				
Workability Factors affecting workability Measurement of workability by different tests	1+0=1	Lecture	3.1	TB CH-5
Setting times of concrete Segregation & bleeding Mixing and vibration of concrete	1+0=1	Lecture	3.2	

(a) Slump cone method (b) Compaction factor method (c) Flow table method (d) Preparation of cube mould for durability test	0+2=2	Practice		
Module IV [2 hrs.Lecture+4hrs.Practice]				
Accelerators-Retarders Plasticisers Super plasticizers- Water proofers Mineral Admixtures like Fly, Ash, Silica Fume	1+0=1	Lecture	4.1	TB CH-7
Ground Granulated Blast Furnace Slag and Metakaoline Their effects on concrete properties	1+0=1	Lecture	4.2	
Preparation of Design Mix of concrete	0+2=2	Practice		
Prepare the design mix using Retarder and Accelerator	0+2=2	Practice		
Module V [2 hrs.Lecture+8 hrs. Practice]				
Special Concretes Introduction to light weight concrete Cellular concrete	1+0=1	Lecture	5.1	TB CH-12
No fines concrete high density concrete	1+0=1	Lecture	5.2	
Preparation of Fiber reinforced concrete	0+2=2	Practice		
Preparation of Light weight concrete mix and Powder concrete	0+2=2	Practice		
Preparation of concrete with plastic aggregates	0+2=2	Practice		
Design of concrete using construction demolition waste	0+2=2	Practice		
Module VI [3 hrs.Lecture+8 hrs.Practice]				
Properties of hardened concrete Determination of Compressive and Flexural	1+0=1	Lecture	6.1	

strength as per BIS				TB CH-10
Properties of Hardened concrete Determination of Compressive and Flexural strength	1+0=1	Lecture	6.2	
Destructive tests and non-destructive tests.	1+0=1	Lecture	6.3	
Splitting tensile strength of cylinder and Flexural strength of beam	2+0=2	Practice		
Compressive strength of cube and cylinder specimen	2+0=2	Practice		
Stress-strain curve for concrete Determination of Young's Modulus	2+0=2	Practice		
(a) Non-destructive tests by Rebound hammer. (b) Non-destructive tests by core cutter	2+0=2	Practice		
Module VII [1 hrs.Lecture+2 hrs.Practice]				
Factors affecting durability. Tests for durability of concrete	1+0=1	Lecture	7	TB CH-9
(a) Carbonation test for concrete. (b) Resistance to chemical attack (Sulphate attack, chloride attack)	0+2=2	practice		TB CH-8
Total (hrs)	30+30=60	30hrs.Lecture+30 hrs.Practice		

Soil Mechanics

Course Title	Code	Type of course	T-P-PJ	Prerequisite
Soil Mechanics	CECC0401	Theory + Practice	2-1-0	Nil

Objective

<ul style="list-style-type: none"> To teach the basic theoretical aspects of soil mechanics and implementation of geotechnical topics in the real-world situations

Course Outcome

<ul style="list-style-type: none"> Students will gain knowledge on soil mechanics and the concepts involve in it Students will develop skill on laboratory experiments, empirical methods and software aids involve in soil mechanics

Evaluation Systems

Internal Examination	Component	% of Marks	Method of Assessment
	Internal Theory	20	Written Examination
	Internal Practice	30(20+10)	Lab work + Learning Record
External Examination	External Theory	30	Written Examination
	External Practice	20	Lab Work
Total Marks		100	

Course Outline

Module I: Soil Properties and Relationships (09 Hours)

Theory

Soil formation; Soil structure and clay mineralogy; Adsorbed water; Mass- volume relationship and Relative density

Practice

- To determine specific gravity of soil solids and free swell index test of soil
- To determine the dry density of the soil by core cutter methods
- To determine the dry density of the soil by sand replacement methods

Module II: CLASSIFICATION AND INDEX PROPERTIES OF SOILS (09 Hours)

Theory

Grain size analysis; Sieve and hydrometer methods; Consistency limits and indices and Activity of clays

Practice

4. Wet sieving and dry sieving test of soil
5. To determine the liquid limit of a soil specimen
6. To determine the plastic limit and shrinkage limit of a soil specimen

Module III: Compaction and Consolidation (09 Hours)

Theory

Compaction: Mechanism of compaction; Factors affecting compaction; Effects of compaction on soil properties; Field compaction equipment and Compaction control

Practice

7. To determine the compaction characteristics of a soil specimen by Standard Proctor's Test and Modified Proctor's Test

Theory

Consolidation: Stress history of clay; e-p and e-log p curves; Magnitude and rate of 1-D consolidation and Terzaghi's theory

Practice

8. To determine the consolidation characteristics of a soil specimen

Module IV: Permeability and Seepage through Soils (10 Hours)

Theory

Permeability: Soil water; Capillary rise; Flow of water through soils; Darcy's law; Factors affecting permeability; Coefficient of permeability and Permeability of layered systems

Practice

9. To determine coefficient of permeability of a soil specimen by constant head permeability test
10. To determine coefficient of permeability of a soil specimen and falling head permeability test

Theory

Seepage through soils: Total, neutral and effective stresses; Quick sand condition; Seepage through soils; Flow nets: Characteristics and Uses

Module V: SHEAR STRENGTH OF SOILS

(12 Hours)

Theory

Introduction; Mohr - Coulomb Failure theories; Types of laboratory strength tests; Strength tests based on drainage conditions and Shear strength of cohesive soils

(Mathematical derivations to be limited to classroom activity. They should not be a part of external evaluation)

Practice

11. To determine the shear strength of the soil by direct shear test
12. To determine the unconfined shear strength of a soil
13. To determine the shear strength of the soil by triaxial test
14. To determine the shear strength of the soil by vane shear test

Module VI: STRESS DISTRIBUTION IN SOIL (04 hours)

Theory

Normal and shear stresses on a plane; Boussinesq's solution for a point load, line load, strip load, uniformly loaded circular and rectangular areas; Isobar and pressure bulb concept; Stress distribution on horizontal and vertical planes and Contact pressure

(Mathematical derivations to be limited to classroom activity. They should not be a part of external evaluation)

Module VII: STABILITY OF SLOPES (07 hours)

Theory

Types of slopes; Failure types; Causes of slope failure; Factors contributing to instability of soil slope; Slope stability analysis: Analysis of finite and infinite slopes; Bishop's solution and Soil stabilization measures (Mathematical derivations to be limited to classroom activity. They should not be a part of External Evaluation)

Practice

15. Analysis of finite and infinite slopes (Using Geo5/ Geo studio / Simple slope software)

Text Book

1. B.C.Punmia, "Soil Mechanics and Foundation", New Delhi: Laxmi publications, 2018.

Reference Books

1. C. Venkataramiah, "Geotechnical Engineering", New age International Pvt .Ltd., 2010.
2. Purushotham Raj, "Geotechnical Engineering", New Delhi: Tata McGraw Hill Publishers, 2018.
3. ManojDutta& S K Gulati, "Geotechnical Engineering", New Delhi: Tata McGraw-Hill Publishers, 2010.
4. K.R. Arora, "Soil Mechanics and Foundation Engineering" New Delhi: Standard Publishers and Distributors, 2018.
5. GopalRanjan&A S R Rao, "Applied Soil Mechanics" New age International Pvt .Ltd,2018

Online Source:

<http://www.nptel.ac.in/courses/105101084/>[Viewed on Dt-12.06.2019]

<http://www.nptel.ac.in/courses/105103097/>[Viewed on Dt-12.06.2019]

Session Plan

Topic coverage and Internal Test	No. of Sessions (in hrs.)	Activity	Assignment	Suggested Reading
Module I [3 Hours Lecture + 6 Hours Practice]				
SOIL PROPERTIES AND RELATIONSHIPS Introduction to geotechnical engineering; Origin and formation of soil	1	Lecture	1.1	Textbook (TB) Chapter (CH)-1
Preliminary definitions and relationships	2	Lecture	1.2 - 1.7	TB CH-2,3
Determination of specific gravity, swelling index of different types of soil	2	Practice		
Determination of dry density of soil by Core cutter method	2	Practice		
Determination of dry density of soil by Sand replacement method	2	Practice		
Module II [3 Hours Lecture + 6 Hours Practice]				
CLASSIFICATION AND INDEX PROPERTIES OF SOILS Grain size analysis; Consistency limits and indices	3	Lecture	2.1 -2.7	TB CH-3,4,5
Wet sieving test , Dry sieving test	2	Practice		
Liquid limit test	2	Practice		

Plastic limit and shrinkage limit test	2	Practice		
Module III [5 Hours Lecture + 4 Hours Practice]				
COMPACTION AND CONSOLIDATION Compaction: Factors affecting compaction and compaction control; Mechanism of compaction	2	Lecture		TB CH-17
Standard Proctor Test and Modified Proctor Test	2	Practice		
Consolidation theory	3+2	Lecture + Practice	3.1 – 3.7	TB CH-15,16
Module IV [6 Hours Lecture + 4 Hours Practice]				
PERMEABILITY AND SEEPAGE THROUGH SOILS Basic concepts of soil permeability & Darcy's law	3	Lecture	4.1 - 4.7	TB CH-7
Determination of coefficient of permeability (By Constant Head Permeability Method and Falling Head Permeability Method)	2+2	Practice		
Seepage through soils	3	Lecture	4.8- 4.9	TB Ch-6 ,9
Module V [4 Hours Lecture + 8 Hours Practice]				
SHEAR STRENGTH OF SOILS Shear strength of different types of soils & failure	4	Lecture	5.1 -5.7	TB CH-18

theories				
To determine the shear strength of the soil by direct shear test	2	Practice		
To determine the unconfined shear strength of a soil	2	Practice		
To determine the shear strength of the soil by triaxial test	2	Practice		
To determine the shear strength of the soil by vane shear test	2	Practice		
Module VI [4 Hours Lecture]				
STRESS DISTRIBUTION IN SOIL Normal and shear stresses on a plane; Boussinesq's solution for a point load, line load, strip load, uniformly loaded circular and rectangular areas; Isobar and pressure bulb concept; Stress distribution on horizontal and vertical planes and Contact pressure	4	Lecture	6.1 -6.7	TB CH-13,14
Module VII[5 Hours Lecture + 7 Hours Practice]				
STABILITY OF SLOPES Types of slopes; Failure types; Causes of slope failure; Factors contributing to instability of soil slope	3	Lecture		TB CH-23
Analysis of finite and infinite slopes	2 +2	Lecture + Practice	7.1 -7.7	
Total (Hours)	60	(30 Hours Theory + 30 Hours Practice)		

Foundation Engineering

Course Title	Code	Type of course	T-P-PJ	Prerequisite
Foundation Engineering	CECC0402	Theory + Practice	2-1-0	Soil Mechanics

Objective

- To teach the basic theoretical aspects and implementation of following topics in the real-world situations: Foundations and Retaining structures

Course outcome

- Students will gain knowledge on retaining structures and various types of foundations on different structures and soil
- Students will develop skill to design various retaining structures and foundations in different conditions

Evaluation Systems

Internal Examination	Component	% of Marks	Method of Assessment
	Internal Theory	20	Written Examination
	Internal Practice	30 (20+10)	Lab Work + Learning Record
External Examination	External Theory	30	Written Examination
	External Practice	20	Lab Work
Total		100	

Course outline

Module I: Shallow Foundation (06 hours)

Theory

Introduction; Different types of shallow foundations; Calculation of bearing capacity of soil and Calculation of settlements of foundations

Practice

1. Bearing capacity of soil can be checked using Geomechanica Software/ Bearing Capacity Software.

Module II: Mat Foundation Design (10 hours)

Practice

2. Generation of structural design documents including necessary plans and section of raft/mat foundation using STAAD. Foundation software
3. Calculation of geotechnical data of soil like ultimate soil bearing capacity, depth of footing, water table depth, unit weights, etc. using STAAD. Foundation software
4. Service load design of mat foundation using STAAD. Foundation software
5. Mesh generation, analysis properties and mat slab analysis/design options of raft/mat foundation using STAAD. Foundation software
6. Checks and reinforcement design of raft/mat foundation using STAAD. Foundation software

Module III: Deep Foundation (11 hours)

Theory

DEEP FOUNDATION: Introduction, Different types of deep foundations, Design methodology for piles, Calculation of pile capacity, Analysis of pile group, Settlement of pile group, Concept of negative skin friction, Piles subjected to lateral loads, Pile load test;

Practice

7. Checking of pile settlement using Group Pile Settlement Software

Module IV: Pile Foundation Design (08 hours)

Practice

8. Calculation of geotechnical data of soil like soil bearing capacity, depth of footing, water table depth, unit weights, etc. of pile foundation in STAAD. Foundation software
9. Service load design of pile foundation using STAAD. Foundation software
10. Structural analysis, checks and reinforcement design of pile foundation using STAAD. Foundation software
11. Design of pile cap using STAAD. Foundation software

Module V: Design of Well Foundation (05 hours)

Theory

DESIGN OF WELL FOUNDATION: Introduction and construction of well foundation;

Practice

12. Design of well foundation using STAAD. Foundation software

Module VI: DESIGN OF EARTH RETAINING STRUCTURES (08 hours)

Theory

DESIGN OF RETAINING STRUCTURES: Introduction, Different types of retaining structures, Stability analysis of rigid walls;

Practice

13. Design of cantilever sheet piles using STAAD.Foundation software
14. Design of anchor sheet piles using STAAD.Foundation software

Module VII: Earth Pressure and Foundation in Difficult Grounds (12 hours)

Theory

EARTH PRESSURE: Introduction , Types of Earth pressure, Rankine's active and passive earth pressure, Smooth vertical wall with horizontal backfill, Extension to Soil, Coulombs wedge theory; (Mathematical derivations to be limited to classroom activity, it should not be a part of external evaluation);

Practice

15. Calculation of Rankine's active and passive earth pressure(Using Earth Pressure Coefficient Software)

FOUNDATIONS IN DIFFICULT GROUNDS: Introduction, Techniques of ground improvement, Foundations in swelling soil, Foundations in collapsible soil, Use of soil reinforcement;

Text Book

- 1.B.C. Punmia. 2018. "Soil Mechanics and Foundation" New Delhi: Laxmi publications.

Reference Books

1. C. Venkataramiah.2010."Geotechnical Engineering" New age International Pvt .Ltd.
2. Purushotham Raj.2018. "Geotechnical Engineering" New Delhi: Tata McGraw Hill Publishers.
3. ManojDutta& S K Gulati.2010. "Geotechnical Engineering" New Delhi: Tata McGraw-Hill Publishers.
4. K.R. Arora.2018. "Soil Mechanics and Foundation Engineering" New Delhi: Standard Publishers and Distributors.
5. GopalRanjan& A S R Rao.2018. "Applied Soil Mechanics" New age International Pvt .Ltd.

Online Source:

<http://www.nptel.ac.in/courses/105101084/> [Viewed on Dt-12.06.2019]

<http://www.nptel.ac.in/courses/105103097/> [Viewed on Dt-12.06.2019]

Session Plan

Topic coverage and Internal Test	No. of Sessions (in hrs.)	Activity	Assignment	Suggested Reading
Module-I:SHALLOW FOUNDATION (06 hours) SHALLOW FOUNDATION: Introduction, Different types of shallow foundations	1	Lecture		TB- 1 Ch-25
Calculation of bearing capacity of soil (Bearing capacity can be checked using Geomechanica Software/ Bearing Capacity Software)	2 +2	Lecture + Practice	1.1	TB- 1 Ch-25
Calculation of settlements of foundation	1	Lecture	1.2	TB- 1 Ch-25
Module II : MAT FOUNDATION DESIGN (10 hours) Generation of structural design documents including necessary plans and section of raft/mat foundation using STAAD.Foundation software	2	Practice		
Calculation of geotechnical data of soil like ultimate soil bearing capacity, depth of footing, water table depth, unit weights, etc. using STAAD.Foundation software	2	Practice		
Service load design of mat foundation using STAAD.Foundation software	2	Practice		
Mesh generation, analysis properties and mat slab analysis/design options of raft/mat foundation using STAAD.Foundation software	2	Practice		
Checks and reinforcement design of raft/mat foundation using STAAD.Foundation software	2	Practice		

Module III :DEEP FOUNDATION (11 hours) DEEP FOUNDATION: Introduction, Different types of deep foundations	1	Lecture		TB- 1 Ch-26
Design methodology for piles, Calculation of pile capacity	2	Lecture	3.1	TB- 1 Ch-26
Analysis of pile group, Settlement of pile group, (Checking of pile settlement using Group Pile Settlement Software)	3 +2	Lecture + Practice	3.2	TB- 1 Ch-26
Concept of negative skin friction, Piles subjected to lateral loads	2	Lecture	3.3	TB- 1 Ch-26
Pile load test	1	Lecture	Field Visit	TB- 1 Ch-26
Module IV :PILE FOUNDATION DESIGN(08 hours) Calculation of geotechnical data of soil like soil bearing capacity, depth of footing, water table depth, unit weights, etc. of pile foundation in STAAD.Foundation software	2	Practice		
Service load design of pile foundation using STAAD.Foundation software	2	Practice		
Structural analysis, checks and reinforcement design of pile foundation using STAAD.Foundation software	2	Practice		
Design of pile cap using STAAD.Foundation software	2	Practice		
Module V: DESIGN OF WELL FOUNDATION (05 hours) DESIGN OF WELL FOUNDATION: Introduction and construction of well foundation	3	Lecture		TB- 1 Ch-21
Design of well foundation using STAAD.Foundation software	2	Practice		
Module VI : DESIGN OF EARTH RETAINING STRUCTURES (08 hours) DESIGN OF RETAINING STRUCTURES:	1	Lecture		TB- 1 Ch-20,21

Introduction, Different types of retaining structures				
Stability analysis of rigid walls	3	Lecture	6.1	TB- 1 Ch-20,21
Design of cantilever sheet piles using STAAD.Foundation software	2	Practice		
Design of anchor sheet piles using STAAD.Foundation software	2	Practice		
Module VII : EARTH PRESSURE AND FOUNDATION IN DIFFICULT GROUNDS (12 hours) EARTH PRESSURE: Introduction, Types of Earth pressure	1	Lecture		TB- 1 Ch-24
Rankine’s active and passive earth pressure	2	Lecture	7.1	TB- 1 Ch-24
Smooth vertical wall with horizontal backfill, Extension to Soil, Coulombs wedge theory	3	Lecture		TB- 1 Ch-24
Calculation of Rankine’s active and passive earth pressure (Using Earth Pressure Coefficient Software)	2	Practice		
FOUNDATIONS IN DIFFICULT GROUNDS: Introduction, Techniques of ground improvement	1	Lecture		
Foundations in swelling soil	1	Lecture		
Foundations in collapsible soil	1	Lecture		
Use of soil reinforcement	1	Lecture		
Total (Hours)	60	(Theory 30 Hours + Practice 30Hours)		

Transportation Engineering

Course Title	Code	Type of course	T-P-PJ	Prerequisite
Transportation Engineering	CECC0403	Theory + Practice	2-2-0	Nil

Objective

- To introduce transportation engineering principles with emphasis on designing principal element of highways along with the safe and efficient operation of highways.

Course outcome

- Students will gain knowledge on planning, material selection for construction, Economics and finance and designing of elements on highway.
- Acquire the skill of designing the geometric elements of highway using AUTOCAD CIVIL 3D software.

Evaluation Systems

Internal Examination	Component	% of Marks	Method of Assessment
	Internal Theory	20	Written Examination
	Internal Practice	30 (20+10)	Lab work + Learning Record
External Examination	External Theory	30	Written Examination
	External Practice	20	Lab Work
Total		100	

Course outline

Module I: Geometric Design

(10 Hours)

Theory

Introduction, Horizontal Alignment, Vertical Alignment, Superelevation, Camber.

Practice Sessions:

- Design of Horizontal Alignment using CIVIL 3D software.
- Design of Vertical Alignment. using CIVIL 3D software.
- Design of Super elevation. using CIVIL 3D software.
- Create profile. using CIVIL 3D software.

Module II: Expressway (10 Hours)

Theory

Introduction, Components, I-Girder, Box culvert, VUP(Vehicle underpasses), PUP (Pedestrian underpasses), ROB(Rail over bridge); Road construction equipments; Machines used; Cement Concrete Roads: Joints in cement concrete pavements; Arrangement of joints; joint filler and sealer; wet mix macadam plant and its components; WBM roads; slipform pavers,; Elevated Roads; Flexible and Rigid pavements

Practice Sessions:

- Design of flexible pavements.
- Design of rigid pavements.

Module III : TRAFFIC ENGINEERING

(20Hrs)

Theory

Introduction to Traffic Engineering; Various Traffic Studies and their application (Field study); Traffic Signals; Traffic Signs and Road Marking; Traffic Operations-Accident Prevention and Safety Methods; Rotary intersection; ITS (Intelligent transportation system); ITS in various countries.

Practice Sessions:

7. Junction Design using civil 3d software.
8. Vehicle volume counts (field study)

Module IV: RAILWAY ENGINEERING

(12Hrs)

Theory

Permanent way components; Cross Section of Permanent Way; ETB (Electric trolley buses); LRT(Light Rail Transit); Maglev (Magnetic Levitation system); Multi-modal Transport systems; Cable cars; Monorails; RORO(Roll-on-Roll-off).

Module V: Airport Engineering

(12Hrs) Theory

Airport layout; Various Components and their functions; Airport site selection; Geometric elements of run way and taxiway; Basic concepts in runway design; Holding aprons; Fighter jets.

Module VI: Highway Materials

(20Hrs)

Theory

Aggregate properties; Types of bitumen; Cutback bitumen; Bitumen emulsion; Tar; Types of tar; Bituminous mix design.

Practice Sessions:

9. Angeles abrasion test.
10. Aggregate Impact value test
11. Penetration Test of Bitumen
12. Ductility value test of Bitumen
13. Softening point test of Bitumen
14. Flash and Fire point test of Bitumen
15. Marshall Stability Test of Bitumen
16. Flakiness index and elongation index test of Aggregate.

Module VII: PAVEMENT FAILURE AND MAINTENANCE

(6Hrs)

Theory

Flexible pavement failure; Rigid pavement failure; Types of maintenance; Maintenance of bituminous surfaces; special repairs in flexible pavements; types of overlay.

Text-Books:

1. S.k.khanna and C.E.G JUSTO, Highway engineering.
2. L.R Kadiyali, Traffic engineering and N B Lal, Principles and practice of highway engineering, Khanna Publications, 2005
3. Railway engineering, S.C.Saxena
4. Airport Engineering, Rangawala

Online Resources:

1. Expressways-https://en.wikipedia.org/wiki/Expressways_in_India
2. Expressway methodology and its components-
<https://www.slideshare.net/ATULSHUKLA48/eastern-peripheral-expressway-training-report>
3. WMM Plant and its components-https://www.youtube.com/watch?v=2dd_C0OuMMA
4. WBM Roads construction-<http://civil-online2010.blogspot.com/2013/06/wbm-road-construction.html>
5. Rotary intersection- https://www.youtube.com/watch?v=FOk_4HuZhjo
6. Railway permanent way components-https://www.youtube.com/watch?v=w_4V8kwkdNU
7. ETB- <https://www.youtube.com/watch?v=6vAGEaKFuyY>
8. LRT- <https://www.youtube.com/watch?v=pc5x5cvlHmw>
9. Maglev-<https://www.youtube.com/watch?v=PTo-krTSZBA>
10. Cable cars- <https://www.youtube.com/watch?v=B186qiXlpZ4>
11. RORO-<https://www.youtube.com/watch?v=WuMXR-LCnds>
12. Airport layout and its components- <https://www.youtube.com/watch?v=Lzp2eHJgvz8>
13. Fighter jets- <https://www.youtube.com/watch?v=CfmF5E1ECYM>

Session Plan

Topic coverage and Internal Test	No. of Sessions (in hrs.)	Activity (lecture, tutorial, lab practice, field studies/field-trip, Workshop etc.)	Assignment (Project, Assignment, field study, seminar, etc.)	Suggested Reading (Book, Video, Online source, etc.)
Module-I[2hrs. Lecture + 8hrs. Practice]				
Introduction	2	Lecture	1.1	Textbook(TB-1), Chapter(Ch-3,4)
Design of horizontal	2	practice	Software, civil	

alignment			3d	
Design of vertical alignment	2	practice	Software, civil 3d	
Design of Superelevation	2	practice	Software, civil 3d	
Create Profile	2	Practice	Software, civil 3d	
Sub-Total (Hrs)	10			
Module II[4 hrs. Lecture + 6hrs Practice]				
Expressways Introduction,components	1	Lecture	2.1	Online source,Ref-1
Road construction equipments	1	Lecture	2.2	TB-1, Ch-8
Cement concrete roads- Introduction,joints	1	Lecture	2.3	TB-1, Ch-8
Overlays- Flexible and Rigid,WMM,WBM	1	Lecture	2.4	TB-1, Ch-7,8, Ref- 3,4
Flexible and rigid pavements design	6	practice		TB-1, Ch-7,8
Sub-total (Hrs)	10			
Module III[4 hrs. Lecture + 16hrs. Practice]				
Traffic engineering introduction	1	lecture	3.1	TB-1. Ch-5
Various traffic studies	10	practice	Field study	TB-1. Ch-5
Traffic signals	1	Lecture	3.2	TB-1. Ch-5
Traffic signs and road marking	1	Lecture	3.3	TB-1. Ch-5
Traffic accidents, safety methods	1	Lecture	3.4	TB-1. Ch-5
Design of intersection, rotary intersection	6	practice	3.5	TB-1. Ch- 5,Video-Ref-5
Module IV[12 hrs. Lecture + 0 hrs. Practice]				
Railway Engineering, introduction	2	lecture	4.1	TB-3, Ch-1
Permanent way components, cross-section of permanent way	2	lecture	4.2	Video,Ref-6
ETB	2	lecture	4.3	Video, Ref-7
LRT	1	lecture	4.4	Video, Ref-8
Maglev	2	lecture	4.5	Video, Ref-9
Multi-modal transport	3	lecture	4.6	Video, Ref-10,11

systems, cable cars, RORO				
Module V[12 hrs. Lecture + 0 hrs. Practice]				
Airport engineering, introduction	2	lecture	5.1	TB-4, Ch-1
Airport layout and various components and functions	3	lecture	5.2	Video, Ref-12
Airport site selection	1	lecture	5.3	TB-4, Ch-3,4
Geometric elements of runway and taxiway	4	lecture	5.4	TB-4, Ch-3,4
Fighter jets	2	lecture	5.1	Video, Ref-13
Module VI[2 hrs. Lecture + 18 hrs. Practice]				
Aggregate properties, types of bitumen, tar, cutback bitumen	1	lecture	6.1	TB-1, Ch-6
Bituminous mix design	1	lecture	6.2	TB-1, Ch-6
LOS Angeles abrasion test	2	practice	6.3	TB-1, Ch-6
Impact value test of aggregate	2	Practice	6.4	TB-1, Ch-6
Penetration test of bitumen	2	Practice	6.5	TB-1, Ch-6
Ductility value test of Bitumen	2	Practice	6.6	TB-1, Ch-6
Softening point test of bitumen	2	Practice	6.7	TB-1, Ch-6
Flash and fire point test of bitumen	2	Practice	6.8	TB-1, Ch-6
Marshall stability test of bitumen	6	Practice	6.9	TB-1, Ch-6
Module VII[4hrs. Lecture +0 hrs. Practice]				
Flexible pavement failure types	1	Lecture	7.1	TB-1,Ch-10
Rigid Pavement Failure types	1	Lecture	7.2	TB-1,Ch-10
Types of maintenance details	2	Lecture	7.3	TB-1,Ch-10
Maintenance of bituminous surfaces,specialrepairs,overlay	2	Lecture	7.4	TB-1,Ch-10
Total (Hrs)	90	(42hours theory and 48 hours practice)		

Water Supply and Waste Water Management

Course Title	Code	Type of course	T-P-PJ	Prerequisite
Water Supply and waste water Engineering	CECC0415	Theory + Practice	2-1-0	Nil

Objective

- ✓ To enable the students understand about the drinking water quality through experiments.
- ✓ To make student understand the sources of drinking water.
- ✓ To train students to know the principles of water treatment and to design the treatment units.
- ✓ To train students to know the principles of waste water treatment and to design the treatment units.
- ✓ To make them understand the quality of sewage generated from different plants.

Course outcome

- ✓ To understand the principles of water treatment units and the design of the treatment units.
- ✓ To understand the principles of waste water treatment and the design of treatment units.
- ✓ To understand the distribution network of the drinking water and the treated waste water.
- ✓ To understand to treat the waste water and reuse to make an eco-friendly environment

Evaluation Systems

Internal Examination	Component	% of Marks	Method of Assessment
	Internal Theory	20	Written Examination
	Internal Practice	30 (20+10)	Lab work + Learning Record
External Examination	External Theory	30	Written Examination
	External Practice	20	Lab Work
Total		100	

Course outline

Module -I: Demand (08Hrs)

Planning and Execution of modern water supply schemes in Urban and Rural India; Sources; Surface Water and Underground water; Per capita demand; Domestic & Non-Domestic demand; Variation in demands; Design period for different components of a Water Supply System

Practice Sessions:

1. Design period for different components of a Water Supply System using excel

Module -II: Demand and supply of water

(10Hrs)

Population Forecast; Collection; Pumping and Conveyance of water; Calculation of loss of head due to friction and minor losses; Pump and Motors.

Practice Sessions:

2. Calculation of loss of head due to friction and minor loss using excel.
3. Power calculations of pump and motor.

Module –III: Water Quality (12Hrs)

Quality of potable water; IS Standard, Miscellaneous Treatments; Removal of colour; Odour ;taste; Iron; Manganese; Fluoride; Dissolved Salts; Arsenic; Radioactivity and Domestic Water treatment.

Practice Sessions:

4. Determination of colour, Odour, pH in water.
5. Determination of Chloride, Fluoride in water.

Module -IV: Water distribution System

(10Hrs)

Purification of water; Screening, aeration; Sedimentation; coagulation; flocculation; Filtration; Disinfection; Softening; Distribution System; Design of Size of Pipes in simple distribution system; Valves and Fittings. **(All the topics will be through field visit/ practicemode)**

Module –V: Practice Sessions

(14 Hrs)

6. Design of sump and Pump well.
7. Design of approach channel.
8. Design of bar screen chamber.
9. Design of sedimentation tank (with flocculation chamber).
10. Design of rapid gravity filter.
11. Design of Size of Pipes in simple distribution system.
12. Design of pipe network

Module -VI: Waste Water Treatment and Design

(11Hrs)

Systems of sanitation; Planning and Execution of Urban & Rural Sewage system; Collection; conveyance and system of Reuse; Quantity of sewage; Hydraulic design and construction of sewers; Appurtenances **(Sewer design will be through HEC software)**

Practice Sessions:

13. Computation of quantity of sewage.
14. Design of sewer using HEC Software
15. Design of primary settling tank

Module -VII: Water Treatment (10 Hrs)

Quality and Characteristics of sewage; Preliminary; Primary; Secondary (Biological); Advanced (Tertiary) Treatment; Disposal and utilization. **(All the topics will be through video presentation)**

E-content:

Text Books:

1. Rangwala: Water Supply and Sanitary Engineering, Charotar Publishing House
2. S.K. Garg: Environmental Engineering Vol.I& II, Khanna Publishers

Reference Books:

1. Waste Water Engineering Treatment and Reuse by MetCalf and Eddy

Online Source:

<https://www.youtube.com/watch?v=20Xk2XfDhuY>
<https://www.youtube.com/watch?v=uME-5LP4KJo>
<https://www.youtube.com/watch?v=orm1MIgBGjM>
<https://www.youtube.com/watch?v=AG7U26V1gPQ>
<https://www.youtube.com/watch?v=FDNzhEAqxgc>

Session Plan

Topic coverage and Internal Test	No. of Sessions (in hrs.)	Activity (lecture, tutorial, lab practice, field studies/field-trip, Workshop etc.)	Assignment (project, Assignment, field study, seminar, etc.)	Suggested Reading (Book, Video, Online source, etc.)
Module I[4hrs.Lecture +4hrs.Practice]				
Planning and Execution of modern water supply schemes in Urban and Rural India, Sources-Surface Water and Underground water.	2	lecture	1.1	Text Book(TB ₁) Chapter(CH)-1
Per capita demand, Domestic & Non-Domestic demand, Variation in demands, Design period for different components of a Water Supply System.	2	lecture	1.2	TB ₁ ,CH-2
Design period for different components of a Water Supply System using excel.	4	practice	1.3	TB ₁ ,CH-2
Module II[6hrs.Lecture +4hrs.Practice]				
Population Forecast	3	lecture	2.1	TB ₁ ,CH-38
Collection, Pumping and				

Conveyance of water, Calculation of loss of head due to friction and minor losses, Pump and Motors.	3	lecture	2.2	TB ₁ ,CH-4
Practice sessions: 1.Calculation of loss of head due to friction and minor loss using excel. 2.Power calculations of pump and motor.	4	practice	2.3	Online source
Module III[7hrs.Lecture +5hrs.Practice]				
Quality of potable water. IS Standard ,Miscellaneous Treatments	3	lecture	3.1	TB ₁ ,CH-5
Removal of colour, Odour, taste, Iron, Manganese, Fluoride, Dissolved Salts, Arsenic, Radioactivity, Domestic Water treatment.	4+5	lecture + practice	3.2	TB ₁ ,CH-11
Module IV[4hrs.Lecture +6hrs.Practice]				
Purification of water, Screening, aeration, Sedimentation, coagulation, flocculation, Filtration, Disinfection, Softening.	2+3	lecture + field studies	4.1	TB ₁ ,CH-6,7,8,9&10
Distribution System, Design of Size of Pipes in simple distribution system, Valves and Fittings.	2+3	lecture + field studies	4.2	TB ₁ ,CH-12&14
Module V[0hrs.Lecture +14hrs.Practice]				
4. Design of sump and Pump well. 5. Design of approach channel. 6. Design of bar screen chamber. 7. Design of sedimentation tank (with flocculation chamber). 8. Design of rapid	14	practice	5	TB ₁ ,CH-17

gravity filter. 9. Design of Size of Pipes in simple distribution system. 10. Design of pipe network				
Module VI[5hrs.Lecture +6hrs.Practice]				
Systems of sanitation, Planning and Execution of Urban & Rural Sewage system,	1	lecture	6.1	TB ₁ ,CH-17
Collection, conveyance and system of Reuse, Quantity of sewage,	2	lecture	6.2	TB ₁ ,CH-18
Hydraulic design and construction of sewers, Appurtenances	2	lecture	6.3	TB ₁ ,CH-18
11. Computation of quantity of sewage. 12. Design of sewer using HEC Software 13. Design of primary settling tank.	6	practice	6.4	TB ₁ ,CH-21&22
Module VII[8hrs.Lecture +2hrs.Practice]				
Quality and Characteristics of sewage.	2	lecture	7.1	TB ₁ ,CH-26
Preliminary, Primary, Secondary (Biological), Advanced (Tertiary) Treatment, Disposal and utilization.	4	lecture	7.2	TB ₁ ,CH-27&28
Principle of Treatment of Industrial Waste Water.	2+2	lecture + field studies	7.3	TB ₁ ,CH-32
Total (hrs)	75	THEORY-42,PRACTICE-33		

Hydrology & Water Resources Engineering

Course Title	Code	Type of course	T-P-P	Prerequisite
Hydrology & Water resources Engineering	CECC0416	theory+ practice	2-1-0	Nil

Objective

- To develop technical skills in students to make them familiar with hydrology, hydro-meteorology, surface and subsurface water, design water resources structures, surface and subsurface water management, integrated water resources planning, Irrigation processes, flood control, and basic of hydropower generation.

Course outcome

- To have knowledge of irrigation implementation on hydrology, water power and water quality along with acquaintance of planning, design, construction and application of irrigation/hydraulic structures in management of surface and subsurface water.

Evaluation Systems

Internal Examination	Component	% of Marks	Method of Assessment
	Internal Theory	20	Written Examination
	Internal Practice	30 (20+10)	Lab work + Learning Record
External Examination	External Theory	30	Written Examination
	External Practice	20	Lab Work
Total		100	

Course outline

Module –I: Precipitation

(5Hrs)

Introduction - hydrologic cycle; water-budget equation; world water balance; applications in engineering, sources of data; forms of precipitation; characteristics of precipitation in India; measurement of precipitation; rain gauge network; mean precipitation over an area; depth area-duration relationships; maximum intensity/depth-duration-frequency relationship

Module –II: Abstraction(5Hrs)

Abstractions from precipitation - evaporation process; evaporimeters; analytical methods of evaporation estimation; reservoir evaporation and methods for its reduction; evapotranspiration; potential evapotranspiration over India; actual evapotranspiration; interception; storage; infiltration; infiltration capacity; measurement of infiltration; infiltration indices

Module -III: Runoff (6Hrs)

Runoff volume; SCS-CN method of estimating runoff volume; flow duration curve; flow-mass curve; hydrograph; factors affecting runoff hydrograph; components of hydrograph; base flow separation; effective rainfall; unit hydrograph and its uses (assumptions and construction procedure only)

Module -IV: Ground Water and Well Hydrology (6Hrs)

Forms of subsurface water; aquifers; types and its properties; geologic formations of aquifers; well hydraulics: steady state flow in wells; equilibrium equations for confined and unconfined aquifers; aquifer tests

Module-V: Water Withdrawals and Uses (4hrs)

Water for energy production; water for agriculture; water for hydroelectric generation; flood control. Analysis of surface water supply; Water requirement of crops-Crops and crop seasons in India; cropping pattern; duty and delta; Quality of irrigation water; Soil-water relationships; consumptive use; irrigation requirement; frequency of irrigation; Methods of applying water to the fields: surface; sub-surface; sprinkler and trickle / drip irrigation

Module-VI: distribution Systems(4Hrs)

Canal systems; alignment of canals; canal losses; estimation of design discharge. Design of channels- rigid boundary channels; alluvial channels; Kennedy's and Lacey's theory of regime channels. Basics of CD works; Water logging: causes; effects and remedial measures; lining of canals; types of lining. Drainage of irrigated lands: necessity, methods.

Module -VII: PART A IRRIGATION STRUCTURES(8Hrs)

(All the topics will be through field visit, practice mode only)

- I. Regulators - Functions of cross regulators; head regulators; canal falls; aqueducts; metering flumes and canal outlets.
- II. Diversion head works- Principles and design of weirs on permeable and impermeable foundation; Khosla's theory- expressions for uplift pressure at key points ; Various corrections and their calculations for simple cases
- III. Storage works: Types of dams, design, principles of rigid gravity, stability analysis.
- IV. Spillways: Spillway types, energy dissipation.
- V. River training: Objectives of river training, methods of river training.

Practice-PART B (22 Hrs)

- 1) Design of irrigation canal using Kennedy's theory.
- 2) Design of irrigation canal using Lacey's theory.
- 3) Design of lined canal.
- 4) Fixing of L-section of the canal.

- 5) Design of tank surplus weir.
- 6) Design of vertical drop weir.
- 7) Design of Notch fall.
- 8) Design of head regulators.
- 9) Design of cross regulators.
- 10) Stability analysis of gravity dam.

Text Books:

- Engineering Hydrology – By K. Subramanya
- Irrigation Engineering and Hydraulic Structure- By S.K.Garg

Reference Books:

1. Engineering Hydrology – By Sharma and Sharma

Topic coverage and Internal Test	No. of Sessions (in hrs.)	Activity (lecture, tutorial, lab practice, field studies/field-trip, Workshop etc.)	Assignment (project, Assibm ent, field study, seminar, etc.)	Suggested Reading (Book, Video, Online source, etc.)
MODULE- I : Precipitation (5 Hrs) Introduction - hydrologic cycle, water-budget equation, world water balance, applications in engineering, sources of data. forms of precipitation, characteristics of precipitation in India, measurement of precipitation, rain gauge network, mean precipitation over an area, depth area- duration relationships, maximum intensity/depth-duration-frequency relationship,	5Hrs	CRT /Class room practice	1.1	Text Book(TB) Chapter(CH) TB ₁ CH-1&2,TB ₂ CH-7
Practice: (2hours) 1. Construction of double mass curve using EXCEL.	2hrs			
Abstraction: A Abstractions from precipitation - evaporation process, evaporimeters, analytical methods of evaporation	5hrs	Theory + class room practice	1.2	TB ₁ CH-3,TB ₂ CH-7

estimation, reservoir evaporation and methods for its reduction, evapotranspiration, potential evapotranspiration over India, actual evapotranspiration, interception, storage, infiltration, infiltration capacity, measurement of infiltration, infiltration indices.				
Practice 4hrs 1. Determination on infiltration capacity using double ring infiltrometer.	4hrs	Practice		
Runoff: Runoff volume, SCS-CN method of estimating runoff volume, flow duration curve, flow-mass curve, hydrograph, factors affecting runoff hydrograph, components of hydrograph, base flow separation, effective rainfall, unit hydrograph and its uses (assumptions and construction procedure only)	6hrs	CRT /Class room practice	1.3	TB ₁ CH-5&6, TB2C H-7
2. Hydrograph analysis using EXCEL. 3. Preparation of stage discharge curve.	2hrs			
Site visit for CD works (aqueduct, Syphons, Outlet and Level crossing, Branch canals and lining of canals	4hrs			
Ground water and well hydrology: Forms of subsurface water, aquifers, types and its properties, geologic formations of aquifers, well hydraulics: steady state flow in wells, equilibrium equations for confined and unconfined aquifers, aquifer tests. Radial flow into a well under confined and unconfined conditions Yield of a well.	6	CRT /Class room practice	1.4	TB ₁ CH-9, TB2CH-16
5. Design of irrigation canal using Kennedy's theory. 6. Design of irrigation canal using Lacey's theory.	4hrs			

Water withdrawals and uses (4hrs) Water for energy production, water for agriculture, water for hydroelectric generation; flood control. Analysis of surface water supply, Water requirement of crops-Crops and crop seasons in India, cropping pattern, duty and delta, Quality of irrigation water; Soil-water relationships, consumptive use, irrigation requirement, frequency of irrigation; Methods of applying water to the fields: surface, sub-surface, sprinkler and trickle / drip irrigation.	4hrs	CRT /Class room practice	1.5	TB2CH-1&2
Practice 4hours: 7. Design of lined canal 8. Fixing of L-section of the canal	2hrs			
Distribution systems: Canal systems, alignment of canals, canal losses, estimation of design discharge. Design of channels- rigid boundary channels, alluvial channels, Kennedy's and Lacey's theory of regime channels. Basics of CD works, Water logging: causes, effects and remedial measures. lining of canals, types of lining. Drainage of irrigated lands: necessity, methods.	4Hrs	Lecture	1.6	TB2CH-4&5
D Design of tank surplus weir. 10.Design of vertical drop weir.	4Hrs	Practice		
Diversion head works- Principles and design of weirs on permeable and impermeable foundation, Khosla's theory- expressions for uplift pressure at key points - Various corrections and their calculations for simple cases.	4Hrs	Practice+Field Visit		
Practice 11. Design of Notch fall. 12. Design of a spur	2Hrs			

Storage works: Types of dams, design, principles of rigid gravity, stability analysis. Spillways: Spillway types, energy dissipation. River training: Objectives of river training, methods of river training construction				TB2CH-9
Practice 13. Design of head regulators. 14. Design of cross regulators. 15. Stability analysis of gravity dam.	4 hrs	practice		
Total	60hrs	(THEORY-30+PRACTICE-30)		

PowerPoint presentations :

Module I: gis.ess.washington.edu/grg/courses/ess326/5-Hydrology.ppt

Module I: abe-research.illinois.edu/courses/tsm352/lectures/Hydrology_Lecture01.pptx

Module I & II: https://www.zapmeta.ws/ws?q=water%20ppt%20presentation&asid=ws_gc_b5_2&mt=b&nw=g&de=c&ap=1o1

https://www.zapmeta.ws/ws?q=water%20ppt%20presentation&asid=ws_gc_b5_2&mt=b&nw=g&de=c&ap=1o1

Module I and Module II: <https://www.slideshare.net/SuryennMon/civil-vhydrology-and-irrigation-engineering-10-cv55notes>

Module III: <https://www.youtube.com/watch?v=28uGiIwwfro>

Module III: <https://www.youtube.com/watch?v=LNUoYhZ44EE>

Quality Control and Risk Management in Construction

Course Title	Code	Type of course	Credits	Prerequisite
Quality Control and Risk Management in Construction	CECC0414	Theory+ Practice	2-1-0	Nil

Objective

<ul style="list-style-type: none"> · To make the student realize the necessity of quality control and quality assurance in construction industry. · To impart the procedures involved in maintaining quality in construction industry and various standards and practices prescribed therefor. · To enlighten the student with the tools of total quality management process. · To give hands on practice to the students in preparing quality assessment schedules and inspection check lists. · To make the student to take up laboratory and field tests for quality assurance for civil engineering structures.
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Course Outcome

<ul style="list-style-type: none"> · Generate quality control schedule for different projects in construction industry. · Prepare quality control inspection check lists for selected civil engineering structures. · Carryout the field and laboratory tests for quality assessment in construction industry.

Evaluation Systems

Internal Examination	Component	% of Marks	Method of Assessment
	Internal Theory	20	Written examination
	Internal Practice	30(20+10)	Lab work + Learning Record
External Examination	External Theory	30	Written examination
	External Practice	20	Lab work
Total		100	

Course outline

Module: I Principles of Quality Assessment & Quality Control (QA & QC) (Theory) (8 Hrs)

[Both Internal & External Assessment University Written Test and Sessional Tests.]

Introduction: Quality Control and Quality Assessment - Construction Quality - Purpose & Scope
 Definition & Evolution of Quality. Factors influencing Construction Quality
 QualityCircle.Establishing QC Requirements - Setting up a Quality Management System - Total

Quality Management - Deming's PDSA Quality Cycle, Juran's Quality Triangle & Triple Role models. Concept of Quality ISO Standards. Quality Audit. Construction Quality Assurance System (CONQUAS). Principles of Quality Control and Quality Assessment. Quality Management System, Quality Control Inspection Process.

Quality Assurance & Control: Objective, Regularity Agent - Owner, Contract and Construction Oriented Objectives & Methods. Techniques and Needs of QA / QC.

Module: II Method Statement and Quality Inspection Schedule (Theory & Class Room Practice)

[Internal & External Assessment.] (8 Hrs)

Method Statement - Importance and Purpose - Contents of Method Statement.

Practice Session on preparation of Method Statement for given Structure (Buildings, Irrigation Structures and Highway Projects).

Quality Inspection Schedule and importance - General Phases of Inspection Schedule for different Construction Projects - Conventional Residential Building, Multi- storied Buildings, Highway Projects - Concrete Roads, Bituminous Pavements, Elevated and, Ground and Underground Water Tanks,

Practice Session on developing Quality Inspection Schedule for given Structure (Buildings, Irrigation Structures and Highway Projects).

Module: III Quality Assessment (QA) Inspection Check Lists (Theory & Class Room Practice) [Internal & External Assessment.] (8 Hrs)

Study of Quality Inspection Check Lists for various construction activities and their importance - Contents to be included - Some Standard Check Lists. Check list for Design Standards and design processes.

Module: IV (12Hrs)

Practice Session on selection of Quality Inspection check lists for given Structure (Buildings, Irrigation Structures and Highway Projects) as per identified Schedule.

Practice Session on selection of Quality Inspection check lists for given Structure (Buildings, Irrigation Structures and Highway Projects) as per identified Schedule.

Module: V Post Construction QA (Field Practice) [Internal & External Practice Assessment. No written university examination.](8 Hrs)

Study of field tests for Quality Assurance. Study of QC standards for various construction equipment including Concrete batch mixing / Bitumen batch mixing equipment.

Practice Session on Rebound Hammer Test, Ultrasonic Pulse Velocity Test and Core Sampling.

Module: VI Risk Involved in Construction Industry (Class Room & Field Practice) [Internal & External Practice Assessment. No written university examination.] (8 Hrs)

Introduction - Definition and Importance of Risk Management studies - Uncertainty Matrix - Importance of Risk Management - Risk Classification and Risk Management Process - Risk causation theories - Risk Identification Process - Preliminary Check List, Risk Events Consequences Scenario - Risk Mapping and Risk Classification - Risk Analysis.

Module: VII Safety Procedures in Construction Industry (Class Room & Field Practice)

[Internal & External Practice Assessment. No written university examination.](8 Hrs)

Evaluation of Safety Project - Accident causation Theories, Foundations of a Major Injury - Unsafe Conditions and Unsafe Acts. Health and Safety Act and Regulations - Building & Other Construction Workers - Regulation of Employment and Condition of Services Act, 1996, Central Rules 1998.

Safety & Health Management System: Appraisal of construction safety management guidelines in Construction Sector - Safety Policy & Organization. Fire Prevention for different types of buildings

Safety precautions in Construction activities, Construction equipment usage.

.Reference

1. Quality Control in Construction Industry
2. SDGC Contractor QC Plan Template
3. Common Mistakes in Construction Phase
4. Quality Control Process
5. Concrete Distress
6. Construction QC Inspection Report
7. Durability & Deterioration of Concrete
8. Health Assessment of RC Structures
9. Quality Inspection & Control
10. IS Code- irc.gov.in.sp.011.1984
11. QA & QC Manual Dept of WS & Sanitation – Punjab

Session Plan

Topic coverage and Internal Test	No. of Sessions (in hrs.)	Activity (lecture, tutorial, lab practice, field studies/field-trip, Workshop etc.)	Assignment (project, Assignment, field study, seminar, etc.)	Suggested Reading (Book, Video, Online source, etc.)
Module I				
Introduction: Quality Control and Quality Assessment - Construction Quality - Purpose & Scope Definition & Evolution of Quality. Factors influencing Construction	2	lecture	1.1	Handouts

Quality Circle.				
Establishing QC Requirements - Setting up a Quality Management System - Total Quality Management - Deming's PDSA Quality Cycle, Juran's Quality Triangle & Triple Role models. Concept of Quality ISO Standards. Quality Audit.	2	lecture	1.2	Handouts
Quality Audit. Construction Quality Assurance System (CONQUAS). Principles of Quality Control and Quality Assessment. Quality Management System, Quality Control Inspection Process.	2	lecture	1.3	Handouts
Quality Assurance & Control: Objective, Regularity Agent - Owner, Contract and Construction Oriented Objectives & Methods. Techniques and Needs of QA / QC.	2	lecture	1.4	Handouts
Sub-total (hrs)	08			
Module II				
Practice Session 1 on Quality Control Testing Procedure & Quality Control Schedule preparation	2	practice	2.1	Handouts
Practice Session 2 on Generation of sample	2	practice	2.2	Handouts

Quality Control inspection Check list for Design Standards and design processes				
Practice Session 3 on Generation of sample Quality Control Inspection schedule Check list for formwork for a Building / Irrigation Structure.	2	practice	2.3	Handouts
Practice Session 4 on Generation of sample Quality Control Inspection schedule Check list for concreting in a Residential building / Irrigation Structure/ Highway Projects.	2	practice	2.4	Handouts
Sub-total (hrs)	08			
Module III				
Study of Quality Inspection Check Lists for various construction activities and their importance - Contents to be included - Some Standard Check Lists. Check list for Design Standards and design processes.	2	practice	3.1	Handouts
Practice Session on selection of Quality Inspection check lists for given Structure (Buildings, Irrigation Structures and Highway Projects) as per identified Schedule.	3	practice, field studies	field study	Handouts

Practice Session on selection of Quality Inspection check lists for given Structure (Buildings, Irrigation Structures and Highway Projects) as per identified Schedule.	3	practice, field studies	field study	Handouts
Sub-total (hrs)	08			
Module IV				
Importance of Quality Assessment for Materials used in construction Industry and their procurement.	1	lecture	4.1	Handouts
Study of laboratory tests for Quality Assurance. Quality Assessment Testing Procedure (Laboratory Tests) - IS Codes for Testing of Materials and Concrete.	4	practice	4.2	Handouts& IS Codes
Quality Assessment Schedule preparation for Laboratory Tests. Check Lists for Quality Control Testing Procedure & Practice.	2	practice	4.3	Handouts& IS Codes
Practice Session on Material Testing and Testing of Concrete for Quality Assessment.	5	practice	4.4	Handouts& IS Codes
Sub-total (hrs)	12			
Module V				
Study of field tests for Quality Assurance. Study of QC standards for various construction	4	practice, field studies	field study	Handouts& IS Codes

equipment including Concrete batch mixing / Bitumen batch mixing equipment Practice Sessions on laboratory tests, field tests and Field Visits				
Practice Session on Rebound Hammer Test, Ultrasonic Pulse Velocity Test and Core Sampling.	4	practice, field studies	field study	Handouts& IS Codes
Sub-total (hrs)	08			
Module VI				
Introduction - Definition and Importance of Risk Management studies - Uncertainty Matrix - Importance of Risk Management -	4	lecture	6.1	Handouts& IS Codes
Risk Classification and Risk Management Process - Risk causation theories - Risk Identification Process - Preliminary Check List, Risk Events Consequences Scenario - Risk Mapping and Risk Classification - Risk Analysis.	4	lecture	6.2	Handouts& IS Codes
Sub-total (hrs)	08			
Module VII				
Evaluation of Safety Project - Accident causation Theories, Foundations of a Major Injury - Unsafe Conditions and Unsafe Acts. Health and Safety Act and Regulations - Building & Other Construction	2	lecture	7.1	Handouts& IS Codes

Workers - Regulation of Employment and Condition of Services Act, 1996, Central Rules 1998.				
<p>Safety & Health Management System: Appraisal of construction safety management guidelines in Construction Sector - Safety Policy & Organization. Fire Prevention for different types of buildings</p> <p>Safety precautions in Construction activities, Construction equipment usage.</p> <p>Safety Practices for material handling, Safety Practices for Equipment Operation - Material safety Data Sheets</p>	2	practice, field studies	field study	Handouts & IS Codes
<p>Study of Safety Provisions for selected organizations - National Power Corporation of India Limited, Atomic Energy Regulation Board, NTPC, Godrej & Boyce.</p> <p>Visit to a project site visit for observing and noting the safety provisions adopted.</p>	2	practice, field studies	field study	Handouts & IS Codes
Sub-total (hrs)	08			
Total (hrs)	60			

Computer Aided Design of Steel Structures

Course Title	Course Code	Type of Course	T-P-PJ	Pre-Requisite
Computer aided design of Steel structures	CECC0407	Theory+ Practice	2-1-0	Nil

Objective

- To teach the basic fundamental behavior of different section of steel structure used in construction by using software

Course Outcome

- After completion of the courses the students will gain knowledge of Steel design calculation with relevant Indian Standards
- Students will develop skill of converting clients requirement to structural drawing by using STAAD.Pro

Evaluation Systems

Internal Examination	Component	% of Marks	Method of Assessment
	Internal Theory	20	Written Examination
	Internal Practice	30 (20+10)	Lab Work + Learning Record
External Examination	External Theory	30	Written Examination
	External Practice	20	Lab Work
Total marks		100	

Course Outline

Module I: PLASTIC ANALYSIS

(7Hours)

Theory

Plastic section modulus; load factor; shape factor; plastic moment of resistance; upper bound theorem and lower bound theorem

Practice

Tensile test of Mild steel specimen to know elastic and plastic failure region in UTM

Module II: FAILURE MECHANISM OF BEAMS AND PORTAL FRAMES (10Hrs)

Theory

Plastic analysis of fixed beam; continuous beam and simple rectangular portals

Practice

1. Failure mechanism of simply supported and cantilever beams with concentrated loads or uniformly distributed load
2. Failure mechanism of portal frames and simple truss with concentrated loads or uniformly distributed load

Module III: DESIGN OF BRACED AND UN-BRACED INDUSTRIAL BUILDING USING STAAD. Pro (13Hrs)**Theory**

Different types of Industrial Floors; Different types of bolts and welds; their design strength calculation; design of tension members; design of beams and design of purlin

Practice

3. Design of bolts and welding
4. Design of beam- column and column–slab by welded and bolted joints
5. Design of tension members

Module IV: DESIGN OF COLUMN (8Hrs)**Theory**

Design of Short and long Columns; design of laced and battened column

Practice

6. Design of short and long column
7. Design of lacing and battening column

Module V: DESIGN OF PLATE AND GANTRY GIRDERS (8Hrs)**Theory**

Introduction; weight and economical depth; design of plate girders; splices; stiffeners; riveted / bolted and welded connections; HSF bolts ;design of gantry girder and application

Practice

8. Design of plate girder
9. Design of gantry girder

Module VI: DESIGN OF TRANSMISSION AND COMMUNICATION TOWER USING STAAD. Pro (10 HRS)**Theory**

Classification of different types of towers; design for wind action; wind load calculation; design of transmission tower; design of a communication tower and design of purlin

Practice

10. Design of Transmission Tower
11. Design of Communication Tower
12. Design of roof truss Purlin

Module VII: DESIGN OF COLUMN BASE USING STAAD.Pro**(8HRS)****Theory**

Design of slab base and design of gusseted base;

Practice

13. Design of slab base
14. Design of gusseted base

Text Books

15. S K Duggal, " Designing of steel structures",2012.
16. S. Ramamurtham and R. Narayan, " Design of steel structures" ,2014

References

Steel Table by R. Agor

Online Resources

NPTEL

Session Plan

Topics	No. of Sessions (in hrs)	Activity	Assignment	Suggested Reading
Module I[5 Hours Lecture+2 Hours Practice]				
PLASTIC ANALYSIS Plastic section modulus, Load factor, shape factor	1	Lecture	1.1	Text Book(TB)- 2 Chapter(Ch)-8
plastic moment of resistance, upper bound theorem	2	Lecture + Practice	1.2	TB-2, Ch8
lower bound theorem	2	Lecture + Practice	1.3	TB-2, Ch8
Tensile test of Mild steel specimen to know elastic and plastic failure region in UTM	2	Practice		
Module II [6 Hours Lecture+4 Hours Practice]				
FAILURE MECHANISM OF BEAMS AND PORTAL FRAMES Plastic analysis of fixed beam	2	Lecture	2.1-2.5	TB-1(Ch-17) TB -2(Ch-8)
Plastic analysis of continuous beam	2	Lecture		TB-1(Ch-17) TB -2(Ch-8)
Plastic analysis of simple rectangular portal	2	Lecture		TB-1(Ch-17) TB -2(Ch-8)

Failure mechanism of simply supported and cantilever beams with concentrated loads or uniformly distributed load	2	Lecture+ Practice		TB-1(Ch-17) TB -2(Ch-8)
Failure mechanism of portal frames and simple truss with concentrated loads or uniformly distributed load	2	Lecture+ Practice		TB-1(Ch-17) TB -2(Ch-8)
Module III[7 Hour Lecture+6 Hour Practice]				
DESIGN OF BRACED AND UN-BRACED INDUSTRIAL BUILDING USING STAAD. Pro Different types of Industrial Floors	1	Lecture		
Different types of bolts and their strength calculation	2	Lecture+ Practice	3.1	TB-1(Ch-2) TB -2(Ch-4)
Different types of welds and their strength calculation	2	Lecture+ Practice	3.2	TB-1(Ch-3) TB -2(Ch-5)
Design of Tension Members	2	Lecture+ Practice	3.3-3.4	TB-1(Ch-6) TB -2(Ch-6) Reference 1
Design of Beams	4	Lecture+ Practice		TB-1(Ch-6) TB -2(Ch-6) Reference 1
Design of Purlin	2	Lecture+ Practice	3.5	TB-1(Ch-7) TB -2(Ch-9) Reference 1
ModuleIV[4 Hour Lecture+4 Hour Practice]				
DESIGN OF COLUMN Design of Short and long Columns		Lecture+		TB -2(Ch-7)
Design of lacing and battening column	4	Lecture+ Practice		TB -2(Ch-7)
Module V [4 Hour Lecture+4 Hour Practice]				
DESIGN OF COLUMN				

BASE PLATES AND GANTRY GIRDERS Analysis for Lateral Load and Load combination for design	1	Lecture		TB -2(Ch-11)
Lateral Load Resisting Systems for gantry girder	1	Lecture		TB -2(Ch-11)
Design Column base plates and anchor bolts	2	Lecture+ Practice	5.1-5.2	TB -2(Ch-11)
Design of gantry girder	4	Lecture+ Practice		TB -2(Ch-11)
Module VI [6 Hours Lecture+4 Hours Practice]				
DESIGN OF TRANSMISSION AND COMMUNICATION TOWER USING STAAD. Pro Classification of different types of Towers	1	Lecture		
Design for wind action and wind load calculation	1	Lecture	6.1	TB1(Ch-13)
Design of transmission tower	4	Lecture+ Practice	6.2-6.3	Online Sources
Design of communication tower	4	Lecture+ Practice		Online Sources
Module VII[2 Hours Lecture+2 Hours Practice]				
DESIGN OF SLAB BASE USING STAAD. Pro Design of slab base	2	Lecture+ Practice	7.1-7.2	TB-1(Ch-5) TB -2(Ch7) Reference 1
Design of gusseted base	2	Lecture+ Practice		TB-1(Ch-5) TB -2(Ch7) Reference 1
Total (Hours)	60	(32 Hours Theory+28 Hours Practice)		

Computer Aided Design of Concrete Structure

Course Title	Code	Type of course	T-P-P	Prerequisite
Computer Aided Design of Concrete Structures	CECC0408	Theory+ Practice	2-1-0	Nil

Objective

- To teach the basic theoretical aspects and contemporary issues in the design and fabrication of reinforced concrete members.

Course outcome

- To gain the knowledge of RCC design calculation with relevant Indian Standards
- To acquire skill of converting clients requirement to structural drawing and BOM by using STAAD PRO.

Evaluation Systems

Internal Examination	Component	% of Marks	Method of Assessment
	Internal Theory	20	Written Examination
	Internal Practice	30 (20+10)	Lab work + Learning Record
External Examination	External Theory	30	Written Examination
	External Practice	20	Lab Work
Total		100	

Course Outline

Module-I: Design & Detailing of Multi-Storied Building Using STAAD PRO(14Hrs)

Practice Sessions:

- Design detailing of rectangular beam, 'T' and 'L' beam, Design of lintel and sunshades
- Design detailing of Slabs: Design and detailing of one way and two way slabs, circular slab

Module-II: Analysis and Design of long column (14Hrs)

Practice Sessions:

- Design detailing of Columns: Short and long columns, axial and eccentrically loaded columns

Module-III: Analysis and Design of Short column (08Hrs)

- Design detailing of short columns uniaxial-bending
- Design for torsion, bond and Shear.

Module-IV: Matrix Methods for structural analysis of Trusses and Beam(10Hrs)

Basic concepts of Matrix methods of structural analysis: Flexibility and Stiffness method application to simple trusses and beams

Module-V: Matrix Methods for structural analysis of Trusses and Beam using STAAD Pro (6 Hrs)

6. Matrix method analysis of beams and trusses by STAAD.PRO

Module –VI: Influence Line Diagram of determinate beams (10Hrs)

ILD for simply supported, cantilever and overhanging beams; max BM and SF due to moving loads, Graphical representation of

Practice Sessions:

7. ILD for simply supported beams
8. ILD For cantilever beam

Module-VII: Influence Line Diagram of indeterminate beams(8Hrs)

9. ILD for continuous beam
10. ILD for three hinged arches

Text Books:

- a) Reinforced Design by DevdasMenon
- b) Structural Analysis by R.C Hibbeler
- c) Reinforced Concrete design-S. N. Sihna. Tata McGraw-Hill, New Delhi
- d) Structural analysis vol-1:S.S.Bhavikatti; Vikas Publication house Online Source:
<https://www.youtube.com/watch?v=8ATp13mOhvg&list=PL51300B0778FB5784&index=24>
<https://www.youtube.com/watch?v=SVC2BeqRKG>
<https://www.youtube.com/watch?v=No71m0oJ6DM>

Session Plan

Topic coverage and Internal Test	No. of Sessions (in hrs.)	Activity (lecture, tutorial, lab practice, field studies/field-trip, Workshop etc.)	Assignment (Project, assignment, field study, seminar, etc.)	Suggested Reading (Book, Video, Online source, etc.)
Module I[6HoursTheory+4Hours Practice]				
DESIGN& DETAILING OF MULTI-STORIED BUILDING USING STAAD PRO	2+0=2	lecture	1.1	Text Book(TB) Chapter (CH)

Design detailing of rectangular beam				
Design detailing of T' and 'L' beam	2+0=2	lecture	1.2	TB1 CH1
Design of lintel and sunshades	1+1=2	lecture	1.3	TB1 CH1
Design detailing of rectangular beam, 'T' and 'L' beam	0+2=2	practice	1.3	Video
Design and detailing of one way and two way slabs	1+1=2	Lecture+ practice	1.4	TB1 CH2
Sub-Total (hrs)	6+4=10			
Module II[8Hours Theory+6Hours Practice]				
ANALYSIS AND DESIGN OF LONG COLUMN				
Design detailing of Short and long columns axial and eccentrically loaded columns	4+2=6	Lecture+ practice	2.1	TB2 CH3
Design detailing axial and eccentrically loaded columns	4+2=6	Lecture+ practice	2.2	TB2 CH3
Sub-Total (hrs)	8+4=12			
Module III4Hours Theory+4Hours Practice]				
ANALYSIS AND DESIGN OF SHORT COLUMN				
Design detailing of short columns uniaxial-bending	2+2=4	Lecture+ practice	3.1	TB2 CH3
Design for torsion, bond and Shear	2+2=4	Lecture+ practice	3.2	TB2 CH3
Module IV[1HoursTheory+5Hours Practice]				
MATRIX METHODS FOR		Lecture	4.1	TB2 CH1
matrix methods for structural analysis of trusses and beam	2+2=4	Practice	4.2	TB2 CH1
matrix methods for structural analysis of trusses and beam	2+2=4	Practice	4.3	TB2 CH1

Module V[2HoursTheory+2Hours Practice]				
Matrix Methods for structural analysis of Trusses and Beam using STAAD Pro	1+1=2	Lecture+ Practice	5.1	TB3 CH5
Max BM and SF due to moving loads				
Suspension Bridges with Three- hinged arch; analysis for static loads; BM diagrams: influence line diagrams	1+1=2	Lecture+ Practice	5.2	TB3 CH5
Module VI[4HoursTheory+4Hours Practice]				
Influence Line Diagram of determinate beams		Lecture+ practice		TB3 CH5
ILD for simply supported beams	2+2=4	Lecture+ practice	6.1	TB3 CH5
ILD For cantilever beam	2+2=4	Lecture+ practice	6.2	TB3 CH5
Sub-Total (hrs)	4+4=8hrs			
Module VII[2HoursTheory+2Hours Practice]				
Influence Line Diagram of indeterminate beams				
ILD for continuous beam	3+2	Lecture+ practice	7.1	TB3 CH5
ILD for three hinged arches	3+2	Lecture+ practice	7.2	TB3 CH5
Total (hrs)	60Hrs	(30Theor y+30 Practice)		

GIS and Digital Cartography

Course Title	Code	Type of course	T-P-PJ	Prerequisite
GIS and Digital Cartography	CECC0413	Theory + Practice	2-2-0	Nil

Objective

<ul style="list-style-type: none"> · To study the basic concepts of GIS. · To study the data structure in GIS · To study data conversion in GIS and Meta data · To know the basics, importance, and methods of Cartography · To study the various maps projection and co-ordinate systems.

Course outcome

At the end of this course the students will be able to:
<ul style="list-style-type: none"> · To understand the structure of spatial data including file associations, attribute tables, Metadata, coordinate systems, and projections. · To develop software skills in programs used for map production in the modern cartographic workflow. · To learn the fundamental concepts of Cartography and its advancements as Digital Cartography. The engineers will be enabling to different aspects of Map Making, Generalization, Map Production and Map Reproduction

Evaluation Systems

Internal Examination	Component	% of Marks	Method of Assessment
	Internal Theory	20	Written examination
	Internal Practice	30(20+10)	Lab work + Learning Record
External Examination	External Theory	30	Written examination
	External Practice	20	Lab work
Total		<i>100</i>	

Course outline

Module – I: BASICS OF GIS(7Hrs)

Introduction; concepts, Information system, components of GIS, History, Geospatial data architecture; Operations, Input data for GIS, display, types of output products. GIS categories; Level and scale of Measurement, importance of data quality.

Practice:

Introduction to GIS (Overview, Features, About the software, Main user interface, Main menu-Project menu; Layer menu; View menu; Bookmarks menu; Plug-ins menu; Help menu, Toolbar, Legend window, Preview map, add data to the map area, Opening and saving projects)

Building a catalog of geographic data (Arc Catalog, folder connection, inside the catalog, folder location, create a working copy of the data, connect directly to your copy of the data, and remove folders that do not need)

Module – II: DATA ANALYSIS TOOLS(12Hrs)

The Spatial Analyst Extension and Model Builder; Metadata, Geo-referencing, Geocoding, Network Analyst; Interpolation and Surface Modeling, Interpolation Methods, The Geodatabase , Building a Geodatabase.

Practice:

Exploring data and adding it to a map (The Contents tab, Explore the contents of the Yellowstone folder, The Preview tab, Yellowstone data in Geography view, Explore the contents of a table, The Metadata tab, add a layer to a map, import metadata, Search for items, map compose)

Managing a dataset (Define a shape file’s coordinate system, modify attributes in database tables, calculate attribute values in ArcMap, Update the table’s metadata, create a layer using the related attributes, Add the vegetation type layer to the map)

ArcGIS Graphics language (generalization, symbology, and coloureffect, change symbology and use transparency in creative ways)

Module - III: SPATIAL DATA ANALYSIS(16Hrs)

Spatial interpolation; measurement and analysis methods, reclassification techniques; Buffer analysis, overlay analysis, Vector overlay analysis, Topological overlay, raster over lay analysis, measurement of length, perimeter and area, queries; 2D to 3 D conversion, DTM and DEM, advantages and disadvantages, Network modeling.

Practice:

Projection (Understanding of projection and coordinate system, projecting a dataset, adding projected dataset into the map, define a projection to the layer)

Georeferencing (Basic of georeferencing, Georeferencinga Scanned Image, Assign Projection to the Referenced Image)

Topology (Concept of topology, topology in different GIS format, Coverage, shapefile, DXF-Drawing Exchange File, Geodatabase, Topology principle, Topological Error and Correction process, creating personal Geodatabase, creating a features dataset)

Module – IV: CARTOGRAPHY(13Hrs)

History and development of Cartography; Definition, scope and concepts of cartography., Characteristics of Map; Categories of maps, Methods of mapping, relief maps, thematic maps. Trends in Cartography.

Practice:

Feature Dataset and Domain (Creating Feature Classes within the Feature Dataset, Creating Domain for the Feature Datasets, Digitizing the Feature Classes, Creating Topology in Arc Catalog, Viewing and Editing the Topology).

Google Earth (Introduction to Google Earth, Convert Shape file to KML Format, Extract data From Google Earth, Extract Point Data, Extract Polygon data, Extract line data, Convert KML File to shape file, overlaying an image into google earth)

Module – V: EARTH MAP RELATION(11Hrs)

Geodesy; Map projection, classification principles of construction of common projections, cylindrical, conical, azimuthal and globular projections. Properties & uses of projection. The spheroid, Map scale, and co-ordinate system. Plane co-ordinates in UTM system, projection used in Survey of India topographic sheets.

Practice:

Buffering and Editing tools: (Buffering in ArcGIS, add the data layer, create the buffer, conflation, extend the line, Erase point, Flip line, Snap, trim line, Densify, create a polygon, Create point, Create polygon)

Data Conversion Tools (from Excel to Table and table to Excel, GPS-from GPX to Features, KML to layer, from PDF to TIFF, from Raster to ASCII/Float/Point/Polygon/Polyline/Video, metadata importer/exporter/translator, Export to CAD features class to coverage, table to the database, CAD to a geodatabase, DEM to raster, LAS dataset to raster, Point/line/polygon to raster, feature class to shape file)

Module – VI: GPS and DGPS(11Hrs)

GPS satellites; Introduction, components, Satellite Ranging, codes, GPS, DGPS, GPS Receiver and its Features, Receiver selection, enhancement of receiver, GPS processor Software; GPS Data, Processing of GPS data and types.

Practice:

Mapping of an area using GPS. Error of GPS, **Open Source Data**; Bhuvan (Introduction to Bhuvan web portal, types of data available with Bhuvan, create an account on Bhuvan, Download data)

Model – VII: Total Station (TS)(20Hrs)

Basic concept ; Contouring of an area using TS, Layout of different structures, Demarcation of an area according to the cadastral map, Locating different objects in the map.

Practice:

1. Contouring
2. Layout of building
3. Demarcation of plot
4. Locating different permanent objects

Text Books

1. Burrough P.A., Principles of Geographical Information System for Land Resources Assessment, Oxford Publications, 1980.
2. A.M. Chandra and S.K. Ghosh 2000. Remote Sensing and GIS. Narosa Publishing House, New Delhi.
3. Paul A. Longley, Micheal F. Goodchild, David J. Magaine David J. Magaine, David W Rhind. Geographical Information System. Vol. I & II, John wiley& Sons. Inc.,1999
4. Kang-tsung Chang, Introduction to Geographical Information System, Fourth Edition, Tata McGraw Hill, 2008.
5. Anji Reddy .M, “*Textbook of Remote Sensing and Geographical Information Systems*”, BS Publications, Hyderabad. 2011. ISBN: 81-7800-112-8.

Session Plan

<i>Topic coverage and Internal Test</i>	<i>No. of Sessions (in hrs.)</i>	<i>Activity (lecture, tutorial, lab practice. etc)</i>	<i>A (project, A, seminar, etc.)</i>	<i>Suggested Reading (Book, Video, Online source, etc.)</i>
Module-I				
Introduction, concepts, Information system, components of GIS, History, Geospatial data architecture, Operations, Geographic co-ordinate systems	1	<i>Lecture</i>	<i>1.1</i>	TB:4,CH:1
Map projections, concepts, In-put data for GIS, display, types of output products.	1	<i>Lecture</i>	<i>1.2</i>	TB:4,CH:2
Level and scale of Measurement, importance of data quality.	1	<i>Lecture</i>	<i>1.3</i>	TB:4,CH:1
Practice				
Introduction to GIS (Overview, Features, About the software, Main user interface, Main menu-Project menu; Layer menu View menu; Bookmarks menu; Plug-ins menu; Help menu, Toolbar, Legend window, Preview map, add data to the map area, Opening and saving projects)	2	<i>Lab Practice</i>		https://www.youtube.com/watch?v=3BkaazSVIbI https://www.youtube.com/watch?v=irs-1nEsDYQ
Building a catalog of geographic data (Arc Catalog, folder connection, inside the catalog, folder location, create a working copy of the data, connect directly to your copy of the data, and remove folders that do not need)	2	<i>Lab Practice</i>		https://www.youtube.com/watch?v=3BkaazSVIbI TB:4,CH:1
Module-II				
GIS data types, data Representation, Data sources, typical GIS data sets, Data	2	<i>Lecture</i>	2.1	TB:4,CH:1 &

Acquisition, vector data model				3
topology, topology rules, Non topological vector data, object based vector data model, relationship between classes	1	<i>Lecture</i>	2.2	TB:4,CH:8
Data structure, data verification and editing spatial data models and errors – GIS database, attribute data input and management.	1	<i>Lecture</i>	2.3	TB:4,CH:9
Practice				
Exploring data and adding it to a map (The Contents tab, Explore the contents of the Yellowstone folder, The Preview tab, Yellowstone data in Geography view, Explore the contents of a table, The Metadata tab, add a layer to a map, import metadata, Search for items, map compose)	2	<i>Lab Practice</i>		https://www.youtube.com/watch?v=3BkaazSVIbI https://www.youtube.com/watch?v=RQ1Xs1D5oUU
Managing a dataset (Define a shape file's coordinate system, modify attributes in database tables, calculate attribute values in ArcMap, Update the table's metadata, create a layer using the related attributes. Add the vegetation type layer to the map)	2	<i>Lab Practice</i>		https://www.youtube.com/watch?v=PHtxbpbDro https://www.youtube.com/watch?v=cv6ltuMpnYM
ArcGIS Graphics language (generalization, symbology, and colour effect, change symbology and use transparency in creative ways)	4	<i>Lab Practice</i>		https://www.youtube.com/watch?v=w7G3SF4doVg
Module-III				
Raster data – elements of data model, cell, value, data structure, cell by cell encoding	2	<i>Lecture</i>	3.1	TB:4,CH:5
Run length encoding, Quad tree, Header files, format	2	<i>Lecture</i>	3.2	TB:4,CH:1

				https://www.youtube.com/watch?v=YI50cJScObl
Types of raster data, data compression, Linking and integration of vector data, Registration.	2	Lecture	3.3	TB:4,CH:1 https://www.gis lounge.com/geodatabases-explored-vector-and-raster-data/
Practice				
Projection (Understanding of projection and coordinate system, projecting a dataset, adding projected dataset into the map, define a projection to the layer)	2	Lab Practice		https://www.youtube.com/watch?v=Ij6iOT11xpE https://www.youtube.com/watch?v=eFhsBHgGMIO
Georeferencing (Basic of georeferencing, Georeferencing a Scanned Image, Assign Projection to the Referenced Image)	4	Lab Practice		https://www.youtube.com/watch?v=cv6ltuMpnym
Topology (Concept of topology, topology in different GIS format, Coverage, shapefile, DXF-Drawing Exchange File, Geodatabase, Topology principle, Topological Error and Correction process, creating personal Geodatabase, creating a features dataset)	4	Lab Practice		https://www.youtube.com/watch?v=hIDxUcG8op0 https://www.youtube.com/watch?v=DQLkdS7omcg
Module-IV				
Data format conversion, Medium conversion	1	Lecture	4.1	TB:4,CH:9

Spatial interpolation, measurement and analysis methods, Data accuracy and standards		2	<i>Lecture</i>	4.2	TH
Attribute data input and Management, Relational mode-Data manipulation, classification techniques.		2	<i>Lecture</i>	4.3	TH
Practice					
Feature Dataset and Domain (Creating Feature Classes within the Feature Dataset, Creating Domain for the Feature Datasets, Digitizing the Feature Classes, Creating Topology in Arc Catalog, Viewing and Editing the Topology).		4	<i>Lab Practice</i>		ht ut h? QQ
Google Earth (Introduction to Google Earth, Convert Shape file to KML Format, Extract data From Google Earth, Extract Point Data, Extract Polygon data, Extract line data, Convert KML File to shape file, overlaying an image into google earth)		4	<i>Lab Practice</i>		ht og n
Module-V					
Geodesy, Map projection, classification principles of construction of common projections, Cylindrical, conical, azimuthal and globular projections. Properties & uses of projection		1	<i>Lecture</i>	5.1	TB:4,CH:2
The spheroid, Map scale, and co-ordinate system. Plane co-ordinates in UTM system		1	<i>Lecture</i>	5.2	TB:4,CH:2
Projection used in Survey of topographic sheets	India	1	<i>Lecture</i>	5.3	TH
Practice					

Buffering and Editing tools: (Buffering in ArcGIS, add the data layer, create the buffer, conflation, extend the line, Erase point, Flip line, Snap, trim line, Densify, create a polygon, Create point, Create polygon)	4	<i>Lab Practice</i>		https://www.youtube.com/watch?v=7AK-jNK39Gs https://www.youtube.com/watch?v=ePScZlhE6A
Data Conversion Tools (from Excel to Table and table to Excel, GPS-from GPX to Features, KML to layer, from PDF to TIFF, from Raster to ASCII/Float/Point/Polygon/Polyline/Video, metadata importer/exporter/translator, Export to CAD features class to coverage, table to the database, CAD to a geodatabase, DEM to raster, LAS dataset to raster, Point/line/polygon to raster, feature class to shape file)	4	<i>Lab Practice</i>		https://www.youtube.com/watch?v=8tS_heOIM1U
Module - VI				
Introduction – GPS satellites – components	1	<i>Lecture</i>	6.1	https://www.maptoaster.com/maptoaster-topo-nz/articles/how-gps-works/how-gps-works.html
Satellite Ranging – codes - GPS – DGPS	1	<i>Lecture</i>	6.2	TB:4,CH:6
GPS Receiver and its Features – Receiver selection	1	<i>Lecture</i>	6.3	TB:4,CH:6
Enhancement of receiver - GPS processor Software – GPS Data	1	<i>Lecture</i>	6.4	TB:4,CH:6
Processing of GPS data and types	1	<i>Lecture</i>	6.4	TB:4,CH:6

Practice				
Mapping of area using GPS	2	<i>Lab Practice</i>		https://www.youtube.com/watch?v=i64d-pAYU0
Error of GPS, Open Source Data- Bhuvan (Introduction to Bhuvan web portal, types of data available with Bhuvan, create an account on Bhuvan, Download data)	4	<i>Lab Practice</i>		https://www.youtube.com/watch?v=Op6Rzx5RftA
Module - VII				
Contouring of an area using TS	1	<i>Lecture</i>	7.1	https://www.sli deshare.net/iaeme/experience-on-using-total-station-surveying-for-mapping-and-contouring
Layout of different structures	1	<i>Lecture</i>	7.2	https://www.youtube.com/watch?v=LBUDvH9wvRI
Demarcation of an area according to the cadastral map	1	<i>Lecture</i>	7.3	https://www.youtube.com/watch?v=wf6rCktLqYU
Locating different objects in the map	1	<i>Lecture</i>	7.4	
Practice				
Contouring	4	<i>Lab Practice</i>		https://www.youtube.com/watch?v=d_DoEB4zWEQ

Layout of building	4	<i>Lab Practice</i>		https://www.youtube.com/watch?v=d_DoEB4zWEQ
Demarcation of plot	4	<i>Lab Practice</i>		https://www.youtube.com/watch?v=d_DoEB4zWEQ
Locating different permanent objects	4	<i>Lab Practice</i>		https://www.youtube.com/watch?v=d_DoEB4zWEQ
Total(hrs.)	90	(30 Theory+60 Practice)		

Strength of Materials

Course Title	Code	Type of course	T-P-PJ	Prerequisite
Strength of Materials	CECC0411	Theory + Practice	1-2-0	Engineering Mechanics

Objective

- To teach the students on basic theories behind mechanics of solids
- To educate the students on using ANSYS for analysis of various mechanical structures and load transmitting elements

Course Outcome

- Students will have knowledge and practical engineering skills in analysis of mechanical strength of structures and load transmission elements and will be able to design them based on input data
- Students will be able to deploy ANSYS to develop mechanical design solutions

Evaluation Systems

Evaluation	Component	Marks	Method of Evaluation
Internal Evaluation	Internal Theory	20	Written Examination
	Internal Practice	30 (20+10)	Lab Work + Learning Record
External Evaluation	External Theory	30	Written Examination
	External Practice	20	Lab Work
Total Marks		100	

Course Outline

Module I: ANALYSIS OF BEAMS

(07 Hrs)

Theory

Shear and Bending Moment in Beams: Types of Beams and Loads; Concept of Shear force; Bending moment and Sign Conventions; Relation Between Load; Shear force and Bending moment; Procedure for Drawing Shear force and Bending moment Diagrams; Point of Contra Flexure.

Practice

1. Simulation (Using ANSYS): Evaluate Shear Force and Bending Moment
2. Simulation (Using ANSYS): Beam Analysis with Point Load, UDL, UVL and Moment

Module II: STRESSES IN BEAMS

(04 Hrs)

Theory

Simple or Pure Bending; Flexure Formula; Section Modulus; Neutral Axis; Determination of Bending Stresses; Shear Stress Distribution for Different Sections

Practice

3. Simulation (Using ANSYS): To Analyze The Bending Stress of a Cantilevered and Simply Supported Beam

<https://www.youtube.com/watch?v=ekKQvGna0ig>

Module III: DEFLECTION OF BEAMS

(05 Hrs)

Theory

Equation of Elastic Curve; Direct Integration Method; Strain Energy Method; Castigliano's Theorem

Practice

4. Stress & Deflection Analysis of Mechanical Component (Using ANSYS)

5. Double Shear Test and Deflection Test Using UTM

Module IV: ANALYSIS OF COLUMN AND SHAFT

(06 Hrs)

Theory

Failure of a Column; End Conditions; Euler's Critical Load for Long Columns; Rankine's Empirical Formula; Effective Length and Slenderness Ratio; Eccentric Loading and Secant Formula

Practice

6. Simulation (Using ANSYS): Buckling Analysis of a Square Column, I-Beam and RCC Beam

Module V: TORSION (08 Hrs)

Theory

Torsion Equation, Design of Shafts; Power Transmitted by Shafts; Composite Shafts; Combined Bending and Torsion; Closed-Coiled Helical Springs; Spring Connected in Series and Parallel

Practice

7. Simulation (Using ANSYS): Static and Dynamic Analysis of Shaft

8. Simulation (Using ANSYS): Spring Structural Analysis

9. Simulation (Using ANSYS): Stress Analysis of Suspension System

10. Stiffness Test of a Helical Spring

https://www.youtube.com/watch?v=xI-NqAKZ_60

<https://www.youtube.com/watch?v=rJ2e4DximL0>

Module VI: THEORIES OF FAILURE (06 Hrs)

Theory

Failure Under Biaxial Loading, Rankine's Theory; Guest's or Tresca's Theory; Von Mises Theory; Graphical Representation of Failure; Safety Factors; Prevention of Failure in Design Stage; Diagnosis of Failure In Post-Manufacturing Stage

Practice

11. Simulation: Spur Gear Fatigue Analysis in Ansys

<https://www.youtube.com/watch?v=2SGqcLZISQ0>

12. Simulation: Chair Structural Analysis in ANSYS

<https://www.youtube.com/watch?v=DIII8bI-ea8>

13. Simulation (Using ANSYS): Bicycle Frame Structural Analysis

https://www.youtube.com/watch?v=p-CUK_pEfR4

Module VII: FATIGUE

(14 Hrs)

Theory

Failure under Cyclic Loading; Endurance Limit. S-N Curve; Stress Concentration; Goodman and Soderberg Criteria.

Practice

14. Fatigue Failure Analysis (Using ANSYS)

<https://www.youtube.com/watch?v=ywDsB3umK2Y>

15. Fatigue Analysis of a Plate with Hole (Using ANSYS)

<https://www.youtube.com/watch?v=c3yM5fT5Ztc>

16. Fatigue Analysis (Using ANSYS) of Crankshaft of Two Wheeler

<https://www.youtube.com/watch?v=D0g3dpc-uYM>

Software requirement: ANSYS

Text Books:

TB 1. Rattan S.S. , Strength of materials,TataMc-Graw Hill Publication.

TB 2. Bansal R K ,Strength of materials,Laxmi Publication (P) Ltd.

Reference Books:

RB1. Boresi A.P. and Schmidt R.J., Advanced mechanics of materials, Willey India

RB2. P. Popov EgorEngineering Mechanics of Solids, Pearson publication

Online Source: YouTube, NPTEL

Session Plan

Topic coverage and Internal Test	No. of Sessions (in hrs.)	Activity (lecture, tutorial, lab practice, field studies/field-trip, Workshop etc)	A (project, A, field study, seminar, etc.)	Suggested Reading (Book, Video, Online source, etc.)
Module-I[3hrs.Lecture+4hrs.Practice]				
Shear And Bending Moment In Beams: Types of Beams and Loads, Concept of Shear force, Bending moment and Sign Conventions	1	Theory	1.1	Text Book(TB) Chapter(Ch)1.TB ₁ ,ch-4,page-99
Relation Between Load, Shear force and Bending moment, Procedure for Drawing Shear force and Bending moment Diagrams, Point of Contra Flexure.	2	Theory	1.2	1. TB ₁ ,ch-4,page-103

Simulation (Using ANSYS): Evaluate Shear Force and Bending Moment Simulation (Using ANSYS): Beam Analysis with Point Load, UDL, UVL and Moment	4	Lab practice	1.3	
Module-II[2hrs.Lecture+2hrs.Practice]				
Stresses in beams: Simple or Pure Bending, Flexure Formula, Section Modulus, Neutral Axis, Determination Bending Stresses, Shear Stress Theory Distribution for Different Sections.	2	Theory	2.1	1. TB ₁ ,ch-5,page-129 2. https://www.youtube.com/watch?v=ekKQvGna0ig
Simulation(Using ANSYS): To Analyze The Bending Stress of a Cantilevered and Simply Supported Beam	2	Lab practice	2.2	
Module-III[1hrs.Lecture+4hrs.Practice]				
Deflection of beams: Equation of Elastic Curve, Direct Integration Method, Strain Energy Method,	1	Theory		a) TB 2 ,ch-12,page-511

Stress & Deflection Analysis of Mechanical Component(Using ANSYS)	4	Lab practice	3.1	
Double Shear Test and Deflection Test Using UTM				
Module-IV[2hrs.Lecture+4hrs.Practice]				
Column analysis: Failure of a Column, End Conditions, Euler's Critical Load for Long Columns, Rankine's Empirical Formula, Effective Length and Slenderness Ratio, Eccentric Loading and Secant Formula.	4	Theory	4.1	1. TB ₁ , ch-12,page-388
Simulation(Using ANSYS): Buckling Analysis of a Square Column, I-Beam and RCC Beam	2	Lab practice	4.2	
Module-V[4hrs.Lecture+4hrs.Practice]				

<p>Torsion: Torsion Equation, Design of Shafts, Power Transmitted by Shafts, Composite Shafts, Combined Bending and Torsion, Closed-Coiled Helical Springs, Spring Connected in Series and Parallel.</p>	4	Theory	5.1	<p>RB₂,ch-6,page no-200</p> <p>2.https://www.youtube.com/watch?v=rJ2e4DximL0</p> <p>3.https://www.youtube.com/watch?v=xI-NqAKZ_60</p>
<p>Simulation (Using ANSYS): Spring Structural Analysis. Stiffness Test of a Helical Spring.</p>	4	Lab practice	5.2	
Module-VI[2hrs.Lecture+4hrs.Practice]				
<p>Theories of failure: Failure Under Biaxial Loading, Rankine's Theory, Guest's or Tresca's Theory, Von Mises Theory, Graphical Representation of Failure, Safety Factors, Prevention of Failure in Design Stage, Diagnosis of Failure In Post-Manufacturing Stage.</p>	2	Theory	6.1	<p>TB₁, ch-3,page-91.</p> <p>2.https://www.youtube.com/watch?v=2SGqcLZISQ0</p> <p>3.https://www.youtube.com/watch?v=p-CUR_pEIR4</p> <p>4.https://www.youtube.com/watch?v=hETp6TDi7-k</p>

Simulation: Spur Gear Fatigue Analysis in Ansys. Simulation(Using ANSYS): Bicycle Frame Structural Analysis	4	Lab practice	6.2	
Module-VII[3hrs.Lecture+8hrs.Practice]				
Fatigue: Failure Under Cyclic Loading, Endurance Limit. S-N Curve, Stress Concentration, Goodman and Soderberg Criteria.	3	Theory	7.1	RB1,Ch-16,page no-567.
Fatigue Analysis of a Plate With Hole(Using ANSYS). Fatigue Analysis(Using ANSYS) of Crankshaft of Two Wheeler	4	Lab practice	7.2	
Tensile Test, Compression Test	4	Lab practice	7.4	
Total (hrs)	47hrs	(THEORY-17+PRACTICE-30)		

Functional Planning & DPR

Course Title	Code	Type of course	T-P-PJ	Prerequisite
Functional Planning & DPR	CECC0501	Theory + Project	1-0-2	Nil

Objective

- ✓ To enlighten the students about various building components and their nominal sizes.
- ✓ To make the students learn how to plan a structure meeting the functional requirements and
- ✓ To train the students towards preparing a Detailed Project Report (DPR) for various structures.

Course outcome

- ✓ After successful completion of the course the students will be able to develop a functional plan and write a DPR of various structures through project work.

Evaluation Systems

Internal Examination	Component	% of Marks	Method of Assessment
	Internal Theory	20	Written examination
	Internal Project	25	Project Work
External Examination	External Theory	30	Written examination
	External Project	25	Project Work + Report
Total		100	

Course outline

Module-I: Introduction to Functional Planning (3 hrs)

Appraisal of various components of buildings - classification of buildings – substructure: various types of foundations; choice of types of foundations – superstructure: types of walls, flooring, doors and windows - Nominal dimensions of building components.

Module-II: Introduction to DPR

(2hrs)

Guidelines for project proposal for (NeGP project); DPR for Highway projects (NHAI); DPR for Irrigation projects; JNNURM DPR toolkit; DPR for APTS; Templates for preparation of detailed project report in r/o for KIIFB Assistance.

Module-III: Detailed Functional planning for buildings other than industrial as per IS code SP 41:1987.(2 hrs)

Climatology: Climate, thermal comfort, shading devices, energy requirement for cooling and heating.

Module-IV:Heat insulation,Ventilation&Lighting (3hrs)

Introduction, terminology, requirements, heat transmission through buildings, thermal performance of buildings, orientation of buildings, building characteristics for various climates, thermal design of buildings, influence of design parameters, mechanical controls.

Ventilation: Introduction, terminology, ventilation requirements, minimum standards for ventilation, ventilation design, energy conservation in ventilating systems.

Lighting: General, illumination requirement, daylighting, daylighting analysis, supplementary artificial lighting design, artificial lighting design, energy conservation.

Module-V:Detailed Functional planning for industrial building as per IS code SP 32:1986. (3hrs)

Lighting: Introduction, illumination levels, characteristics of good lighting, daylighting, principles of daylighting design, artificial lighting, maintenance.

Ventilation: Introduction, physiological considerations, standards of temperature, control of heat, amount of ventilation required, natural ventilation, mechanical ventilation, evaporative cooling, air conditioning, measurement of ventilation, ventilations for contaminants control, installation and operation.

Module-VI: EIA (2hours)

Checklists, Salient features, Statutory clearances, land acquisition, feasibility report, Environmental Impact analysis, Basically Cost – Benefits analysis, Investment criteria, payback period, Discounted cash flow (DCF) Technique, Net Present Worth (NPW), Benefit Cost Ratio (B C Ratio), Internal rate of return (IRR)

Module-VI: Project (30 + 30 = 60 hrs)

Project

Students to select any two projects & prepare report on FP & DPR. Any other projects as per their choice approved by course instructor can also be taken up.

List of projects

- a) Hotel buildings
- b) Hospital buildings
- c) Academic campus buildings
- d) Administrative buildings
- e) Bridges & overpasses
- f) Irrigation projects

- g) Residential buildings
- h) Shopping complex
- i) Convention centre
- j) Micro or Mini-hydel power Plant

Reference

- a) IS code SP 41:1987.
- b) IS code SP 32:1986?

E-content:

- a) Handouts
- b) Various Templates for DPR
- c) Case Studies

Online Source:

Session Plan

Topic coverage and Internal Test	No. of Sessions (in hrs.)	Activity (lecture, tutorial, lab practice, field studies / field-trip, workshop etc.)	Assignment (project, Assignment, field study, seminar, etc.)	Suggested Reading (Book, Video, Online source, etc.)
Module I				
Introduction to Functional Appraisal of various components of buildings - classification of buildings – substructure: various types of foundations; choice of types of foundations – superstructure: types of walls, flooring, doors and windows	2 +4	Lecture	field study	E material & Online source
Module II				
Guidelines for project proposal for (NeGP project); DPR for Highway projects (NHAI); DPR for Irrigation projects; JNNURM DPR toolkit; DPR for APTS; Templates for preparation of detailed project report in r/o for KIIFB Assistance.	2+6	Lecture+Project	Project	E material & Online source
Module III				

<p>Detailed Functional planning for other than industrial building as per IS code SP 41:1987.</p> <p>Climatology: Climate, thermal comfort, shading devices, energy requirement for cooling and heating.</p>	2+8	Lecture + Project	Class room project work	E material, Online source & I.S. Codes
Module IV				
<p>Heat insulation: Introduction, terminology, requirements, heat transmission through buildings, thermal performance of buildings, orientation of buildings, building characteristics for various climates, thermal design of buildings, influence of design parameters, mechanical controls.</p> <p>Ventilation: Introduction, terminology, ventilation requirements, minimum standards for ventilation, ventilation design, energy conservation in ventilating systems.</p> <p>Lighting: General, illumination requirement, daylighting, daylighting analysis, supplementary artificial lighting design, artificial lighting design, energy conservation.</p>	3+ 8	Lecture + Project	Field Study	
Module V				
<p>Detailed Functional planning for industrial building as per IS code SP 32:1986.</p> <p>Lighting: Introduction, illumination levels, characteristics of good lighting, daylighting, principles of daylighting design, artificial lighting, maintenance.</p> <p>Ventilation: Introduction, physiological considerations, standards of temperature, control of heat, amount of ventilation required, natural ventilation,</p>	3+12	Lecture + Project	Project work at class room	E material, Online source & I.S. Codes

mechanical ventilation, evaporative cooling, air conditioning, measurement of ventilation, ventilations for contaminants control, installation and operation.				
Module VI				
Checklists, Salient features, Statutory clearances, land acquisition, feasibility report, Environmental Impact analysis, Basically Cost – Benefits analysis, Investment criteria, payback period, Discounted cash flow (DCF) Technique, Net Present Worth (NPW), Benefit Cost Ratio (B C Ratio), Internal rate of return (IRR)	3+12	Lecture + Project	Classroom (Project work)	
Module VII				
Preparation of DPR of projects and submission	20	Project	PPT presentation	
Total (hrs)	75	[15Theory + 60Project =75]		

Domain - Construction Planning & Project Management

Course Code	Course Title	Course Nature	Credits	Prerequisite
DECP0101	Construction Equipment Management.	Theory	3	Nil
DECP0401	Site Supervision & Measurement Methods.	Theory + Practice	4	Nil
DECP0402	Geotechnical Investigations	Theory + Practice	3	Nil
DECP0403	Repairs, Renovation and Rehabilitation of Structures	Theory + Practice	3	Quality control
DECP0601	Tendering Process, Bidding Contract Agreements & Arbitration.	Practice + Project	3	Quality control and DPR
DECP0301	Software Based Project Scheduling and Management	Project	4	Nil
DEET0300	Project	Project	6	
DEET0800	Internship	Practice	4	
Total			30	

Construction Equipment Management

Course Code	Course Title	Course Type	T-P-PJ	Prerequisites
DECP0101	Construction Equipment Management	Theory	3-0-0	Nil

Course Objective:

- To enlighten the student with various equipment used in construction industry including selection criterion and economics of the same.
- To appraise the student with the aspects related to functioning, operation and maintenance of various construction equipment

Course Outcomes:

- After successful completion of the course the students will be able to identify the particular equipment to be used in the construction project they will undertake.
- Prepare plans for economic management of the equipment in the projects they undertake.

Evaluation Systems

	Component	% of Marks	Method of Assessment
Internal Examination	Internal Theory	30	Written examination
	Assignment	5	Report or Presentation + Learning Record
	Attendance	5	Based on class attended
External Examination	External Theory	60	Written examination
Total		100	

Module I (Theory) 6Hrs.

Introduction: Planning & Selection of Equipment - Equipment classification - Selection criteria & Source of Information Economics of Equipment: - Down Time Cost & Obsolescence Cost - Equipment Value, Depreciation, Owning & Operation Cost.

Module II (Theory) 4Hrs.

Time Factors & Equipment Life: Equipment Time - Down Time & Cycle Time. Equipment Life - Economic Life, Useful Life, Operating Life and Working Life Equipment Management & Procurement:

Module III (Theory) 3Hrs.

Equipment Management Check List - Equipment Order and Invoice - Equipment Maintenance sheets and Log Book.

Module IV (Theory & Field Visit) 6Hrs.

Practice based study on the functions, operational process, specifications for different constructional equipment

Road Making Equipment, Material Handling Equipment and Grading Equipment
Batching Plant, Concreting Equipment & Slip form Equipment

Module V (Theory & Field Visit) 6Hrs.

Hauling, Tunneling and other Equipment
Excavation & Embankment Making Equipment and Grading Equipment

Module VI (Theory & Field Visit) 10Hrs.

Batching & Mixing Equipment, Concreting Equipment & Slip form Equipment and Asphaltic Equipment

Material Handling Equipment and Hauling & Hoisting Equipment
Pile Driving Equipment and De-watering Equipment

Module VII (Theory) 10Hrs.

Based study & discussion on Materials Management
Basics of Materials Management
Inventory Management
MRP

Text Books:

1. Construction Equipment-James E. Russel, Prentice Hall.
2. Construction Planning and project management-Neeraj K. Jha.
3. Construction Planning and project management-U.K. Shrivastava.
4. Construction Planning and project management-P.S. Gahlot & B.M. Dhir.

Pedagogy

Sl. No.	Topic	Activity through	T
1	Introduction	L	1
2	Instructional Session 1 <ul style="list-style-type: none"> ✓ Planning & Selection of Equipment ✓ Equipment classification ✓ Equipment Selection criteria & Source of Information. 	L	3
3	Instructional Session 2 <ul style="list-style-type: none"> ✓ Economics of Equipment: - Down Time Cost & Obsolescence Cost ✓ Equipment Value, Depreciation, Owning & Operation Cost. 	L	3
4	Instructional Session 3 <ul style="list-style-type: none"> ✓ Time Factors & Equipment Life ✓ Equipment Time - Down Time & Cycle Time ✓ Equipment Life of Economic Life, Useful Life, Operating Life and Working Life. ✓ Equipment Management & Procurement 	L	4
5	Instructional Session 4 <ul style="list-style-type: none"> ✓ Equipment Management Check List ✓ Equipment Order and Invoice ✓ Equipment Maintenance sheets and Log Book. 	L	3
6	Instructional Session 5 <ul style="list-style-type: none"> ✓ Appraisal regarding Equipment for different purposes ✓ Road Making Equipment, Material Handling Equipment and Grading Equipment ✓ Batching Plant, Concreting Equipment & Slip form Equipment 	L& PPT	4
7	Instructional Session 6 <ul style="list-style-type: none"> ✓ Hauling, Tunnelling and other Equipment ✓ Equipment classification 	L & PPT	1
8	Instructional Session 7 <ul style="list-style-type: none"> ✓ Equipment Procurement 	L & PPT	1
9	Instructional Session 8 <ul style="list-style-type: none"> ✓ Excavation & Embankment Making Equipment and ✓ Grading Equipment 	L & PPT	2

10	Instructional Session 9 <ul style="list-style-type: none"> · Batching & Mixing Equipment · Asphaltic Equipment 	L & PPT	2
11	Instructional Session 10 <ul style="list-style-type: none"> · Concreting Equipment & Slip form Equipment 	L & PPT	2
12	Instructional Session 11 <ul style="list-style-type: none"> · Material Handling Equipment and Hauling & Hoisting Equipment. 	L & PPT	2
13	Instructional Session 12 <ul style="list-style-type: none"> · Pile Driving Equipment and · De-watering Equipment 	L & PPT	2
14	Instructional Session 13 <ul style="list-style-type: none"> · Maintenance of construction equipment's. 	L & PPT	2
15	Instructional Session 14 <ul style="list-style-type: none"> · Construction equipment management. 	L & PPT	2
16	Instructional Session 15 <ul style="list-style-type: none"> · Basics of Materials Management 	L & PPT	2
17	Instructional Session 16 <ul style="list-style-type: none"> · Inventory Management · Basics of Materials Management · MRP 	L& PPT	2
18	Field Visit to construction site	FV, GP, RP & PPT	7
TOTAL TIME (45 HRS)			45

Site Supervision & Measurement Methods

Course Code	Course Title	Course Type	T-P-PJ	Prerequisite
DECP0401	Site Supervision & Measurement Methods	Theory + practices	2-2-0	Nil

Course Objectives:

- To provide knowledge about the buildings, bridges and culvert etc
- To make understand about the quality construction
- To make familiar with different technique of construction work
- To provide knowledge about the different component wise practical of construction works.
- To make student familiar with drawing (plans, elevations, sections, etc) for finding out the dimensions.

Course Outcome

- To know the basic knowledge of Civil Construction work, and Identify the Quantity and Quality of work.

Evaluation Systems

Internal Examination	Component	% of Marks	Method of Assessment
	Internal Theory	20	Written examination
	Internal Practice	30(20+10)	Lab work + Learning Record
External Examination	External Theory	30	Written examination
	External Practice	20	Lab work
Total		100	

Module I (5hrs)

Introduction of Site Supervision, Basic knowledge of civil construction, Type of Buildings, Structural system of Building, Principal of site selection, Site plan, Planning Regulations and Bye-Laws, Principal of Planning, Basic functional Requirements of a Building, Important of Building Component, Site investigation, Ground Techniques

Module II (10hrs)

Different Types of Tools and its use Different Equipment's (Construction, pumping, drilling, Concreting, Road making) etc, Units Conversion, measurement of the building,(Plinth area, Builtup areas, Construction area, Floor area, etc, Different types of Safety materials and its use

Module III (15Hrs)

Lay out and marking of the Building,(center line, construction line),Earth work excavation for different foundation work, Foundation (Raft foundation, Shallow foundation,Streep foundation) with RRMasonry(Straight, L,T,+ Junction),

Module IV (15Hrs)

Brick Masonry (Straight, L,T,+ Junction), R.C.C.etc..Plinth Work, Super Superstructure work, Brick Work(Header Bond,Strecher Bond, English Bond, Flemish Bond, Rat Trap Bond, Gardening Bond etc..)Pre-cast Structure, Lintel with Chaja, Different Type of Arches (Segmental Arch, Semi circle, Pointed Arch etc..)

Module V (15Hrs)

Structural Work, Steel Cutting & Bending, Different type of Stirrups, Site visit to see the Bridge work (Well Foundation with, Box Foundation etc..),

Module VI (15Hrs)

Project work for calculation to get the Volume work and Quantity of material consumed with existing structure, cost calculation,etc..

Module VII (15Hrs)

Project work for calculation to get the Volume work and Quantity of material consumed with existing structure, cost calculation,etc..

Reference Books:

1. Building Construction by Rangwala,
2. Esimating and Costing by B.N.Dutta

Pedagogy

SL. NO	Topics	Pedagogy	Instructional hrs.	
	<u>Module: 1</u> (12hrs)		Theory	Practical (hrs)
1.	Introduction for site supervision,basic knowledge of construction ,type of building,principal of site	Theory	1	0
2.	Introduction for site supervision,basic knowledge of construction ,type of building,principal of site	Theory	1	0
3.	Different equipment's(Construction,pumping,drilling,	Theory/pract	0	2
4.	Different types of Safety materials and its use.	Theo/pract	0	2
5.	Principal of site selection, Site plan, Planning Regulations and Bye-Laws, Principal of Planning, Basic functional Requirements of Building	Theory	1	0
6.	Principal of site selection, Site plan, Planning Regulations and Bye-Laws, Principal of Planning, Basic functional Requirements of Building	Theory	1	0
7.	Measurement of the building,(Plinth area,Built-up areas, Construction area, Floor area,Carpet Areas	Practical	0	2
8.	Lay out and marking of the Building,(center line, construction line)	Practical	0	2
	<u>Module: 2</u> (12hrs)			
9.	Important of Building Component, Site investigation, Ground Techniques, Different Types	Theory	1	0
1	Important of Building Component, Site investigation, Ground Techniques, Different Types	Theory	1	0
1	Lay out and marking of the Building,(center line, construction line),Earth work excavation for different foundation work	Practical	0	2
1	Foundation (Raft foundation, Shallow foundation,Streep foundation)	Practical	0	2

1	Foundation with rrmasonry(straight &l'junction) with mortar	Theory	1	0
1	Foundation with rrmasonry('t' & '+' junction) with mortar and pointing	Theory	1	0
1	Foundation with rrmasonry(straight &l'junction) with mortar	Practical	0	2
1	Foundation with rrmasonry('t' & '+' junction) with mortar and pointing	Theory	0	2
1			4	8
1	Module: 3(12hrs)			
1	Foundation with brick masonry(straight &l'junction) with mortar	Theory	1	0
2	Foundation with brick masonry('t' & '+' junction) with mortar and pointing practical	Theory	1	0
2	Foundation with brick masonry('t' & '+' junction) with mortar and pointing	Practical	0	2
2	Foundation with brick masonry(straight &l'junction) with mortar	Practical	0	2
2	Foundation with brick masonry('t' & '+' junction) with mortar and pointing	Theory	1	0
2	Pear&streep foundation with rrmasonry with dry packing	Theory	1	0
2	Foundation with brick masonry('t' & '+' junction) with mortar and pointing	Practical	0	2
2	Pear&streep foundation with rrmasonry with dry packing	Practical	0	2
2	Module: 4(18hrs)			
2	Brick masonry with header bond with straight l',t' &+'junction	Theory	1	0
2	Layout , marking for fixing of door and open	Theory	1	0
3	Brick masonry with header bond with straight l',t' &+'junction	Practical	0	2
3	Brick masonry with streature bond with straight l',t' &+'junction	Practical	0	2
3	Brick masonry with english bond with straight l'junction	Theory	1	0
3	Brick masonry with english bond with t' &+'junction	Theory	1	0

34	Brick masonry with english bond with straight l'junction	Practical	0	2
3	Brick masonry with english bond with t'&+'junction	Practical	0	2
3	Brick masonry with flemish bond with straight l'junction	Theory	1	0
3	Brick masonry with flemish bond with t'&+'junction	Theory	1	0
3	Brick masonry with flemish bond with straight l'junction	Practical	0	2
3	Brick masonry with flemish bond with t'&+'junction	Practical	0	2
4	Module: 5(12hrs)			
4	Brick masonry with rat trap bond with straight l't,+'junction	Theory	1	0
4	Plumbing,indian pan ,comord fitting for toilet,elect	Theory	1	0
4	Brick masonry with rat trap bond with straight l'junction	Practical	0	2
4	Brick masonry with rat trap bond with t'&+'junction	Theory	1	0
4	Brick masonry with arch with rat trap bond	Theory	1	0
4	Brick masonry with semi circle arch with flemish	Practical	0	2
4	Brick masonry with arch with rat trap bond	Practical	0	2
4	Module: 6(12hrs)			
5	Low cost building technology with filler slab	Theory	1	0
5	Brick masonry with semi circle arch with english	Theory	1	0
5	Plastering,pointing(rough, external&internal)	Practical	0	2
5	Brick masonry with semi-circle arch with english bond	Practical	0	2
5	Brick masonry with pointed arch with english bond	Theory	1	0
5	Brick masonry with segmental arch with english bond	Theory	1	0
5	Brick masonry with pointed arch with english	Practical	0	2
5	Brick masonry with segmental arch with english bond	Practical	0	2
5	Module: 7(12hrs)			

5	Project work (collecting data from existing	Theory	1	0
6	Project work (collecting data from existing	Theory	1	0

	Project work (to make the drawing)	Practical	0	2
6	Project work (to calculate volume of work)	Practical	0	2
6	Project work (to calculate volume of work)	Theory	1	0
6	Project work (to calculate volume of work)	Theory	1	0
		Practical		2
6	Project work (to calculate volume of work)		0	
		Practical		2
6	Project work (to calculate volume of work)		0	

Geotechnical Investigations

Course Code	Course Title	Course Type	T-P-PJ	Prerequisite
DECP0402	Geotechnical Investigation	Theory+ Practice	2-1-0	Nil

Course Objectives:

- ✓ To make the student realize the importance of geotechnical investigations in construction industry.
- ✓ To enlighten the student with the subsurface geotechnical exploration methods and the processes.
- ✓ To appraise various impart the procedures of geotechnical investigations for varying soils.
- ✓ To give hands on practice to the students in carrying laboratory and field tests during the geotechnical investigation process.
- ✓ To involve the student in the boring, drilling, trial pitting and preparation of geotechnical investigation reports.

Course Outcomes:

- ✓ Plan geotechnical investigations before constructing a structure.
- ✓ Conduct the laboratory and field tests as a part of geotechnical investigations.
- ✓ Analyze the geotechnical investigation test data and prepare a report for selected categories of structures

Evaluation Systems

Internal Examination	Component	% of Marks	Method of Assessment
	Internal Theory	20	Written examination
	Internal Practice	30(20+10)	Lab work + Learning Record
External Examination	External Theory	30	Written examination
	External Practice	20	Lab work
Total		<i>100</i>	

Module I (06 hours)

Introduction: Importance of Geotechnical Investigations –Soil Exploration, Methods of site exploration.

Practice:

Estimation of soil parameters for foundation design-Recommendations about the allowable bearing pressure, the type of foundation or structure. Writing a detail aboutscope of the investigations.

Module II (13 hours)

Planning for Subsurface Exploration: Fact finding and Geological survey, Reconnaissance, Preliminary Exploration, Detailed Exploration , Planning Trial Pitting, boring and drilling, Boring of Holes-Depth of exploration, Boring Methods.

Practice:

Information Extraction from site investigation topography, Description of the proposed structure, the location & geological condition of the site.

Field Visit for observing Boring, Drilling, Probing and Trial Pitting—Preparation of Borehole Log-Details of the field exploration programme, indicating the number of the borings, their locations & depths

Module III (09 hours)

Subsurface Exploration Necessity & Objectives and Types of Subsurface Explorations. Suitability of different investigation procedures for Shallow & Deep Investigations, Soft Marine Clays & Expansive Soils and Liquefiable soils & Lateritic deposits.

Practice:

Give details of the methods of exploration-Details about the soil formation, depth of change in soil formation from ground level from the geophysical exploration data.

Module IV (08 hours)

Sampling of soils and Sample Analysis: Disturbed samples , Undisturbed samples ,Study of Testing methods (In situ tests) - Different types of samplers, Sample Sizes, equipment / apparatus for different tests and Soil Disturbance during Sampling & its effect, **Requirement of good sampling process.**

Practice:

General description of the sub-soil conditions as obtained from in-situ test, such as standard penetration test, cone test. Discussions of the results.

Module V (09 hours)

Undisturbed Sampling Techniques: Study of Standards available, relevant codes and Sampling, laboratory testing and in situ testing requirements.

Practice:

Field Visit for Undisturbed Sampling and Analysis of field test data.

Module VI (07 hours)

Practice:

Water table location, Depth of ground water table & the changes in water levels.Finding out solution for different types of problems.

Module VII (08 hours)**Practice:**

Preparation of Geotechnical Investigation Reports for Major Projects - Dams, Hydroelectric Projects, Railway Projects, Commercial Structures, Industrial Structures, Residential Structures.

Resources List:

1. IGS-TC04-GI-Manual 2016
2. IS SP7 (NBC- 2005)
3. Site Investigation (Clayton, Matthews and Simons)
4. Writing Geotechnical Investigation Report

PEDAGOGY

Sl.No	Topic	Pedagogy	Instructional Hours	
			Theory	Practice
	Module I: Introduction: Importance of Geotechnical Investigations –Soil Exploration, Methods of site exploration.	CRT	2	
	Estimation of soil parameters for foundation design-Recommendations about the allowable bearing pressure, the type of foundation or structure. Writing a detail aboutscope of the investigations.	PRA		4
	Module II: Planning for Subsurface Exploration: Fact finding and Geological survey, Reconnaissance, Preliminary Exploration, Detailed Exploration	CRT	3	
	Planning Trial Pitting, boring and drilling, Boring of Holes-Depth of exploration, Boring Methods.	CRT	4	
	Information Extraction from site investigation topography, Description of the proposed structure, the location &geological condition of the site.	PRA		2
	Field Visit for observing Boring, Drilling, Probing and Trial Pitting—Preparation of Borehole Log- Details of the field exploration programme, indicating the number of the borings, their locations & depths.	PRA		4
	Module III: Subsurface Exploration Necessity & Objectives and Types of Subsurface Explorations.	CRT	3	
	Suitability of different investigation procedures for : <ul style="list-style-type: none"> · Shallow & Deep Investigations · Soft Marine Clays & Expansive Soils · Liquefiable soils & Lateritic deposits 	CRT	4	

	Give details of the methods of exploration-Details about the soil formation, depth of change in soil formation from ground level from the geophysical exploration data.			2
	Module IV : Sampling of soils and Sample Analysis: Disturbed samples , Undisturbed samples ,Study of Testing methods (In situ tests) - Different types of samplers, Sample Sizes, equipment / apparatus for different tests and Soil Disturbance during Sampling & its effect, Requirement of good sampling process.	CRT	6	
	General description of the sub-soil conditions as obtained from in-situ test, such as standard penetration test, cone test. Discussions of the results.	PRA		2
	Module V: Undisturbed Sampling Techniques: Study of Standards available, relevant codes and Sampling, laboratory testing and in situ testing requirements.	CRT	5	
	Field Visit for Undisturbed Sampling and Analysis of field test data.	PRA		4
	Module VI: Water table location, Depth of ground water table & the changes in water levels. Finding out solution for different types of problems.	CRT + PRA	3	4
	Module VII: Preparation of Geotechnical Investigation Reports for Major Projects - Dams, Hydroelectric Projects ,Railway Projects , Commercial Structures ,Industrial Structures , Residential Structures.	PRA		8
	Subtotal		30	30

Repairs, Renovation and Rehabilitation of Structures

Course Code	Course Title	Course Type	T-P-P	Prerequisite
DECP0403	Repairs, Renovation and Rehabilitation of structures	Theory+ Practice	2-1-0	Quality Control

Course Objectives

- To make the students conversant with the emerging technology involved in construction industry causes of deterioration, assessment, repair and renovation and maintenance of distressed/damaged structures and demolition procedures including various processes.
- Students shall gain knowledge about importance and methods of substrate preparation, modern repair materials, and various repair techniques repair renovation of damaged/dilapidated, corroded structures

Course Outcomes

- After successful completion of the course the students will have capability/knowledge of various important, monumental but distressed and damaged modern materials that longevities old concrete and masonry structures

Evaluation Systems

Internal Examination	Component	% of Marks	Method of Assessment
	Internal Theory	20	Written examination
	Internal Practice	30(20+10)	Lab work + Learning Record
External Examination	External Theory	30	Written examination
	External Practice	20	Lab work
Total		<i>100</i>	

Module I: Maintenance and Repair Strategies 4(Theory) +4 (Practice)

Introduction: concepts of durability and degradation of concrete structures - Defect identification, Types of damages of concrete/masonry structures (normal and marine environment), tests for damage evaluation.

Practice Session 1: Study session on Crack Diagnosis and its appraisal - Reasons for crack development / Crack prevention, Monitoring & Measuring Crack propagation and preparing a report on crack repairing techniques (field work)

Module II: Deterioration and distressed structures 4 (Theory) + 4 (Practice)

Deterioration of Structures, Distress in Structures, Causes and Prevention cracks, Mechanism of damage-Types of Damage, Maintenance, Repair and Rehabilitation, Facets of Maintenance,

importance of Maintenance, Various aspects of Inspection, Assessment procedure for evaluating a damaged structure, causes of deterioration.

Practice Session 2 (Practice cum Project): Case Study of old building developing cracks due to Natural hazards & Renovation - Natural Hazards

Practice session 3: Damage Control & Building Performance Levels and Structural & Non-structural Performance Levels

Module III: Retrofitting 4 (Theory) + 4 (Practice)

Earthquake damages of buildings, their retrofitting, restoration, effects of earthquakes, response of buildings to earthquake motion, factors related to building damages due to earthquake, methods of seismic retrofitting, restoration of earth quake damaged structures.

Practice session 4: Seismic up gradation of structures, Rehabilitation & Retrofitting and their necessity - Leakage arrest & Water proofing and Termite treatment

Practice Session 5: Study and report preparation on strengthening of different structural elements - Columns, Beams, Slabs and Foundation treatment. Conducting non-destructive tests and preparation of reports

Module IV: Damage diagnosis and assessment 6 (Theory) +6 (Practice)

Visual inspection, Non Destructive Testing using Rebound hammer, Ultra sonic pulse velocity, Semi destructive testing, Probe test, Pull out test, Chloride penetration test, Carbonation, Sulphate attack, Carbonation depth testing, Corrosion activity measurement, Freeze-thaw re

Practice Session 6: Study and report preparation on strengthening of different structural elements - Columns, Beams, Slabs and Foundation treatment.

Practice Session 7: (Practice cum Project): Visits to different buildings in Jatni/JITM campus (or outside) and identify the repairs needed and to prepare a report repair schedule.

Module V: Modern construction materials 4 (Theory) + 4 (Practice)

Advanced Construction materials for repair, renovation and retrofitting, processes and techniques used for repairs, rehabilitation and retrofitting Construction chemicals based on nanotechnology, various types of fibre wrappings, Special concretes and mortar, concrete chemicals, special elements for accelerated strength gain, Expansive cement, polymer concrete, sulphur infiltrated concrete, Ferro cement, Fibre reinforced concrete (basic ideas only)

Practice Session 8: (site visit and submission of report): Special reflection in toilets, plumbing fittings, electrical renovations, choosing interiors, aesthetics, false ceiling, partitions etc.

Practice Session 9: Site visit to old dilapidated structures and reporting possible ameliorative measures or reporting demolition.

Module VI: Techniques for repair and renovation methods 4 (Theory) + 4 (Practice)

Grouting, guniting and shotcreting, Plate bonding, RCC Jacketing / Propping and supporting, Fiber wrap technique and Chemical and electro- chemical methods of repair, Rust eliminators, polymers coating for reinforced bars during repair, foamed concrete, Epoxy injection, Mortar repair for cracks, shoring, shuttering and underpinning.

Practice Session 9: Statutes and acts - Model Building Bye-laws, Ancient Monuments & Archeological Sites & Remains Act 2010, Permissions in Prohibited and Regulated Areas.

Module VII: Repair & Renovation of corrosion and marine structures: 4 (Theory) + 4 (Practice)

Methods of corrosion protection, corrosion inhibitors, corrosion resistant steels, coatings and cathodic protection. Engineered demolition techniques for dilapidated structures – ideas and case studies

Practice session 10: Site visit to an ancient monument and reporting possible renovative measures.

Practice Session 11: Study & Report preparation on Renovation Methodology for different elements of a Building

Text books:

1. Denison Campbell, Allen and Harold Roper, “Concrete Structures, Materials, Maintenance and Repair”, Longman Scientific and Technical UK, 1991.
2. Allen R.T. & Edwards S.C, Repair of Concrete Structures, Blakie and Sons, UK, 1987

References:

1. Shetty M.S., "Concrete Technology - Theory and Practice", S.Chand and Company, 2008.
2. Dov Kominetzky M.S., “Design and Construction Failures”, Galgotia Publications Pvt. Ltd., 2001
3. Ravishankar.K., Krishnamurthy T.S, " Structural Health Monitoring, Repair & Rehabilitation of Concrete Structures", Allied Publishers, 2004.
4. CPWD and Indian Buildings Congress, Hand book on Seismic Retrofit of Buildings, Narosa Publishers, 2008.

Special references:**Resources List**

1. Chemical Action and Strengthening
2. Condition Assessment for Repair - NDM
3. Conservation Heritage Buildings
4. CPWD Handbook on R R of RCC Buildings
5. Fundamentals of Waterproofing
6. NDT Part I - Dr. Fixit
7. NDT Part II - Dr. Fixit
8. Preservation Rehabilitation, Restoration & Reconstruction of Heritage Buildings
9. Renovation of Buildings Maintenance Management - Dr. Fixit
10. Repair Practices and Materials
11. Seismic Retrofitting
12. Waterproofing.doc

PEDAGOGY

Topic coverage and Internal Test	No. of Sessions (in hrs)	Activity	Assignme nt/Project	Suggest ed Reading (Book, Video, Online source, etc.)
Module I				
Maintenance and Repair Strategies Introduction: concepts of durability and degradation of concrete structures - Defect identification, Types of damages of concrete/masonry structures (normal and marine environment), tests for damage evaluation	4	Theory (PPT mode)		
Practice Session 1: Study session on Crack Diagnosis and its appraisal - Reasons for crack development / Crack prevention, Monitoring & Measuring Crack propagation and preparing a report on crack repairing techniques (field work in Jatni or JITM campus)	4	Campus Building visit and submission of report		
Module II				

<p>Deterioration and distressed structures: Deterioration of Structures, Distress in Structures, Causes and Prevention cracks, Mechanism of damage-Types of Damage, Maintenance, Repair and Rehabilitation, Facets of Maintenance, importance of Maintenance, Various aspects of Inspection, Assessment procedure for evaluating a damaged structure, causes of deterioration.</p>	4	Theory (PPT mode)		
<p>Practice Session 2: (Practice cum Project): Case Study of old building developing cracks due to Natural hazards & Renovation - Natural Hazards Practice session 3: Damage Control & Building Performance Levels and Structural & Non-structural Performance Levels</p>	4	Case study, Class room Practice		
Module III				
<p>Retrofitting: Earthquake damages of buildings, their retrofitting, restoration, effects of earthquakes, response of buildings to earthquake motion, factors related to building damages due to earthquake, methods of seismic retrofitting, restoration of earth quake damaged structures.</p>	4	Theory PPT mode		
<p>Practice session 4: Seismic up gradation of structures, Rehabilitation & Retrofitting and their necessity - Leakage arrest & Water proofing and Termite treatment Practice Session 5: Study and report preparation on strengthening of different structural elements - Columns, Beams, Slabs and Foundation treatment. Conducting nondestructive tests and preparation of reports.</p>	4 periods	Class room Practice		
Module IV				
<p>Damage diagnosis and assessment : Visual inspection, Non Destructive Testing using Rebound hammer, Ultra sonic pulse velocity, Semi destructive testing, Probe test, Pull out test, Chloride penetration test, Carbonation, Sulphate attack, Carbonation depth testing,</p>	6	Theory PPT mode		

Corrosion activity measurement, Freeze-thaw re Practice				
<p>Practice Session 6: Study and report preparation on strengthening of different structural elements - Columns, Beams, Slabs and Foundation treatment.</p> <p>Practice Session 7: (Practice cum Project): Visits to different buildings in Jatni/JITM campus (or outside) and identify the repairs needed and to prepare a report repair schedule. outside) and identify the repairs needed and to prepare a report repair schedule.</p>	6	Site visit and preparation of report		
Module V				
<p>Modern materials for repair and renovation</p> <p>Advanced Construction materials for repair, renovation and retrofitting, processes and techniques used for repairs, rehabilitation and retrofitting Construction chemicals based on nanotechnology, various types of fibre wrappings, Special concretes and mortar, concrete chemicals, special elements for accelerated strength gain, Expansive cement, polymer concrete, sulphur infiltrated concrete, Ferro cement, Fibre reinforced concrete (basic ideas only)</p>	4	Theory PPT mode		
<p>Practice Session 8: (site visit and submission of report): Special reflection in toilets, plumbing fittings, electrical renovations, choosing interiors, aesthetics, false ceiling, partitions etc.</p> <p>Practice Session 9: Site visit to old dilapidated structures and reporting possible ameliorative measures or reporting demolition.</p>	4	Field visit and submission of report		
Module VI:				

<p>Techniques for repair and renovation methods</p> <p>Grouting, Guniting and shotcreting, Plate bonding, RCC Jacketing / Propping and supporting, Fiber wrap technique and Chemical and electro- chemical methods of repair, Rust eliminators, polymers coating for reinforced bars during repair, foamed concrete, Epoxy injection, Mortar repair for cracks, shoring and underpinning</p>	4	Theory PPT mode		
<p>Practice Session 9: Statutes and acts - Model Building Bye-laws, Ancient Monuments & Archeological Sites & Remains Act 2010, Permissions in Prohibited and Regulated Areas</p>	4	Class room Practice		
Module VII				
<p>Repair/ Renovation of corrosion in marine structures</p> <p>Methods of corrosion protection, corrosion inhibitors, corrosion resistant steels, coatings and cathodic protection. Engineered demolition techniques for dilapidated structures – ideas and case studies</p>	4	Theory		
<p>Practice session 10: Site visit to an ancient structures and reporting possible renovate measures.</p> <p>Practice Session 11: Study & Report preparation on Renovation Methodology for different elements of a Building</p>	4	Field visit and report submission		
		Theory : 30 hrs	Classroom practice - 30hrs	

Tendering Process, Bidding Contract Agreements Arbitration

Code	Course Title	Type of course	T-P-PJ	Prerequisite
DECP0601	Tendering Process, Bidding Contract Agreements and Arbitration.	Practice + Project	0-2-1	Quality Control and DPR

Objective

- To make students understand the basics of contract to enhance / develop the skills of professionals working in construction and allied sectors to upgrade their skills in procurement in Construction projects and help them to grow in their career

Course Outcome

- Upon successful completion of the course, students shall be fit in CPWD, state Government departments and infrastructural organizations, persons working in development projects in public or private sectors. Consultancy units, research organizations as well as self-employed practitioners engaged in the planning, design, Procurement, construction, operation and maintenance.
- Apply legal aspects of construction projects in construction contract, of issues related to contract administration, apply various disputes resolution techniques including arbitration.

Evaluation Systems

Internal Examination	Component	% of Marks	Method of Assessment
	Internal Practice	50(40+10)	Lab Work + Learning Record
	Internal Project	50	Project Work
External Examination	External Practice	50	Lab Work
	External Project	50	Project Work + Report
Total		200	

Course Outline

Module I (60 hours)

Module I: (Tender basics) :Laws governing structure & Working of Construction firms.

Project cost estimate, administrative approval and Technical sanction. AR, SR, OPWD code, and CPWD code.

Module II: Contract Outlines: Contracts, types of construction contracts, Evaluation of contract documents, need for documents, present stage of national and international contract documents, roles and functions of participants to the contract.

Module III: Tender: Tender as a basis of Contract, Tender Types, Notice inviting Tender, e-tendering, Preparation of tender documents, pre-qualification bid evaluation, Financial bid evaluation, Tendering procedures (submission of bids, analysis of submitted tenders), Basis for evaluation and acceptance, letter of intent, work order and agreement , award of contract, project financing and contract payments,

Module IV: Contracts

Contracts Outline, types of construction contracts, contract specifications, CPWD contract conditions, FIDIC form of contract, General conditions of contract, Evaluation of contract documents, need for documents, present stage of national and international contract documents, roles and functions of participants to the contract. Subcontracting: selection of subcontractors, work order with terms and conditions.

Module V: Contract Conditions: Clarification by parties to contract, obligations and responsibilities of the parties, Securities, protection and indemnification, bonds and insurance, subsurface conditions, inspection of work, change of work, rejected work and deficiencies.

Module VI (Arbitration): Causes and resolution of disputes, settlement for claims and extra items, arbitration., Agreements, Appointment of Arbitrators, Conditions of Arbitrations, Powers and duties of Arbitrator, Enforcement of Award-costs, Arbitration Act old & new.

Claims, Disputes and project closure: Claims its source and management, Disputes and its cause, dispute avoidance and its resolution, Causes leading to arbitration, Contract closure at construction site and at levels of project manager.

Text Books

- ✓ Bids Tenders &Praposals, Harold Lewis
- ✓ Civil engineering contracts & estimate, B. S. Patil
- ✓ Contract management in civil works, V. A. Prakash
- ✓ Construction Project Management, Kumar Neerajjha"

Session Plan(practice works appended below)

Topic coverage and Internal Test	No. of Sessions (in hrs.)	Activity	Assignment /Project	Suggested Reading (Book, Video, Online source, etc.)
Module I				

Module I: Tender basics:Laws governing structure & Working of Construction firms, Project cost estimate, administrative approval and Technical sanction. AR, SR, OPWD code and CPWD code.THE INDIAN CONTRACT ACT, 1872.	3+4	Practice +Project		
Module II : Contract Outlines: Contracts, types of construction contracts, Evaluation of contract documents, need for documents, present stage of national and international contract documents, roles and functions of participants to the contract.	3+4	Practice +Project		
Module III: Tender: Tender as a basis of Contract, Tender Types, Notice inviting Tender, e-tendering, Preparation of tender documents, pre-qualification bid evaluation, Financial bid evaluation, Tendering procedures (submission of bids, analysis of submitted tenders), Basis for evaluation and acceptance, letter of intent, work order and agreement award of contract, project financing and contract payments, Surety bonds and Guarantees	4+6	Practice +Project		
Module IV: Contracts: contract specifications, CPWD contract conditions, FIDIC form of contract, General conditions of contract, Evaluation of contract documents, need for documents, present stage of national and international contract documents, roles and functions of participants to the contract. Subcontracting: selection of subcontractors, work order with terms and conditions.	4+8	Practice +Project		
Module V: Contract Conditions (GCC and SCC and BOQ): Clarification by parties to contract, obligations and responsibilities of the parties, Securities, protection and indemnification, bonds and insurance, subsurface conditions, inspection of work, change of work, rejected work and deficiencies. Subcontracts, billing and payments	3+5	Practice +Project		

Module VI (Arbitration): Causes and resolution of disputes, settlement for claims and extra items, arbitration., Agreements, Appointment of Arbitrators, Conditions of Arbitrations, Powers and duties of Arbitrator, Enforcement of Award-costs, Arbitration Act old & new.	4+4	Practice +Project		
Module VII: Claims, Disputes and project closure: Claims its source and management, Disputes and its cause, dispute avoidance and its resolution, Causes leading to arbitration, Contract closure at construction site and at levels of project manager.Arbitration and Conciliation Act 1996; Arbitration case study.	3+5	Practice +Project		
		Theory : 24 classes	Practice projects : 36 classes	

Class room Practice Sessions:

1. **Practice I:** Writing item rate of contract for EW, Concrete, Bitumen roads, Concrete pavements with calculation of leads and lifts like inaccessible areas, Jails and hospitals.
2. **Practice II:** Preparation of Tender call notices for
 - i. Quotation call notices.
 - ii. Short tender call notices
 - iii. Tender call notices for a major work
 - iv. E- tender call notices
 - v. Corrigendum to TCN's
3. **Practice III:** Preparation of pre-bid evaluation documents for different works:
 - i. Multi Storied Building
 - ii. Road works
 - iii. Runways
 - iv. Hydraulic Structures
 - v. Preparation of design projects
4. **Practice session IV:** Preparation of draft financial bid evaluation documents (previous works).
5. **Practice session V:** Case studies of pre-bid evaluation of tenders and preparation comparative statement.

6. **Practice Session VI:** Preparation of Gnat or bar chart, CPM and PERT for construction projects
7. **Practice VII:** Practice of preparation lump Sum, K₂, F₂ and other agreements
8. **Practice Session VIII:** Practice for preparation of different type of bills for payment
9. **Practice session VIII:** Calculation for price escalation for materials, labour and POL
10. **Practice session IX:** Case studies for arbitration cases
11. **Practice session X:** Preparation of contract closure documents at site, managers level and final closure of contract.

Software Based Project Scheduling and Management

Code	Course Title	Course Type	T-P-PJ	Prerequisite
DECP0301	Software Based Project Scheduling and Management	Project	0-0-4	Nil

Course objective

- To enable the student understand the basic principles of Project Management.
- Make the student familiarize with the activities involved in a civil engineering construction project.
- To mold the student for taking up a major project through applying the higher version project software.

Course outcomes

- Identify various activities of a construction project and the critical path for executing the same.
- Carry out a major project and prepare a document that contains all aspects of a construction project.

Students shall take any one of the following projects for practice:

- Commercial Structures
- Residential Structures
- Industrial Structures
- Water Resources Structures
- Projects on Transportation

Note: The students can take up other activities also related to Construction Project during their Major Project.

Module I (18 Hours):

Lesson 1: Introduction to -MS Project as an execution tool, Project Information.

Lesson 2: Steps before Starting a Project- Activities and Events Identification.

Lesson 3: Creating and Defining Projects-Entering and Scheduling Tasks- Work Breakdown Structure.

Module II (18 Hours)

Lesson 4: Project Views.

Lesson 5: Calendars---Calendar Tasks & Milestones Structure.

Lesson 6: Organizing Tasks- Summary and Sub Tasks- Predecessor and Successor.

Module III (18 Hours)

Lesson 7: Working with Task Duration, Constraints, and Deadlines-Gant Chart.

Lesson 8: Introducing Dependencies -Task Relationships - Network Development-Network Diagram –

Task Types- Lag and Lead Time- Identify the Critical Path / Time Constraints

Module IV: (18 Hours)

Lesson 9: Working with Resources-Resource Identification- Equipment and Human Resources Assigning

Resources to Tasks

Lesson 10: Customizing and Formatting

Module V: (16 Hours)

Lesson 11: Resource Management

Lesson 12: Communication and Progress Updates

Module VI: (20 Hours)

Lesson 13: Tracking Work in Project

Lesson 14: Project Baselines & Running Reports

Module VII: (12 Hours)

Lesson 15: Printing Project Information, Consolidating Projects and Resources, Course Summary and Review.

Pedagogy

Sl. No	Topic	Pedagogy	(Instructional Hours) Project
1	Module I (18 Hours): Lesson 1: Introduction to - MS Project as an execution tool,Project Information.	PRO	6
2	Lesson 2: Steps before Starting a Project- Activities and Events Identification.	PRO	6
3	Lesson 3: Creating and Defining Projects-Entering and Scheduling Tasks- Work Breakdown Structure.	PRO	6
4	Module II (18 Hours) Lesson 4: Project Views.	PRO	6
5	Lesson 5: Calendars---Calendar Tasks & Milestones Structure	PRO	5
6	Lesson 6: Organizing Tasks- Summary and Sub Tasks- Predecessor and Successor.	PRO	5
7	Module III (18 Hours) Lesson 7: Working with Task Duration, Constraints, and Deadlines-Gant Chart.	PRO	6
8	Lesson 8: Introducing Dependencies -Task Relationships - Network Development-Network Diagram – Task Types- Lag and Lead Time- Identify the Critical Path / Time Constraints	PRO	10

9	Module IV: (18 Hours) Lesson 9: Working with Resources-Resource Identification-Equipment and Human Resources Assigning-Resources to Tasks	PRO	10
10	Lesson 10: Customizing and Formatting	PRO	6
11	Module V: (16 Hours) Lesson 11: Resource Management	PRO	8
12	Lesson 12: Communication and Progress Updates	PRO	8
13	Module VI: (20 Hours) Lesson 13: Tracking Work in Project	PRO	8
14	Lesson 14: Project Baselines	PRO	8
15	Running Reports	PRO	4
16	Module VII: (12 Hours) Lesson 15: Printing Project Information	PRO	4
17	Consolidating Projects and Resources	PRO	4
18	Course Summary and Review	PRO	4
	Subtotal		120

Project

Course Title	Code	Course Type	T-P-PJ	Pre-requisites
Project	DEET0300	Project	0-0-6	Not before Semester 4

Students take up group projects and deal the following activities during the course of their project. The project Report should contain the reports of the activities and the explanation of the activity, how the same is taken up and the outcome of the activity.

- ✓ Functional Planning of the project,
- ✓ Preparation of documents and notices required for obtaining Environmental clearance,
- ✓ Preparing working drawings using Auto CAD, Revit & STAADPRO (for Reinforcement Drawing),
- ✓ Listing of Specifications, Rate Analysis and Estimating using Estimator Software,
- ✓ Resource Scheduling & Levelling,
- ✓ Preparing Quality Control checks and Quality Inspection sample reports specific to the project,
- ✓ Identifying the possible Risks involved (specific to the project) and listing the Safety Measures,
- ✓ Preparing sample M - book and Muster Role (Form 21),
- ✓ Tendering Process, and Development of Contract Agreement during their Major Project and
- x. Project Closure.

Internship

Course Title	Code	Course Type	T-P-PJ	Pre-requisites
Internship	DEET0800	Practice	0-4-0	Not before Semester 4

Students to select a construction firm and obtain training (for about 8 to 10 months) on the works that are being carried out there. They are required to prepare set of different reports on the activities in which they received training. The activities should invariably involve the aspects related to planning and design apart from the topics covered in various subjects of the domain. One report on each of the activities is to be submitted individually even if a group of students work in the same site. The reports should be certified by the authorized technical personnel of the organization.

Domain - Planning, Design & Drawing

Course Code	Course Title	Course Type	Credits	Prerequisite
DEPD0101	Green Building Design	Theory	3	Nil
DEPD0102	Earthquake Resistant Design	Theory	3	Nil
DEPD0103	Barrier Free Design	Theory	2	Nil
DEPD0104	Intelligent Building Design	Theory	2	Nil
DEPD0201	Architectural Design	Practice	6	Nil
DEPD0202	3D Modelling and VR experience of Building	Practice	4	Nil
DEET0300	Project	Project	6	
DEET0800	Internship	Internship	4	
		Total	30	

Green Building Design

Course Title	Course Code	Type of course	T-P-PJ	Prerequisite
Green Building Design	DEPD0101	Theory	3-0-0	Nil

Objective

- To understand the concept of Green Building design
- To understand the various parameters of Green Building design.

Course outcome

- To study the theory of sustainability.
- To study the changing climatology and contribution of built mass
- To learn reduction of carbon foot prints

Evaluation Systems

	Component	% of Marks	Method of Assessment
Internal Examination	Internal Theory	30	Written examination
	Assignment	5	Report or Presentation + Learning Record
	Attendance	5	Based on class attended
External Examination	External Theory	60	Written examination
Total		100	

Course Outline

Module I Theory of sustainable design (3 hours)

Various regions and their reciprocating design, concept of traditional design and logic, implication of the same logic in today's context, Basic Design Principles, ergonomic data and application

Ex: Dhajji-dwari construction of Kashmir/HP, Nilgiri Hills tribal houses

Module II Principles of Green Building Design (6 hours)

Design responding to climatological data, Eco-friendly use of material, technology used while construction and dependency of energy etc.

Module III Environment management (6 hours)

Design and its equation with environment, Building and its impact on surrounding – short term and in the long run, Measures to cut-down adverse impacts, Alternative methods to reduce the negative impact on environment.

Module IV Ecological Planning (6 hours)

Concepts of ecology, Co-relation with building design, Balance between ecosystem and intervention in terms of built environment, Study the direct proportion between improvements in ecological aspects with Green building design index.

Module V Green building material and technology (6 hours)

Existing building material over the green building material, impact of technology and how to erase the carbon foot prints, alternatives for building materials, cutting edge technology to modify and use/reuse the building materials.

Ex: use of Fly-ash bricks, Fly-ash modified in light weight building blocks

Module VI Green building rating tools (6 hours)

Green building rating tools- Leeds and IGBC codes. GRIHA– Material selection Embodied energy- Operating energy- Façade systems- Ventilation systems- Transportation- Water treatment systems- Water efficiency- Building economics

Module VII GREEN BUILDING DESIGN CASE STUDY (6 hours)

Students to work through a controlled process of analysis and design to produce drawings and models of their own personal green building project. Topics include building form, orientation and site considerations; conservation measures; energy modeling; heating system; renewable energy systems; material choices. End with student Presentation.

Text Books

1. Colin Porteous, “The New Eco-Architecture”, Spon Press, 2002.
2. Energy Conservation Building Codes: www.bee-india.nic.in
3. Lever More G J, “Building Energy Management Systems”, E and FN Spon, London, 2000.
4. Ganesan T P, “Energy Conservation in Buildings”, ISTE Professional Center, Chennai, 1999.
5. John Littler and Randall Thomas, “Design with Energy: The Conservation and Use of Energy in Buildings”, Cambridge University Press, 1984.

Session Plan:**Weeks- 15****Contact Hours: 3 Hrs per week = 45 Hrs**

Sr. NO	TOPICS	PEDAGOGY/ MODE OF PRESENTATION AND REMARKS	HOURS
1	Various regions and their reciprocating design, concept of traditional design and logic, implication of the same logic in today's context, Basic Design Principles, ergonomic data and application Ex: Dhajji-dwari construction of Kashmir/HP, Nilgiri Hills tribal houses	- PPT - Audio-video presentation for awakening	3
2	Design responding to climatological data, Eco-friendly use of material, technology used while construction and dependency of energy etc.	- Class notes - Power point presentation	6
3	Design and its equation with environment, Building and its impact on surrounding – short term and in the long run, Measures to cut-down adverse impacts, Alternative methods to reduce the negative impact on environment.	- Slides and Photographs - Class notes	6
4a	Intrim Exam	Allotted marks 10	1
5	Concepts of ecology, Co-relation with building design, Balance between ecosystem and intervention in terms of built environment, Study the direct proportion between improvements in ecological aspects with Green building design index.	- PPT - Videos	6-8
6	Existing building material over the green building material, impact of technology and how to erase the carbon foot prints, alternatives for building materials, cutting edge technology to modify and use/reuse the building materials. Ex: use of Fly-ash bricks, Fly-ash	- Sketches on black board -Class notes	4-6

	modified in light weight building blocks		
7	Green building rating tools- Leeds and IGBC codes. GRIHA- Material selection Embodied energy- Operating energy- Façade systems- Ventilation systems- Transportation- Water treatment systems- Water efficiency- Building economics	-Class notes and discussions	6
8	Students to work through a controlled process of analysis and design to produce drawings and models of their own personal green building project. Topics include building form, orientation and site considerations; conservation measures; energy modeling; heating system; renewable energy systems; material choices. End with student Presentation.	-Case Study - Solutions on PPT	6
9	Intrim Test - II		1

Earthquake Resistant Design

Course Title	Code	Type of course	T-P-PJ	Prerequisite
Earthquake Resistant Design	DEPD0102	Theory	3-0-0	Nil

Objective

<ul style="list-style-type: none">✓ To understand the difference between Earthquake Resistant Design and Structural Design✓ To expand the parameters of forces and loading impacts.✓ To understand the design guidelines in disaster resistant construction

Course outcome

<ul style="list-style-type: none">✓ To study co-relation with architectural design and performance of building during earthquake✓ To study advanced structural design parameters✓ To analyze the detailing of reinforcement design and its impact on performance
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Evaluation Systems

	Component	% of Marks	Method of Assessment
Internal Examination	Internal Theory	30	Written examination
	Assignment	5	Report or Presentation + Learning Record
	Attendance	5	Based on class attended
External Examination	External Theory	60	Written examination
Total		100	

Course Outline

Module I Introduction to the Subject (3 hours)

Focus on the complexities involved in developing Earthquake resistant buildings, Performance of structural buildings in past earthquake. An overview and possible causes of failure during seismic loading

Module II Design Guidelines & Principles of Earthquake Resistant Design (6 hours)

Formulating the management plan and understanding the design guidelines in disaster resistant construction. Norms by IS codes and prevailing practices. Examples and various regions with iconic buildings as live samples.

Module III Indian Seismicity (6 hours)

Indian Seismicity Map, Past Earthquakes and building performances, Effects of EQ shaking, The philosophy, Indian codes impacting Building configuration and basics.

Module IV Traditional Practices (6 hours)

Vernacular architecture and their response to EQ. Their essence and logic, The advanced construction practices over the conventional practices.

Module V The detailing in Building construction (6 hours)

Masonry construction, frame structures and their performance, Beam-column design and detailing, junction design and detailing.

Module VI Earthquake resistant structural members (6 hours)

Shear wall provisions and detailing; Pounding and seismic joint detailing, Infill walls-cladding-glazing detailing

Module VII Special Construction Features and restoration (6 hours)

Cantilever, staircase design in seismic areas, Building byelaws and urban planning, historic building and possible provisions. Retrofitting techniques, Base isolation concepts.

Text Books

1. Seismic Design hand book for Buildings
2. Earth quake Architecture: New construction techniques for quake disaster Prevention

Session Plan:

Weeks- 15

Contact Hours: 3 Hrs per week = 45 Hrs

Sr. NO	TOPICS	PEDAGOGY/ MODE OF PRESENTATION AND REMARKS	HOURS
1	Module-1 Introduction to over view of disaster, major natural disasters- flood, tropical cyclone, droughts, landslides, heat waves, earthquakes, fire hazards etc.	- PPT - Audio-video presentation for awakening	6
2	Factors for disasters. Basic understanding on fragile eco system, physiographic and geo chemical data mapping, soil and topography, Hydrological factors, inclement climatic conditions	- Class notes - Power point presentation	3
3a	Module-2 Strategies for disaster prevention and mitigation. Disaster management plan.	- Slides and Photographs - Class notes - BBC documentary on Loma Preta	6

3b	Revision, Overlap time and overview of the modules	EQ (1 Hour)	
4a	Intrim Exam	Allotted marks 10	1
4b	National crisis management committee, state management group	- Slides &Notes - Class notes	5
5	Design guidelines in disaster proofing construction	- PPT - Videos on Advanced construction in Japan	6-8
6	Engineering, Agricultural, Architectural, landscaping and planning solution for different type of calamities.	- Sketches on black board -Class notes	3
7	Norms, standard, practice procedure for shelter and settlement. Organizational and management aspt	-Class notes and discussions	3-4
8	- Current Projects/Challenges - Research overview and scope	-Discussion - Examples on PPT	2
9	Intrim Test - II Actual implementation + Revision of Notes/key points	- TERI Projects in EQ-Flood zone - Showing actual projects for more ideas	1 2-3

Barrier Free Design

Course Title	Code	Type of course	T-P-PJ	Prerequisite
Barrier Free Design	DEPD0103	Theory	2-0-0	Nil

Objective

<ul style="list-style-type: none">✓ To understand the disability and its impact on built environment✓ To open the built mass for everyone✓ To make student able to construct an efficient built mass
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Course outcome

<ul style="list-style-type: none">✓ To study the various provisions in the code✓ To design or modification based on provision in the code✓ To analyze the improved performance of the same building with different set of users

Evaluation Systems

	Component	% of Marks	Method of Assessment
Internal Examination	Internal Theory	30	Written examination
	Assignment	5	Report or Presentation + Learning Record
	Attendance	5	Based on class attended
External Examination	External Theory	60	Written examination
Total		100	

Course Outline

Module I Introduction to the Barrier Free Design (2 hours)

The need, reason and enforcement by government. Live examples and overview of public buildings.

Module II Types of disability and inferences (4 hours)

Types of disability, mobility devices and controls. Construction and maintenance standards, classification of buildings and access provisions. Examples and various types of building with different functions as live samples.

Module III Design Element within built mass (4 hours)

Design elements within buildings, site planning, parking, approach to plinth levels, corridors, entrance and exit, windows, stairways, lifts, toilets, signage, guiding and warning systems, floor materials.

Module IV Design Element outside the built mass (4 hours)

Design elements outside the building – curb at footpath, road crossing, public toilet, bus stop, toilet booth, and signage

Module V The provision in the codes (4 hours)

Provision in residential building, auditorium, parks, restaurants, railway station. Modern building bye-laws.

Module VI Hands on experience (4 hours)

A small live design problem which aims at design standards and construction techniques for barrier free environment

Module VII Case study based observations (4 hours)

Visit to nearby public buildings, parks: observations related to disability and effectiveness of design.

Text Books

1. Building without barriers for the disabled, Harkness, Sarh P/690.554 HAR/B
2. Disability and rehabilitation Handbook/ Goldenson, RM/362.2002 DIS/M

Session Plan:**Weeks- 15****Contact Hours: 2 Hrs per week = 30 Hrs**

Sr. NO	TOPICS	PEDAGOGY/ MODE OF PRESENTATION AND REMARKS	HOURS
1	The need, reason and enforcement by government. Live examples and overview of public buildings.	- PPT - Audio-video presentation for awakening	2
2	Types of disability, mobility devices and controls. Construction and maintenance standards, classification of buildings and access provisions. Examples and various types of building with different functions as live samples.	- Class notes - Power point presentation	4
3a	Design elements within buildings, site planning, parking, approach to plinth levels, corridors, entrance and exit.	- Slides and Photographs - Class notes	2 + 2 hrs
3b	Design for windows, stairways, lifts, toilets, signage, guiding and		

	warning systems, floor materials.		
4	Intrim Test - I		1
5	Design elements outside the building – curb at footpath, road crossing, public toilet, bus stop, toilet booth, and signage	- PPT - Videos on Advanced construction	4
6	Provision in residential building, auditorium, parks, restaurants, railway station. Modern building bye-laws.	- Sketches on black board - Class notes	4
7	A small live design problem which aims at design standards and construction techniques for barrier free environment	- Hands on experience	4
8	Visit to nearby public buildings, parks: observations related to disability and effectiveness of design.	Case study based observations	4
9	- Current Projects/Challenges - Research overview and scope	- Discussion - Examples on PPT	2
10	Intrim Test - II		1

Intelligent Building Design

Course Title	Code	Type of course	T-P-PJ	Prerequisite
Intelligent Building Design	DEPD0104	Theory	2-0-0	Nil

Objective

<ul style="list-style-type: none">✓ To understand the concepts of automated buildings✓ To understand modern technology within built environment
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Course outcome

<ul style="list-style-type: none">✓ To study integrates technology and process to create a facility that is safer, more comfortable and productive for its occupants✓ To design Smart buildings
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Evaluation Systems

	Component	% of Marks	Method of Assessment
Internal Examination	Internal Theory	30	Written examination
	Assignment	5	Report or Presentation + Learning Record
	Attendance	5	Based on class attended
External Examination	External Theory	60	Written examination
Total		100	

Course Outline

Module I Introduction to the Intelligent buildings (2 hours)

Operationally efficient for its owners. Reasons and necessity, performance and cost saving parameters etc.

Module II Advance Parameters (4 hours)

Reuse of water/waste, structured cabling systems, wireless, communication protocol, interoperable smart building databases, smart disposal of waste.

Module III Efficiency improvement (4 hours)

Advanced technology—combined with improved processes for design, construction and operations—provide a superior indoor environment that improves occupant comfort and productivity while reducing energy consumption and operations staffing.

Module IV Control Systems (4 hours)

Lighting Control systems, electric power management systems, access control systems, video surveillance systems, video IPTV

Module V Digital provisions (4 hours)

digital signage systems, fire alarm and mass notification systems, voice network and distributed antenna systems, data networks, facility management systems.

Module VI Hands on experience (4 hours)

The economics of intelligent buildings, audio visual systems, network integration, energy and sustainability with a small scale live office room/small house design

Module VII Case study based observations (4 hours)

Visit to CUTM Labs, nearby offices and restaurants/supermarkets: observations related to smart building design.

Text Books

1. Smart Buildings systems for Architects, Owner, and Builders. By James Sinopoli, Elsevier
2. Intelligent buildings by James Sinopoli, Elsevier RM/362.2002 DIS/M

Session Plan:**Weeks- 15****Contact Hours: 2 Hrs per week = 30 Hrs**

Sr. NO	TOPICS	PEDAGOGY/ MODE OF PRESENTATION AND REMARKS	HOURS
1	Operationally efficient for its owners.Reasons and necessity, performance and cost saving parameters etc.	- PPT - Audio-video presentation for awakening	2
2	Reuse of water/waste, structured cabling systems, wireless, communication protocol, interoperable smart building databases, smart disposal of waste.	- Class notes - Power point presentation	4
3	Advanced technology—combined with improved processes for design, construction and operations— provide a superior indoor environment that improves occupant comfort and productivity while reducing energy consumption and	- Slides and Photographs - Class notes	4 hrs

	operations staffing.		
4	Intrim Test - I		1
5	Lighting Control systems, electric power management systems, access control systems, video surveillance systems, video IPTV	- PPT - Videos on Advanced construction	4
6	digital signage systems, fire alarm and mass notification systems, voice network and distributed antenna systems, data networks, facility management systems.	-Class notes	4
7	The economics of intelligent buildings, audio visual systems, network integration, energy and sustainability with a small scale live office room/small house design	- Hands on experience	4
8	Visit to CUTM Labs, nearby offices and restaurants/supermarkets: observations related to smart building design.	Case study based observations	4
9	- Current Projects/Challenges - Research overview and scope	-Discussion - Examples on PPT	2
10	Intrim Test - II		1

Architectural Design

Course Code	Course Title	Type of course	T-P-P	Prerequisite
DEPD0201	Architectural Design	Practice	0-6-0	Nil

Objective

- ✓ To understand the Basic Principles of architectural design
- ✓ To understand the overlays of various aspects on architectural building design.

Course outcome

- ✓ To study the basic concepts of building Design.
- ✓ To study the climatology, soil condition, site analysis and other factors on design.
- ✓ To learn building bye laws application while designing any building

Evaluation Systems

Internal Examination	Component	% of Marks	Method of Assessment
	Internal Practice	50 (40+10)	Lab work + Learning Record
External Examination	External Practice	50	Lab work
Total		100	

Course Outline

Module I Introduction to Architectural Design (12 hours)

Basic Design Principles, ergonometic data and application

Practice

1. Conceptualization of Design: Own House drafting

Module II Addition of layers (24 hours)

Geological data, climatological data and impact of hydrology: study the result in modified architectural plan

Practice

2. Modification of your own house design for a different region
3. Apply the knowledge to design a small scale house/flat/bungalow

Module III Site Analysis (36 Hours)

Land observation data, Site analysis and application potential information from the same on design

Double line plan, concept of section and elevation

Practice

1. Site Analysis Parameters and implications
2. Correction and re-orientation of Design
3. Preparation of architectural drawings for sanctioning of design (Double line plan, elevation, section)

Module IV Service layouts (24 Hours)

Parking, Road network, Water supply, Electrical and sanitation layouts.

Practice

1. Site plan with parking layout and road network
2. Water supply and electrical layout
3. Storm water and sewage disposal layout (may include roof plan)

Module – V – Planning of bigger scale buildings (36 Hours)

Hotel or Student Hostel, Hospital or Public School.

Practice

1. Architectural Plan
2. Building layout with key sections
3. Complete set of presentation drawings

Module – VI – Structural and service layout (24 Hours)

Adding layer of structural members and services on the designed project of Hotel or Student Hostel/ Hospital or Public School – Any one or live project.

Practice

1. Grid plan
2. Water supply and electrical layout
3. Centre-line and earthwork schedule

Module – VII – Building Bye laws (24 Hours)

Study the building bye laws and practice their implications on design. Modify and cross-check the building design in terms of fire safety, staircase, FAR, projections, ventilation etc Hotel or Student Hostel/ Hospital or Public School – Any one or live project.

Practice

1. Norms and plan co-relationship
2. Parking and site layout – Pre-viva
3. Complete set of drawings for the building- Final viva

Text Books

1. James Snider Catmese, Introduction to Design.
2. V.S.Parmar, Design fundamentals in Architecture, Somaiya publications private limited, New Delhi
3. Francis D.K.Ching, Architecture-Form, space and order, Van, Nostrand Reinhold company, NewYork.

3D Modelling and VR Experience of Building

Course Code	Course Title	Type of course	T-P-P	Prerequisite
DEPD0202	3D Modelling and VR experience of Building	Practice	0-4-0	Nil

Objective

<ul style="list-style-type: none"> ✓ To understand the Elements of planning building, fundamentals of Building Information Modelling (BIM). ✓ To understand the various drawing methods and modes.
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Course outcome

<ul style="list-style-type: none"> ✓ To understand the Generation of 2D (plan, section and elevation) and 3D modelling. ✓ Able to carve out detailed specification and dimensioning of the following using AutoCAD, Revit Architecture and CATIA
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Evaluation Systems

Internal Examination	Component	% of Marks	Method of Assessment
	Internal Practice	50 (40+10)	Lab work + Learning Record
External Examination	External Practice	50	Lab work
Total		100	

Course outline and Session Plan

(Each Practice session is for 6 hours)

Practice Session 1: Generation of 3D modelling with detailed specification and dimensioning of a (G+20) multi-storeyed building with same floor plans using Revit Architecture and CATIA.

Practice Session 2: Generation of elevation for with detailed specification and dimensioning of a multi-storeyed building with same floor plans using AutoCAD for (practice session 1).

Practice Session 3: Generation of section for with detailed specification and dimensioning of a multi-storeyed building with same floor plans using AutoCAD, Revit Architecture and CATIA (practice session 1).

Practice Session 4: Generation of 3D modelling with detailed specification and dimensioning of a (G+20) multi-storeyed building with varying floor plans using Revit Architecture and CATIA.

Practice Session 5: Generation of elevation for with detailed specification and dimensioning of a multi-storeyed building with varying floor plans using AutoCAD (practice session 4).

Practice Session 6: Generation of section for with detailed specification and dimensioning of a multi-storeyed building with varying floor plans using AutoCAD, Revit Architecture and CATIA (practice session 4).

Practice Session 7: Generation of 3D modelling with detailed specification and dimensioning of a (G+5) shopping complex using Revit Architecture and CATIA.

Practice Session 8: Generation of elevation for with detailed specification and dimensioning of a (G+5) shopping complex using AutoCAD (practice session 7).

Practice Session 9: Generation of section for with detailed specification and dimensioning of a (G+5) shopping complex using AutoCAD, Revit Architecture and CATIA (practice session 7).

Practice Session 10: Generation of 3D modelling with detailed specification and dimensioning of a (G+4) hospital building using Revit Architecture and CATIA.

Practice Session 11: Generation of elevation for with detailed specification and dimensioning of a (G+4) hospital building using AutoCAD (practice session 10).

Practice Session 12: Generation of section for with detailed specification and dimensioning of a (G+4) hospital building using AutoCAD, Revit Architecture and CATIA (practice session 10).

Practice Session 13: Generation of 3D modelling with detailed specification and dimensioning of a (G+4) hostel building using Revit Architecture and CATIA.

Practice Session 14: Generation of elevation for with detailed specification and dimensioning of a (G+4) hostel building using AutoCAD (practice session 13).

Practice Session 15: Generation of section for with detailed specification and dimensioning of a (G+4) hostel building using AutoCAD, Revit Architecture and CATIA (practice session 13).

Course Code	Course Title	Course Nature	Credits	Pre-requisite
DESP0401	Remote Sensing & Digital Image Processing	Theory + Practice	5	Nil
DESP0901	Geospatial Technology and its Application	Theory + Practice+ Project	5	Nil
DESP0402	Photogrammetry and its Application	Theory + Practice	4	Nil
DESP0201	Lidar Remote Sensing and its Applications	Practice	3	Basic Survey
DESP0202	Smart City Planning	Practice	3	Nil
DEET0800	Internship	Practice	4	
DEET0300	Project	Project	6	
			30	

Remote Sensing and Digital Image Processing

Course Title	Code	Type of course	T-P-PJ	Prerequisite
Remote Sensing and Digital Image Processing	DESP0401	Theory + Practice	3-2-0	Nil

Objective

<ul style="list-style-type: none"> To teach Basic Principles of Remote Sensing and understand the current remote sensing system, Digital Image processing and Integration.

Course outcome

<ul style="list-style-type: none"> Students will gain knowledge of basic concepts of remote sensing, aerial photogrammetry. Students will gain knowledge of applications different satellites imagery, image classification techniques and image analysis and interpretation.

Evaluation Systems

Internal Examination	Component	% of Marks	Method of Assessment
	Internal Theory	20	Written examination
	Internal Practice	30(20+10)	Lab work + Learning Record
External Examination	External Theory	30	Written examination
	External Practice	20	Lab work
Total		100	

Course Outline

Module – I Basic Concept

(7+6 Hrs)

Theory

Introduction of Remote Sensing: Principles of RS and its Type; Energy sources and Radiation principles, Pixel, DN value, Energy equation; EMR and Spectrum; EMR interaction with Atmosphere; scattering, Absorption, Atmospheric window, Black body radiation; EMR interaction with earth surface features, reflection, absorption, emission and transmission, Spectral signature; Interaction with vegetation, soil, water bodies; Advantage of RS over conventional method, Limitation, Ideal remote sensing.

Practice:

1. Installation of Image Processing software's
2. Layer stacking
3. LUT

4. Subset

Module – II Digital Image

(6+6=12 hours)

Theory

Data acquisition: Procedure, Reflectance and Digital numbers; Intensity, Reference data, Ground truth, Analog to digital conversion, FCCs, TCC, Platforms and sensors; orbits ,types, Resolutions; Image Interpretation; visual- Interpretation keys.

Practice:

1. FCCs and TCC
2. Resolution
3. Image Interpretation

Module – III Satellite Information and Principles

(6+6=12 hours)

Theory

Land observation satellites, characters and applications; PSLV, GSLV, Satellite, Platform Types; LANDSAT series; IRS series; IKONOS Series; QUICKBIRD series; Weather/Meteorological satellites; INSAT series, NOAA, Applications, Marine observation satellites; OCEANSAT

Practice:

1. Download satellite data from GLOVIS / Earth Explorer / Bhuvan etc.
2. Mosaicking

Module – IV IMAGE ACQUISITION AND FORMAT

(6+2=8 hours)

Theory

Digital Image Processing; Export and import, Data formats; BSQ, BIL, BIP, Run length encoding, Image Compression Data products.

Practice:

1. Export and Import
2. Histogram
3. Subset using AOI

Module – V Image Processing

(6+8=14 hours)

Theory

IMAGE RECTIFICATION; Preprocessing and Post processing Geometric distortion; sources and causes for distortion, rectification, GCP, Resampling, Image registration; Radiometric distortion; sources and causes, atmospheric correction

Practice:

1. Geometric correction
2. Radiometric correction

3. Atmospheric correction

Module – VI Classification

(6+12=18 hours)

Theory

IMAGE CLASSIFICATION; Classification techniques, types, Supervised and Un-supervised; PCA; Image Enhancement; Accuracy assessment.

Practice

1. Supervised Classification
2. Un-supervised Classification
3. Image Enhancement
4. Accuracy Assessment

Model – VII Remote Sensing and Its application

(8+12=20 hours)

Theory

Hyperspectral RS and its application; Microwave RS and its application; Thermal RS and its application; Optical RS and its application; Sensor and its types.

Practice:

1. Application of Hyperspectral remote sensing and case study
2. Application of microwave remote sensing and case study
3. Application of thermal remote sensing and case study
4. Application of optical remote sensing and case study

Text Books

1. Remote sensing & Image interpretation, THOMAS M. LILLESAND AND RALPH W. KIEFER, JOHN WILEY & SONS, INC. PUBLISHERS.
2. Remote sensing & GIS, B.Bhatta, OXFORD UNIVERSITY PRESS.
3. Remote Sensing principle & application, FLOYDIF SABINS, W.H FREEMAN & COMPANY, NEWYORK.
4. FUNDAMENTALS OF DIGITAL IMAGE PROCESSING, ANIL K JAIN, JAIN, Prentice Hall, New Delhi.
5. DIGITAL IMAGE PROCESSING, ABHISHEK YADAV, POONAM YADAV, OSCAR PUBLICATION, DELHI

Session Plan

Topic coverage and Internal Test	No. of Sessions (in hrs.)	Activity (lecture, tutorial, lab practice, field studies/f field-trip, Workshop etc.)	Assignment (project, assignment, field study, seminar, etc.)	Suggested Reading (Book, Video, Online source, etc.)
Introduction of Remote Sensing – Principles of RS-Types, Pixel, DN value, Energy sources and Radiation principles, Energy equation	2	Lecture & Video and Practice	1.1	TB:1, CH:1 TB:2, CH:2
EMR and Spectrum, EMR interaction with Atmosphere-scattering, Absorption, Atmospheric window, Black body radiation	2	Lecture and Practice	1.2	TB:1, CH:1 TB:2, CH:2
EMR interaction with earth surface features-reflection, absorption, emission and transmission	1	Lecture & Video	1.3	TB:1, CH:1 TB:2, CH:2
Spectral signature, Interaction with vegetation, soil, water bodies, Advantage of RS over conventional method, Limitation, Ideal remote sensing.	2	Lecture & Practice	1.4	TB:1, CH:1 TB:2, CH:2
PRACTICE				
Installation of Image Processing software's and Data Exploring	2			https://www.youtube.com/watch?v=XO1ZbqEemBM
Layer stacking and LUT	2			https://www.youtube.com/watch?v=Oaxc6UHx1tQ

Subset	2			https://www.youtube.com/watch?v=jIZeXzipmkg
Total	7+6=13			
Module-2				
Data acquisition - Procedure, Reflectance and Digital numbers- Intensity	1	Lecture & Video	2.1	TB:1, CH:1
Ground truth, Analog to digital conversion. FCCs, TCC	2+2	Lecture & Practice	2.2	
Platforms and sensors- orbits - types	1	Lecture & Practice	2.3	TB:2, CH:2
Resolution and its type, Image Interpretation	2+4	Lecture & Practice	2.4	TB:1, CH:1
Total	6+6=12			
Module 3				
Land observation satellites, characters and applications	1	Lecture & Video	3.1	TB:5, CH:1
PSLV and GSLV Concepts	1	Lecture & Video	3.2	TB:5, CH:1
LANDSAT series, IRS Series , IKONOS Series, QUICKBIRD series	2	Lecture & Video	3.3	TB:5, CH:1
Weather/Meteorological satellites, INSAT series, NOAA, Applications, Marine observation satellites, OCEANSAT Download satellite data from GLOVIS / Earth Explorer / Bhuvan etc. ,Mosaicking	2	Lecture & Video	3.4	TB:5, CH:1
PRACTICE				
Satellite Data downloading from Bhuvan, Earth Explorer, GLOVIS	6			https://glovis.usgs.gov/
Total	6+6=12			

Module IV				
Concepts of Digital Image Processing,	2	lecture	4.1	TB:1, CH:1
DIP, Data Formats-BSQ, BIL, BIP , Run length encoding, Export and Import, Image acquisition	2	Lecture	4.2	TB:1 CH:1
Export and Import, Histogram, Subset using AOI	2	Lab. Practice	4.3	TB:1, CH:1
PRACTICE				
Export and Import, Histogram, Subset using AOI	2			https://www.youtube.com/watch?v=jw_AytR6ID0
Total	6+2=8			
Module V				
Pre-processing and Post processing Geometric distortion, sources and causes for distortion	2	Lecture & Video	5.1	TB:3, CH:1
Geometric correction	2	Lab. Practice	5.2	TB:3, CH:1
Radiometric correction ,Atmospheric correction	2	Lab. Practice	5.3	TB:3, CH:1
PRACTICE				
Geometric correction	4			https://www.youtube.com/watch?v=xCDrHf8QxmI
Radiometric correction and Atmospheric correction	4			https://www.youtube.com/watch?v=RPMemRR1UPs
Total	6+8=14			
Module : VI				
Introduction to Classification	2	Lecture & Video	6.1	https://www.youtube.com/watch?v=25HTqFpcmps
Image Enhancement	2	Lecture & Video	6.2	https://www.youtube.com/watch?v=0qKOdmIOZIM
Supervised Classification	1	Lab. Practice	6.3	http://gsp.humboldt.edu/olm_2015/Courses/GSP_216_Online/lesson6-

				1/supervised.html
Un-supervised Classification, Image Enhancement	2	Lab. Practice	6.4	https://ieeexplore.ieee.org/abstract/document/964969
Accuracy Assessment	1	Lab. Practice	6.5	http://desktop.arcgis.com/en/arcmap/latest/manage-data/raster-and-images/accuracy-assessment-for-image-classification.htm
PRACTICE				
Image Enhancement	4			
Supervised Classification	2			https://www.youtube.com/watch?v=2SjzJHg4wIY
Un-supervised Classification and PCA	4			https://www.youtube.com/watch?v=g_V6BVRz82E
Accuracy Assessment	2			https://www.youtube.com/watch?v=GcyMurueZc
Total	6+12=18			
Module: VII				
Hyperspectral RS and its application, Microwave RS and its application	1	Lecture & Video	7.1	TB:4, CH:1
Thermal RS and its application, Optical RS and its application	1	Lecture & Video	7.2	B:4, CH:2
Application of Hyperspectral remote sensing and case study	1	Lab. Practice	7.3	B:4, CH:3
Application of microwave remote sensing and case study	1	Lab. Practice	7.4	B:4, CH:4
Application of thermal remote sensing and case study	1	Lab. Practice	7.5	B:4, CH:5
Application of optical remote sensing and case study	1	Lab. Practice	7.6	B:4, CH:2
PRACTICE				
Hyper spectral RS and its application, Microwave RS and its application	4			PRACTICAL

Thermal RS and its application, Optical RS and its application	4			PRACTICAL
Application of Hyperspectral remote sensing and case study	4			PRACTICAL
Application of thermal remote sensing and case study	4			PRACTICAL
Application of optical remote sensing and case study	4			PRACTICAL
Total	6+20=26			
	105			

Geospatial Technology and its Application

Course Title	Code	Type of course	T-P-PJ	Prerequisite
Geospatial Technology and its Application	DESP0901	Theory+ Practice+ Project	2-2-1	Nil

Objective

<ul style="list-style-type: none"> To teach the basic concepts of Geospatial Technology and data structure in Geospatial Technology
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Course outcome

<ul style="list-style-type: none"> Students will gain knowledge about the structure of spatial data including file associations, attribute tables, Metadata, coordinate systems, and projections. To develop software skills in programs used for map production in the modern cartographic workflow.

Evaluation Systems

Internal Examination	Component	% of Marks	Method of Assessment
	Internal Theory	40 (30+5+5)	Written examination + Assignment + Attendance
	Internal Practice	50 (40+10)	Lab Work
	Internal Project	50	Project Work
External Examination	External Theory	60	Written examination
	External Practice	50	Lab Work
	External Project	50	Project Work + Report
Total		300	

Course outline

Module – I: GEOSPATIAL TECHNOLOGY FOR URBAN AND REGIONAL

PLANNING

(8+8+6)

Theory

Relevance of remotely sensed data for Urban & Regional Analysis and Planning; Identification of settlement features from aerospace images; Visual and digital analysis techniques; Scale and Resolution concepts; Scope and limitations.

Urban growth analysis; Slum development; House typology; Site selection for urban development, Density analysis, Population estimation, Transportation network analysis, Change Detection and mapping, classification, Urban fringe, CBD, Urban sprawl, Case studies, Land surface Temperature.

Practice:

1. Urban growth analysis

2. Site selection for urban development
3. Land surface Temperature

Module – II: GEOSPATIAL TECHNOLOGY FOR WATER RESOURCES

ENGINEERING

(4+14+6)

Theory

Watershed, types, divide catchment, command area, stream types, Drainage network, different pattern; morphometric analysis, Bifurcation ratio analysis; Assessment of **Groundwater potential zones** and Groundwater mapping; Site selection for recharge structures, Hydrogeological Mapping GIS applications to ground water studies.

Practice:

4. Mapping of catchment, command area
5. Drainage network analysis
6. Morphometric analysis
7. Mapping of Groundwater potential zones

Module – III: GEOSPATIAL TECHNOLOGY FOR ENVIRONMENTAL

ENGINEERING

(4+12+2)

Theory

Monitoring atmosphere constituents; air pollution, industrial activity, modeling using GIS, Resource development in remote areas, Impacts of anthropogenic activity, Solid Waste management; Water Pollution, Shortest path Identification, Network analysis.

Practice:

1. Air pollution mapping
2. Solid waste management
3. Network analysis
4. Water pollution

Model – IV: GEOSPATIAL TECHNOLOGY FOR AGRICULTURE AND FORESTRY

(4+6+8)

Theory

Spectral behavior of leaf, Vegetation indices; NDVI, TVI, SVI, PCA; Vegetation classification and mapping; Estimation of Leaf area index, Biomass estimation, Deforestation / afforestation / Change detection in forests, case studies. Identification of crops, acreage estimation, production forecasting, pests and disease attacks through remote sensing, crop stress detection due to flood and drought.

Practice:

8. Biomass estimation
9. Calculation of different Indices
10. Forest (Deforestation, afforestation) mapping
11. Crop estimation

Model – V: GEOSPATIAL TECHNOLOGY FOR DISASTER MANAGEMENT (4+6+2)

Theory

Types of disaster Natural and manmade; Cyclone, flood, landslide, land subsidence, fire, Tsunami and earthquake. Issues and concern for various causes of disasters; Principles of Disaster Management; Natural Disasters, Hazards, Risks and Vulnerabilities. Issues in Environmental Health, Water & Sanitation

Practice:

12. Area of Flood, landslide, Tsunami and earthquake mapping using GIS
13. Health GIS

Model – VI: Web GIS

(3+8+2)

Theory

FOSS and its use in web mapping; Designing web services and web maps, storing and processing spatial data with FOSS, Drawing and querying maps on the server with WMS, Putting layers together with a web mapping API, Drawing vector layers with the browser.

Practice:

14. Designing web services and web maps
15. Drawing and querying maps on the server with WMS
16. Putting layers together with a web mapping API
- 17 Drawing vector layers with the browser

Model – VII: GEOSPATIAL TECHNOLOGY FOR OCEAN ENGINEERING & COASTAL MANAGEMENT

(3+6+4)

Theory:

Coastal erosion and protection; alt-water intrusion studies; Estuaries and their impact on coastal process wetland mapping, thematic data base generation in GIS and analysis, mangroves and coastal zone management Coastal Vulnerability.

Practice:

18. Shoreline change detection
19. Mangrove change detection
20. Saltwater intrusion
21. Coastal Vulnerability mapping

Text Book

1. Anji Reddy .M, “Textbook of Remote Sensing and Geographical Information Systems”, BS Publications, Hyderabad. 2011. ISBN: 81-7800-112-8.
2. Kang tsung Chang , “Introduction to Geographical Information System”, Tata McGraw Hill, 7th edition, 2010
3. Burrogh .P.A, “Principles of Geographical Information System for Land Resources Assessment”, Oxford Publications, | ISBN-13: 978-0198545927, 1986.

4. Chandra .A.M and Ghosh .S.K, “Remote Sensing and Geographical Information System”, Narosa Publishing House, New Delhi. 2006.
5. Paul A. Longley, Micheal F. Goodchild, David J. Magaine David J. Magaine, David W. Rhind, “Geographical Information System”, Vol. I & II, John wiley & Sons.Inc1999.

Session Plan

Topic coverage and Internal Test	No. of Sessions (in hrs.)	Activity (lecture, tutorial, lab practice, field studies/field-trip, Workshop etc.)	Assignment (Project, assignment, field study, seminar, etc.)	Suggested Reading (Book, Video, Online source, etc.)
Module-I (6 hours lecture + 14 hours practice)				
Relevance of remotely sensed data for Urban & Regional Analysis and Planning - Identification of settlement features from aerospace images	2	Lecture	1.1	TB:4, CH:2
Visual and digital analysis techniques - Scale and Resolution concepts - Scope and limitations.	2	Lecture	1.2	TB:1, CH:1
Urban growth analysis - Slum development - House typology - Site selection for urban development - Density analysis - Population estimation	2	Lecture	1.3	TB:4, CH:3
Transportation network analysis - Change Detection and mapping- classification - Urban fringe - CBD - Urban sprawl-Case studies, Land surface Temperature	2	Lecture		TB:4, CH:4
PRACTICE				
Urban growth analysis	2+2	Practice	1.4	https://www.youtube.com/watch?v=oq7EBgNe4d0
Site selection for urban development	2+2	Practice	1.5	https://www.youtube.com/watch?v=ItZHK3WemWE
Land surface Temperature	4+2	Practice	1.6	https://www.youtube.com/watch?v=G09MOTHFikM

Module-II (4 hours Lecture + 14 hours practice + 6 hours project)				
Watershed, types, divide catchment, command area	1	Lecture	2.1	TB:5, CH:1
stream types, Drainage network, different pattern, morphometric analysis, Bifurcation ratio analysis	1	Lecture	2.2	TB:5, CH:2
Assessment of groundwater potential zones and groundwater mapping	1	Lecture		TB:5, CH:2
Hydrogeological Mapping GIS applications to ground water studies	1	Lecture		TB:5, CH:3
Practice + Project (14+6)				
Mapping of catchment, command area	2	Practice	2.3	
Drainage network analysis	2	Practice	2.4	
Morphometric analysis	4+2	Practice	2.5	
Mapping of Groundwater potential zones	6+4	Practice		
Module III (4 hours lecture + 12 hours Practice +2 hours project)				
Monitoring atmosphere constituents- air pollution - industrial activity, modeling using GIS	1	Lecture	3.1	
Resource development in remote areas-Impacts of anthropogenic activity	1	Lecture	3.2	
Solid Waste management, Water Pollution,	1	Lecture		
Shortest path Identification, Network analysis	1	Lecture		
Practice + Project (12+2)				
Air pollution mapping	4	Practice	3.3	
Solid waste management	4	Practice	3.4	
Network analysis	2+2	Practice	3.5	
Water pollution	2	Practice	3.6	
Module IV 4 hours lecture + 6 hours practice + 8 hours project)				
Spectral behavior of leaf – Vegetation indices – NDVI, TVI, SVI, PCA – Vegetation	1	Lecture	4.1	TB:1, CH:1

classification and mapping				
Estimation of Leaf area index, Biomass estimation, Deforestation / afforestation / Change detection in forests - case studies	1	Lecture	4.2	TB:1, CH:1
Identification of crops -acreage estimation -production forecasting - pests and disease attacks through remote sensing	1	Lecture	4.3	TB:1, CH:2
crop stress detection due to flood and drought	1	Lecture	4.4	TB:1, CH:2
Practice + Project (6+8)				
Biomass estimation	2+6	Practice and Project		https://www.youtube.com/watch?v=Odm8A1myBaI
Calculation of different Indices Forest (Deforestation, afforestation) mapping	2	Practice		https://www.youtube.com/watch?v=Odm8A1myBaI
Crop estimation	2+2	Practice and project		https://www.youtube.com/watch?v=Odm8A1myBaI
Module V (3 hours lecture + 6 hours practice + 2 hours project)				
Types of disaster Natural and manmade: Cyclone, flood, landslide, land subsidence, fire, Tsunami and earthquake.	2	Lecture	Assignment	INCOIS BULLETIN
Issues and concern for various causes of disasters. Principles of Disaster Management	1	Lecture		INCOIS BULLETIN
Natural Disasters, Hazards, Risks and Vulnerabilities, Issues in Environmental Health, Water & Sanitation	1	Lecture		INCOIS BULLETIN
Practice + Project (6+2)				
Area of Flood, landslide, Tsunami and earthquake mapping using GIS	4	Practice	5.1	https://www.youtube.com/watch?v=jppv9YSw8_8
Health GIS	2+2	Practice and project	5.2	https://www.youtube.com/watch?v=jppv9YSw8_8
Module VI (3 hours lecture + 8 hours practice + 2 hours project)				
FOSS and its use in web mapping, Designing web services and web maps	1	lecture	6.1	https://enterprise.arcgis.com/en/server/latest/create-web-

				apps/windows/about-web-gis.htm
storing and processing spatial data with FOSS, Drawing and querying maps on the server with WMS	1	Lecture	6.2	https://enterprise.arcgis.com/en/server/latest/create-web-apps/windows/about-web-gis.htm
Putting layers together with a web mapping API, Drawing vector layers with the browser	1	Lab Practice	6.3	https://enterprise.arcgis.com/en/server/latest/create-web-apps/windows/about-web-gis.htm
Practice + Project (8+2)				
Designing web services and web maps	2	Practice		https://www.youtube.com/watch?v=8y2GiwdcKUU
Drawing and querying maps on the server with WMS	2	Practice		https://www.youtube.com/watch?v=8y2GiwdcKUU
Putting layers together with a web mapping API	2	Practice		
Drawing vector layers with the browser	2+2	Practice		
Module VII (3 hours lecture + 6 hours practice + 4 hours project)				
Coastal erosion and protection, salt-water intrusion studies	1	Lecture	7.1	TB: 6, CH:5
Estuaries and their impact on coastal process wetland mapping	1	Lecture	7.2	TB: 6, CH:5
Thematic data base generation in GIS and analysis, mangroves and coastal zone management Coastal Vulnerability.	1	Lecture		TB: 6, CH:5
Practice + Project (6+4)				
Shoreline change detection	2+2	Practice		https://www.youtube.com/watch?v=MUkpE_uWKcA
Mangrove change detection	2+2	Practice		https://www.youtube.com/watch?v=29Ku8hX3f5M
Saltwater intrusion and Coastal Vulnerability mapping	2	Practice		
Total (Hrs.)	120			

Photogrammetry and Application

Course Title	Code	Type of course	T-P-PJ	Prerequisite
Photogrammetry and Application	DESP0402	Theory+ Practice	2-2-0	Nil

Objective

To teach digital photogrammetry techniques and applications

Course outcome

- Students will gain knowledge about the survey by Photogrammetry method.
- Prepare DEM, TIN model and generate contour map.

Evaluation Systems

Internal Examination	Component	% of Marks	Method of Assessment
	Internal Theory	20	Written examination
	Internal Practice	30(20+10)	Lab work + Learning Record
External Examination	External Theory	30	Written examination
	External Practice	20	Lab work
Total		<i>100</i>	

Course outline

Module -I: INTRODUCTION

(3+6 hours)

Theory:

Fundamentals of photogrammetry and aerial photography; History, aerial cameras, aerial films and processing. Types of aerial photos. Fundamentals and geometry of aerial photographs; Scale, Advantages and disadvantages of small scale and large-scale aerial photographs.

Practice:

1. Scale determination from aerial photo
2. Aerial photo Interpretation

Module - II: CONCEPT of PHOTOGRAMMETRY

(7+8 hours)

Theory

Introduction, Terrestrial and Aerial photographs; vertical and oblique photographs, height determination contouring, photographic interpretations, stereoscopy, parallax bar; Flight Planning, Photo Interpretation, Applications of aerial Photos, Photo theodolite.

Practice:

3. Use of Parallax bar and determination of Height from stereo pair

4. Satellite DEM and ortho Image generation

Module - III: DIGITAL PHOTOGRAMMETRY & ITS COMPONENTS (4+6 hours)

Theory:

Digital Cameras; CCD Camera, Full frame CCD Frame transfer CCD, CCD cameras with piezo shift, Interline transfer CCD, Time delay integration CCD sensor, Spectral Sensitivity of CCD sensor, Geometric problems of CCD images; line jitter, blooming, warm up effect, tailing, Typical CCD systems.

Practice:

5. Primary and additive colour creation

6. Stereo test

Module – IV: RELIEF AND TILT DISPLACEMENTS (5+8 hours)

Theory:

Mosaics and types of mosaics, stereoscopic vision and stereoscopes; image displacement due to relief, concepts of stereo-photogrammetry, normal vision, depth perception and vertical exaggeration.

Practice:

7. Mosaic

8. Stereoscopic vision

9. Relief displacement

Module – V: DIGITAL CONVERSIONS (3+12 hours)

Theory:

Analog to digital conversion; Scanner, flat bed, drum type, Sensor characteristics; Scanner resolutions, Scanner calibration, Video Cameras, Frame Grabber ; Typical Scanner systems and Video cameras.

Practice:

10. Analog to digital conversion

11. Orientation of stereo model

12. Determination of Height

Module – VI: DRONE SURVEY (5+12 hours)

Theory:

Aerial mapping and modelling using drone; types of mapping, types of mapping product, mapping for agriculture, mapping for Construction, Autonomous flight planning, Waypoints,

collecting nadir imagery for 2D mapping, Collecting oblique imagery for 3d mapping, Volumetric measurements, map accuracy, ground truthing, ground control points.

Practice:

- 13. Aerial mapping using DRONE
- 14. Mosaicking of aerial Photo
- 15. Correction and rectification

Module – VII: DIGITAL PHOTOGRAMMETRIC APPLICATIONS (3+8 hours)

Theory:

DTM generation; Image correlation, Image matching, Digital Ortho-photo generation, Automated aero triangulation, Link between GIS and Digital Photogrammetry.

Practice:

- 16. DTM generation
- 17. Image correction
- 18. Link between GIS and Digital Photogrammetry
- 19. Ortho Image generation

References Book

- 1. Krauss .J, “Photogrammetry”, Vol. I IV Edition, Springer -Verlag Publishers, 1993.
- 2. “International Archives of Photogrammetry and Remota Sensing”, ISPRS, Volume XXIX, B5, Commission 5, 1995.
- 3. Remote sensing & Image interpretation, THOMAS M. LILLESAND AND RALPH W. KIEFER, JOHN WILEY & SONS, INC. PUBLISHERS.
- 4. Anji Reddy .M, “Textbook of Remote Sensing and Geographical Information Systems”, BS Publications, Hyderabad. 2011. ISBN: 81-7800-112-8.
- 5. Proceedings of Annual Convention of ASPRS, 1993-96

Session Plan

Topic coverage and Internal Test	No. of Sessions (in hrs.)	Activity (lecture, tutorial, lab practice, field studies/field-trip, Workshop etc.)	Assign ment (project, assignm ent, seminar, etc.)	Suggested Reading (Book, Video, Online source, etc.)
Module - I (3 hours lecture + 6 hours practice)				
Fundamentals of	1	Lecture & Video	1.1	TB:1, CH:1

photogrammetry and aerial photography: History, aerial cameras, aerial films and processing				
Types of aerial photos. Fundamentals and geometry of aerial photographs, Scale	1	Lecture & Video	1.2	TB:1, CH:1
Advantages and disadvantages of small scale and large-scale aerial photographs	1	Lecture, Video + Practice	1.3	TB:1, CH:1
PRACTICE				
Scale determination from aerial photo, Aerial photo Interpretation	6	Practice		https://www.youtube.com/watch?v=CPz0vs_jO5Y
Module - II (7 hours lecture + 8 hours practice)				
Introduction, Terrestrial and Aerial photographs, vertical and oblique photographs, height determination contouring	2	Lecture	2.1	http://ncert.nic.in/textbook/pdf/kegy306.pdf
Photographic interpretations, stereoscopy, parallax bar- Flight Planning	3	lecture	2.2	TB:4,CH:2
Photo Interpretation, Applications of aerial Photos-Photo theodolite.	2	Lecture	2.3	TB:4,CH:2
Practice				
Use of Parallax bar and determination of Height from stereo pair	4			https://www.youtube.com/watch?v=2kIWR_ZXY3w
Satellite DEM and ortho Image generation	4			https://www.youtube.com/watch?v=SuLnyGF0jqI
Module - III 4 hours Lecture and Video+ 6 hours practice)				
Digital Cameras - CCD Camera - Full frame	1	Lecture & Video	3.1	TB:4,CH:3

CCD Frame transfer CCD				
CCD cameras 1 with piezo shift, Interline transfer CCD, Time delay integration CCD sensor	1	Lecture & Video	3.2	TB:4,CH:3
- Spectral Sensitivity of CCD sensor, Geometric problems of CCD images - line jitter, blooming, warm up effect, tailing	1	Lecture & Video	3.3	TB:4,CH:3
Typical CCD systems, line scanners - SPOT, MOMS Data	1	Lecture & Video	3.4	TB:4,CH:3
Primary and additive colour creation, Stereo test	6	Practice		https://www.youtube.com/watch?v=2kIWR_ZXY3w
Module –IV (6 hours Lecture + 8 hours practice)				
Mosaics and types of mosaics, stereoscopic vision and stereoscopes	2	lecture	4.1	TB:3, CH:3 https://pdfs.semanticscholar.org/ec65/6357da18445dd339a1f18a1c71de4b0ca62f.pdf
Image displacement due to relief, concepts of stereo-photogrammetry	2	Lecture	4.2	TB:3,CH:2
Normal vision, depth perception and vertical exaggeration	1	Lecture	4.3	TB:3,CH:3
Practice				
Mosaic, Stereoscopic vision	4	Practice		https://www.youtube.com/watch?v=1MXNRrHLuWk
Relief displacement	4	Practice		https://www.youtube.com/watch?v=G8gfC27Ybew
Module –V (3 hours lecture + 12 hours practice)				
Analog to digital conversion - Scanner -	1	Lecture	5.1	TB:4, CH:2

flat bed, drum type				
Sensor characteristics - Scanner resolutions - Scanner calibration	1	Lecture	5.2	TB:4, CH:2
Video Cameras - Frame Grabber - Typical Scanner systems and Video cameras	1	Lecture		TB:4, CH:2
Practical				
Analog to digital conversion	4	Practice		https://www.youtube.com/watch?v=V3Yp8imYE4I
Orientation of stereo model	4	Practice		https://www.youtube.com/watch?v=qS7GaaxWw4c
Determination of Height	4	Practice		https://www.youtube.com/watch?v=_rAcGShrM8
Module –VI (5 hours lecture and 12 hours practice)				
Aerial mapping and modelling using drone, types of mapping, types of mapping product, mapping for agriculture, mapping for Construction	2	Lecture		TB:1,CH:4
Autonomous flight planning, Waypoints, collecting nadir imagery for 2D mapping, Collecting oblique imagery for 3d mapping	2	Lecture		TB:1,CH:4
Volumetric measurements, map accuracy, ground truthing, ground control points.	1	Lecture		TB:1,CH:4
Practical				
Aerial mapping using	4	Practice		https://www.youtube.com/watch?v=qS7GaaxWw4c

DRONE				com/watch?v=UXVH8er9LTE
Mosaicking of aerial Photo	4	Practice		https://www.youtube.com/watch?v=RwTkUG28wW0
Correction and rectification	4	Practice		https://www.youtube.com/watch?v=KrzuMDpH9d0
Module –VII (3 hours lecture + 8 hours practice)				
DTM generation - Image correlation - Image matching	1			TB:1,CH:5
Digital Ortho-photo generation – Automated aero triangulation	1			TB:1,CH:5
Link between GIS and Digital Photogrammetry	1			TB:1,CH:5
Practical				
DTM generation, Image correction	4	Practice		https://www.youtube.com/watch?v=bB6AWRr-8mw
Link between GIS and Digital Photogrammetry, Ortho Image generation	4	Practice		https://www.youtube.com/watch?v=bB6AWRr-8mw
Total	90			

LIDAR Remote Sensing and Application

Course Title	Code	Type of course	T-P-PJ	Prerequisite
LIDAR Remote Sensing and Application	DESP0201	Practice	0-3-0	Basic Survey

Objective

- To teach LIDAR technique for linear and elevation measurement for multiple use geospatial management and planning plans, LIDAR technique to get 3D map and terrain information and 3D Experience Platform and Catia.

Course outcome

- Students will gain knowledge about LIDAR and its application.
- Students will be more skilled in CATIA Civil module

Evaluation Systems

Internal Examination	Component	% of Marks	Method of Assessment
	Internal Practice	50 (40+10)	Lab work + Learning Record
External Examination	External Practice	50	Lab work
Total		100	

Course Outline

Model – I: LIDAR SYSTEM DESIGN

1. Download of LIDAR data
2. Layer stacking
3. Data Validation

Module – II: GEOREFERENCING AND CALIBRATION OF LIDAR DATA

4. Georeferencing Technology
5. Boresight Calibration - Lidar Data Preprocessing
6. Project Coverage Verification - Review Lidar Data against Field Control
7. Lidar data errors and rectifications, - processes calibration of Lidar data - artifacts and anomalies - Lidar Error Budget.

Module – III: AUTOMATED CLASSIFICATION

8. Noise Removal and other sensor-related artifacts - Layer Extraction - Automated Filtering
9. Manual Editing and Product Generation – Surface Editing - Hydrologic Enforcement
10. DEM, DSM -TIN,
11. Breaklines, Contours, and Accuracy Assessment.

Module – IV: LIDAR APPLICATIONS

12. Topographic Mapping, , flood inundation analysis, line-of-sight analysis
13. Forestry, various types of LIDAR sensors-, vegetation metric calculations - specific application software.
14. Corridor mapping system, data processing and quality control procedures.
15. Modelling

Resources List

1. Lidar: Range-Resolved Optical Remote Sensing of the Atmosphere, edited by Claus Weitkamp.
2. Manual of Airborne Topographic Lidar by Michael S. Renslow.
3. Lidar Techniques and Remote Sensing in the Atmosphere: Understanding the Use of Laser Light in the Atmosphere by Francis Emmanuel Mensah.

Session Plan

Sl. No.	Topic	Pedagogy	Hour	REFERENCES
1.	Download of LIDAR data	PRACTICE	6	https://www.youtube.com/watch?v=9IIRZm29HBg
2.	Layer stacking	PRACTICE	6	https://www.youtube.com/watch?v=prA10TUCPtg
3.	Data Validation	PRACTICE	6	https://www.youtube.com/watch?v=G8IC6dD5L-A
4.	Georeferencing Technology	PRACTICE	6	https://www.youtube.com/watch?v=XJ-s5BMZqJ8&t=160s
5.	Boresight Calibration - Lidar Data Preprocessing	PRACTICE	6	https://www.youtube.com/watch?v=BcmBrXfDkcs
6.	Project Coverage Verification - Review Lidar Data against Field Control	PRACTICE	6	https://www.youtube.com/watch?v=DcjHGc3Z24w&t=34s
7.	Lidar data errors and rectifications, - processes calibration of Lidar data -	PRACTICE	6	https://www.youtube.com/watch?v=9IIRZm29HBg

	artifacts and anomalies - Lidar Error Budget			
8.	Noise Removal and other sensor-related artifacts - Layer Extraction - Automated Filtering	PRACTICE	6	https://www.youtube.com/watch?v=prA10TUCPtg
9.	Manual Editing and Product Generation – Surface Editing - Hydrologic Enforcement	PRACTICE	6	https://www.youtube.com/watch?v=G8IC6dD5L-A
10.	DEM, DSM -TIN	PRACTICE	6	https://www.youtube.com/watch?v=XJ-s5BMZqJ8&t=160s
11.	Breaklines, Contours, and Accuracy Assessment.	PRACTICE	6	https://www.youtube.com/watch?v=BcmBrXfDkcs
12.	Topographic Mapping, , flood inundation analysis, line-of-sight analysis	PRACTICE	6	https://www.youtube.com/watch?v=DcjHGc3Z24w&t=34s
13.	Forestry, various types of lidar sensors-, vegetation metric calculations - specific application software.	PRACTICE	6	https://www.youtube.com/watch?v=G8IC6dD5L-A
14.	Corridor mapping system, data processing and quality control procedures	PRACTICE	6	https://www.youtube.com/watch?v=XJ-s5BMZqJ8&t=160s
15.	Modelling	PRACTICE	6	https://www.youtube.com/watch?v=BcmBrXfDkcs
		Total	90	https://www.youtube.com/watch?v=DcjHGc3Z24w&t=34s

Smart City Planning

Course Title	Code	Type of course	T-P-PJ	Prerequisite
Smart City Planning	DESP0202	Practice	0-3-0	Nil

Objective

<ul style="list-style-type: none">· To teach students learning with Autodesk Infracore and work with Open Street Map and Drafting of different types of buildings in the project area, the concept of terrain and slope for designing of drainage, road and railway and designing the city features including park, garden etc.

Course outcome

<ul style="list-style-type: none">· Students will gain knowledge about to design and plan a twin city model.· Students will get more knowledge on designing of building, road, drainage etc. through Autodesk Infracore and 3D EXPERIENCE Platform

Evaluation Systems

Internal Examination	Component	% of Marks	Method of Assessment
	Internal Practice	50 (40+10)	Lab work + Learning Record
External Examination	External Practice	50	Lab work
Total		100	

Course outline

Module-I City Modelling

Digital Twin city, Open source data: - Open Street Map, City GML, Open Topography, SRTM, Google Satellite maps.

Module-II Terrain Preparation

3DModeling:- base maps, terrain preparation, contour preparations, 3DModeling of city furniture's such as Buildings, Bridges, road, canal, assembly, stadium.

Module-III 3D Modelling

3DModeling; Texturing and rendering, virtual reality using HTC vive or 360-degree point capture.

Module-IV Simulation

Virtual Simulations; Shadow analysis, Storm Water management

MODULE-V Risk Management

Virtual Simulations; Pedestrian behaviour, solar lights intensity, risk management.

Module-VI Virtual Simulations

Virtual Simulations; urban scope Generation, mobility and traffic Simulation, urban emergency management, water supply, flood simulations, city electric power management, health, education, governance.

Module-VII City planning

Virtual Simulations: - flood simulations, city electric power management, health, education, Good governance.

6. Session Plan

Sl. No.	Topic	Pedagogy	Hour	REFERENCES
1.	Digital Twin city, Open source data: - Open Street Map, City GML	PRACTICE	6	https://youtu.be/VPJz-AucqF4
2.	Open Topography, SRTM, Google Satellite maps	PRACTICE	6	https://youtu.be/0zwBFc9aVtE
3.	3DModeling:- base maps, terrain preparation, contour preparations,	PRACTICE	6	https://youtu.be/tXDWxGUp8N0
4.	3DModeling of city furniture's such as Buildings, Bridges, road, canal, assembly, and stadium.	PRACTICE	6	https://youtu.be/P8qKaL9IGjk
5.	Texturing and rendering, virtual reality using HTC vive or 360-degree point capture.	PRACTICE	6	https://youtu.be/ZBLwb2nisJQ
6.	Shadow analysis, Strome Water management	PRACTICE	6	https://youtu.be/9nV9rNYYbxw
7.	Pedestrian behaviour, solar lights intensity,	PRACTICE	6	https://youtu.be/VPJz-AucqF4
8.	Generation scope, mobility and traffic Simulation	PRACTICE	6	https://youtu.be/0zwBFc9aVtE
9.	Flood simulations	PRACTICE	6	https://youtu.be/tXDWxGUp8N0
10.	Urban emergency management,	PRACTICE	6	https://youtu.be/P8qKaL9IGjk
11.	Water supply	PRACTICE	6	https://youtu.be/ZBLwb2nisJQ
12.	City electric power management	PRACTICE	6	https://youtu.be/9nV9rNYYbxw
13.	Risk management	PRACTICE	6	https://youtu.be/VPJz-AucqF4

14.	Health, Education,	PRACTICE	6	https://youtu.be/0zwBFc9aVtE
15.	E-Governance	PRACTICE	6	https://youtu.be/tXDWxGUp8N0
Total			90	

Project

Course Title	Code	Type of course	T-P-PJ	Prerequisite
Project	DEET0300	Project	0-0-6	Nil

Course objectives:

To teach application of remote sensing and GIS and mold the student for taking up a major project through applying the GIS and Remote sensing image-processing software's. **Course**

Outcome:

Students take up group projects and deal the following activities during the course of their project.

The project Report should contain the reports of the activities and the explanation of the activity, how the same is taken up and the outcome of the activity.

1. Functional Planning of the project
2. Identification of Objects
3. Literature Review
4. Preparation of Flow chart for Methodology
5. Layer creation and GIS analysis
6. Identifying the possible Risks involved (specific to the project)
7. Result and Discussion
8. Conclusion
9. Recommendation
10. References

Internship

Course Title	Code	Type of course	T-P-PJ	Prerequisite
Internship	DEET0800	Practice	0-4-0	Nil

Students have to undergo twelve-week practical training in remote sensing and Geographical information System related organizations of their choice but with the approval of the department. At the end of the training student will submit a report as per the prescribed format to the department.

Assessment process

This course is mandatory and a student has to pass the course to become eligible for the award of degree. The student shall make a presentation before a committee constituted by the department, which will assess the student based on the report submitted, and the presentation made. Marks will be awarded out of 100 and appropriate grades assigned as per the regulations.

The following colour represents the syllabus revision, skill, employability and entrepreneurship.

Green : Skill

Pink : Employability

Sky : Entrepreneurship

Centurion University of Technology and Management Odisha

CHOICE BASED CREDIT SYSTEM

COURSE STRUCTURE & SYLLABUS

BASKET - I



**Centurion
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Empowering Communities...*

School of Engineering & Technology

2018

BASKET - I
(Basic Sciences)

<i>Course Code</i>	<i>Course Title</i>	<i>Course Type</i>	<i>Credits</i>	<i>Prerequisite</i>	<i>Department Offering</i>
<i>FCBS0101</i>	<i>Environmental Science</i>	<i>Theory</i>	<i>3</i>	<i>Nil</i>	<i>Chemistry</i>
<i>FCBS 0102</i>	<i>Differential Equations</i>	<i>Theory</i>	<i>3</i>	<i>Nil</i>	<i>Mathematics</i>
<i>FCBS 0103</i>	<i>Linear Algebra & Vector Calculus</i>	<i>Theory</i>	<i>3</i>	<i>Nil</i>	<i>Mathematics</i>
<i>FCBS 0104</i>	<i>Integral Transform</i>	<i>Theory</i>	<i>3</i>	<i>Nil</i>	<i>Mathematics</i>
<i>FCBS 0105</i>	<i>Complex Analysis</i>	<i>Theory</i>	<i>3</i>	<i>Nil</i>	<i>Mathematics</i>
<i>FCBS0106</i>	<i>Discrete Mathematics</i>	<i>Theory</i>	<i>3</i>	<i>Nil</i>	<i>Mathematics</i>
<i>FCBS0107</i>	<i>Calculus</i>	<i>Theory</i>	<i>3</i>	<i>Nil</i>	<i>Mathematics</i>
<i>FCBS0108</i>	<i>Probability & Statistics</i>	<i>Theory</i>	<i>3</i>	<i>Nil</i>	<i>Mathematics</i>
<i>FCBS0109</i>	<i>Numerical Methods</i>	<i>Theory</i>	<i>3</i>	<i>FCBS0102 Differential Equations</i>	<i>Mathematics</i>
<i>FCBS0401</i>	<i>Applied Analytical Chemistry</i>	<i>Theory + Practice</i>	<i>3</i>	<i>Nil</i>	<i>Chemistry</i>
<i>FCBS0402</i>	<i>Industrial Chemistry</i>	<i>Theory + Practice</i>	<i>3</i>	<i>Nil</i>	<i>Chemistry</i>
<i>FCBS0403</i>	<i>Applied Engineering Materials</i>	<i>Theory + Practice</i>	<i>3</i>	<i>Nil</i>	<i>Chemistry</i>
<i>FCBS0404</i>	<i>Electricity and Magnetism</i>	<i>Theory + Practice</i>	<i>4</i>	<i>Nil</i>	<i>Physics</i>
<i>FCBS0405</i>	<i>Basic Mechanics and Properties of Matter</i>	<i>Theory + Practice</i>	<i>4</i>	<i>Nil</i>	<i>Physics</i>
<i>FCBS0406</i>	<i>Optics and Optical Fibres</i>	<i>Theory + Practice</i>	<i>4</i>	<i>Nil</i>	<i>Physics</i>

Environmental Science

Subject Name	Code	Type of course	T-P-Pr (Credit)	Prerequisite
Environmental Science	FCBS0101	Theory	3	Nil

Course Objective:

- To understand the concept of multi-disciplinary nature of Environmental Science where different aspects are dealt with a holistic approach.
- Students will develop a sense of community responsibility by becoming aware of environmental issues in the larger social context.
- One must be environmentally educated.

Course Outcome:

- Understand the natural environment and its relationships with human activities.
- Characterize and analyze human impacts on the environment.
- Integrate facts, concepts, and methods from multiple disciplines and apply to environmental problems.
- Design and evaluate strategies, technologies and methods for sustainable management of environmental systems and for the remediation or restoration of degraded environments.

Evaluation System

	Component	% of Marks	Method of Assessment
Internal Examination	Midterm Test	30	Written examination
	Assignment	05	Report and Presentation
	Attendance	05	Attendance percentage
	Total	40	
External Examination		60	Written examination
Total		100	

MODULE-I

Environment and its multidisciplinary nature; Need for public awareness; Renewable and non renewable resources—forest, water, mineral, land, food and energy resources; Structure and function of ecosystems of forest, grass land, desert and aquatic types.

MODULE -II

Biodiversity and its conservation: Biodiversity at global, national and local levels; Threats to biodiversity - Habitat loss; wild life poaching and man - wildlife conflicts; Endangered and endemic species; conservation measures.

Causes, effects and control measures of pollution, air, water and noise pollution; Nuclear hazards; solid-waste management—Causes, effects and control measures; Management of disasters due to natural causes of floods, earthquakes, cyclones and landslides.

MODULE-III

Social issues and the environment; Sustainable environment, Water conservation measures; Rain water harvesting; Resettlement and rehabilitation of people; Climate change and global warming; Acid rain; Ozone layer depletion; water land reclamation; Consumerism and waste products; Features of Environment Protection Act, Air pollution and Control of Pollution Acts; Water Pollution and its Control Act. Effects of Pollution explosion on environment and public health; Need for value education to Protect environment and resources.

Text Book: Anubhav Kaushik & C.P. Kaushik : Environmental Studies-New age International Publishers.

Reference Books:

1. Benny Joseph : Environmental Studies-Tata Mac Graw Hill
2. E. Bharucha : Text book of Environmental Studies for Under graduate courses– Universities Press. (Book prepared by UGC Committee.

Differential Equations

Subject Name	Code	Type of course	T-P-Pr (Credit)	Prerequisite
Differential Equations	FCBS 0102	Theory	3	Nil

Course Objectives:

- To understand most of the physical phenomena from Science and Engineering which are modeled by differential equations.
- To find and interpret the solutions of the ODE & PDE appearing in signal systems, dynamical systems, stability theory and a number of applications to scientific and engineering problems.
- To develop the ability to apply differential equations to significant applied and/or theoretical problems.

Course Outcomes: Upon successful completion of this course, the student will be able to:

- Learn fundamental concepts of ODE & PDE theories and where and how such equations arise in applications to scientific and engineering problems.
- Be competent in solving linear/non-linear 1st & higher order ODEs & PDEs using analytical solution methods to obtain their exact solutions.
- Recognize the major classification of ODEs & PDEs and the qualitative differences between the classes of equations.

Evaluation System

	Component	% of Marks	Method of Assessment
Internal Examination	Midterm Test	30	Written examination
	Assignment	05	Report and Presentation
	Attendance	05	Attendance percentage
	Total	40	
External Examination		60	Written examination
Total		100	

MODULE-I (12 Hours)

First Order Differential Equations: Separable Equations, Homogeneous & Non-homogeneous Equations, Exact Differential Equations, Integrating Factor, Linear Differential Equations, Bernoulli Equation.

MODULE-II (15 Hours)

Second & Higher Order Linear Differential Equations: Linear Dependence and Independence of Solutions, Wronskian, Constant Coefficient Homogeneous Equations, Cauchy-Euler Equation, Nonhomogeneous Equations, Method of Variation of Parameter, Method of Inverse Operator, Legendre Equation.

MODULE-III (15Hrs)

Partial Differential Equation of First Order, Linear and Non-linear Partial Differential Equations, Charpit's Method, Homogeneous and Non-homogeneous Linear Partial Differential Equations with Constant Coefficients, Cauchy Type Differential Equation.

Text Book:

1) Higher Engineering Mathematics by B.V. Raman Publisher: TMH
Chapters: 8 (8.1 to 8.10); 9 (9.1 to 9.7), 18 (18.1 to 18.8) **Reference**

Book: 1) Advanced Engineering Mathematics by P.V.O'Neil Publisher: Thomson

Linear Algebra & Vector Calculus

Subject Name	Code	Type of course	T-P-Pr (Credit)	Prerequisite
Linear Algebra & Vector Calculus	FCBS 0103	Theory	3	Nil

Course Objectives:

- To apply concepts of Linear Algebra & Vector Calculus to the problems related to models in work, circulation and flux Problems, hydrodynamics and fluid dynamics, electrical circuits, networking, linear programming, graph theory, computer graphics, cryptography, thermodynamics, construction of curves and surfaces through specified points etc.
- To solve the system of linear equations appearing in the problems of electrical engineering, mechanical engineering, applied mechanics etc.
- To apply vectors in higher dimensional space in experimental data, storage and warehousing, electrical circuits, graphical images, mechanical systems and in physics.

Course Outcomes:

Upon successful completion of this course, the student will be able to:

- Use matrix operations to solve systems of linear equations and be able to determine the nature of the solutions.
- Compute with the characteristic polynomial, eigenvalues, eigenvectors and eigenspaces of a matrix as well as the geometric and the algebraic multiplicities of an eigenvalue and then to diagonalise that matrix.
- Determine the important quantities associated with scalar and vector fields.

Evaluation System

	Component	% of Marks	Method of Assessment
Internal Examination	Midterm Test	30	Written examination
	Assignment	05	Report and Presentation
	Attendance	05	Attendance percentage
	Total	40	
External Examination		60	Written examination
Total		100	

MODULE-I (14 Hours)

Linear Algebra, Basic Concepts, Linear System of Equations, Solution by Gauss Elimination, Conditions of Existence and Uniqueness of Solutions, Rank of a Matrix, Determinants and Cramer's Rule, Linear Dependence and Independence.

MODULE-II (14 Hours)

Eigen Values and Eigen Vectors, Basis, Symmetric, Skew-Symmetric and Orthogonal Matrices, Complex Matrices, Similarity of Matrices, Diagonalization.

MODULE-III (14 Hours)

Vector Differential Calculus: Vector Algebra, Inner Product, Vector Product, Vector & Scalar Functions and Fields, Derivatives, Gradient of a Scalar Field, Directional Derivative, Divergence of a Vector Field, Curl of a Vector Field.

Text Book:

1) *Advanced Engineering Mathematics* by E. Kreyszig Publisher: Johnwiley & Sons Inc-8th Edition Chapters: 6 (6.1 to 6.6); 7 (7.1, 7.3 to 7.5), 8 (8.1 to 8.4, 8.9 to 8.11) **Reference Books:**

1) *Advanced Engineering Mathematics* by P.V.O' Neil Publisher: Thomson

Mathematical Methods by Potter & Goldberg ; Publisher : PHI

Integral Transform

Subject Name	Code	Type of course	T-P-Pr (Credit)	Prerequisite
Integral Transform	FCBS 0104	Theory	3	Nil

Course Objectives: To describe the ideas of Fourier and Laplace Transforms and indicate their applications in the fields such as Signal & System, Digital Signal Processing, Image Processing, Theory of Control Systems, Differential Equations and many others.

- To use Fourier series for solving boundary value problems appearing in scientific & engineering problems.
- To get acquainted with the fact that the Laplace transform is related to the Fourier transform, but the Fourier transform expresses a function or signal as a series of modes of vibration (frequencies), whereas the Laplace transform resolves a function into its moments.

Course Outcomes: Upon successful completion of this course, the student will be able to:

- Obtain Laplace transform of simple functions, functions expressed in graphical form, integrals and derivatives.
- Solve differential & integral equations with initial conditions using Laplace transform.
- Compute the Fourier series representation of a periodic function, in both exponential and sine-cosine forms.
- Evaluate the Fourier transform of a continuous function and be familiar with its basic properties.

Evaluation System

	Component	% of Marks	Method of Assessment
Internal Examination	Midterm Test	30	Written examination
	Assignment	05	Report and Presentation
	Attendance	05	Attendance percentage
	Total	40	
External Examination		60	Written examination
Total		100	

MODULE-I (16 Hours)

Laplace Transforms, Transforms of Derivatives and Integrals, Derivatives and Integrals of Transforms, Shifting Properties, Unit Step Function, Dirac's Delta Function, Convolution, Inverse Transforms, Solution to Differential Equation, Integral Equation.

MODULE-II (12 Hours)

Periodic Functions, Trigonometric Series, Fourier Series, Fourier Expansion of Functions of any Period, Even and Odd Functions, Half Range Expansions,

MODULE-III (14Hrs)

Fourier Integrals: Fourier Sine Integral, Fourier cosine Integral. Fourier Transforms: Fourier Sine Transform, Fourier Cosine Transform.

Text Book:

Advanced Engineering Mathematics by E.Kreyszig
 Publisher: Johnwiley & Sons Inc-8th Edition Chapters:
 5 (5.1 to 5.6); 10 (10.1 to 10.4, 10.8, 10.9) **Reference**

Books:

- 1) *Advanced Engineering Mathematics* by P.V.O'Neil .Publisher: Thomson
- 2) *Higher Engineering Mathematics* by B.V.Raman .Publisher: TMH

Complex Analysis

Subject Name	Code	Type of course	T-P-Pr (Credit)	Prerequisite
Complex Analysis	FCBS 0105	Theory	3	Nil

Course Objectives:

- To understand the application of Complex Analysis to Two-Dimensional problems in Physics including Hydrodynamics and Thermodynamics and also in Engineering fields such as; Nuclear, Aerospace, Mechanical and Civil engineering, signal processing & communications.
- To acquire the skill of contour integration to evaluate complicated real integrals appearing in Engineering problems via residue calculus.

Course Outcomes: Upon successful completion of this course, the student will be able to:

- To get equipped with the understanding of the fundamental concepts of functions of a complex variable along with the concepts of analyticity, Cauchy-Riemann relations and harmonic functions.
- Evaluate complex contour integrals applying the Cauchy integral theorem, Cauchy integral formula and Residue theorem.
- Illustrate the applications of the calculus of residues in the evaluation of real integrals.

Evaluation System

	Component	% of Marks	Method of Assessment
Internal Examination	Midterm Test	30	Written examination
	Assignment	05	Report and Presentation
	Attendance	05	Attendance percentage
	Total	40	
External Examination		60	Written examination
Total		100	

MODULE-I (14 Hours)

Complex Analysis: Analytic Function, Cauchy-Riemann Equations, Laplace Equation, Harmonic Function, Linear Fractional Transformation.

MODULE-II (14 Hours)

Parametric representation, Line Integral in the Complex plane, Cauchy's Integral Theorem, Cauchy's Integral Formula, Derivatives of Analytic Function.

MODULE-III (14Hrs)

Power Series, Taylor's Series, Maclaurin Series, Laurent's Series, Singularities and Zeroes, Residue Theorem, Residue Integration Method, Evaluation of Real Integrals.

Text Book:

1) *Advanced Engineering Mathematics* by E. Kreyszig Publisher: Johnwiley & Sons Inc-8th Edition Chapters: 12 (12.1 to 12.4, 12.9); 13, 14 (14.2, 14.4) & 15.

Reference Books:

- 1) *Advanced Engineering Mathematics* by P.V. O'Neil Publisher: Thomson
- 2) *Fundamentals of Complex Analysis (with Applications to Engineering and Science)* by E.B. Saff & A.D. Snider Publisher: Pearson

Discrete Mathematics

Subject Name	Code	Type of course	T-P-Pr (Credit)	Prerequisite
Discrete Mathematics	FCBS 0106	Theory	3	Nil

Course Objectives:

To learn a particular set of mathematical facts and to apply their applications in many subjects of Computer Science and Engineering such as Cryptography, Theory of Computation & Data Networking.

To understand mathematical reasoning in order to read, comprehend and construct mathematical arguments as well as to solve problems, occurred in the development of programming languages.

To work with discrete structures such as graphs to study the structure of the world wide web, to model a computer network and to find the shortest path between two places in a transportation network.

Course Outcomes: Upon successful completion of this course, the student will be able to:

- Evaluate elementary mathematical arguments and identify fallacious reasoning.
- Apply the logical structure of proofs and work symbolically with connectives and quantifiers to produce logically valid, correct and clear arguments.
- Reformulate statements from common language to formal logic. Apply truth tables and the rules of propositional and predicate calculus.
- Model and solve real-world problems using graphs, both quantitatively and qualitatively.

Evaluation System

	Component	% of Marks	Method of Assessment
Internal Examination	Midterm Test	30	Written examination
	Assignment	05	Report and Presentation
	Attendance	05	Attendance percentage
	Total	40	
External Examination		60	Written examination
Total		100	

MODULE-I (12 Hours)

Propositional Logic, Propositional Equivalence, Predicates and Quantifiers, Nested Quantifiers, Rules of Inference, Recurrence Relations, Solving Linear Recurrence Relations.

MODULE-II (16 Hours)

Relations and its properties, Representation of Relations, Closure of Relations, Equivalence Relations and Partitions, Partial Ordering, POSet, Hasse Diagram, Maximal & Minimal elements of a Poset, Supremum & Infimum of a Poset, Lattice, Basic properties of Lattices.

MODULE-III (14Hrs)

Introduction to Graph Theory, Graph terminology, Representation of graphs, Graph Isomorphism, Connectivity, Euler and Hamiltonian Paths, Planar graph, Graph Coloring, **Text Books:**

- 1 *Discrete Mathematics and its Applications* by K.H.Rosen Publisher: TMH, Sixth Edition
Chapters: 1(1.1 to 1.5) ; 6 (6.1, 6.2) ; 7; 8(8.1 to 8.5, 8.7, 8.8)
- 2 *Elements of Discrete Mathematics* by C.L.liu & D.P. Mohapatra Publisher: TMH, Third Edition Chapter: 11 (11.1 to 11.4) **Reference Books:**
Discrete and Combinatorial Mathematics by R.P.Grimaldi Publisher: Pearson
Discrete Mathematics and Applications by Thomas Koshy Publisher: Elsevier
Discrete Mathematical Structures by B. Kolman, R.C. Busby & S. Ross Publisher: PHI

Calculus

Subject Name	Code	Type of course	T-P-Pr (Credit)	Prerequisite
Calculus	FCBS0107	Theory	3	Nil

Objective

<ul style="list-style-type: none"> · To study how things change. It provides a framework for modeling systems in which there is change, and a way to deduce the predictions of such models. · To construct a relatively simple quantitative models of change, and to deduce their consequences. · The fundamental idea of calculus is to study change by studying “instantaneous” change, by which we mean change over tiny interval of time.
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Course Outcome

<p>Upon successful completion of this course, students will be able to:</p> <ul style="list-style-type: none"> · Understand the importance of linear functions in mathematics. · Understand the major problems of differential and integral calculus. · Understand and recognize other important classes of functions (such as trigonometric and rational functions), and be able to use calculus with these functions.
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Evaluation Systems

	<i>Component</i>	<i>% of Marks</i>	<i>Method of Assessment</i>
Internal Examination	Midterm Test	30	Written examination
	Assignment	05	Report and Presentation
	Attendance	05	Attendance percentage
	Total	40	
External Examination		60	Written examination
Total		100	

MODULE-I (6 Hours)

Asymptotes

MODULE-II (6 Hours)

Curve Tracing

MODULE-III (6 Hours)

Curvature

MODULE-IV (6 Hours)

Reduction Formulae

MODULE-V (6 Hours)

Vector Integral Calculus: Line Integrals.

MODULE-VI (6 Hours)

Surface Integrals, Green's Theorem

MODULE-VII (6 Hours)

Volume Integrals, Gauss's Theorem, Stokes' Theorem (without proof).

Text Books:

- 1) A Text book of Calculus Part-III : Shantinakaran
Chapters: 1 (Art 1 & 3), 3(Art 7, 8, 9)
- 2) A Text book of Calculus Part – II : Shantinakaran
Chapter: 8 (Art. 24, 25, 26),
- 3) A Text book of Calculus Part – II : Shantinakaran
Chapter: 10 (Art.33, 34, 35, 36, 37)
- 4) A Textbook of Vector Calculus by Shanti Narayan & P. K. Mittal, S. Chand & Co. , 2003
Chapters: 7 (7.1 to 7.6, 7.8 & 7.11)

Probability & Statistics

Subject Name	Code	Type of course	T-P-Pr (Credit)	Prerequisite
Probability & Statistics	FCBS0108	Theory	3	Nil

Objective

- To translate real-world problems into probability models.
- To motivate in students an intrinsic interest in statistical thinking.
- To recognize the role of and application of probability theory, descriptive and inferential statistics in many different fields of engineering.

Course Outcome

Upon successful completion of this course, students will be able to:

- Define and illustrate the concepts of sample space, events and compute the probability and conditional probability of events.
- Define, illustrate and apply the concepts of discrete and continuous random variables, the discrete and continuous probability distributions.
- Define, illustrate and apply the concept of the expectation to the mean, variance and covariance of random variables.
- Compute probabilities based on practical situations using the Binomial, Poisson and Normal distributions.

Evaluation Systems

	Component	% of Marks	Method of Assessment
Internal Examination	Midterm Test	30	Written examination
	Assignment	05	Report and Presentation
	Attendance	05	Attendance percentage
	Total	40	
External Examination		60	Written examination
Total		100	

MODULE-I

(6 Hours)

Probability: Sample space and Events, Principles of Counting, Classical definition of probability.

MODULE-II

(6 Hours)

Axioms of probability, Elementary theorems, Addition and Multiplication rules, Conditional probability.

MODULE-III

(6 Hours)

Probability Distributions: Discrete and Continuous Random Variables.

MODULE-IV

(6 Hours)

Probability Density and Distribution functions, Mean and Variance of Distributions. Binomial Distribution.

MODULE-V

(6 Hours)

Poisson Distribution, Normal Distributions, Poisson and Normal Distributions as Limiting forms of Binomial Distribution.

MODULE-VI

(6 Hours)

Statistics: Random Sampling, Population and Sample, Sample Mean and Variances.

MODULE-VII**(6 Hours)**

Point and Interval Estimations, Confidence Intervals, Fitting Straight Lines, Correlation and Regression.

Text Book:

- Advanced Engineering Mathematics by E. Kreyszig
 Publisher: John Willey & Sons Inc-8th Edition
 Chapters: 22(22.1 to 22.8), 23(23.1 to 23.3, 23.9, 23.10)

Reference Books:

- Statistical Methods By S.P. Gupta (31st Edition); Publisher: Sultan Chand & Sons.
- Mathematical Statistics By S.C. Gupta & V.K. Kapur (10th Edition); Publisher: Sultan Chand & Sons.

Numerical Methods

Subject Name	Code	Type of course	T-P-Pr (Credit)	Prerequisite
Numerical Methods	FCBS0109	Theory	3	FCBS0102 Differential Equations

Objective

<ul style="list-style-type: none"> To understand the limitations of analytical methods and the need for numerical methods and the ability to apply these numerical methods to obtain the approximate solutions to engineering and mathematical problems. Ability to decide and to derive appropriate numerical methods for approximating the solutions of various types of problems in engineering and science and analyze the error incumbent in any such numerical approximation. Ability to report analysis, solution and results in a standard engineering format.

Learning Outcome

<p>Upon successful completion of this course, students will be able to:</p> <ul style="list-style-type: none"> Perform error analysis to select an appropriate numerical model and to estimate errors in numerical solution of a given problem. Derive a variety of numerical algorithms/methods & compare the viability of different approaches to the numerical solutions of various mathematical problems arising in roots of linear and non-linear equations, interpolation and approximation, numerical differentiation and integration, system of linear algebraic equations and differential equations. Analyze and evaluate the accuracy of common numerical methods.
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Evaluation Systems

	Component	% of Marks	Method of Assessment
Internal Examination	Midterm Test	30	Written examination
	Assignment	05	Report and Presentation
	Attendance	05	Attendance percentage
	Total	40	
External Examination		60	Written examination
Total		100	

MODULE-I (6 Hours)
Approximation and round of errors, Truncation error and Taylor's series, Roots of equation using Bisection Method.

MODULE-II (6 Hours)
Roots of equation using the false-position method, fixed point iteration, Newton-Raphson method, Secant method.

MODULE-III (6 Hours)
Solution of System of Linear algebraic equations: Gauss-Seidel method, Lagrange Interpolation.

MODULE-IV (6 Hours)
Newton divided difference interpolation, Inverse Interpolation, Lagrange Interpolation, Newton's forward and backward interpolation.

MODULE-V (6 Hours)
Numerical Differentiation, Numerical integration by the trapezoidal rule.

MODULE-VI (6 Hours)
Numerical integration by the Simpson's rules, Gauss quadrature rule.

MODULE-VII (6 Hours)
Solution of Ordinary Differential Equations: Euler's method, Improvement of Euler's method, Runge-Kutta methods.

Text Book:

- 1) Advanced Engineering Mathematics by E. Kreyszig
Publisher: John Willey & Sons Inc-8th Edition
Chapters: 17 (17.1 to 17.3, 17.5), 18 (18.3), 19 (19.1)

Reference Books:

- 1) Numerical Methods for Scientific and Engineering Computation by M. K. Jain, S. R. K. Iyengar & R.K. Jain; New Age International Publishers.
- 2) Introductory Methods of Numerical Analysis by S.S. Sastry; Third Edition, Prentice Hall India.

Applied Analytical Chemistry

Subject Name	Code	Type of course	T-P-Pr (Credit)	Prerequisite
Applied Analytical Chemistry	FCBS0401	Theory + Practice	3	Nil

Course Objective

- The aim of this course is to give students that are going to carry out an experimental work the necessary comprehension in analytical chemistry.
- The course will also provide the student with knowledge to be able to understand and critically evaluate experimental data produced by others.

Course outcome

- Explain fundamental principles for environmental analytical methods (titration, electrochemistry, instrumentation and basic parameters of water, soil, fuel etc)
- Point out suitable analytical techniques for analyzing a specific compounds in an environmental matrix
- Point out suitable techniques for sampling and handling of environmental samples
- Apply quality control on chemical analysis and laboratory work and explain its importance
- Plan and carry out laboratory experiments, including data analysis and conclusions
- Describe simple approaches for troubleshooting

Evaluation System

	<i>Component</i>	<i>% of Marks</i>	<i>Method of Assessment</i>
<i>Internal Examination</i>	Internal	20	Written examination
	Assignment	30	Report and Presentation
<i>External Examination</i>	<i>End Sem</i>	30	Written examination
	<i>Practice</i>	20	Experiment followed by Viva
<i>Total</i>		100	

Module-1

Water Analysis: Importance of water, different types of water, sources and uses of water, types of water pollutants and domestic and industrial significance of analysis of water. Removal of hardness by Lime-Soda, Zeolite and Ion exchange methods. Removal of DO and dissolved CO₂ from water by De-aeration method. Desalination of brackish water by Reverse osmosis and electro dialysis process. Water disinfection by bleaching powder, liquid Cl₂, and chloramine.

Practice:

1. Determination of total hardness by EDTA method, total dissolved solids, total alkalinity
2. Determination of Turbidity by nephelometer, pH, Conductivity.
3. Determinations of BOD, COD, DO.

NB: The above parameters can also be determined by using water kits and the results are to be compared with those obtained manually.

Module-2

Soil Analysis: Composition of rocks and minerals, soil profile and properties.

Practice:

1. Determination of texture of soil.
2. Determination of moisture content in a soil sample, pH, electrical conductivity,
3. Determination of water holding capacity of soil.
4. Measurement of Calcium and Magnesium Using EDTA methods.

Module-3

Chemistry of fuels: Classification of fuels, composition and properties of Petroleum, LPG, Water gas, producer gas, CNG. Knocking – Mechanism of knocking, harmful effects, Anti knocking agents – TEL, Catalytic converters – Principle & working, Unleaded petrol, Power alcohol & Biodiesel. Photovoltaic cells - construction & working of a PV cell **Practice:**

1. Proximate analysis of fuel (Coal, biomass etc.) Moisture, Volatile content, Ash, fixed carbon
2. Testing of fuel properties of the plastic oil and bio diesel: Specific gravity by picnometer, flash point and fire point by pesky-Marten flash point apparatus, viscosity by Redwood viscometer, calorific value by bomb calorimeter

Industrial Chemistry

Subject Name	Code	Type of course	T-P-Pr (Credit)	Prerequisite
Industrial Chemistry	FCBS0402	Theory + Practice	3	Nil

Course Objective

Students may also explore in depth specialized areas of chemistry of materials, including ores, metals, cemenas well as dyes, oils, soaps

- Introduce the students to industrial processing principles as applicable to chemical and allied industries.
- Provide the students with the knowledge of how raw materials are sourced for various chemical industries and how these materials are processed.
- Provide students with advanced technical skills in Chemical Engineering that will enable them to (a) translate fundamental discoveries in materials and other high technology areas to commercial exploitation, and (b) adapt readily to the challenges presented in a diverse range of industrial sectors that can benefit from process engineering approaches.

Course outcome

- Appreciate better their future roles as chemists in Industrial establishments
- Be able to explain the origin of raw materials used in the chemical and allied industries
- Have a good understanding of how chemical raw materials are processed into finished products.
- Graduates find employment in, quality control, oil and petroleum industry, textile industry, dyes and paints industry, cement industry, just to name a few.

Evaluation System

<i>Internal Examination</i>	<i>Component</i>	<i>% of Marks</i>	<i>Method of Assessment</i>
	Internal	20	Written examination
	Assignment	30	Report and Presentation
<i>External Examination</i>	<i>End Sem</i>	30	Written examination
	<i>Practice</i>	20	Experiment followed by Viva
<i>Total</i>		100	

Module 1: Preparation of soap, dyes and oil analysis :

Introduction: Types of soap (soft and hard soap), methods of preparation of soap, mechanism, difference between fats and oils, physical properties of fats and oil, general introduction to chemistry of dye, various example of dyes, types of dyes.

Practice:

- Preparation of soap by saponification
- Determination of the properties different type of soap
 1. pH test
 2. Foam test
- Hard water test
- Determination of iodine number of oil
- Preparation of dyes (azo dyes): 2- naphthol + 4 - nitro aniline: salicylic acid + 4- nitro aniline
- Preparation of Phenyle.

Applications: Effect of water hardness in cleansing action of soap. Application of dyes to cloth

Module 2: Metals estimation from ores

Introduction: General introduction on ores, types of ore, important ore minerals, application of ores.

Practice:

- Estimation of Cu in copper ore
- Determination of Fe as ferrous iron in an ore sample
- Determination of Zn in Zinc ore by EDTA complex metric method

Module 3: Analysis of cement

Introduction: what is cement? types of cement, composition of cement, preparation of cement, applications.

Practice:

- Estimation of calcium in Portland cement
- Cement hydration and pH evaluation during curing
- To check the quality of cement (colour, texture, smell test, float test, shape test and strength test)

Applied Engineering Materials

Subject Name	Code	Type of course	T-P-Pr (Credit)	Prerequisite
Applied Engineering Materials	FCBS0403	Theory + Practice	3	Nil

Course Objective

- To understand the importance of the chemical approach to nanomaterials
- To study the preparation, analysis and applications of metal nanoparticles
- To develop an understanding of conjugated polymers and their applications
- To understand how polymer composition and architecture imparts unique properties and behavior
- To study organic-inorganic hybrid materials (COMPOSITES) and how the incorporation of metals in the polymer architecture leads to new properties and applications

Course outcome

- Know what it takes to have a career in nanotechnology
- Understand the need to increase Nanotechnology awareness
- Understand the definition of Nanotechnology
- Know the processing of Nanoparticles and Nanomaterials □ Know the application of Nanotechnology and nanomaterials

Evaluation System

Internal Examination	Component	% of Marks	Method of Assessment
	Internal	20	Written examination
	Assignment	30	Report and Presentation
External Examination	End Sem	30	Written examination
	Practice	20	Experiment followed by Viva
Total		100	

Module 1: Nano Materials:

Introduction, nano scale, applications in various fields.

Practice:

- Synthesis of Ag, Au nano particles by wet chemical methods. □ Synthesis of ZnO Nanoparticles by Precipitation Method □ Synthesis of Cu nano particles Sonochemical method.
- Synthesis of Fe nano particles Co-precipitation method.
- Thickness measurement by sol-gel process of coating.

Module 2: Polymers

Introduction, types of polymers, Polymerisation mechanisms.

Practice:

- Synthesis of Thiokol Rubber
- Synthesis of a Rubber Ball from Rubber Latex
- Synthesis of Polystyrene (PS)
- Synthesis of Polymethyl Methacrylate (PMMA) □ Synthesis of Nylon-6:6.
- Determination of molecular weight of polymers by visometry method.

Module 3: Composites

Introduction :Biopolymers or synthetic polymers reinforced with natural or biofibers(termed as bio composites) as a viable alternative to glass fibre composites.Biocomposites“ refers to those composites that can be employed in bioengineering.Biocomposites are composite materials, that is, materials formed by a matrix (resin) and a reinforcement of natural fibers (usually derived from plants or cellulose). Bio composites are the combination of natural fibers (biofibers) such as wood fibers (hardwood and softwood) or non - wood fibers (e.g., wheat, kenaf, hemp, jute, sisal, and flax) with polymer matrices from both renewable and non-renewable resources.

Practice:

- Synthesis of bio composite materials by using jute fibres and wood fibres

Electricity and Magnetism

Subject Name	Code	Type of course	T-P-Pr (Credit)	Prerequisite
Electricity and Magnetism	FCBS0404	Theory + Practice	4	Nil

Course Objective

- To understand electric circuit components and their use.
- To learn and verify the fundamental laws of electricity, learn how to use certain electrical devices. Understanding magnetic properties of matter and performing experiments to realize magnetism.

Course outcome

- Realizing the importance and use of electrical components in a circuit.
- Learning how to do different connections and their purpose.
- Understanding magnetism of matter and its applications

Evaluation Criteria

Internal Examination	Component	% of Marks	Method of Assessment
	Internal		20
	Assignment	30	Report and Presentation
External Examination	End Sem	30	Written examination
	Practice	20	Experiment followed by Viva
Total		100	

Practice I Theory:

Electric field, Potential, EMF, capacitance, resistance, series connection, parallel connection, Kirchhoff's laws, RC circuits, LC circuits.

Lab:

1. Use a Multi-meter for measuring (a) Resistance, (b) AC and DC Voltages, (c) DC Current, (d) Capacitance and (e) Checking electrical fuses.
2. To determine an unknown Low Resistance using Potentiometer. 3. To determine an unknown Low Resistance using Carey Foster's Bridge.

Practice II

Theory: Electrical Circuits: AC Circuits: Kirchhoff's laws for AC circuits. Complex Reactance and Impedance. Series LCR Circuit: (1) Resonance, (2) Power Dissipation and (3) Quality Factor, and (4) Band Width. Parallel LCR Circuit.

Lab:

1. To verify the Superposition, and Maximum power transfer theorems.
2. To determine self-inductance of a coil by Anderson's bridge.
3. To study response curve of a Series LCR circuit and determine its (a) Resonant Frequency, (b) Impedance at resonance, (c) Quality factor Q, and (d) Band width.
4. To study the response curve of a parallel LCR circuit and determine its (a) Anti- resonant frequency and (b) Quality factor Q.

PRACTICE III

Theory: Magnetic Properties of Matter: Magnetization vector (**M**). Magnetic Intensity (**H**). Magnetic Susceptibility and permeability. Relation between **B**, **H**, **M**. Ferromagnetism. B-H curve and hysteresis. Electromagnetic Induction: Faraday's Law. Lenz's Law. Self Inductance and Mutual Inductance. Reciprocity Theorem. Energy stored in a Magnetic Field.

Lab:

2. To study the induced e.m.f. as a function of the velocity of the magnet.
3. Measurement of field strength B and its variation in a solenoid.
4. Determination of μ_r ratio.

Text Book:

1. *Electricity and Magnetism* By K. K. Tiwari, S. Chand Publishing References:
2. *Electricity and Magnetism*, By M. C. Saxena, Satya Prakash, V. P. Arora, Publisher: Pragati Prakashan
3. *Introduction to Electrodynamics*, by David J. Griffiths Prentice-Hall; 3 edition (2011) 4. *Electricity and Magnetism* by - D. C. Tayal, Himalaya Publishing, 2009.

Basic Mechanics and Properties of Matter

Subject Name	Code	Type of course	T-P-Pr (Credit)	Prerequisite
Basic Mechanics and Properties of Matter	FCBS0405	Theory + Practice	4	Nil

Course Objective

- To give the students overall idea about material properties and also hands on experience to measure them.
- To make them realize the applications of material properties.
- To expose them to phenomena like hydrostatics, elasticity, viscosity, surface tension and their applications in various places.
- Encouraging them to build simple models to explain the mechanical properties. **Theory:**

Course outcome

- To understand material properties and perform experiments on them.
- To understand the applications of material properties in real life.
- To be able to make small models for explain few mechanical properties.

Evaluation System

	<i>Component</i>	<i>% of Marks</i>	<i>Method of Assessment</i>
<i>Internal Examination</i>	Internal	20	Written examination
	Assignment	30	Report and Presentation
<i>External Examination</i>	<i>End Sem</i>	30	Written examination
	<i>Practice</i>	20	Experiment followed by Viva
<i>Total</i>		100	

Elasticity: Elastic constants, Relation among elastic constants, torsion of right circular cylinder, bending of beams, Vibration of loaded cantilever.

Lab:

1. Young's modulus by single/double cantilever
2. Young's modulus by Searle's method
3. Rigidity modulus using Barton's apparatus
4. Poisson's ratio

Practice II Theory:

Hydrostatics: hydrostatic force on a body, buoyancy, metacentric height, hydrostatic pressure, pressure measurement: manometer

Viscosity: Viscosity of fluids, Stoke's law, terminal velocity, Poiseulle's equation, Searle's viscometer.

Surface tension & surface energy: Pressure difference across curved liquid surface. **Lab:**

1. Viscosity by Stokes method
2. Viscosity by Poiseulle's method
3. Metacentric height of floating body
4. Measurement of Pressure by manometer
5. Surface tension by capillary rise method
6. Determination of surface tension by Quincke's method

Practice III:

Basic Mechanics

Theory: Kinematics and Kinetics, Effort amplification using levers and pulleys, Friction, Laws of friction.

Rotational Motion: Moment of Inertia, Theorem of Parallel and Perpendicular axes. Moment of inertia of circular disc.

Lab:

1. Effort-output ratio using combination of pulleys
2. Verification of laws of static and dynamic friction
3. Moment of inertia of fly wheel

Text Book:

1. *Elements of Properties of Matter, Dec 2010* by D.S. Mathur, S.Chand (G/L) & Company Ltd Reference Books:

1. *A Text Book of Fluid Mechanics* by R.K. Bansal, Laxmi Publishers, 2005
2. *Engineering Mechanics Statics and Dynamics* by A. K. Tayal, Umesh Publications.

Optics and Optics Fibre

Subject Name	Code	Type of course	T-P-Pr (Credit)	Prerequisite
Optics and Optics Fibre	FCBS0406	Theory + Practice	4	Nil

Course Objective

To understand optical phenomena.

- *To understand different light sources and their use*
- *Understand designing of microscope and artificial light sources*
- *Understanding optical fiber and its applications*

Course outcome

- *Students should understand optical phenomena.*
- *Students should learn about different light sources and their use*
- *Students should be able to understand optical fiber principle, operations and its applications.*

Evaluation System

	Component	% of Marks	Method of Assessment
Internal Examination	Internal	20	Written examination
	Assignment	30	Report and Presentation
External Examination	End Sem	30	Written examination
	Practice	20	Experiment followed by Viva
Total		100	

Practice I

Theory: Reflection and refraction of light. Mirror formula, lens maker's formula. Refraction through a prism. Dispersion, light sources: Principle and operations of sodium lamp, mercury lamp and LASER.

Lab:

1. To determine refractive index of the Material of a prism using sodium source.
2. To determine the dispersive power and Cauchy constants of the material of a prism using mercury source.
3. To determine the refractive index of glass slab using travelling microscope.
4. Designing of a compound microscope.

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Theory: Interference. Young's experiment, conditions for interference, Intensity distribution of fringes, Interference in thin films, Newton's rings.

Diffraction: types of diffraction, Fraunhofer diffraction at a single slit, diffraction at N-parallel slits and plane diffraction grating.

Polarization: Polariser and analyser, optical rotation and Polarimeter

Lab:

1. Determination of wavelength of light by Newton's ring method.
2. Determination of wavelength of LASER source by diffraction grating method
3. Thickness of thin paper by wedge-shaped films
4. Dispersive power and resolving power of a plane diffraction grating.
5. Polarimetry

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Theory: Optical properties—scattering, refraction, reflection, transmission & absorption. Introduction, principle of Laser, stimulated and spontaneous emission, Coherence (temporal and spatial) Ruby Laser, Application of Lasers.

Optical Fibres: Introduction, numerical aperture, step index and graded index fibres, attenuation

& dispersion mechanism in optical fibers (Qualitative only), application of optical fibres, optical communication (block diagram only)

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1. Measurement of attenuation and bending losses of an optical fibre.
2. Measurement of numerical aperture of a optical fibre
3. Study of spatial and temporal coherence of LASER

4. Making
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1. *A Text Book of Optics by M.N. Avadhanulu, Brij Lal, N. Subrahmanyam, S Chand; 23rd Rev. Edn. References:*

2. *Optics by Ajoy Ghatak, McGraw Hill Education; 5 edition*

3. *Physics-I for engineering degree students by B.B. Swain and P.K.Jena.*

4. *Concepts in Engineering Physics by I Md. N. Khan.*

Centurion University of Technology and Management Odisha

COURSE STRUCTURE & SYLLABUS

BASKET - II



Centurion
UNIVERSITY

Shaping Lives...
Empowering Communities...

**CENTURION UNIVERSITY OF TECHNOLOGY AND
MANAGEMENT**

School of Engineering & Technology

2018

CURRICULUM
COURSES OFFERED BY DEPARTMENT OF HUMANITIES AND
MANAGEMENT
BASKET - II

Course Code	Course Title	Course type	Credits	Prerequisite	Department Offering
FCHU1201	Foundations of English Communication	Workshop	2	Nil	Humanities
FCHU1202	Communicative Practice Laboratory -I	Workshop	2	Nil	Humanities
FCHU1203	Business Communication	Workshop	2	Nil	Humanities
FCHU1204	Communicative Practice Laboratory-II	Workshop	2	Nil	Humanities
FCHU1205	Corporate Readiness Laboratory	Workshop	2	Nil	Humanities
FCHU1206	IT Enabled Communication	Workshop	2	Nil	Humanities
FCHU1207	Career Communication	Workshop	2	Nil	Humanities
FCHU1208	Personality Development	Workshop	2	Nil	Humanities
FCHU1209	Seminar and Technical Writing	Workshop	2	Nil	Humanities
FCHU1210	Professional Etiquette	Workshop	2	Nil	Humanities
FCHU1211	Creative Writing	Workshop	2	Nil	Humanities
FCHU1212	English for Competition (GRE/GMAT/TOEFL/IELTS)	Workshop	2	Nil	Humanities
FCHU1213	Be a Contributor	Workshop	2	Nil	Humanities
FCHU0210	Life Skills Development (LSD) – I	Practice	2	Nil	Humanities
FCHU0211	Life Skills Development (LSD) – II	Practice	2	Nil	Humanities
FCHU0212	Life Skills Development (LSD) - III	Practice	2	Nil	Humanities
FCMG0114	Economics	Theory	2	Nil	Management
FCMG0102	Accounting & Finance	Theory	2	Nil	Management
FCMG0103	Management Processes and OB	Theory	2	Nil	Management
FCMG0104	Production and Operation Management	Theory	2	Nil	Management
FCMG0105	Marketing Management	Theory	2	Nil	Management
FCMG0108	Introduction to Research	Theory	2	Nil	Management

<i>FCMG0113</i>	<i>Indian Society and Culture</i>	<i>Theory</i>	<i>2</i>	<i>Nil</i>	<i>Management</i>
<i>FCMG0115</i>	<i>Human Rights</i>	<i>Theory</i>	<i>1</i>	<i>Nil</i>	<i>Management</i>
<i>FCMG0116</i>	<i>Introduction to Ethics</i>	<i>Theory</i>	<i>1</i>	<i>Nil</i>	<i>Management</i>
<i>FCMG1201</i>	<i>Disaster Management</i>	<i>Workshop</i>	<i>2</i>	<i>Nil</i>	<i>Management</i>
<i>FCMG1202</i>	<i>Ms Excel</i>	<i>Workshop</i>	<i>2</i>	<i>Nil</i>	
<i>FCMG0401</i>	<i>Gender Issues in Development</i>	<i>Theory+ Project</i>	<i>1</i>	<i>Nil</i>	<i>Management</i>

Note: The evaluation for Workshop type subject will be 100% internal by the concerned faculty.

SYLLABUS
FCHU1201 FOUNDATIONS OF ENGLISH COMMUNICATION

<i>Pre - requisites</i>	<i>Course Type</i>	<i>Credits</i>
<i>Nil</i>	<i>Workshop</i>	<i>2</i>

COURSE OBJECTIVES

To develop vocabulary and grammar knowledge

To develop reading comprehension skills

COURSE OUTCOMES

Development of academic and sub-technical vocabulary

Enhancement of basic language skills, i.e., listening, speaking, reading and writing

Development of grammatical competence

Confidence level improvement

This course aims to build the vocabulary, comprehension, and writing skills for effective communication in English language. It will focus on reading, listening to, and writing passages, as a means of learning communications skills.

The essential elements of this course will include:

MODULE-I: READING SKILLS (7hrs.)

Read **one** of the following books:

Animal Farm

Alice in Wonderland

Guide

Malgudi Days

Harry Potter

Amar Chitra Katha

Comprehension Skills: Students will respond to comprehension lessons from the chosen book.

MODULE-II: WRITING SKILLS (7hr.)

Students learn grammar and usage by writing passages, and getting formal feedback on these.

MODULE-III: LISTENING SKILLS (6hrs.)

Students respond to questions based on listening to videos, audio, or speaking assignments of classmates.

MODULE-IV: SPEAKING SKILLS (7hrs.)

Speaking assignments based on chosen book or contemporary topics.

TEXT BOOKS:

Esteras, Santiago Remacha and Fabre, Elena Marco. (2007). *Professional English in Use ICT Student's Book*. Cambridge: Cambridge University Press.

REFERENCES:

Grellet, F. (1981). *Developing Reading Skills*. Cambridge: Cambridge University Press

McCarthy, M. & O'Dell, F. (2008). *Academic Vocabulary in Use*. Cambridge: Cambridge University Press.

Ur Penny, (1992). *Five-Minute Activities: A Resource Book of Short Activities* (Cambridge Handbooks for Language Teachers). Cambridge: CUP

F Klippel. (1984). *Keep Talking*. Cambridge: CUP

EVALUATION SYSTEM (CONTINUOUS INTERNAL ASSESSMENT)

<i>Methods</i>	<i>Conversations</i>	<i>Listening Comprehension</i>	<i>Book Review Presentation</i>	<i>Vocab.</i>	<i>Mid-I (Presentation)</i>	<i>Mid-II (Online) Common Errors</i>	<i>Mid-III (Written)</i>	<i>% of Marks 100(Best 5)</i>
Total	20	20	20	20	20	20	20	100

S. No.	Topic	Pedagogy	Details	Instructional Hrs			
				Th	Pract	video	Proj
1	Getting to Know Each Other	Activity Based Learning	Catch the Ball Introductions Ice-breaker Share an interesting fact, stories, questions, memories, embarrassing moments or sometimes relevant to the context. Useful link: http://www.icebreakers.ws/small-group/catch-ball-introductions-icebreaker.html	0	1	0	0
2	Conversation Practice	Pair work using Realia	Formulaic Expressions Doing Things with Words/ Objects <u>Description:</u> Student practice real life situations like using maps, asking for directions, small talk on weather, holidays, parties and eating out.	0	1	1	0
3	Formal and Informal Communication	Degrees of Formality	Worksheet: Ask the students to work in small groups of 2/3. They must read through the phrases in the table, deciding whether each phrase is formal or informal in conversation a conversation situation. When they have finished, review the exercise as a class (answers provided in the worksheet)	0	1	1	0

S. No.	Topic	Pedagogy	Details	Instructional Hrs			
				Th	Pract	video	Proj
4	Shadowing	Pronunciation – intonation, stress, pause	Find an Audio to Listen & Repeat – BBC News, Seminar Talk, Ted Talk etc. https://www.youtube.com/watch?v=GVWFGIyNswI	0	1	1	0
5	Speech Acts	Plain English	Students can 'become' anyone they like for a short time! They will be encouraged to come forward and perform small speech acts and role-plays.	0	1	0	0
6	Ask Me Questions Challenge	Questions & Responses	Individual to respond- the whole class to ask questions. In this session, a student will learn communication management.	0	1	0	0
7	TED Talk Listening	Listening Comprehension	Ice-breaker: Talkathon Assignment: In groups of 4, you are going to create/write 10 questions about the TED Talk Afterwards, the groups of 4 will split up in new groups of 4 to discuss and compare their questions. Comprehension Test	0	1	1	0
8	Ted Talks	Communication & Confidence Body Language	Listen to a Ted Talk & make a presentation on a popular/contemporary topic	0	1	1	0
9	Reading Comprehension	Pre-reading	Students are encouraged to read any two books in the first semester. [Animal Farm/Old Man and The Sea/ Guide/Malgudi	0	1	1	0

	Strategies - 1		Days/Amar Chitra Katha]				
10	Reading Comprehension Strategies - 2	Mid - reading	Students respond to comprehension lessons from the chosen books. [Comprehension Passages, Gap filling and Sentence Completion]	0	1	1	0
11	Reading Comprehension Strategies - 3	Post Reading	Students respond to comprehension lessons from the chosen books. [Summarizing/ Narrating/ Enacting/Vocabulary Quiz/]	0	1	0	0
12	Book Review	Writing Short Passages/ Paragraphs	Write a review of your favorite book in at least 250 words. Mention 3 specific learnings and 3 distinct ways in which you plan to incorporate them in your life. To choose from the recommended books.	0	1	0	0
13	News Reading	7 Cs of Communication	Group Activity: Campus/ National News Reading Students read notice boards and visit departments Prepare campus news headlines Present in the class	0	1	0	0

S. No.	Topic	Pedagog	Details	Instructional Hrs			
				Th	Pract	video	Proj
14	Writing to the Point	Word Usage and Sentence Structure Main Idea, Coherence & Cohesion	Each group is seated in a circle. In this activity, the leader of each group cannot see (either blind or blind fold using a handkerchief), but can hear the peer voice. Ask the leader to flip through the pages, and put the finger randomly on fifteen words from the chosen book in five minutes. The other participates copy the words that are closest to the finger. This time bound activity increases the curiosity of the students and engages them in exciting communication and completion of the task. Then, I ask the students to shape the randomly chosen disconnected words into a short poem/story/essay by adding a title to it. Read Out Loud in the Class	0	1	0	0
15	Word Power	Synonyms & Antonyms	App: SPEAK ENGLISH	0	1	1	0
16	Homonyms	Some confusable words Minimizing errors through discussions	Activity: Select the correct option, Use the confusables in sentences to bring out their meaning	0	1	0	0
17	Reading and Writing about visuals	Useful Expressions	Presentation about visuals Task: Selecting information from a visual	0	1	0	0

18	Word Formation	Word structure Word hunt Vocabulary explorations	Group Activity: Students make word clouds	0	1	0	0
19	Vocabulary Building	Descriptive words	Activity : Describe yourself/ your favorite person using 5 descriptive words	0	1	0	0
20	Listen to Popular Songs	Verb tense and aspect of grammar Vocabulary Idioms and expressions	Listen to the song with lyrics Ask questions about the title Gap Filling Exercises	0	1	0	0
21	Vocabulary Development	Word Power	Quiz/ Puzzle	0	1	0	0
22	Grammar	Common Errors	Surprise Quiz & debriefing	0	1	0	0
23	Grammar	Correct Usage	Easy Grammar App-Practice Sets	0	1	0	0
24	English Language Enhancement-I	Tenses	Usage, Question and explanation Fill in the blanks	0	1	0	0
25	English Language Enhancement -II	Active and Passive	I am passive..../I am active activity	0	1	0	0
26	English Language Enhancement-III	Reported Speech	Assignment & debriefing	0	1	0	0
27	English Language Enhancement -IV	Subject-verb agreement	Online Quiz & debriefing	0	1	0	0
28	Learn Grammar with Fun	Conditionals	Activity: The whole class is divided into The Zero Conditional, The First conditional, The Second conditional, and The Conditional to perform the task	0	1	0	0

FCHU1202 COMMUNICATIVE PRACTICE LABORATORY –I

<i>Pre - requisites</i>	<i>Course Type</i>	<i>Credits</i>
<i>Nil</i>	<i>Workshop</i>	<i>2</i>

The language laboratory acts as a platform for learning, practicing and producing language skills through interactive lessons and communicative mode of teaching.

COURSE OBJECTIVES

To expose the students to a variety of self- instructional, learner- friendly modes of language learning.

To enable them to learn better pronunciation through stress on word accent, intonation, and rhythm.

To maintain good linguistic - through accuracy in grammar, pronunciation and vocabulary.

COURSE OUTCOMES

Ability to communicate fluently in different business situation

Effective oral and written communication

Appropriate word usage with correct pronunciation

Clarity of word stress and intonation

A student is required to take up five lab tests of 100 marks- three tests in spoken mode and two tests in written mode.

MODULE-I: FRIENDLY COMMUNICATION (9 HOURS)

Doing Things with Words: To ask for information, help, permission; To instruct, command, request, accept, refuse, prohibit, persuade

Practice of Formulaic Expressions: Greetings, farewells, introductions, thanks, apologies, regrets, good wishes, congratulations, condolences, offers.

Conversation Practice in familiar and unfamiliar situations

(This module will be practiced through conversation activities in pairs & groups)

MODULE-II: GRAMMAR AND VOCABULARY (9 HOURS)

The focus will be on the appropriate usage of language.

Elimination of common errors

Editing passages

Word power A-Z: Easy and quick techniques

Vocabulary building exercises

(Open Source Language Laboratory will be used to take quizzes and practice grammar & vocabulary)

MODULE-III: PHONETICS AND SPOKEN ENGLISH (12 HOURS)

Students will be trained to find out the correct pronunciation of words with the help of a dictionary /software, to enable them to monitor and correct their own pronunciation.

Pronunciation Guidelines: Consonants and Vowels

Pronunciation practice (for accent neutralization), particularly of problem sounds, in isolated words as well as sentences

Speaking Techniques: Using correct stress patterns, developing voice quality

Rhythm and Intonation

(Reading aloud of dialogues, speeches etc. for practice in pronunciation)

(In this module, the learners will use video series from BBC & Sky Pronunciation Suite to improve spoken English)

TEXT BOOKS:

Dwyer, J. (2000). *The Business Communication Handbook*. New Jersey: Prentice Hall.

REFERENCES:

Brown, G & Yule, G. (1983). *Teaching the Spoken Language*. Cambridge: Cambridge University Press.

Brown, H. D. (1994). *Teaching by Principles: An Interactive Approach to Language Pedagogy*. New Jersey: Prentice Hall.

EVALUATION SYSTEM (CONTINUOUS INTERNAL ASSESSMENT)

Methods	Role play	Speech Acts	Grammar Quiz	Story Telling	JAM	Vocabulary-Exercise	Vocabulary-Quiz	% of Marks 100(Best 5)
Total	20	20	20	20	20	20	20	100

SESSION PLAN: COMMUNICATIVE PRACTICE LABORATORY -1**MODULE I: FRIENDLY COMMUNICATION (9 HOURS)**

S. No.	Topic	Pedagogy	Details	Instructional Hrs.			
				Th	Prac	Vide o	Pro j
Lab-1	Ice-Breaking/ Introductory Session	Name Game and Other Ice-breaking Activities	Knowing Each Other http://www.buzzle.com/articles/classroom-icebreaker-activities-for-students.html http://cutmlanguagelab.org/course/view.php?id=3	0	2	0	0
Lab -2	Conversation Practice-I	Role Plays OSLL (Moodle)	Speech Acts/ Formulaic Expression http://cutmlanguagelab.org/course/view.php?id=3	0	2	0	0
Lab -3	Conversation Practice-Ii	Small Skits	Small Skits Using Formulaic Expressions http://www.lazybeescripts.co.uk/Scripts/Results.aspx?iSh=5&iSk=1&iMR=11&iXR=15&iPo=2&iI7=1&iAS=2&iPS=2 http://cutmlanguagelab.org/course/view.php?id=3	0	2	0	0

MODULE II: GRAMMAR AND VOCABULARY (12 HOURS)

S. No.	Topic	Pedagogy	Details	Instructional Hrs.			
				Th	Prac	Vide o	Pro j
Lab-4	Elimination of Common Grammatical Errors	Quiz OSLL (Moodle)	Emphasis on Tense, Verbs, Modals, Conditionals, Active and Passive Voice, Statements, Questions and Responses, Articles, Preposition & Concord http://cutmlanguagelab.org/course/view.php?id=3 http://www.learnenglishfeelgood.com	0	2	0	0

Lab - 5	Document Makeover	Assignment OSSL (Moodle)	Editing passages: Grammatical and Construction errors http://cutmlanguagelab.org/course/view.php?id=3	0	2	0	0
Lab - 6	Vocabulary Building- Word Power	Assignment and Online practice	http://a4esl.org/ http://cutmlanguagelab.org/course/view.php?id3	0	2	0	0
Lab - 7 & 8	Vocabulary Building	Assignment and Online practice	Synonyms, Antonyms, Homophones, One-Word Substitution, Phrasal Verbs http://www.majortests.com/word-focus/vocabulary-tests.php http://www.grammarbank.com/synonyms-antonyms-worksheet.html http://cutmlanguagelab.org/course/view.php?id3	0	2	0	0

MODULE-III: PHONETICS AND SPOKEN ENGLISH (12 HOURS)

S. No.	Topic	Pedagogy	Details	Instructional Hrs.			
				Th	Prac	Video	Proj
Lab -9	Phonetics-I	Online Practice OSSL (Moodle)	Phonemic Transcription Using IPA Symbols, Stress Pattern in Words and Phrases http://usefulengish.ru/phonetics/practice-consonants http://www.agendaweb.org/phonetic.html http://cutmlanguagelab.org/course/view.php?id=3 https://www.youtube.com/watch?v=htmkblboG9Q	0	1	1	0
Lab -10	Phonetics-Ii	Online Practice OSSL (Moodle) Sky Pronunciation Suite	Rhythm and Intonation http://www.learning-english-online.net/areas/pronunciation/stress-and-intonation/ http://www.tolearnenglish.com/english_lessons/intonation-exercises http://cutmlanguagelab.org/course/view.php?id=3	0	2	0	0
Lab -11	Event Narration, Story Telling	Assignment	http://gdpi.hitbullseye.com/other-selection-tools-extempore.php http://cutmlanguagelab.org/course/view.php?id=3 http://grammar.about.com/od/developingessays/a/topnarrative07.htm	0	2	0	0

Lab -12	Speaking - Jam, Extempore	Activity Based OSLL (Moodle)	http://orelt.col.org/module/unit/3-practice-public-speaking http://cutmlanguagelab.org/course/view.php?id=3 https://www.youtube.com/watch?v=wV66cH5uQ https://www.youtube.com/watch?v=Mm-4T7qQS4	2	0	0
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FCHU1203 BUSINESS COMMUNICATION

<i>Pre - requisites</i>	<i>Course Type</i>	<i>Credits</i>
<i>Nil</i>	<i>Workshop</i>	<i>2</i>

COURSE OBJECTIVES

The course on Business Communication focuses on the basic skills required to be an effective communicator. It aims at imparting the communication skills that are needed in the academic and professional pursuits.

This is directed towards helping the students gain skills in comprehension, group discussions, presentations, interviews, active listening, technical writing and the ability to manage cross-cultural interactions. The focus is on the difficulty experienced by individual students, and the effort to explore a useful strategy for self-improvement. This is achieved through an amalgamation of lecture oriented approach of teaching with the task based skill oriented methodology of learning.

COURSE OUTCOMES

Understand the differences between general communication and business communication

Development of basic language skills, i.e., listening, speaking, reading and writing

Effective participation in group discussion and job interviews

MODULE-I: UNDERSTANDING COMMUNICATION IN BUSINESS (8 hrs.)

The module is a guide to organization communication. It is directed towards enabling students to develop the skills necessary to manage the human resources of their organization.

General Communication and Business Communication

Communication in Organizational Settings: Patterns of Communication in the Business World

– Upward, Downward, Horizontal Grapevine etc, Channels of Communication- Internal and External, Formal and Informal

Introduction to Cross Cultural Communication

Strategies to Overcome Communication Barriers

MODULE-II: READING AND WRITING (10 hrs.)

This unit works on the competency in reading and writing skills through such tasks/activities as reading books, articles, magazines, novels, developing outlines, key expressions, situations, slogan writing and theme building exercises, dialogue writing, interpreting pictures, technical writing.

Importance of Developing Reading Skills

Sub-Skills of Reading: Predicting Content, Skimming & Scanning, Topic sentence and supporting details, Inferential Reading, Guessing the Meaning of Unfamiliar Words, Note Making

Importance of Writing Skills and Principles of Effective Writing

Writing Process: Pre-writing, Drafting and Re-Writing

Paragraph Writing

Summaries and Abstracts

Business Correspondence: Writing Business Letters, E-mail Messages, Memo, Notice, Circulars, Reports, Proposals

Career Communication: Writing Resume/ CV and Job Application Letter

MODULE-III: LISTENING AND SPEAKING (9 HOURS)

Listening is the mother of all speaking. This unit aims to achieve competence in speaking i.e., the ability to communicate orally in clear, coherent, and persuasive language appropriate to purpose, occasion, and audience. The module focuses on developing this competency which includes acquiring poise and developing control of the language through experience in making presentations to small groups, to large groups, and through the media.

Listening Skills: Listening Process, Hearing and Listening, Types and Barriers, Effective Listening Strategies

Common forms of Oral Communication in the Business World:

Meetings: Organize Meetings, Preparing an Agenda, Chairing a Meeting, Drafting Resolutions, Writing Minutes

Persuasive Speaking: Improving Fluency and Self-Expressions, Articulation, Good Pronunciation, Voice Quality

Making an Oral Presentation: Planning, Preparing and Delivery

Facing an Interview: Preparation, Types of Interview, Do's and Don'ts

Group Discussions: Debate and GD, Types of GD, GD Etiquette

(Treatment: Developing listening and speaking skills through various activities, such as role play activities, practicing short dialogues, JAM, group discussions, debates, speeches, listening to news bulletins, viewing and reviewing documentaries and short films etc.)

TEXT BOOKS:

An Introduction to Professional English and soft skills by B.K Das et al., Cambridge University Press

REFERENCES:

Effective Technical Communication, M. Ashraf Rizvi, TMH Publications.

Business Communication, Krizan. Merrier. Logan. Williams, Thomson

Business Communication Today, Courtland L Bovee, John V Thill & Mukesh Chaturvedi, Pearson Education.

Business communication by Meenakshi Raman and Prakash Singh (Oxford)

Business Communication, Urmila Rai & S.M Rai, Himalaya Publishing House

EVALUATION SYSTEM (CONTINUOUS INTERNAL ASSESSMENT)

Methods	Role Plays (Org. Comm.)	Reading Comprehension & Note-Making	Listening & Individual Presentation	GD	Mid-I (Online Test on Vocabulary)	Mid-II (Written exam on module 2)	Mid-III (Oral Presentation)	% of Marks 100 (Best 5)
Total	20	20	20	20	20	20	20	100

SESSION PLAN: BUSINESS COMMUNICATION

S. No.	Topic	Pedagogy	Details	Instructional Hrs			
				Th	Pract	video	Proj
1	Introduction To Business Communication	Business games Written Assignment	What is Business Communication? General Communication vs. Professional Comm. Das, AIPE & SS,	0	1	0	0
2	General Communication & Business Communication	Audio-visual clips Communication game- Change your style	Difference in Style Degrees of Formality pp. 6-7 http://christopherhouse.blogspot.in/2012/08/difference-between-business.html	0	1	0	0

3	Communication In Organisational Settings	Small group work Role Plays Quiz	Internal Communication: Formal Communication Network Informal Communication Network External Communication Raman, BC, pp- 13-21 http://keydifferences.com/difference-between-formal-and-informal-communication.html	0	1	0	0
4	Understanding The Importance Of Cross-Cultural Communications	Flip class- Match your points Role Plays	The Global Marketplace The Multicultural Workforce Krizen, BC, Chapter 2 & Bovee, BCT, pp. 63- 65 http://study.com/academy/lesson/cross-cultural-communication-definition-strategies-examples.html	0	1	0	0

S. No.	Topic	Pedagogy	Details	Instructional Hrs			
				Th	Pract	video	Pro j
5	Improving Intercultural Sensitivity	Communication Games and activities	Recognise Cultural Differences Overcome Ethnocentrism Study other Cultures Overcome Language Barriers Develop Effective intercultural Skills Bovee, BCT, pp. 66-82	0	1	0	0
6	Over Coming Miscommunication	Workshop (Emphasis on listening skill)	The Information Gap principle Organizational Structure Difference in Status Incorrect Choice of Medium Message Complexity Cultural Differences Psychological Barriers Noise, and barriers http://www.businesscoachphil.com/overcoming-miscommunication-at-work Raman, BC, pp.22-27	0	1	0	0
7	Strategies For Improving Organisational Communication	Good Listener Case Studies Role plays & presentations	Open Feedback, Simple Language, Avoid Overload, Walk the Talk http://debo10199businesscommunication.blogspot.in/2012/02/strategies-for-improving-organizational.html Raman, BC, pp.34-40	0	1	0	0

MODULE II: READING AND WRITING

S. No.	Topic	Pedagogy	Details	Instructional Hrs			
				Th	Pract	video	Pro j
8	Importance Of Developing Reading Skills & Reading Strategies	Reading News clips	The Importance of Developing Reading Skills Vocabulary Skills Word Meaning Recognition Guessing the Meaning from Word Structure and Context Guidelines for Improving Reading Skill Types of Reading	0	1	0	0

			Tips for Improving Reading Speed Rizvi, ETC, pp. 219- 224 http://www.nclrc.org/essentials/reading/stratread.htm				
9	The Sub-Skills of Reading	Guessing Game	Understanding the Main Idea and Supporting Details Reading between the Lines: Inferential Reading Understanding the Writer's Point Of View Making Predictions · Guessing the Meanings of Unfamiliar Words · Skimming and Scanning Rizvi, ETC, pp. 228-250 http://literallycommunication.blogspot.in/2013/06/reading-skills-and-its-sub-skills.html	0	1	0	0
10	Note-Making	Topicalizing Schematising Use of Reduction Devices Methods of Sequencing Practice in Note	Mechanics of Note Making Note Writing Techniques Rizvi, ETC, pp.273-289 · http://www2.le.ac.uk/offices/ld/resources/study/notes	0	1	0	0

S. No.	Topic	Pedagogy	Details	Instructional Hrs			
				Th	Pract	video	Proj
11	Importance of Writing Skills	Tasks on small paragraphs Creative writing	Writing Process: Pre-writing, Drafting and Re-writing Idea Mapping Writing and Editing Rai, BC, pp. 182-192 http://smallbusiness.chron.com/importance-writing-skills-business-845.html	0	1	0	0
12	Paragraph Writing	Written Assignment Developing story outline	Unity in writing Topic sentence Chronological order of development Using Connectives Organizing a Paragraph Adequate Development of supporting details Cohesion & Coherence in a Paragraph Rizvi, ETC, pp.337-350 http://www.wikihow.com/Write-a-Paragraph	0	1	0	0
13	Summaries & Abstracts	Written Assignment based on guidelines	Differences between Abstract and Summary Procedure for Writing Abstracts Procedure for writing summary Rizvi, ETC, pp.290-307 http://www.uts.edu.au/current-students/support/helps/self-help-resources/academic-writing/abstract-and-executive-summary	0	1	0	0
14	Writing Business Letter &	Written Assignment based on	Purpose & goal Principles of effective letter writing: Courtesy and consideration, Directness and	0	1	0	0

	<i>Proposal</i>	<i>guidelines</i>	<i>conciseness, Avoid verbosity, Participial endings, Positive and direct statements, Clarity and precision Structure and layout Rizvi, ETC, pp.351-365 & Raman, BC, PP.256-260 http://www.writing-business-letters.com/business-proposal-letter.html</i>				
15	<i>Memo, Notice, Circulars & Email</i>	<i>Written Assignment based on guidelines</i>	<i>What is a Memo? Email writing format Characteristics of Effective Memo Difference between notice and circular Essentials of notice and notice format Rizvi, ETC, pp.423-436 http://www.umuc.edu/writingcenter/writingresources/effective_memos.cfm http://www.englishtransform.com/2014/04/difference-between-circular-memo-notice.html</i>	0	1	0	0
16	<i>Reports</i>	<i>Written Assignment based on guidelines</i>	<i>Definition and Types Deciding on Format and Length Structure / Parts of Formal Report Topics Covered in a Report Introduction, Body and Closing Krizen, BC, pp 259-303 & Rizvi, ETC, pp. 452-467 http://cgu.edu/pages/852.asp</i>	0	1	0	0

TREATMENT: Tasks/activities as reading books, articles, magazines, novels, developing outlines, key expressions, situations, slogan writing and theme building exercises, dialogue writing, interpreting pictures, technical writing.

MODULE III: LISTENING AND SPEAKING

S. No.	Topic	Pedagogy	Details	Instructional Hrs			
				Th	Pract	video	Proj
17	<i>Listening Skills</i>	<i>Effective Listening Strategies TED Talks: Listening and individual presentation</i>	<i>Listening Process Hearing and Listening Types and Barriers Rizvi, ETC, pp. 59-75 Video : https://www.youtube.com/watch?v=C8zNx_IarUw</i>	0	1	0	0
18	<i>Listening Attentively</i>	<i>News video clips and quizzing</i>	<i>Overall comprehension Extracting Detail information Listening between the lines Note taking Video https://www.youtube.com/watch?v=t2z9mdX1j4A</i>	0	1	0	0
19	<i>Persuasive Speaking</i>	<i>Inspirational audio-video clips for language</i>	<i>Communication module for persuasive meeting Feed back Taking care of non-verbal elements Decoding message Handling noise</i>	0	1	0	0

		improvement	Raman, BC, pp. 123- 169 & Rizvi, ETC, pp.195 -218 Video: https://www.youtube.com/watch?v=NBObNfR2n_4 Reference: http://www.speaking.pitt.edu/student/public-speaking/persuasive.html				
20	Oral Presentation	Individual presentation on Events	Improving Fluency and Self-Expressions Articulation Good Pronunciation, Voice Quality Planning & Preparing your Oral Presentation Types of Delivery Guidelines for Delivery: Verbal elements, non-verbal elements, visual elements Practice delivery elements Controlling Nervousness and Stage fright Handling questions responsively narration/JAM Raman, BC, pp. 123- 169 & Rizvi, ETC, pp.195 -218 http://www4.caes.hku.hk/epc/presentation/VIDEO https://www.youtube.com/watch?v=WJIOZfLQ5w4	0	2	0	0
21	Group Discussions	GD Sessions on current/ social issues	Nature of Group Discussion Characteristics of Group Discussion Skills Selection Group Discussions Subject knowledge Oral communication skills Team management Group Discussion Strategies Role Functions in Group Discussions Rizvi, ETC, pp 165-187 https://www.youtube.com/watch?v=ymcMo7JWSu8 http://placement.freshersworld.com/what-is-group-discussion/33122049	0	2	0	0
22	Group Discussions	GD Sessions on current/ social issues	Debate and GD Types of GD GD Etiquette		1		
23	Revision	TUTORIAL	Module - I		1		
24	Revision	TUTORIAL	Module - I		1		
25	Revision	TUTORIAL	Module - I		1		

FCHU1204COMMUNICATIVE PRACTICE LABORATORY –II

<i>Pre - requisites</i>	<i>Course Type</i>	<i>Credits</i>
<i>Nil</i>	<i>Workshop</i>	<i>2</i>

The suggestive assignments in the laboratory are intended as learning activities to facilitate the students in accomplishing the language skills which are needed to succeed in the business world.

COURSE OBJECTIVES

To master Study Skills

To acquire strategic competence to use both spoken & written language to use in a wide range of communication strategies

To acquire Business Performance Skills

COURSE OUTCOMES

The students will be able to

Write effectively for a variety of professional and social settings. They will practice writing as a process of motivated inquiry engaging others writers' ideas as they explore and develop their own. They will demonstrate an ability to revise for content and edit for grammatical and stylistic clarity. And they will develop an awareness and confidence in their own voice as a writer.

Become accomplished, active readers who appreciate ambiguity and complexity, and who can articulate their own interpretations with an awareness and curiosity for other perspectives.

Demonstrate the skills needed to participate in a conversation that builds knowledge collaboratively; listening carefully and respectfully to others' view points; articulating their own ideas in relation to other voices and ideas. Students will be able to prepare, organize and deliver an engaging oral presentation.

A student is required to take up five lab tests of 100 marks- at least two tests in written mode and three tests in spoken mode.

MODULE-I: LISTENING (6 HOURS)

Exercises on Active Listening: The whole group listens to any speech/news broadcast in English and notes down the important points. They listen again to check their points and evaluate themselves. The group then compares points to see how well they have understood the broadcast.

MODULE- II: SPEAKING (8 HOURS)

Situational Dialogues / Role Play: Organization Communication

Oral Presentations- Prepared and Extempore

'Just a minute' Sessions (JAM)

Debates

Mock Meetings

Cracking Job Interviews: Mock Sessions

Group Discussions on current topics

(This module will be practiced through speaking activities like role plays, presentations, and discussions)

MODULE-III: READING (8 HOURS)

Students will be given practice in reading and comprehension 6-8 passages of 100-300 words each, on topics of General as well as professional interest. The texts will be supported by suitable exercises designed to foster comprehension skills and vocabulary enrichment. Students are encouraged to read newspapers, articles, books and novels.

Reading Comprehension Exercises Through Tests, Writing Summary and Presenting, Note Making

Review Presentation (Movie/ Article/ Book)

Vocabulary Building Exercises

(This module encourages extensive use of reading materials)

MODULE-IV: WRITING (8 HOURS)

The Writing Lab content is designed to acquaint the students not only with the techniques of effective writing but also give them an insight into planning and writing documents that produce results.

Short Paragraphs on current general and technical topics

Creative Writing: Idea Generation

Business Letters, Email Messages, Project Writing

Writing Resumes and Cover Letters

(* Students will be required to produce and submit by the end of second semester a 350-500 word project report on a topic of their choice. The project should involve data collection, analysis and reporting. Ten marks (out of 100 marks allocated for Lab Test) will be set apart for the project.)

TEXT BOOK:

An Introduction to Professional English and soft skills by B.K Das et al., Cambridge University Press

REFERENCES:

Effective Business Communication, AshaKaul, Prentice Hall

Professional Communication, ArunaKoneru, TMH

EVALUATION SYSTEM (CONTINUOUS INTERNAL ASSESSMENT)

Methods	Listening Skills	Movie Review	Role Plays	Group Discussion	Mock Interview	JAM	Vocabulary/ Comprehension	% of Marks
Total	20	20	20	20	20	20	20	100(Best 5)

SESSION PLAN: COMMUNICATIVE PRACTICE LABORATORY –II

MODULE I: LISTENING (6 HOURS)

S No.	Topic	Pedagogy	Details	Instructional Hrs			
				Th	Pract	Video	Proj
Lab-1	Introduction and Ice Breakers	Activity - Based	Knowing Each Other, People's Bingo http://cutmlanguagelab.org/course/view.php?id=4	0	2	0	0
Lab - 2	Exercises On Active Listening	Activity Based	Feedback, Note Taking, Summarizing, Paraphrasing and Non-verbal Cues http://cutmlanguagelab.org/course/view.php?id=4 https://www.youtube.com/watch?v=cSohjLYOI2A	0	1	1	0
Lab - 3	Movie Review Presentation	Activity Based	The October Sky/ In Pursuit of Happiness/A Beautiful Mind/ Any Other http://cutmlanguagelab.org/course/view.php?id=4	0	1	1	0

MODULE II: SPEAKING (8 HOURS)

S. No.	Topic	Pedagogy	Details	Instructional Hrs			
				Th	Pract	Video	Pro
Lab-4	Organization Communication	Role play	Business Situations and Mock Meeting http://cutmlanguagelab.org/course/view.php?id=4 http://eduscapes.com/distance/course_activities/simulations.htm https://www.youtube.com/watch?v=3X51J-ZDMmE	0	2	0	0
Lab - 5	Oral Presentations	Activity OSLL (Moodle)	Prepared and Extempore/ Debate / 'Just a Minute' Talk (JAM) http://cutmlanguagelab.org/course/view.php?id=4	0	2	0	0
Lab - 6	Interview /Group Discussion	Mock Interview /Group Discussion OSLL (Moodle)	Frequently Asked Questions (FAQs) Discussion on Current Topics - General, Social, Political, Management, Creative, Education and Sports http://cutmlanguagelab.org/course/view.php?id=4 https://www.youtube.com/watch?v=ymcMo7JWSu8 https://www.youtube.com/watch?v=7gcsZ9H2I6s	0	2	0	0

MODULE-III: READING (8 HOURS)

S. No.	Topic	Pedagogy	Details	Instructional Hrs			
				Th	Pract	Video	Pro
Lab -7	Reading Assignment - I	Assignment , online practice and discussion	Reading abridged texts, relevant topics, and news articles http://cutmlanguagelab.org/course/view.php?id=4	0	2	0	0
Lab -8	Reading Assignment - Ii		Reading for comprehension and vocabulary http://cutmlanguagelab.org/course/view.php?id=4 http://www.majortests.com/sat/reading-comprehension.php	0	2	0	0

MODULE-IV: WRITING (8 HOURS)

S. No.	Topic	Pedagogy	Details	Instructional Hrs			
				Th	Pract	Video	Pro
Lab -9	Writing Short Paragraphs - General,	Assignment, online practice	Write, Rewrite, Expand, Correct, Complete, and Improve Paragraphs http://cutmlanguagelab.org/course/	0	2	0	0

	<i>Current and Technical Topics</i>	<i>and discussion</i>	view.php?id4				
Lab -10	<i>Idea Generation and Creative Writing</i>	<i>Assignment and discussion</i>	<i>Problem solving/decision making, Strategy development, Outline a proposal, Create a timeline Collaboration technique, Expression of creativity, Condensing various thoughts, Put visuals and text together</i> http://cutmlanguagelab.org/course/view.php?id=4	0	2	0	0
Lab -11	<i>Memo Writing & Emails</i>	<i>Assignment and discussion</i>	<i>Adopt the steps of writing process for preparing of memo and emails</i> http://cutmlanguagelab.org/course/view.php?id=4 https://www.youtube.com/watch?v=6zHLHc9CcvQ	0	2	0	0
Lab -12	<i>Preparation Of Business Reports/ Proposals And Presentation</i>	<i>Project Work and discussion</i>	<i>Adopt the steps of writing process for preparing business reports and proposals</i> http://cutmlanguagelab.org/course/view.php?id=4 mails https://www.youtube.com/watch?v=elKVRDBAMvQ	0	2	0	0

FCHU1205CORPORATE READINESS LABORATORY

<i>Pre - requisites</i>	<i>Course Type</i>	<i>Credits</i>
<i>Nil</i>	<i>Workshop</i>	<i>2</i>

A real-time project approach in the laboratory is intended to provide a developmentally appropriate ambience, make the students proactive, encourage and motivate as well as develop skills to become a good listener, good communicator and responsible. A student will experience the challenging application process and at the same time prepare for the challenging world. The experience gained from working on projects can help one understand the appropriate and effective use of language skills. It also creates context in which learners engage in purposeful communication.

All communication activities are supported with the help of live projects on general techno-management or local themes which provide exposure to the students and help them to find a suitable job in the industry.

A student is required to take up five laboratory tests of 100 marks.

COURSE OBJECTIVES

Understand the process of communication

View communication from the perspective of each stakeholder

Plan and manage communication difficulties

Learn exactly how, when and what of communication

COURSE OUTCOMES

Understanding the convention of project report

Understanding the process of data collection and documentation

Preparation and presentation of project report

Preparation for various academic and professional needs

INSTRUCTION AND DELIVERY

Instruction- led facilitation highlights interactions between students and their facilitators, and emphasizes guidance from the facilitator who will track, assess and mentor them.

Students will make a team of four members who will take up real problems and run through the semester trying to solve the problems. The lab program will augment this learning with the right theory.

Participants will use PPTS, flash presentations or high impact presentations, flip charts, blogs, boards with graphical or pictorial representations, with captions and outlines, video display or any other best mode of presentation, post-it notes and group activities to document all processes and methodology.

OUTLINE

LAB1: Introduction to the Lab Program (Session will be driven by the Facilitators)

(Structure, Objective, Methodology, Objective of Choosing Project as a Vehicle to Learn the Course, Process of Carrying out the Project, Announcing the List of Projects)

LAB2: Discussion on Project Approach and Communication (Session will be driven by the Facilitators)

LAB3: Win Your Project: A Presentation by Groups (Session will be driven by the Students)

LAB4: Project Plan Presentation by Groups (Session will be driven by the Students)

LAB5: Review of Weekly Status Reports by the Guide, and Discussions (Session will be driven by the Students)

LAB6: Progress Presentation by Groups, and Feedback by Guide and Co-Guide (Session will be driven by the Students)

LAB7: Review of Documentation File/Dossier, and Feedback by Guide

LAB8: Progress Presentation and Submission of Dossier Containing Documentary Notes

(E.g., compilation of weekly status reports, minutes, photocopies of emails, feedbacks, testimonials, photographs)

LAB 9: Presentation on the Project, Feedback by the Guide and Co-guide

LAB 10: Final Presentation by Groups in front of a Panel and Submission of Project Work

TEXT BOOK:

The Essential Guide to Doing your Research Project by O'LEARY (2011)

REFERENCES:

Logical Framework Analysis, Capacity Building Workshop for Dryland Management, May 3-5, 2000

Professional Presentations by Goodale (2007)

EVALUATION SYSTEM (CONTINUOUS INTERNAL ASSESSMENT)

Methods	Win Your Project	Project Plan Presentation	Weekly Reports	Progress Presentation	Project Presentation	Documentation	Project Report	% of Marks 100 (Best 5)
Total	20	20	20	20	20	20	20	100

S. No.	Topic	Pedagogy	Details	Instructional Hrs			
				Th	Pract	video	Proj
1	Introduction to the Lab Program	Project-based Learning Discussion Beyond the class Learning	Structure, Objective, Methodology, Objective of Choosing Project as a Vehicle to Learn the Course, Process of Carrying out the Project (Session will be driven by the Facilitators)	0	2	0	0
2	Announcing the List of Projects		Topics available in OSL (Moodle) http://cutmlanguagelab.org/	0	1	0	1
3	Project Approach & Communication		(Session will be driven by the Facilitators) https://www.youtube.com/watch?v=1ybtFwYb7Oc	0	1	0	1
4	Win Your Project		Rationale for choosing the project topic What makes you say that you deserve the project?/ Why should we give you the project (Session will be driven by the Students)	0	1	0	1
5	Project Plan		Stakeholder Analysis, Objective Analysis, Situation Analysis, Problem Analysis, Strategy Analysis (Session will be driven by the Students)	0	1	0	1
6	6Review of Weekly Status		Dossier Verification/Reports by the Guide	0	1	0	1
7	Review of Progress	Project-based Learning Group	Progress Presentation by Groups, and Feedback by Guide and Co-Guide (Session will be driven by the Students)	0	1	0	1
8	Documentation Review	Presentation with Facilitator Beyond the class Learning	Review of Documentation File/Dossier, and Feedback by Guide	0	1	0	1
9	Progression Presentation	Project-based Learning	Progress Presentation and Submission of Dossier Containing Documentary Notes	0	1	0	1

	<i>and Report Submission</i>	<i>Presentation and Report Writing Beyond the class Learning</i>	<i>(E.g., compilation of weekly status reports, minutes, photocopies of emails, feedbacks, testimonials, photographs)</i>				
<i>10</i>	<i>Presentation on the Project</i>	<i>Project-based Learning Presentation Beyond the class Learning</i>	<i>Presentation on the Project, Feedback by the Guide and Co-guide</i>	<i>0</i>	<i>1</i>	<i>0</i>	<i>1</i>
<i>11</i>	<i>Project Work</i>	<i>Discussion</i>	<i>Performance Analysis</i>	<i>0</i>	<i>0</i>	<i>0</i>	<i>2</i>
<i>12</i>	<i>Communication</i>	<i>Discussion</i>	<i>Performance Analysis</i>	<i>0</i>	<i>2</i>	<i>0</i>	<i>0</i>

FCHU1206IT ENABLED COMMUNICATION

<i>Pre - requisites</i>	<i>Course Type</i>	<i>Credits</i>
<i>Nil</i>	<i>Workshop</i>	<i>2</i>

COURSE OBJECTIVE AND OUTCOME

Upon completing the syllabus, students should be able to:

- Speak confidently and fluently, in both formal and informal contexts.
- Write clearly, correctly and cogently
- Design and have a Home Page/Blog Space, Facebook Page and post comments/reports for collaboration & online presence
- Evolve from the role of an 'information provider', through 'motivator' and 'catalyst of change', to 'Change Agent'.

COURSE OUTLINE

MODULE I: CONCEPTUAL FOUNDATIONS

Pre-Course Assessment

Tell me a bit about yourself: Your background, your major, your professional aspirations ... your likes ... and maybe your favorite movie, and what you like to do in your spare time...

Do you know?

Introduction to IT Enabled Communication

Communication in the New Age Context and Demand for Communication Interventions

(This module includes pre-course assessments and presentations)

MODULE II: BLOG DESIGNING & POSTING

Step-by- Step to Writing a Blog: Researching, Brainstorming and Structuring, Writing, Posting, Editing and Accessorizing

Photoshop for Image, Editing and graphic design

(This module will be driven through methods like self-learning, learning by doing, and workshop)

MODULE III: TECHNOLOGY AND COMMUNICATION

Tools for Business Correspondence and web-based exercises

Creating and delivering high impact presentations with Slides and other Visuals

Video Documentaries

Video Conferencing Sites, Skype, Team Viewer

(This module will be facilitated through presentations, use of tools and technology)

TEXT BOOKS

Shirley Taylor, Model Business Letters (MBL) and Other Business Documents, 5th Edition.

Krizen. Merrier. Logan. Williams, Business Communication, and Thomson (BC: Krizen).

M.M. Monippally, Business Communication Strategies (BCS: MMM), TMH, New Delhi, 2001.

Arthur H. Bell & Dayle M. Smith, Management Communication (MC: AHB & DMS), Wiley Student Edition, 2005

LINKS

http://ctb.ku.edu/en/tablecontents/section_1017.htm

Useful websites for some topics will be linked to the course for improving language proficiency skills of the students.

www.a4esl.org

www.learnenglishfeelgood.com

EVALUATION SYSTEM (CONTINUOUS INTERNAL ASSESSMENT)

<i>Methods</i>	<i>Pre-sen-tation</i>	<i>Blog Design & Post</i>	<i>Video Documentary</i>	<i>E-mail Writing</i>	<i>Business Letters</i>	<i>Poster/ Template Design</i>	<i>Mid-Sem written Exam</i>	<i>% of Marks 100(Best 5)</i>
Total	20	20	20	20	20	20	20	100

MODULE I: CONCEPTUAL FOUNDATIONS (3HRS)

S. No.	Topic	Pedagogy	Details	Instructional Hrs			
				Th	Pract	video	Proj
1	Pre-Course Assessment [IT Enabled Communication]	Record pre-course assessments on communication management & technology by 'Probing & Doing'	Do you Know?	0	1	0	0
2	Tell me a bit about yourself	Know each other, and create a classroom philosophy through a game	Your background, your major, your professional aspirations ... your likes ... and maybe your favorite movie, and what you like to do in your spare time...	0	1	0	0
3	Communication in the New Age	Presentation	Context and Demand for Communication Interventions Explore top five social networking sites relevant to technology sector and present in the class, create and maintain online presence on Facebook, Google + or any other	0	1	0	0

MODULE II: BLOG DESIGNING & POSTING

S. No.	Topic	Pedagogy	Details	Instructional Hrs			
				Th	Pract	video	Proj
4	Step-by- Step to Writing a Blog - 1	Learning to Learn (Self-learning)	Researching	0	1	0	0
5	Step-by- Step to Writing a Blog - 2	Learning to Learn (Self-learning)	Brainstorming & Structuring	0	1	0	0
6	Step-by- Step to Writing a Blog - 3	Learning to Learn (Self-learning)	Writing & Posting	0	1	0	0
7	Step-by- Step to Writing a Blog - 4	Learning to Learn (Self-learning)	Editing & Accessorizing	0	1	0	0
8	Blog	Workshop (Self-learning)	One Day Workshop On Blog Design (CUTM e-content)	0	1	1	0
9	Blog Design	Posting assignments/ weekly reports/share what he/she has learnt (Doing)	Assignment: "Me in a Minute" blog post, email your blog's web address to the facilitators and peer group	0	1	0	0
10	Photoshop - 2	Self- Learning & Peer Learning	Editing and Graphic Design	0	1	1	0
11	Photoshop -3	Photoshop (FOSS) Training	Video tool www.spoken-tutorial.org	0	1	0	0
12	Photoshop	Workshop	One Day Workshop On Blog Design (CUTM e-content)	0	1	1	0

MODULE III: TECHNOLOGY AND COMMUNICATION

S. No.	Topic	Pedagogy	Details	Instructional Hrs			
				Th	Pract	video	Proj
13	Business Correspondence	Document Makeover, Web-based Exercises	Letters & Emails [Write to the point with correctness, conciseness, coherence and completeness]	0	1	0	0
14	Impress Presentation	Training and Practice	Language Laboratory Impress (FOSS)- Presentations (www.spoken-tutorial.org)	0	1	0	0
15	Enhancing presentation through slides and other visuals	Use of media for presenting the visual contents to reinforce the message, and create online presence	Equip the learners with techniques where they feel more confident in front of an audience Assignment [Improve the slides] Slide Share/ Upload on YouTube or Google +	0	1	0	0
16	Delivering High Impact Presentations	Video Recording & Peer Evaluation	Mastering the Art of Delivery, Preparing to Speak, Overcoming Anxiety, Handling Questions Watch-YouTube: Steve Jobs and iPod	0	1	0	0
17	Video Documentaries	Video documentary (Self- Learning)	Each student/group will make a short documentary movie (CSR, Facilities Labs, Student Projects etc.)	0	1	0	0
18	Making of Video Documentary	Workshop	One Day Workshop on Making Video Documentaries	0	1	1	0
19	Documentary Movie	10 min. video presentation by individuals/ groups	Feedback and Analysis	0	1	0	0
20	Video Conferencing	Free conference calls, webcam chat, video conferencing, group calls	Create Account & Practice [Skype, TeamViewer, Mobile]	0	1	0	0
21	Organize and Manage a Video Conference	Use video conference for business meetings Video conference etiquette & tips	Organise, Share & Collaborate	0	1	0	0

FCHU1207 CAREER COMMUNICATION

<i>Pre - requisites</i>	<i>Course Type</i>	<i>Credits</i>
<i>Nil</i>	<i>Workshop</i>	<i>2</i>

OBJECTIVES

- Prepare the graduates to acquire their dream jobs.*
- Build their mindset with right attitude, self-awareness, pro-activeness.*
- Build confidence, and enhance their communication skills to handle all situations.*

OUTCOMES

- Build the confidence of students*
- Trigger the thinking and analyzing ability of the learners to solve problems.*
- Readiness to work on their dream jobs.*

List of Experiments

LAB 1: Introduction to Career Communication

LAB 2: Presentation on Corporate House

Create an awareness and exposure on corporate life and culture.

Learners get exposure to corporate life and culture.

LAB 3: Corporate Quiz

LAB 4: Telephonic Conversation

Learners are equipped with basic knowledge and skill practice for improved telephonic communication.

LAB 5: Email Writing

Learn the characteristics of successful e- mail messages.

Create an effective e-mail message.

LAB 6: Mini Test on Email Writing

LAB 7: Learning Etiquette

Understand what etiquette is & why it's important.

Provide practical techniques and generally-accepted professional and ethical conduct or behaviour that will help create a favourable impression in social and professional life.

Practice proper manners like greeting, saying 'please', 'thank you'.

Appear professional and well groomed.

LAB 8 :Identifying Traits for Professional and Interpersonal Success

Understand the importance of effective interpersonal communication and traits for professional success.

Explore the significance of Active Listening, Problem Solving, Respect, Decision Making,

Empathy, Co-operation and Non-verbal communication for professional success.

LAB 9: Job-Application -Cover Letter

Develop the career writing skills of the learners with special emphasis on their interest in specific job positions, their strengths and what values they will bring to the organisation.

LAB 10: Job-Applications – CV

Produce a polished and impressive CV that can be tailored to each specific job application.

Develop the career writing skills of the learners with special emphasis on Statement of Purpose.

Provide with tools to showcase Unique Selling Points for the specified job description.

LAB 11: Participating in Group Discussion (GD)

Mock Interview on basic questions

LAB 12: Facing an Interview

EVALUATION SYSTEM (CONTINUOUS INTERNAL ASSESSMENT)

<i>Methods</i>	<i>Presentation</i>	<i>Corporate Quiz</i>	<i>Telephonic Conversation</i>	<i>Email Writing</i>	<i>CV</i>	<i>GD</i>	<i>Interview</i>	<i>% of Marks 100(Best 5)</i>
Total	20	20	20	20	20	20	20	100

SESSION PLAN: CAREER COMMUNICATION

S. No.	Topic	Pedagogy	Details	Instructional Hrs.			
				Th	Pract	video	Pro j
	<i>Introduction to Career Communication</i>	<i>Discussion</i>	<i>The Course introduces students to the resources and skills necessary for a successful job or internship search</i> http://cutmlanguagelab.org/course/view.php?id=2	0	2	0	0
LA B-1	<i>Presentation on Corporate House</i>	<i>Team Presentation</i>	<i>Create an awareness and exposure on corporate life and culture. Learners get exposure to corporate life and culture.</i> http://cutmlanguagelab.org/course/view.php?id=2	0	1	1	0
LA B-2	<i>Corporate Quiz</i>	<i>OSLL (Moodle) Quiz</i>	<i>This Corporate Quiz is an initiative to bring forth all the updates and insights from various industries. Through this quiz, students will be updated with the current happening in the present Corporate world</i> http://cutmlanguagelab.org/course/view.php?id=2 https://www.youtube.com/watch?v=g-_xABU21Yc	0	2	0	0
AB-3	<i>Telephonic Conversation</i>	<i>OSLL (Moodle) Role play (Pair Work)</i>	<i>Learners are equipped with basic knowledge and skill practice for improved telephonic communication</i> https://www.youtube.com/watch?v=mmXAqMQe0AI https://www.youtube.com/watch?v=6tfFRD0enV0	0	1	1	0
LA B-5	<i>Email Writing</i>	<i>Doing</i>	<i>Learn the characteristics of successful e-mail messages. Create an effective e-mail message.</i> http://cutmlanguagelab.org/course/view.php?id=2 https://www.youtube.com/watch?v=mmXAqMQe0AI	0	1	1	0
AB-6	<i>Email Writing</i>	<i>Mini Test OSLL (Moodle)</i>	<i>(Questions from TCS)</i> http://cutmlanguagelab.org/course/view.php?id=2 https://www.youtube.com/watch?v=LTKb5Fexcuk	0	2	0	0

S. No.	Topic	Pedagog	Details	Instructional Hrs.			
				Th	Pract	video	Pro j
LAB-7	<i>Learning Etiquette</i>	<i>Demonstration Video Analysis</i>	<i>Understand what etiquette is & why it's important. Provide practical techniques and generally-accepted professional and ethical conduct or</i>	0	1	1	0

			<i>behaviour that will help create a favourable impression in social and professional life.</i> http://cutmlanguagelab.org/course/view.php?id=2 https://www.youtube.com/watch?v=ieYuoQ9sMyA				
LAB -8	<i>Identifying Traits for Professional and Interpersonal Success</i>	<i>Group Activity Video Analysis</i>	<i>Understand the importance of effective interpersonal communication and traits for professional success.</i> <i>Explore the significance of Active Listening, Problem Solving, Respect, Decision Making, Empathy, Co-operation and Non-verbal communication for professional success.</i> http://cutmlanguagelab.org/course/view.php?id=2	0	1	1	0
LAB -9	<i>Job-Application - Cover Letter</i>	<i>Document Makeover</i>	<i>Develop the career writing skills of the learners with special emphasis on their interest in specific job positions, their strengths and what values they will bring to the organisation.</i> http://cutmlanguagelab.org/course/view.php?id=2 https://www.youtube.com/watch?v=37TbhadX0C8	0	2	0	0

FCHU1208PERSONALITY DEVELOPMENT

<i>Pre - requisites</i>	<i>Course Type</i>	<i>Credits</i>
<i>Nil</i>	<i>Workshop</i>	<i>2</i>

The laboratory aims at the promotion of the strategies for the personality development of the participants. The rationale behind this endeavor is the recognition of the multifaceted influence of the personality of the participants.

A student is required to take up five laboratory tests of 100 marks.

COURSE OBJECTIVE

Project the force of inner self, assert individuality, influence others and power to success.

COURSE OUTCOME

Learners develop a positive attitude and graceful personality.

LIST OF EXPERIMENTS

Lab 1: Self-Discovery/Self-Analysis

Identifying strengths and weaknesses through games and activities

Lab 2: Impression Management

Formation of impression, first and lasting impression, change: warm-up discussion

Lab 3: Body Language and Communication Style Profile Test

Lab 4 : Working on Attitude: Assertive, Aggressive, Passive

Measure your attitude, case study and role plays

Lab 5: Build Your Skills

Interpersonal Communication and Self

Lab 6: Team Building and Teamwork

Ice-breaker, test your team skills, exercise on stages of formation and effective teams

Lab 6: Explore Your Personality

Lab 7 : Motivation and Success

Ted talks, invited talks and success stories

Lab 8: Time Management

Identifying important time wasters, time management exercises

Lab 10 : Stress Management

Case-based discussions to identify causes of stress, and manage stress

Lab 11: Etiquette and Manners

Test your etiquette and manners, practice good manners

Lab 12 : Personality and Career Choice

Matching your career & personality

TEXT BOOKS:

Basic Managerial Skills for All, 9th Edition, E.H. McGrath, S.J.

Personality Development by [Harold R. Wallace & L. Ann Masters](#), 2006.

REFERENCES:

Personality Development by [John Aurther](#) .Reprint, 2009.

[Personality Development - Transform Yourself](#) by [Rajiv K. Mishra](#), 2004.

[Power of One - Personality and Self-Development](#) by [Dr. Abhishek Mishra](#), 2007.

EVALUATION SYSTEM (CONTINUOUS INTERNAL ASSESSMENT)

<i>Meth ods</i>	<i>Self- introductio n in sales pitch</i>	<i>Debate/ Extempor e</i>	<i>Presentatio n (USP)</i>	<i>Group Activity (Communicatio n)</i>	<i>Public Speaking on Current Topic</i>	<i>Case- based Discussions</i>	<i>Motiva -tion Speech</i>	<i>% of Marks 100 (Best 5)</i>
Total	20	20	20	20	20	20	20	100

SESSION PLAN: PERSONALITY DEVELOPMENT

S. No.	Topic	Pedagogy	Details	Instructional Hrs			
				Th	Pract	video	Proj
1	Self-Discovery/Self-Analysis	Activity Based Learning	Game	0	2	0	0
2	Impression Management	Videos and interactions	19 tips to impress others https://www.buzzfeed.com/carolynkylstra/impress-literally-everyone-you-meet?utm_term=.nbz2MKVOJO#.qywdZLkQXO	0	1	1	0
3	Body Language and Communication Style Profile Test	Understanding of different postures and gestures through online test	http://www.queendom.com/queendom_tests/tranfer	0	1	1	0
4	Working on Assertive, Aggressive, Passive	Role Plays and are Encouraged to watch videos	https://www.youtube.com/watch?v=O6eyUUkpoU8 Role plays	0	1	1	0
5	Build Your Skills	Videos	https://www.youtube.com/watch?v=w97dR3OJB1k http://www.investopedia.com/video/play/interpersonal-skills/	0	1	1	0
6	Team Building and Teamwork	Activity Based Learning	Coin Logo Time Required: 5-10 minutes Begin by asking all participants to empty their pockets, purses, and wallets of any coins they may have and place them on the table in front of them. If someone doesn't have any coins or only has very few, others in the room can share their coins with them. Instruct each person to create their own personal logo using the coins in front of them in just one minute. Other materials they may have on them, such as pens, notebooks, wallets, etc. can also be used in creation of the logo. If there is a particularly large group, people can be broken up into teams of 3-6 people and instructed to create a logo that represents them as a team or the whole room can gather to use the coins to create a logo for the organization/group/department/etc. Each solitary participant can explain their logo to the group or if the room was split into groups, the leader can have each group discuss what led to the team logo and what it says about them. Not only does this activity promote self and mutual awareness, but it also enables participants to get to know each other on a more personal level. http://www.livestrong.com/article/219775-team-building-exercises-for-small-groups/	0	1	1	0
7	Explore Your Personality	videos	https://www.16personalities.com/free-personality-test	0	1	1	0
8	Motivation		https://www.youtube.com/watch?v=1LEg5EZ	0	1	1	0

	<i>and Success</i>	<i>videos</i>	w3iQ https://www.youtube.com/watch?v=g-PNJHhf-ag				
9	<i>Stress Management</i>	<i>Classroom Exercise</i>	Time Wasters Exercise.pdf	0	1	0	0
10	<i>Etiquette and Manners</i>	<i>videos</i>	https://www.youtube.com/watch?v=55cXVve0Ipw for table manners https://www.youtube.com/watch?v=VLqKVfSG-bk for interview etiquette. https://www.youtube.com/watch?v=4-8AlriF908 for manners.	0	1	1	0

S. No.	Topic	Pedagogy	Details	Instructional Hrs			
				Th	Pract	video	Proj
11	<i>Personality and Career Choice</i>	<i>Classroom exercise</i>	rs_self-assessment.pdf	0	1	0	0
12	<i>Time Management</i>	<i>Group Activity</i>	<p>How long is a minute?</p> <p>At the beginning of session ask people to close their eyes for 30 seconds and after that to open it. Nobody can watch the clock and don't measure the time. Ask of participants to open their eyes after what they believe has been 30 seconds.</p> <p>Of course, they all open them at different times. Afterwards, we talk about our understanding of time. Even though everyone has an equal (24 hours a day or 30 seconds for exercise), in fact, we experience it and use it in different ways. Some of us experienced it as a short period, other as a long. This always works as a good opener.</p> <p>2) Cover all the clocks in the room, then ask participants to remove their wrist watches and stand up. Instruct them to sit down when they think 1 minute has elapsed after you shout "Start" to begin the countdown. You will be surprised with the results. Just enjoy the fun that follows this activity</p>	0	1	0	0

FCHU1209 SEMINAR AND TECHNICAL WRITING

<i>Pre - requisites</i>	<i>Course Type</i>	<i>Credits</i>
<i>Nil</i>	<i>Workshop</i>	<i>2</i>

Seminar allows students the opportunity to put all of information together. The students are required to prepare technical reports including oral presentations supported by written technical papers. Seminar is designed to assist students in preparing for their career.

COURSE OBJECTIVES

Understand the requirements and ethics of technical writing in the 21st Century workplace.

Work professionally, individually and in a team to produce effective technical documents incorporating verbal, visual, and multimedia materials as necessary.

Communicate effectively by analyzing audience, organizing documents, writing clearly and precisely with no grammar errors and presenting the document with skillful design.

Locate, evaluate, and incorporate pertinent information.

Write clear, intelligent technical reports

Make seminar presentations

COURSE OUTCOMES

Understand how technical communication is used in the workplace.

Understand and use the principles of design in business and technical communication.

Apply useful descriptive language to your technical documents.

Students will gain experience in preparing a technical report including an oral presentation supported by a written technical paper.

MODULE-I: TECHNICAL COMMUNICATION ESSENTIALS

COURSE OUTCOMES

Describe the writing process most useful in today's technical writing environment.

Analyze an audience and consider appropriate writing situations to meet the audience's needs.

Understand the ethics of the workplace and apply those ethics to their technical and business writing.

OUTLINE: Communicating in the Workplace, Technical Writing Process Today, Readers and Contexts of Use, Ethics in the Technical Workplace

MODULE- II: DOCUMENT DESIGN

COURSE OUTCOMES

Create and use graphics that complement your business and technical communication.

OUTLINE: Designing Documents and Interfaces, Creating and Using Graphics

MODULE-III: TECHNICAL COMMUNICATION STRATEGIES AND RESEARCHED REPORT WRITING

COURSE OUTCOMES

Define terms clearly in technical documents.

Explain instructions and processes clearly.

Write clear proposals for business and technical situations.

Research and manage information.

Write an analytical report.

OUTLINE: Researching and Managing Information, Organizing and Drafting, Technical Definitions, Technical Descriptions, Instructions and Documentation, Proposals, Analytical Reports

MODULE-IV: SEMINAR PRESENTATION

COURSE OUTCOME

Students will not only learn from the experience gained in preparing and presenting their seminar, but will have the opportunity to observe and participate in the seminar given by their classmates.

OUTLINE: Technical Report, Seminar Presentation

(Planning, Preparing, Organizing and Seminar Presentation are the 4 stages of this module)

TEXT BOOK:

Gerson, Sharon J. and Gerson, Steven M. (2007). *Technical Writing Process and Product*. Delhi: Pearson Education.

REFERENCES:

Effective Technical Communication, M. Ashraf Rizvi, TMH Publications.

Business Communication Today, Courtland L Bovee, John V Thill & Mukesh Chaturvedi, Pearson Education.

EVALUATION SYSTEM (CONTINUOUS INTERNAL ASSESSMENT)

Methods	Proposal Writing	Report Writing	Organizing Seminar	Document Formatting	Preparing a Technical Paper	Seminar Presentation-I	Seminar Presentation-II	% of Marks 100 (Best 5)
Total	20	20	20	20	20	20	20	100

SESSION PLAN: SEMINAR AND TECHNICAL WRITING

S. No.	Topic	Pedagogy	Details	Instructional Hrs			
				Th	Pract	video	Proj
1	Introduction to Technical Writing	Activity Based Learning	Writing Genres: Technical versus non-technical writings https://www.youtube.com/watch?v=LTDsgd0ytbE	0	1	0	0
2	Preparing to Write	Doing	Audience Analysis Brainstorming Organizing information Link: https://www.youtube.com/watch?v=wxKJT13EhuM	0	1	0	0
3	Gathering information	Google Search	How do we gather information? Ways, techniques and tools	0	2	0	0
4	Focusing on Writing Skills	Workshop	Brainstorming, Drafting, Editing	0	2	0	0
5	Technical Writing Conventions	Analysis and Discussion	Analysis of different case studies	0	1	0	0
6	Reporting	Learning to Learn Analysis and Discussion	FORMAT: Preliminary pages, Summary, Main section, Conclusion, Recommendations References	0	2	0	0

S. No.	Topic	Pedagogy	Details	Instructional Hrs			
				Th	Pract	video	Proj
7	Using and interpreting Graphics	Group work and Discussion	Matching Games : Texts and graphic types	0	2	0	0
8	Document Formatting	Workshop	Layouts Use of MS Word for Documenting	0	2	0	0

			Document templates APA Format (6th) - Microsoft Word 2010 https://www.youtube.com/watch?v=aWT9zgMPviY				
9	Documentation	Workshop	Documenting Sources: https://www.youtube.com/watch?v=-H2fRG_Rtns	0	2	0	0
10	Introduction to Seminar	Discussion	Seminar : Needs and ways of preparation Video : https://www.youtube.com/watch?v=Rz2II40tOuI	0	1	0	0
11	Questioning Skills	Workshop	Asking and Responding to questions in Seminars TED TALK: https://www.youtube.com/watch?v=PkcHstP6Ht0	0	2	0	0
12	Analysis of various Seminars	Videos and Discussion	Analysis of Seminars: Pros and Cons How to make a seminar effective? https://www.youtube.com/watch?v=x7qPAY9JqE4	0	1	1	0
13	Preparing for a Seminar	Group Work	Grouping Selection of topics	0	1	0	0
14	Collection of Information	Workshop	Primary and secondary sources Preparing sample PPTs	0	2	0	0
15	Seminar Presentation-I	Group Work	Demonstration and Discussion	0	2	0	0
16	Seminar Presentation-II		Demonstration and Discussion	0	2	0	0

FCHU1210PROFESSIONAL ETIQUETTE

<i>Pre - requisites</i>	<i>Course Type</i>	<i>Credits</i>
<i>Nil</i>	<i>Workshop</i>	<i>2</i>

Etiquette begins with meeting and greeting. Good professional etiquettes indicate that you are a mature responsible, adult who can aptly represent any organization. Etiquettes center upon respect.

COURSE OBJECTIVES

- To recognize the importance of proper etiquette at workplace*
- To understand the elements and characteristics of proper etiquette*
- To behave professionally and gain respect*
- To develop an action plan to improve professionalism*

COURSE OUTCOMES

At the end of this course students would be able to learn:

- Professional behavior, standards for appearance, action and attitude in a business environment*
- Handle a variety of social and business situation*
- Different styles of communication based on different situations.*

MODULE- I: MEETING AND GREETING ETIQUETTE, OFFICE ETIQUETTE (7hrs)

- Personal Branding and First Impressions
- Introducing yourself and introducing a guest
- Professionalism at office
- Language styles, tone and attitude

MODULE-II: COMMUNICATION EXCELLENCE (7hrs)

- Techno Etiquette
- Phone Etiquette
- Email Etiquette
- Social Media Etiquette

MODULE-III: NETWORKING ETIQUETTE (6hrs)

- Business Card Etiquette
- Names
- Titles
- Net Etiquette
- Proper Introductions

MODULE-IV: BUSINESS ETIQUETTE (7)

- Presentation Etiquette
- Meeting Etiquette
- Dining Etiquette
- Global Etiquette

TEXT BOOK:

The New Etiquette, Real Manners for Real People in Real situations- An A-to-Z Guide by Marjabella Young Stewart, St. Martin Griffin.

Soft Skills, Know Yourself and the World, K.Alex.

REFERENCES:

Do's and Taboos of Hosting International Visitors, Roger E. Axtell, John Wiley & Sons, Inc.

Breaking through Culture Shock: What You Need to Succeed in International Business by Elisabeth Marx.

Dos and Taboos of International Trade by Roger E. Axtell, John Wiley & Sons, Inc. The Art of Writing Effective E-mails, Jayprakash, Sajitha, Himalayan Publications. International Communication Management-Individual & Organizational Outcomes by Antonio Ragus, Bookboon, 2010.

Business Communication for Success by Scott Mac Lean, Flat World Knowledge, 2010.

Effective Technical Communication, M. Ashraf Rizvi, TMH Publications.
EVALUATION SYSTEM (CONTINUOUS INTERNAL ASSESSMENT)

Methods	Introducing others, Small Talk	Role Play in formal & informal situations	Presentation	Telephonic interview	Email	Mock Meeting	Quiz on Professional Etiquette	% of Marks 100(Best 5)
Total	20	20	20	20	20	20	20	100

LESSON PLAN: PROFESSIONAL ETIQUETTE

S. No.	Topic	Pedagogy	Details	Instructional Hrs			
				Th	Pract	video	Proj
MODULE 1: MEETING & GREETING ETIQUETTE, OFFICE ETIQUETTE							
1	Personal Introduction	Role play on formal situation with proper introduction	http://smallbusiness.chron.com/first-impressions-business-etiquette-2908.html	0	1	0	0
2	Introducing Others	Knowing each other Fish bowl game	http://www.fasset.org.za/downloads/Office_Etiquette_Material/Handbook_Essential_Office_Etiquette.pdf				
3	Basics of Etiquette	Video clips Small skits	http://www.fasset.org.za/downloads/Office_Etiquette_Material/Handbook_Essential_Office_Etiquette.pdf	0	1	0	0
4	Interpersonal Etiquette	Video clips Activity on using speech acts with appropriate body language Guessing game	http://www.fasset.org.za/downloads/Office_Etiquette_Material/Handbook_Essential_Office_Etiquette.pdf	0	1	0	0
5	Professionalism And Front Office Etiquette	Video Clips Role play on front office management on their dream company Quiz	http://careerplanning.about.com/od/workplacesurvival/a/professionilism.htm http://www.octech.edu/sites/www/Uploads/files/TRIO/Professionalism%20in%20the%20Workplace.pdf	0	1	0	0
6	Professional Conduct	Conversational practice and SWOT Analysis in pair/group task	http://www.fasset.org.za/downloads/Office_Etiquette_Material/Handbook_Essential_Office_Etiquette.pdf	0	1	0	0
7	Professionalism And Front Office Etiquette	Video Clips Role play on front office management on their dream company Quiz	http://careerplanning.about.com/od/workplacesurvival/a/professionilism.htm http://www.octech.edu/sites/www/Uploads/files/TRIO/Professionalism%20in%20the%20Workplace.pdf	0	1	0	0
8	Formal & Informal Attire	Communication Game Quiz	http://www.fasset.org.za/downloads/Office_Etiquette_Material/Handbook_Essential_Office_Etiquette.pdf	0	1	0	0
9	Language Etiquette And Attitude	Enactment in different formal situations with appropriate communication styles	http://www.english.wisc.edu/rfyoung/336/attitudes.pdf https://blog.udemy.com/communication-styles/ http://www.english.wisc.edu/rfyoung/336/attitudes.pdf	0	1	0	0
10	Techno	Conversational	http://theedgeexecutivecoaching.com/arti	0	1	0	0

	<i>Etiquette</i>	<i>practice and Small skits</i>	cles/etiquette/techno-etiquette/# Question & Answers :http://www.workforce.com/articles/q-a-about-techno-etiquette				
11	<i>Smart Phone Etiquette</i>	<i>Dialogue Exchange Telephonic Quiz</i>	http://www.talkenglish.com/LessonPractice.aspx?ALID=483	0	1	0	0
12	<i>Email Etiquette Social Media Etiquette</i>	<i>Video Clips Written task practice Group work Debate</i>	http://www.businessemail etiquette.com/business-e-mail-etiquette-basics/ http://www.realsimple.com/work-life/work-life-etiquette/manners/social-media-etiquette http://www.moneycrashers.com/social-media-etiquette-tips-personal-business/ Video : https://www.youtube.com/watch?v=RFZwtkoNGrk https://www.youtube.com/watch?v=ootxiibcOWc	0	0	1	0

MODULE II: COMMUNICATION EXCELLENCE (7 HOURS)

S. No.	Topic	Pedagogy	Details	Instructional Hrs			
				Th	Pract	video	Proj
10	<i>Techno Etiquette</i>	<i>Conversational practice and Small skits</i>	http://theedgeexecutivecoaching.com/articles/etiquette/techno-etiquette/# Question & Answers :http://www.workforce.com/articles/q-a-about-techno-etiquette	0	1	0	0
11	<i>Smart Phone Etiquette</i>	<i>Dialogue Exchange Telephonic Quiz</i>	http://www.talkenglish.com/LessonPractice.aspx?ALID=483	0	1	0	0
12	<i>Email Etiquette Social Media Etiquette</i>	<i>Video Clips Written task practice Group work Debate</i>	http://www.businessemail etiquette.com/business-e-mail-etiquette-basics/ http://www.realsimple.com/work-life/work-life-etiquette/manners/social-media-etiquette http://www.moneycrashers.com/social-media-etiquette-tips-personal-business/ Video : https://www.youtube.com/watch?v=RFZwtkoNGrk https://www.youtube.com/watch?v=ootxiibcOWc	0	0	1	0

MODULE-III NETWORKING ETIQUETTE (6HRS)

S. No.	Topic	Pedagogy	Details	Instructional Hrs			
				Th	Pract	video	Proj
13	<i>Netiquette</i>	<i>Written Assignment Drafting Email</i>	http://jillbremer.com/articles/etiquette/techno-etiquette/ http://www.slideshare.net/MarcellineChitolie/techno-etiquette-final-copy	0	1	1	0
14	<i>Business Card</i>	<i>Presentations and</i>	http://www.careerealism.com/3-rules-	0	1	1	0

	<i>Etiquette</i>	<i>small group work</i>	to-smart-business-card-etiquette/				
15	<i>Forms of Addressing</i>	<i>Written assignment Scrabble and puzzles</i>	http://www.talkenglish.com/LessonPractice.aspx?ALID=483	0	1	1	0

MODULE IV: BUSINESS ETIQUETTE (7 hours)

S. No.	Topic	Pedagogy	Details	Instructional Hrs			
				Th	Pract	video	Proj
16	<i>Present ation Etiquette</i>	<i>Demonstration</i>	http://dianegottsman.com/2013/11/business-etiquette-9-powerful-presentation-tips/ http://dianegottsman.com/2012/07/stand-and-deliver-ten-tips-to-delivering-a-powerful-presentation/	0	1	1	0
17	<i>Meeting Etiquette</i>	<i>Mock Meeting</i>	http://businessculture.org/northern-europe/uk-business-culture/meeting-etiquette/ http://www.fasset.org.za/downloads/Office_Etiquette_Material/Handbook_Essential_Of_fice_Etiquette.pdf	0	1	1	0
18	<i>Dinning Etiquette</i>	<i>Activity on- Playing the role of the Host/Hostess, Playing the role of the Guest</i>	<i>Rizvi, ETC, pp.139-164 Soft Skill, Dr.K.Alex-pp-203-219</i>	0	1	1	0

S. No.	Topic	Pedagogy	Details	Instructional Hrs			
				Th	Pract	video	Proj
19	<i>Golden Rules of Global Etiquette</i>	<i>Discussion and Activity</i>	<i>Developing intercultural skill</i> http://www.kwintessential.co.uk/cultural-services/articles/international-business-etiquette.html http://www.kwintessential.co.uk/resources/country-profiles.html http://www.forbes.com/sites/susanadams/2012/06/15/business-etiquette-tips-for-international-travel/ http://www.marcaria.com/international-business-etiquette-customs-and-culture.asp	0	1	1	0
20	<i>Doubt Clearing</i>	<i>One-to-One Interaction</i>	<i>Practice</i>	0	1	0	0
21	<i>Recap</i>	<i>Discussion</i>	<i>Performance Analysis</i>	0	1	0	0

FCHU1211 CREATIVE WRITING

<i>Pre - requisites</i>	<i>Course Type</i>	<i>Credits</i>
<i>Nil</i>	<i>Workshop</i>	<i>2</i>

The aim of the course is to prepare students for careers in a workplace that is information-rich and that increasingly values communication skills and the ability to think creatively and critically. The class time will be devoted to writing workshop, innovation exercises, and the critical appreciation of write-ups. The Creative Writing course will focus on

Reading

Writing Creatively

Presentations

Thus the main objective is to breed a culture of learning where students learn a variety of approaches to creative writing in a cooperative learning environment.

COURSE OBJECTIVES

Develop thinking skills

Acquire basic skills and techniques to develop a suitable practice of creative writing in context

Use a constructive approach to critique his/her own work, as well as work by his/her peers

Organize, prepare and present spoken presentations clearly and expressively

COURSE OUTCOMES

Upon the Completion of the course, a student will

Create Blog/ Online Presence

Submit works for publication

Compose a variety of written responses for different purposes and audiences

Collaborate by sharing ideas, examples and insights, productively and respectfully in informal conversations and discussions.

Students will put into practice the learning into the personal, professional and technical sphere.

MODULE -I: WRITING CREATIVELY (12hrs)

Foundational activities

Introduction to Class Standards

(Workshops, peer conferencing, blogging, reading outside the classroom)

Collaborative Creation of Classroom Philosophy

Basics of Creative Writing

Different forms of expression

Memoirs/Writing the Personal Narratives

Situational Writing/ Writing for the Target Audience

Dialogues, Essay, Poetry Slam

Script Writing

Writing for Blogs

Cooking Up Interview Stories

Writing from visuals

Pictures, Graphs, Images, Diagrams and Designs, Cartoons

Brochures and Newsletters

(This module will be facilitated through creative writing and speaking activities)

MODULE-II: READING AND CRITICAL APPRECIATION (8hrs)

Book

(Independent Study: Two Master Piece)

Article

Movie

(Student Work: Free Choice, Discussion and Oral/ Written Critiquing, Editing/ Revision

Publication/ Sharing, Short Report on Two Authors

(This module will be facilitated through reading activities and critical appreciation)

MODULE-III: POWER OF LATERAL THINKING TO CREATE NEW IDEAS (7hrs)

General Concepts: Creativity and Lateral Thinking
 Using the Technique of Lateral Thinking in Writing
 Idea Generation Games and Activities
 Six Thinking Hats

(This module will be facilitated through idea generation activities and presentation)

TEXT BOOKS

Creative Writing: A Workbook with Readings- Linda Anderson

Creative Writing- By DevAnjanaNeira

REFERENCES

The Cambridge Companion to Creative Writing by David Morley, Philip Neilsen

Creative Writing- By Adele Ramet

The Creative Writing Mfa Handbook: A Guide for Prospective Graduate Students By Tom Kealey

EVALUATION SYSTEM (CONTINUOUS INTERNAL ASSESSMENT)

Methods	Memoirs	Essay/ Dialogue Writing	Slam Poetry	Script Writing	Writing for Blog	Presentation from Visuals	Cooking up Interview Stories	% of Marks 100(Best 5)
Total	20	20	20	20	20	20	20	100

**SESSION PLAN: CREATIVE WRITING
 MODULE-1 : WRITING CREATIVELY (12 hours)**

S. No.	Topics	Pedagogy	Details	Instructional Hrs			
				Th	Prac t	Vide o	Proj
1	Foundational activities Introduction to Class Standards (Workshops, peer conferencing, blogging, reading outside the classroom)	Conversatio nal practice, Role Plays	https://www.teachingchannel.org/videos/peer-conferencing https://blogging.org/	0	2	0	0
2	Collaborative Creation of Classroom Philosophy	Group tasks	http://writing-speech.dartmouth.edu/teaching/first-year-writing-pedagogies-methods-design/collaborative-learninglearning-peers https://www.earlham.edu/media/894432/creative-writing-rules.pdf	0	2	0	0
3	Basics of Creative Writing	Video links /Practice	http://www.idiotsguides.com/education/creative-writing/creative-writing-basics/ https://www.youtube.com/watch?v=syuvXYpV4zA	0	2	0	0
4	Different forms of expression Memoirs/Writing the Personal Narratives Situational Writing/ Writing for the Target Audience	Group work, writing, video links ,	https://www.youtube.com/watch?v=PLHkuSpJxPs	http://classroom.synonym.com/creative-writing-between-memoir-personal-narratives 1729.htm	0	2	0

			toKkWas				
5	Dialogues, Essay, Poetry Slam	Role Plays, Written tasks	https://www.youtube.com/watch?v=zJGX2raiafU https://en.wikipedia.org/wiki/Poetry_slam Examples of poetry slams : http://www.poetrysoup.com/poems/best/slam https://www.writersstore.com/how-to-write-a-screenplay-a-guide-to-scriptwriting/	0	2	0	0
6	Script Writing Writing for Blogs	Writing tasks individual/pairs Video links Blog writing practice	https://www.youtube.com/watch?v=XZszextv6yE BLOGS https://www.youtube.com/watch?v=t21sKonfylk https://www.themuse.com/advice/6-types-of-stories-you-should-have-on-hand-for-job-interviews http://lifehacker.com/prepare-these-15-stories-for-your-next-job-interview-1610270959 https://www.themuse.com/advice/the-interview-technique-you-should-be-using https://twp.duke.edu/uploads/assets/Using%20Visual%20Rhetoric%20in%20Academic%20Writing.pdf https://www.youtube.com/watch?v=r6ZVGBQYNXE	0	2	0	0
7	Cooking Up Interview Stories		https://www.themuse.com/advice/6-types-of-stories-you-should-have-on-hand-for-job-interviews http://lifehacker.com/prepare-these-15-stories-for-your-next-job-interview-1610270959 https://www.themuse.com/advice/the-interview-technique-you-should-be-using https://twp.duke.edu/uploads/assets/Using%20Visual%20Rhetoric%20in%20Academic%20Writing.pdf https://www.youtube.com/watch?v=r6ZVGBQYNXE	0	1	0	0
8	Writing from visuals Pictures, Graphs, Images, Diagrams and Designs, Cartoons Brochures and Newsletters		https://twp.duke.edu/uploads/assets/Using%20Visual%20Rhetoric%20in%20Academic%20Writing.pdf https://www.youtube.com/watch?v=r6ZVGBQYNXE	0	1	0	0

MODULE-II: READING AND CRITICAL APPRECIATION (8 HOURS)

S. No.	Topics	Pedagogy	Details	Instructional Hrs			
				Th	Pract	Vide o	Proj
9	Book (Independent Study: Two Master Piece)		http://www.howtolearn.com/2012/08/different-reading-techniques-and-when-to-use-them/	0	2	0	0
10	Article writing			0	2	0	0
11	Movie Review (Student Work: Free Choice, Discussion and Oral/ Written Critiquing, Editing/ Revision)			0	1	1	0
12	Publication/ Sharing, Short Report on Two Authors		https://www.elsevier.com/authors/book-authors/science-and-technology-book-publishing/overview-of-the-publishing-process	0	2	0	0

MODULE-III: POWER OF LATERAL THINKING TO CREATE NEW IDEAS (7hrs)

S. No.	Topics	Pedagogy	Details	Instructional Hrs			
				Th	Prac	Vide	Proj
13	General Concepts: Creativity and Lateral Thinking	Role Plays/ Oral Presentations Practice	www.brainstorming.co.uk/tutorials/definitions.html http://www.trainingcoursematerial.com/free-training-articles/creativity-problem-solving-decision-making-and-lateral-thinking/defining-lateral-thinking-parallel-thinking-creativity-and-innovation Video : https://www.youtube.com/watch?v=H7PyFNzPSVY	0	1	1	0
14	Idea Generation Games and Activities	Pair/group activities	http://study.com/academy/lesson/what-is-idea-generation-definition-process-techniques.html	0	1	1	0
15	Six Thinking Hats	Group task	http://www.debonogroup.com/six_thinking_hats.php	0	1	1	0
16	DOUBT CLEARING			0	1	0	0

FCHU1212ENGLISH FOR COMPETITION (GRE/GMAT/TOEFL/IELTS)

<i>Pre - requisites</i>	<i>Course Type</i>	<i>Credits</i>
<i>Nil</i>	<i>Workshop</i>	<i>2</i>

COURSE OBJECTIVE

Familiarize the learners with the pattern of the TOEFL/GMAT/IELTS/GRE examination and improve overall English skills to face the competitive exams confidently.

COURSE OUTCOME

Learners understand the pattern of the TOEFL, IELTS and GRE examination and apply test-taking strategies in exams.

A student is required to take up five laboratory tests of 100 marks.

LIST OF EXPERIMENTS

1: TOEFL Listening

Developing Listening Comprehension by taking notes after the short recorded conversations.

2: TOEFL Speaking

Developing test taking strategies to face speaking test of TOEFL exam through role play and Mock Interview.

3: TOEFL Reading

Practicing and improving student's confidence in completing the various sections of reading test in TOEFL examination.

4: TOEFL Writing

Learning and enhancing writing skills required for TOEFL writing test.

5: IELTS Listening

Practicing the listening comprehension of the students and handling questions while listening to the recorded conversations.

6: IELTS Speaking

Developing test taking strategies to face speaking test of IELTS examination through role plays and mock interviews.

7: IELTS Writing

Summarizing or explaining information presented in a graph, chart, table or diagram.

8: IELTS Reading

Understanding and interpreting the text in its particular use of language, ideas and style.

9: GRE Reading Comprehension

Taking GRE Reading Comprehension examination with confidence utilizing the methods and strategies.

10: GRE SENTENCE COMPLETION

Developing sentence completion strategies through logical thinking.

11: GRE SENTENCE EQUIVALENCE

Learning and developing strategies to deal with sentence equivalence questions.

12: GRE VOCABULARY

Understanding and using appropriate choice of vocabulary in GRE vocabulary section.

13. GRE Vocabulary & Verbal-Sentence Corrections

14. GMAT Verbal-Critical Reasoning

15. GMAT Verbal- Reading Comprehension

(The entire lab will be facilitated through online quizzes, and practice sets available in language lab))

TEXT BOOKS:

NorthStar Building Skills for the TOEFL iBT, High Intermediate Level (Pearson Education).

NorthStar Building Skills for the TOEFL iBT, Intermediate Level (Pearson Education).

McGraw-Hill's New GRE: 2011-2012 Edition

Princeton Review: Cracking the New GRE 2012

REFERENCES:

Longman Preparation Course for the TOEFL Test – iBT Speaking (Pearson Education).
 Longman Preparation Course for the TOEFL Test – iBT Listening (Pearson Education).
 Longman Preparation Course for the TOEFL Test – iBT Writing (Pearson Education).
 Longman Preparation Course for the TOEFL Test – iBT Reading (Pearson Education).
 NorthStar Building Skills for the TOEFL iBT, Advanced Level (Pearson Education).
 Achieve IELTS Workbook: Intermediate to Upper Intermediate: English for International Education (Achieve IELTS Intermediate/Upper) (Paperback).
 Kaplan New GRE Premier 2011-2012
 Barron's New GRE 19th Edition Grade
 Manhattan GRE
 Gruber's Complete GRE Guide 2012
 Nova's GRE Prep Course Grade
 ETS's Official Guide to the GRE Revised General Test
 Barron's GRE Verbal Workbook
 Barron's IELTS with Audio CD: International English Language Testing System (Paperback)
 Achieve IELTS Teacher's Book: Intermediate to Upper Intermediate: English for International Education (Achieve IELTS Intermediate/Upper) (Paperback)
 Step Up to IELTS Self-study Student's Book [STUDENT EDITION] (Paperback)
 IELTS Collected Papers: Research in speaking and writing assessment (Studies in Language Testing) (Paperback)

EVALUATION SYSTEM (CONTINUOUS INTERNAL ASSESSMENT)

<i>M</i> <i>e</i> <i>t</i> <i>h</i> <i>o</i> <i>d</i> <i>s</i>	Listening & fill-up blanks, short answers, Multiple-choice	JAM/ Questions & Responses	Vocabulary Quiz, Sentence Completion & Re-order paragraphs	Reading Comprehension	Summarize /Data Comment	Essay Writing	Analytical Writing	% of Marks 100 (Best 5)
<i>T</i> <i>o</i> <i>t</i> <i>a</i> <i>l</i>	20	20	20	20	20	20	20	100

SESSION PLAN: ENGLISH FOR COMPETITION

S. No.	Topic	Pedagogy	Details	Instructional Hrs			
				Th	Pract	video	Pro t
1	TOEFL Listening	Listening Activity Based Learning	http://www.examenglish.com/TOEFL/toefl_listening.htm	0	1	1	0
2	TOEFL Speaking	Listening and speaking activity	http://www.examenglish.com/TOEFL/TOEFL_Speaking_part5.htm	0	1	1	0
3	TOEFL Reading & Writing	Reading and Writing Practice	http://www.examenglish.com/TOEFL/TOEFL_reading1.htm (Reading) https://www.englishclub.com/esl-exams/ets-toefl-practice-writing.htm .	0	2	0	0

			http://www.time4writing.com/toefl/ (Writing)				
4	IELTS Listening	Listening Practice	http://takeielts.britishcouncil.org/prepare-your-test/free-ielts-practice-tests/listening-practice-test-1	0	1	1	0
5	IELTS Speaking	Speaking Practice	http://takeielts.britishcouncil.org/prepare-your-test/free-practice-tests/speaking-practice-test-1	0	2	0	0
6	IELTS Writing & Reading	Writing & Reading Practice	http://takeielts.britishcouncil.org/prepare-your-test/free-practice-tests/writing-practice-test-1-ielts-academic http://takeielts.britishcouncil.org/sites/default/files/Writing_practice_test_1_IELTS_Academic_questions.pdf (writing) http://takeielts.britishcouncil.org/prepare-test/practice-tests/reading-practice-test-1-academic (Reading)	0	2	0	0
7	GRE Reading Comprehension	Reading Practice	http://gre.graduateshotline.com/reading_comprehension_practice.html#.V2kJDRITXCM https://www.ets.org/gre/revised_general/prepare/verbal_reasoning/reading_comprehension/sample_questions	0	2	0	0
8	GRE Sentence Completion & Sentence Equivalence	Online practice	http://gre.graduateshotline.com/gre_sentence_completion.pl https://www.ets.org/gre/revised_general/prepare/verbal_reasoning/text_completion/sample_questions http://www.examfocus.com/gre/pt/verbal/sentence-equivalence-1.html	0	2	0	0
9	GRE Vocabulary	Online practice	http://gre.graduateshotline.com/	0	2	0	0
10	GMA Verbal-Sentence Corrections	Online practice	http://freegmattest.net/Questions http://www.majortests.com/gmat/sentence_correction.php	0	2	0	0
11	GMAT Verbal-Critical Reasoning	Online practice	http://www.majortests.com/gmat/critical_reasoning_test01	0	2	0	0
12	GMAT Verbal-Reading Comprehension	Online practice	http://www.majortests.com/gmat/reading_comprehension_test01	0	2	0	0

FCHU1213BE A CONTRIBUTOR

<i>Pre - requisites</i>	<i>Course Type</i>	<i>Credits</i>
<i>Nil</i>	<i>Workshop</i>	<i>2</i>

PROGRAM OBJECTIVES:

1. Build consciousness of ‘contributor thinking’ in students systematically by exposing them to the essential building blocks of contributor thinking. [The 4 sets of the program represent the 4 fundamental building block of the program]
2. Through projects expose students to the ‘realness’ of contributor way of thinking in the world around them.

SESSION PLAN:

Semester 1 of program delivery	SET 1: CONTRIBUTOR BASICS	
	UNIT 1: Who is a Contributor?	~5hrs
	UNIT 2: Scope of Contribution (<i>Self, Organization, Society</i>)	~5hrs
	UNIT 3: Depth of Contribution (<i>From ‘opportunities to contribute’ to a ‘life of Purpose’</i>)	~5hrs
	SET 2: BASIC AXIOMS OF LIFE	
	UNIT 4: The Contributor’s Response (<i>From ‘victim’ to ‘creator of my destiny’</i>)	~5hrs
	UNIT 5: The Contributor’s Identity (<i>From ‘static identities’ to ‘dynamic identities’</i>)	~5hrs
Semester 2 of program delivery	UNIT 6: The Contributor’s Vision of Success & Career (<i>From an ‘acquisitive vision’ to a ‘contributive vision’</i>)	
	SET 3: CONTRIBUTOR EFFECTIVENESS	
	UNIT 7: Engage Deeply	~5hrs
	UNIT 8: Design Solutions	~5hrs
	UNIT 9: Create Value	~5hrs
	SET 4: CONTRIBUTOR CONDUCT	
	UNIT 10: Thinking Win-win (Enlightened Self-Interest)	~5hrs
UNIT 11: Thinking Human-impact (Imaginative Sympathy)	~5hrs	
UNIT 12: Building Trust-surplus (Trust Behaviors)	~5hrs	
Full program duration		~60hrs

1.0 | Faculty can utilise the 5 hours of classroom as follows –

<p>i. The Class Engagement Books (for each unit)</p>	
<p>ii. The Program App (Channel Illumine App)</p>	<p>~ 4hrs for Book and App engagement.</p>
<p>iii. Projects (for each unit)</p> <p>Students can do 1-2 projects in each semester. The project is done out of class. In-class time is only for student presentation.</p>	<p>~1hr for project presentations</p>

Source: This document is an abridged version of ‘Overview of Become a Contributor Program’ given in your Facilitator Guide. It is strongly recommended that faculty refer the detailed Facilitator Guide for more details.

EVALUATION PARAMETERS (Total-100 Marks)

A] ENGAGEMENT IN CLASS		40 marks
1	Regular attendance across classes	10 marks
2	Quality of class participation (<i>involvement in discussions, asking thoughtful questions, sharing examples, etc.</i>)	15 marks
3	In-class assignments <ul style="list-style-type: none"> ✓ <i>Students can be asked to submit their filled books for specific in-class assignments (Illumine can provide a list of which class engagements in each book, can be checked for this)</i> ✓ <i>Any 4 books (one from each set), can be considered for marking.</i> 	15 marks
B] PROJECT WORK		30 marks
<ul style="list-style-type: none"> ✓ <i>Project assignments are provided by Illumine for the course.</i> ✓ <i>Mark students on their best 3, from these project assignments.</i> 		
1	Completion & submission of assigned projects, with basic quality	10 marks
2	Design and execution of the project (Methodology of project work) (<i>students present how they went about the project – their approach, method, documentation of research work</i>)	10 marks
3	Project presentation & project output uploads (<i>assessed against the project goal</i>)	10 marks
C] PRE & POST TEST		20 marks
1	Completion of pre-test	5 marks
2	Completion of post-test	5 marks
3	Improvement (sent by Illumine, based on test results)	10 marks
D] APP USAGE (sent by Illumine, based on app usage pattern)		10 marks

FCHU0210 LIFE SKILLS DEVELOPMENT-I [English]

<i>Pre - requisites</i>	<i>Course Type</i>	<i>Credits</i>
<i>Nil</i>	<i>Practice</i>	<i>2</i>

OBJECTIVES

To provide ample opportunities for practice

To approach reading comprehension questions and improve your vocabulary

OUTCOME

To qualify competitive exams

MODULE I: (24 HOURS)

s No.	Topic	Pedagogy	Details	Instructional Hrs			
				Th	Pract	video	Pro j
1	Reading Comprehension-1 & 2	Workbook Practice	Passage Reading	0	2	0	0
2	Reading Comprehension-3 & 4	Workbook Practice	Passage Reading	0	2	0	0
3	Reading Comprehension-1, 2 & 3	Workbook Practice	Passage Reading	0	2	0	0
4	Reading Comprehension-4,5 & 6	Workbook Practice	Passage Reading	0	2	0	0
5	Vocabulary(10 New Words)	Workbook Practice	Learning 10 new words	0	2	0	0
6	Vocabulary(15 New Words)	Workbook Practice	Learning 15 new words	0	2	0	0
7	Vocabulary(15 New Words)	Workbook Practice	Learning 15 new words	0	2	0	0
8	Vocabulary(20 New Words)	Workbook Practice & Quiz	Learning 20 new words	0	2	0	0
9	Reading Comprehension-1 & 2	Workbook Practice	Passage Reading	0	2	0	0
10	Reading Comprehension-3 & 4	Workbook Practice	Passage Reading	0	2	0	0
11	Reading Comprehension-5 & 6	Workbook Practice	Passage Reading	0	2	0	0
12	Speaking Skills	ACTIVITY	JAM	0	2	0	0
MODULE II: (24 HOURS)							
1	Vocabulary	Workbook Practice	Learning new words	0	2	0	0
2	Vocabulary	Workbook Practice	Learning new words	0	2	0	0
3	Reading Practice	News Reading	Reading Comprehension	0	2	0	0
4	Reading Comprehension-1 & 2	Workbook Practice	Passage Reading	0	2	0	0
5	Reading Comprehension-3 & 4	Workbook Practice	Passage Reading	0	2	0	0

7	Vocabulary	Workbook Practice	Learning new words	0	2	0	0
8	Vocabulary	Quiz	Learning new words	0	2	0	0
9	Vocabulary	Workbook Practice	Learning new words	0	2	0	0
10	Speaking Skills	GD & Analysis	General Topics	0	2	0	0
11	Reading Comprehension-1 & 2	Workbook Practice	Passage Reading	0	2	0	0
12	Vocabulary-1	Quiz	Learning new words	0	2	0	0
MODULE-3 (24 HOURS)							
1	Reading Comprehension-1 & 2	Workbook Practice	Passage Reading	0	2	0	0
2	Vocabulary-1	Workbook Practice	Learning new words	0	2	0	0
3	Vocabulary-2	Surprise Quiz	Learning new words	0	2	0	0
4	Vocabulary-2	Workbook Practice	Learning new words	0	2	0	0
5	Vocabulary-3	Workbook Practice	Learning new words	0	2	0	0
6	Vocabulary-3	Asking Each Other	Learning new words	0	2	0	0
7	Vocabulary-4	Quiz	Learning new words	0	2	0	0
8	Reading Comprehension-1 & 2	Workbook Practice	Passage Reading	0	2	0	0
9	Reading Comprehension-3 & 4	Workbook Practice	Passage Reading	0	2	0	0
10	Speaking Practice	Activity Based Learning	Extempore/ Communication Game	0	2	0	0
11	Vocabulary-5	Workbook Practice	Learning new words	0	2	0	0
12	Vocabulary-5	Recap & Analysis	Vocabulary Exercises	0	2	0	0

EVALUATION SYSTEM: INTERNAL ASSESSMENT (50) + EXTERNAL ASSESSMENT (50)

Methods	Online Test-I	Online Test-I	Online Test-I	Attendance	Assignment	% of Marks 50
Total	10	10	10	10	10	100

FCHU0211LIFE SKILLS DEVELOPMENT-II [APTITUDE]

<i>Pre - requisites</i>	<i>Course Type</i>	<i>Credits</i>
<i>Nil</i>	<i>Practice</i>	<i>2</i>

OBJECTIVE

Aptitude and Reasoning Tests are designed to give an objective assessment of a Candidate's ability in numerical as well as analytical

OUTCOMES

Ability skills will be increased

Improved skills to qualify all competitive exams like Banking Exams, Company-based Exams, Railway Exams, GATE Exams

SESSION PLAN: APTITUDE MODULE I: (24 HOURS)

S. No.	Topic	Pedagogy	Details	Instructional Hrs			
				Th	Pract	video	Proj
1	Number System-01	Workbook Practice	Operation on Numbers, Classification of Numbers, Tests of Divisibility	0	2	0	0
2	Number System-01	Workbook Practice		0	2	0	0
3	Number System-02	Workbook Practice	Unit Digit Calculation, Remainder Calculation,	0	2	0	0
4	Number System-02	Workbook Practice		0	2	0	0
5	Practice Test - 01	Practice Test	Practice Test on Number System http://gradestack.com/blogs/short-quiz-on-number-system-for-ctet-2015/	0	2	0	0
6	Lcm & HCF	Workbook Practice	Basics of LCM & HCF	0	2	0	0
7	Lcm & HCF	Workbook Practice	Basics of LCM & HCF	0	2	0	0
8	Practice Test - 02	Practice Test	Practice Test on LCM & HCF	0	2	0	0
9	Average	Workbook Practice	Basics of Average	0	2	0	0
10	Average	Workbook Practice	Basics of Average	0	2	0	0
11	Practice Test - 03	Practice Test	Practice Test on Average	0	2	0	0
12	Practice Test - 04	Practice Test	Practice Test on Number System, LCM & HCF & Average	0	2	0	0

MODULE II: (24 HOURS)

S. No.	Topic	Pedagogy	Details	Instructional Hrs			
				Th	Pract	video	Proj
1	Percentage	Workbook Practice	Basics of Percentage	0	2	0	0
2	Percentage	Workbook Practice	Basics of Percentage	0	2	0	0
3	Practice Test – 05	Practice Test	Practice Test on Percentage	0	2	0	0
4	Ratio & Proportion	Workbook Practice	Basics of Ratio & Proportion	0	2	0	0
5	Practice Test-06	Practice Test	Practice Test on Ratio & Proportion	0	2	0	0
6	Time & Work	Workbook Practice	Basics of Time & Work, Chain Rule	0	2	0	0
7	Time & Work	Workbook Practice	Basics of Time & Work, Chain Rule	0	2	0	0
8	Practice Test – 07	Practice Test	Practice Test on Time & Work	0	2	0	0
9	Pipes & Cistern	Workbook Practice	Basics of Pipes & Cistern	0	2	0	0
10	Time & Distance, Trains	Workbook Practice	Basics of Time & Distance, Trains	0	2	0	0
11		Workbook Practice	Basics of Time & Distance, Trains	0	2	0	0
12	Practice Test – 08	Practice Test	Practice Test on Time & Distance, Trains	0	2	0	0

MODULE-3 (24 HOURS)

S. No.	Topic	Pedagogy	Details	Instructional Hrs			
				Th	Pract	video	Proj
1	Boats & Streams	Class Task	Basics of Boats & Streams	0	2	0	0
2	Profit & Loss	Class Task	Basics of Profit & Loss	0	2	0	0
3	Profit & Loss	Home Task	Basics of Profit & Loss	0	2	0	0
4	Practice Test - 09	Practice Test	Practice Test on Profit & Loss http://gradestack.com/ssc/quants-quiz-on-profit-and-loss-for-ssc-cgl-2015-exam/	0	2	0	0
5	Practice Test - 10	Practice Test	Practice Test on Boats & Streams	0	2	0	0
6	Practice Test - 11	Practice Test	Practice Test on Average, Percentage, Number System, LCM & HCF, Boats & Streams, Average, Profit & Loss, Trains, Time & Distance www.livetest.in	0	2	0	0
7	Practice Test - 12	Practice Test	Practice Test on Average, Percentage, Number System, LCM & HCF, Boats & Streams, Average, Profit & Loss, Trains, Time & Distance https://www.wiziq.com/tests/aptitude-test	0	2	0	0
8	Practice Test - 13	Practice Test	Practice Test on Average, Percentage, Number System, LCM & HCF, Boats & Streams, Average, Profit & Loss, Trains, Time & Distance	0	2	0	0
9	Practice Test - 14	Practice Test	Practice Test on Average, Percentage, Number System, LCM & HCF, Boats & Streams, Average, Profit & Loss, Trains, Time & Distance	0	2	0	0
10	Practice Test - 15	Practice Test	Practice Test on Average, Percentage, Number System, LCM & HCF, Boats & Streams, Average, Profit & Loss, Trains, Time & Distance	0	2	0	0
11	Practice Test - 16	Practice Test	Practice Test on Average, Percentage, Number System, LCM & HCF, Boats & Streams, Average, Profit & Loss, Trains, Time & Distance http://www.freeonlinetest.in	0	2	0	0
12	Practice Test - 17	Practice Test	Practice Test on Average, Percentage, Number System, LCM & HCF, Boats & Streams, Average, Profit & Loss, Trains, Time & Distance	0	2	0	0

			<i>References for online tests:</i> http://www.careerride.com/Online-practice-test.aspx http://www.freeonlinetest.in http://gradestack.com www.livetest.in https://www.wiziq.com/tests/aptitude-test				
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EVALUATION SYSTEM: INTERNAL ASSESSMENT (50) + EXTERNAL ASSESSMENT (50)

<i>Methods</i>	<i>Online Test-I</i>	<i>Online Test-I</i>	<i>Online Test-I</i>	<i>Attendance</i>	<i>Assignment</i>	<i>% of Marks</i>
Total	10	10	10	10	10	100

FCHU0212LIFE SKILLS DEVELOPMENT – III [REASONING]

<i>Pre - requisites</i>	<i>Course Type</i>	<i>Credits</i>
<i>Nil</i>	<i>Workshop</i>	<i>2</i>

SESSION PLAN: REASONING MODULE I: (24 HOURS)

S. No.	Topic	Pedagogy	Details	Instructional Hrs			
				Th	Pract	video	Proj
1	Number Series	Workbook Practice	BASICS	0	2	0	0
2	Number Series	Workbook Practice	BASICS	0	2	0	0
3	Practice Test - 01	Practice Test	Practice Test on Number Series http://gradestack.com/ssc/reasoning-quiz-on-number-series-for-ssc-exams-3/	0	2	0	0
4	Letter Series	Class Task	BASICS	0	2	0	0
5	Letter Series	Workbook Practice	BASICS	0	2	0	0
6	Practice Test - 02	Practice Test	Practice Test on Letter Series	0	2	0	0
7	Alpha Numeric Series	Workbook Practice	Basics	0	2	0	0
8	Alpha Numeric Series	Workbook Practice	Basics	0	2	0	0
9	Practice Test - 03	Practice Test	Practice Test on Alpha Numeric Series	0	2	0	0
10	Continuous Pattern Series	Workbook Practice	Basics	0	2	0	0
11	Continuous Pattern Series	Workbook Practice	Basics	0	2	0	0
12	Practice Test - 04	Practice Test	Practice Test on Number Series, Letter Series, Alpha Numeric Series & Continuous Pattern Series	0	2	0	0

MODULE II: (24 HOURS)

S. No.	Topic	Pedagogy	Details	Instructional Hrs			
				Th	Pract	video	Proj
1	Percentage	Workbook Practice	Basics of Percentage	0	2	0	0
2	Percentage	Workbook Practice	Basics of Percentage	0	2	0	0
3	Practice Test - 05	Practice Test	Practice Test on Percentage	0	2	0	0
4	Ratio & Proportion	Workbook Practice	Basics of Ratio & Proportion	0	2	0	0
5	Practice Test-06	Practice Test	Practice Test on Ratio &	0	2	0	0

			<i>Proportion</i>				
6	<i>Time & Work</i>	<i>Workbook Practice</i>	<i>Basics of Time & Work, Chain Rule</i>	0	2	0	0
7	<i>Time & Work</i>	<i>Workbook Practice</i>	<i>Basics of Time & Work, Chain Rule</i>	0	2	0	0
8	<i>Practice Test - 07</i>	<i>Practice Test</i>	<i>Practice Test on Time & Work</i>	0	2	0	0
9	<i>Pipes & Cistern</i>	<i>Workbook Practice</i>	<i>Basics of Pipes & Cistern</i>	0	2	0	0
10	<i>Time & Distance, Trains</i>	<i>Workbook Practice</i>	<i>Basics of Time & Distance, Trains</i>	0	2	0	0
11	<i>Time & Distance, Trains</i>	<i>Workbook Practice</i>	<i>Basics of Time & Distance, Trains</i>	0	2	0	0
12	<i>Practice Test - 08</i>	<i>Practice Test</i>	<i>Practice Test on Time & Distance, Trains</i>	0	2	0	0

MODULE-3 (24 HOURS)

S. No.	Topic	Pedagogy	Details	Instructional Hrs			
				Th	Pract	video	Proj
1	<i>Miscellaneous</i>	<i>Workbook Practice</i>	<i>Basics</i>	0	2	0	0
2	<i>Miscellaneous</i>	<i>Workbook Practice</i>	<i>Basics</i>	0	2	0	0
3	<i>Practice Test - 11</i>	<i>Practice Test</i>	<i>Practice Test on Syllogism, Puzzle, Letter & Number Series, Miscellaneous</i>	0	2	0	0
4	<i>Practice Test - 12</i>	<i>Practice Test</i>	<i>Practice Test on Syllogism, Puzzle, Letter & Number Series, Miscellaneous</i>	0	2	0	0
5	<i>Practice Test - 13</i>	<i>Practice Test</i>	<i>Practice Test on Syllogism, Puzzle, Letter & Number Series, Miscellaneous</i>	0	2	0	0
6	<i>Practice Test - 14</i>	<i>Practice Test</i>	<i>Practice Test on Syllogism, Puzzle, Letter & Number Series, Miscellaneous</i>	0	2	0	0
7	<i>Practice Test - 15</i>	<i>Practice Test</i>	<i>Practice Test on Syllogism, Puzzle, Letter & Number Series, Miscellaneous</i>	0	2	0	0
8	<i>Practice Test - 16</i>	<i>Practice Test</i>	<i>Practice Test on Syllogism, Puzzle, Letter & Number Series, Miscellaneous</i>	0	2	0	0
9	<i>Practice Test - 17</i>	<i>Practice Test</i>	<i>Practice Test on Syllogism, Puzzle, Letter & Number Series, Miscellaneous</i>	0	2	0	0
10	<i>Practice Test - 18</i>	<i>Practice Test</i>	<i>Practice Test on Syllogism, Puzzle, Letter & Number Series, Miscellaneous</i>	0	2	0	0
11	<i>Practice Test - 19</i>	<i>Practice Test</i>	<i>Practice Test on Syllogism, Puzzle, Letter & Number Series, Miscellaneous</i>	0	2	0	0
12	<i>Practice Test - 20</i>	<i>Practice Test</i>	<i>Practice Test on Syllogism, Puzzle, Letter & Number</i>	0	2	0	0

			<i>Series, Miscellaneous</i> http://gradestack.com http://www.freeonlinetest.in www.livetest.in				
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EVALUATION SYSTEM: INTERNAL ASSESSMENT (50) + EXTERNAL ASSESSMENT (50)

<i>Methods</i>	<i>Online Test-I</i>	<i>Online Test-I</i>	<i>Online Test-I</i>	<i>Attendance</i>	<i>Assignment</i>	<i>% of Marks</i>
Total	10	10	10	10	10	100

FCMG0114 ECONOMICS

<i>Pre - requisites</i>	<i>Course Type</i>	<i>Credits</i>
<i>Nil</i>	<i>Theory</i>	<i>2</i>

Course Objective:

In today's dynamic economic environment, effective managerial decision making requires timely and efficient use of information. The basic purpose of this course is to provide students with a basic understanding of the economic principles, methodologies and analytical tools that can be used in business decision making problems. It provides an understanding of the economic environment and its impact on strategy formulation. The course also focuses on the impact of economic policies on managerial decision-making by providing an understanding of fiscal policy, and national and global economic issues affecting business.

The language of science (and all analytical thinking) is mathematics. Since economics is a social science, use of some mathematical tools, basically the constrained and un-constrained optimization techniques will help in measuring and solving the basic economic problems and thus improves decision-making. It becomes difficult and totally un-practicable to solve business (economic) problems logically and systematically without use of mathematics. The basic objective is to solve problems mathematically and interpret the results economically.

Module-1: Micro Economics

Introduction to economics: Scarcity, Choice and Efficiency, Fundamental issues of what, how and for whom to produce to make the best use of economics. Demand for a commodity: Law of demand, Demand schedule and demand curve, Individual and market demand, Change in demand, Consumer behavior: Analysing law of demand through Marshallian utility analysis, Indifference curve technique and Consumer Surplus.

Elasticity of demand: Price Elasticity of demand: Estimation, Types, Elasticity and revenue, Factors affecting price elasticity of demand. Income elasticity, Cross elasticity, Uses of different concepts of elasticity in business decisions.

Analysis of Supply: Law of Supply, Supply schedule and supply curve, Change in supply, Price elasticity of supply, Equilibrium of demand and supply: Equilibrium with demand and supply curves, Effect of a shift of demand and supply curves.

Production Function: Production function with one variable input, Production function with two variable inputs, optimal combination of inputs, Returns to scale

Cost Theory: Types of costs, Production and cost, Short-run cost functions, Long-run cost functions, Economies of scale and scope, Cost-Volume-profit Analysis

Market: Meaning, types and characteristics of different market structure (Perfect competition, Monopoly, Monopolistic competition and Oligopoly)

Module: 2: Macro Economics

National Income Accounting: Circular flow of Income, National Income Concept, Eight variants of national product aggregates, Measurement (Income, Value Added and Expenditure), Real and Nominal GNP, Difficulties in measuring the national income, Uses of National income statistics,

Money and Inflation: Demand for and supply of money. Causes and consequences of Inflation.

Commercial and central banking: Role and functions of commercial banks and R.B.I., Monetary

Policy and Fiscal policy: Objectives and Instruments, Balance of Payment (BoP): Meaning, BoP Account, Disequilibrium in BoP, Measures to correct disequilibrium in BoP, Foreign Exchange:

Floating Exchange Rate and Fixed Exchange Rates

Books & Reference:

1. *Managerial Economics in a Global Economy*, by D. Salvatore, Sixth Edition, OUP, 2008
2. *Managerial Economics*, Truett & Truett, Wiley Publication.
3. *Managerial Economics*, by Petersen Craig H. Cris Lewis and S.K. Jain, Pearson, 2007
4. *Modern Micro Economics*, Koutsoyiannis, (1975), A, Macmillan Press
5. *Managerial Economics*, Mehta, P. L (1999), Sultan Chand & Sons

6. *Principles of Microeconomics, Mankiw, N. G (2006), Cengage Learning*
7. *Macroeconomics, Mankiw, N. G, (2009), Worth Publishers*
8. *Macroeconomics, Theory and Policy, Dwivedy, D.N (2007), Tata McGraw Hill*
9. *Macroeconomics, D'Souza, E (2008), Pearson Education*
10. *Macroeconomic Analysis, Shapiro, E (2003), Galgotia Publications*
11. *Environmental Economics in Theory and Practice – Hankey N, Shogren J F, and White B – 1999
– Macmillan Indian Limited*
12. *Indian Economy, Mishra &Puri (2011), Himalaya Publishing House*

FCMG0102 ACCOUNTING AND FINANCE

<i>Pre - requisites</i>	<i>Course Type</i>	<i>Credits</i>
<i>Nil</i>	<i>Theory</i>	<i>2</i>

Course Objective:

- To familiarise the students with basic terms of accounting, accounting principles, concepts and convention.*
- To equip the students with various concepts, tools and techniques of Cost accounting as well as Management accounting essential for managerial decision making process.*
- To aware students overview of Time Value of Money, Working Capital and Stock Market*

Course outcomes:

On the successful completion of this paper the students should be able composed the information about:

- Develop a basic understanding of accounting and financial ratio analysis.*
- Students will be able to create, balance and deliver a budget and use budget information for planning and decision purposes.*
- Undertake various costing techniques and information for planning and decision-making*
- Demonstrate time management by understand various financial funding options for project planning and working capital management of an organizations.*
- Know how financial markets as well as the global economy are impacting their organization today and how they will impact their organization into the future.*

Module 1:

Basic Accounting Concepts and Conventions, Basic Accounting Equation, Accounting Mechanism: Journals, Ledgers, Trial Balance, Basic Financial Statements: Analysis of Items found in Balance Sheet and Income Statement, Ratio Analysis

Module 2:

Cost Concepts and Cost Terms: Financial Accounting vrs. Cost Accounting, Direct and Indirect Costs, Fixed, Variable and Semi-variable Costs, Standard, Budgeted and Actual Costs, Controllable and Non-controllable costs, Preparation of Cost Sheet, Cost-Volume-Profit Analysis: Concept of Marginal Cost and Contribution, Concept of Break Even Analysis, Applications of Marginal Costing

Module 3:

Time Value of Money: Concept, Simple and Compound Interest, Present Value of a Single Amount, Present Value of an Uneven Series, Future Value of an Annuity, Present Value of an Annuity
Working Capital Management: Meaning and Components of Working Capital, Determinants of Working Capital, Profitability-Risk Trade-off, Types of Working Capital, Importance of Working Capital, Operating Cycle: Concept and Estimation
Stock Market: Types of Capital Issues: Initial Public Offer, Follow-on Public Offer, Rights Issues, Preferential Issues, Red-herring Prospectus, Free Pricing of Issues, Greenshoe Option, Lock-in Period, Safety Net, Listing of Securities on Stock Exchanges

Books Recommended:

- Accounting for Management—Ashok Sehegal, Taxxman*
- Financial Accounting -- A managerial Perspective, R. Narayanswamy, PHI*
- Khan & Jain – Management Accounting, TMH.*
- Horngren ,Datar, Foster- Cost Accounting, Pearson.*
- Financial Accounting, Jain/Narang/Agrawal, Kalyani.*
- Basic Financial Accounting for Management, Shah, Oxford.*
- Financial Management by I. M. Pandey*
- Financial Management – Theory and Practice by Chandra*
- Financial Management – Text and Problems by Khan & Jain*

FCMG0103 MANAGEMENT PROCESSES AND ORGANIZATIONAL BEHAVIOR

<i>Pre - requisites</i>	<i>Course Type</i>	<i>Credits</i>
<i>Nil</i>	<i>Theory</i>	<i>2</i>

Course Objectives:

Management as a subject of study has brought a new paradigm in managing organizations. The young professionals has to learn and reflect the basic principles of management. Along with it the knowledge of Individual and group behaviour and its impact at the workplace is vital. Organizational Behavior (OB) is a field of study that investigates the impact that individuals, groups, and structure have on behavior within an organization. Then it applies that knowledge to make organizations work more effectively. This course will expose students to gain knowledge on the basic principles of management and organization behavior.

Course Introduction

Management as a subject of study has brought a new paradigm in managing organizations. The young professionals has to learn and reflect the basic principles of management. Along with it the knowledge of Individual and group behaviour and its impact at the workplace is vital. Organizational Behavior (OB) is a field of study that investigates the impact that individuals, groups, and structure have on behavior within an organization. Then it applies that knowledge to make organizations work more effectively. This course will expose students to gain knowledge on the basic principles of management and organization behavior.

Course Content

Unit: I

Emergence of Management as a discipline, Principles of management, (Planning, organizing, staffing and controlling) Contributions to management by Luther Gullick , Henri Fayol and Peter F. Drucker and Introduction: Concept and models of OB, Approaches to OB (Systems, Human resource and Contingency)

Unit: II

Individual System: Learning, Perception, Personality and Motivation,

Unit: III

Social System: Group Dynamics and Leadership.

Books Recommended:

1. Robins & Sanghii; Organizational Behavior, Pearson
2. Luthans ,F; Organizational Behavior-TMH
3. Udai Pareek ; Understanding Organizational Behavior, Oxford
4. Prasad,L.M; Organization behavior, S.Chand.
5. K. Aswathappa; Organization behaviour
6. Prasad.L.M ; Principles of Management,

FCMG0104 PRODUCTION AND OPERATION MANAGEMENT

<i>Pre - requisites</i>	<i>Course Type</i>	<i>Credits</i>
<i>Nil</i>	<i>Theory</i>	<i>2</i>

Course Objective:

The course is designed to acquaint the students with decision making in production and operation function of an organization.

Course Outcomes :

- Acquire a working understanding of the roles/functions of production management in the context of business enterprise.
- The learner will have a deep knowledge of the fundamental theory and mathematical principles involved in Production and Operation Management.
- They can use specialized knowledge in Operations Management to solve business processes.
- They will be capable of applying these principles to solve relevant production or service system problems.

Module 1:

Operations Management- An Introduction : Primary topics in Operations Management, Operations Function and Transformation process . Manufacturing Strategy and Mass customization, Product Development and Service Design , New Product design, Product life cycle, Process design, Process life cycle

Module 2:

Project scheduling Models: Project Network, Critical path Method (CPM), Programme Evaluation Review Technique (PERT).

Scheduling: Objective of Scheduling, Sequencing, Sequencing model: "n" jobs 1 machine, "n" jobs 2 machines.

Module 3:

Inventory Management: Concept of inventory with independent demand: Inventory cost structure, Deterministic inventory model - EOQ models, instantaneous receipt, Inventory model with discounts.

Module 4:

Quality Management: Concept of quality; Quality of design, Conformance & performance; Cost of poor process performance and quality. Statistical Quality Control - Process Control (X-bar, R & P chart, np chart).

Concept of TQM,Just in Time and Lean Production Basic element in JIT, Pull system, Push system

Books Recommended:

- 1) Chase, Jacobs, Aquilano, Agarwal, - "Operations Management", TMH
- 2) Krajewski,Ritzman,Kansal, - "Operations Management", Pearson
- 3) Everette. Adam Jr., Ronald J. Ebert, - "Production and Operations Management", PHI
- 4) Roberta S. Russell & Bernard W. Taylor III, - "Operations Management", Pearson/ PHI
- 5) Aswathappa& Sridhar Bhat, - "Production and Operations Management", HPH
- 6) Gaither, Frazier- Operations Management

FCMG0105MARKETING MANAGEMENT

<i>Pre - requisites</i>	<i>Course Type</i>	<i>Credits</i>
<i>Nil</i>	<i>Theory</i>	<i>2</i>

Course Objective:

- To familiarize the students with the concepts and theories and strategies of marketing.*
- To focus on the application of these concepts to various marketing contexts*
- To focus on the emerging areas of marketing*

Course outcomes :

- The students will understand the various marketing approach in today's competitive scenario.*
- The students will learn the application of various marketing tools for solving business problems*
- The students will acquire and develop the marketing skills to be a successful marketing person*

Module 1:

Introduction to marketing; What is marketing?, Importance of marketing function, Process of marketing, Concepts like need, want, value, satisfaction etc, Elementary idea of marketing mix. Understanding Marketing Environment; Factors affecting marketing environment (PESTEL), Porter's five forces model, Introduction to market research

Module 2:

Segmentation, Targeting & positioning (STP); What is market segmentation?, Criteria for effective segmentation, Targeting selected markets, Targeting strategies, Positioning, Effective positioning strategies, Positioning of brands and repositioning, introduction to consumer behavior.

Module 3:

Product Management; Classification of products, Product life cycle (PLC), Brand and branding. Pricing; Meaning & objective, steps in setting the price, pricing policies. Promotion; What is promotion, types of promotion, advertising, sales promotion, integrated marketing communication Place; Marketing channels, Channel conflict management, Distribution system. Introduction to services marketing, Emerging concepts like green marketing, e-marketing & social marketing.

Books Recommended:

- Marketing Management: A South Asian Perspective- Phillip Kotler, Kevin Lane Keller, Abraham Koshy and MithileshwarJha, 13th Edition Pearson, Education Publication*
- Marketing Mangement: Fourth edition- RajanSaxena*
- Positioning: The Battle for Your Mind- Al Ries& Jack Trout, Warner Books USA*

FCMG0108 INTRODUCTION TO RESEARCH

<i>Pre - requisites</i>	<i>Course Type</i>	<i>Credits</i>
<i>Nil</i>	<i>Theory</i>	<i>2</i>

Course Objectives:

- *To introduce the students about research, methods and techniques.*
- *To understand the process and apply in other areas.*

Course outcome:

- *Students will be able to understand the process of doing a research.*
- *Students will be able to write a research report.*

Course Contents:

Module: I Science and Social Science as Knowledge

Common sense view of Science, Seeing is believing?, Visual Experiences, Relevant Facts, Facts precede theory, Observation, Experiment as an adequate basis of Science, Deductive and inductive logic, falsification-A logical view,

Module: II Process of doing Research

Overview: Problem Definition, hypothesis and its function, Types of Research, Literature Review, Research Design, *Sampling:* Census and sample survey, different types of sample design, *Measurement:* Measurement and scaling techniques, *Methods of Data Collections:* Experimentation, observation, interview, Survey, case study; *Data Analysis and Interpretation:* Qualitative and quantitative data, data presentation, central tendency and dispersion, association, test of significance.

Module: III Report Writing and Presentation

Significance of report writing, different steps in report writing, layout of research report & Types of Report, Presentation, Ethics in Report Writing.

Books Recommended

1. *Ranjit Kumar, 2011, Research Methodology: A Step by Step Guide, Sage South Asia Publication.*

FCMG0113 INDIAN SOCIETY AND CULTURE

<i>Pre – requisites</i>	<i>Course Type</i>	<i>Credits</i>
<i>Nil</i>	<i>Theory</i>	<i>2</i>

Course Objectives:

- Develop an understanding social environment*
- Develop an understanding of cultural environment*
- Understanding the linkages among social, cultural and business environment*

Course outcomes :

- Students would develop an idea about the socio-cultural environment in which they would be working as scientists, researchers and entrepreneurs.*
- More specifically, they would get an appreciation of how societal and cultural issues interface with technology and science in the context of overall development of the country.*
- Attempt is also made to familiarise students with the science and technology policies that would benefit modern India.*

Course Contents:

Module 1: Introduction to Indian Society

Indian Society - Roots of Indian Society , Social Structure – Rural and Urban Contexts, Social Institutions in Indian Society, Caste, Tribe, Dalits and Other Excluded Groups, Power and Conflicts

Module 2: Introduction to Culture in Indian Society

Culture in Ancient, Medieval and Modern India, Languages and Literature in India, Culture Change and its Impact on Indian Society

Module 3: Social Movements

Reformers and Radicals – Rammohan Roy, Syed Ahmed Khan, JotiroPhule, Gopal Krishna Gokhale, BalGangadharTilak, TarabaiShinde, DayanandaSaraswatiand Vivekananda Nurturing a Nation – M. K. Gandhi, RabindraNath Tagore, B R Ambedkar, Mohammad Ali Jinnah, EV Ramaswami, Jawaharlal Nehru, RammanoharLohia, Jayaprakash Narayan, Verrier Elwin Peasant, Tribal, Women and Environment movement

Module 4: Social Issues in Modern India

Poverty, Gender Inequality, Disparity and Social Exclusion: SC, ST, Women, Child, Challenged

Module 5: Science, Technology and Society

Science, Technology and Development Linkage, Appropriate Technology, Science and Technology Policy

Books Recommended:

- Indian Society and Culture: Continuity and Change – by N. Hasnain*
- Social and Cultural History of India – O.M. Prakash*
- Makers of Modern India – RamachandraGuha*

Human Rights

Subject	Code	Type of course	Credit	Prerequisite
Human Rights	FCMG0115	Theory	1	Nil

Course Objective

The course is an introduction to human rights. Human beings are rational beings. They by virtue of their being human, possess certain basic and inalienable rights which are commonly known as human rights. Human Rights are defined as all those rights which are essential for the protection and maintenance of dignity of individuals and create conditions in which every human being can develop his or her personality to the fullest extent. The purpose of this course is for students to gain a holistic view of human rights and their implications.

Course outcome

Student would have an understanding of human rights, its history, characteristics, types, protection, violation and the legal framework for their protection, therefore, a fair knowledge of the Universal Declaration of Human Rights.

Evaluation Systems

<i>Methods</i>	<i>% of Marks</i>
<i>Internal(written exam/assignment/experiments/project/report writing etc.</i>	<i>40</i>
<i>Quiz, Presentations and Written exams</i>	
<i>External Exam</i>	<i>60</i>
<i>Total</i>	<i>100</i>

Course outline

Module I	Introduction to Human Rights
Topic	Meaning and Definition, History, Principles, Characteristics, Types
Pedagogy	Example: lecture (ppt), videos, etc
<i>Lab/Activity</i>	
<i>Assignment/practice</i>	
<i>No. of hours</i>	5
<i>Reference materials: Book/e- content/online source</i>	

Module 2	Human Rights Law
Topic	International Human Rights Law, Council of Human Rights, Universal Declaration of Human Rights, Legal Effects of the Declaration, International Humanitarian Law
Pedagogy	Example: lecture, videos, Case studies, etc
<i>Lab/Activity</i>	

Assignment/practice	
No. of hours	5
Reference materials: Book/e-content/online source	

Module 3	Conflicts of Rights and Future Challenges
Topic	Meaning and Definition, History, Principles, Characteristics, Types
Pedagogy	Example: lecture, videos, case studies, etc
Lab/Activity	
Assignment/practice	
No. of hours	5
Reference materials: Book/e-content/online source	

Reference

Text Books:

1. Arihants UGC NET Human Rights and Duties

2. Kapoor, S. K. Central Law Agency's Human Rights under International Law and National Law

Reference Books:

Clapham Andrew, 2015, Human Rights: A Very Short Introduction, Oxford University Press

Smith Rhona, 2015, Textbook on International Human Rights, Oxford University Press

Online Source:

8 Human Rights Study Books you can download for free

<https://www.humanrightscareers.com/.../10-human-rights-study-books-you-can-download>

<https://www.humanrightscareers.com/courses/>

Introduction to Ethics

Subject	Code	Type of course	Credit	Prerequisite
Introduction to Ethics	FCMG0116	Theory	1	Nil

Course Objective

<ul style="list-style-type: none"> · The course is an introduction to Ethics. This course will introduce the meaning of ethics and the historical development – utilitarianism, ethical relativism and virtue ethics. Will also examine some current ethical issues, especially in science and engineering. Questions which will be considered are: what is the good life? Do we have a moral duty to act in certain ways? Are there such things as natural human rights? Are some values more compelling than or better than others? · This course is designed to introduce undergraduate engineering students to the concepts, theory and practice of engineering ethics. It will allow students to explore the relationship between ethics and engineering and apply classical moral theory and decision making to engineering issues encountered in academic and professional careers.
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Course outcome

<p>By the end of the course, Student will be able to:</p> <ul style="list-style-type: none"> · Demonstrate knowledge of important ethical systems · Demonstrate their respect of different ethical perspectives · Critique some aspects of an ethical position · Clearly formulate their ethical position on an issue and develop arguments based on sound inferences and clear premises (through project) <p>The course will have three modules to cover the above expected learning outcomes.</p>

Evaluation Systems

<i>Methods</i>	<i>% of Marks</i>
<i>Internal(written exam/assignment/experiments/project/report writing etc.</i>	<i>20</i>
<i>Quiz, Group work, Presentations</i>	<i>20</i>
<i>Project</i>	<i>20</i>
<i>External Exam</i>	<i>40</i>
<i>Total</i>	<i>100</i>

Course outline

Module I	Introduction to Ethics
Topic	What is the study of ethics, Introduction to Indian and Western Ethics
Pedagogy	lecture (ppt),
Lab/Activity	
Assignment/practice	
No. of hours	2
Reference materials: Book/e-content/online source	

Module 2	Different Ethical systems and Perspectives
Topic	Ethical relativism and its implications, utilitarianism, duty ethics and virtue ethics
Pedagogy	lecture, Case studies, small group work
Lab/Activity	
Assignment/practice	
No. of hours	6
Reference materials: Book/e-content/online source	

Module 3	Critique of various aspects of ethical positions
Topic	Critique and development of the ability to formulate own ethical position on an issue
Pedagogy	lecture, small group work
Lab/Activity	
Assignment/practice	
No. of hours	3
Reference materials: Book/e-content/online source	

Session Plan

Topic coverage and Internal Test	No. of Sessions (in hrs.)	Activity (lecture, tutorial, lab practice, field studies/field-trip, Workshop etc.)	Assignment (project, assignment, field study, seminar, etc.)	Suggested Reading (Book, Video, Online source, etc.)
Module 1				
Meaning and Definitions of Ethics Morals and Ethics Comparison of ethics and engineering ethics The importance of ethics in science and engineering	1	Lecture		Lecture Notes and reference in books, online resources
Introduction to Ethics in different cultures The importance of core values Moral/ethical dilemmas and hierarchy of moral values Factors affecting moral responsibility, and degrees of responsibility	1	Lecture		Lecture Notes and reference in books, online resources
Module 2				
Ethical Relativism and its implications	1	Lecture		Lecture Notes and Articles, online resources
Utilitarianism and its implications Engineers in organizations: Ethics in the workplace Fairness (personal and social) Engineering Professionalism and Ethics, Leadership,	1	Lecture		Lecture Notes and Articles, online resources

Specific case example – Challenger Incident Reliability, risk and safety Risk management Resource allocations				
Duty ethics and its implications Law and Ethics	2	Lecture		Lecture Notes and Articles, online resources
Virtue ethics and its implications Ethics in the workplace Fairness (personal and social)	2	Lecture		Lecture Notes and Articles, online resources
Module 3				
Critique of various aspects of ethical positions Ethics in the electronic and digital age Ethics and the environment Sustainable engineering Privacy and confidentiality issue	1	Lecture		Handouts and online resources
How to formulate an ethical position on an issue	2	Lecture		Handouts and online resources
<i>Project work and presentations</i>	4 hours			

FCMG1201 DISASTER MANAGEMENT

<i>Pre – requisites</i>	<i>Course Type</i>	<i>Credits</i>
<i>Nil</i>	<i>Theory</i>	<i>2</i>

Course Objective			
<p>The aim is to impart knowledge on</p> <ul style="list-style-type: none"> ✓ To provide students an exposure to disasters, their significance, types & Comprehensive understanding on the concurrence of Disasters and its management. ✓ To ensure that students begin to understand the relationship between vulnerability, disasters, disaster prevention, risk reduction and the basic understanding of the research methodology for risk reduction measures. ✓ Equipped with knowledge, concepts, and principles, skills pertaining to Planning, Organizing, Decision-making and Problem solving methods for Disaster Management. ✓ The course also facilitates students to globally share their views, ideas and information pertaining to Disaster Management on a common platform. ✓ To develop rudimentary ability to respond to their surroundings with potential disaster response in areas where they live, with due sensitivity. 			
GUIDELINES ON GRADING AND STANDARDS OF ASSESSMENT			
A continuous evaluation system will be adopted to evaluate the students. There will be an individual and group assignments, presentations and written test.			
COURSE CONTENT			
Module - 1			
UNIT I – Introduction to Disaster Management (2hrs)			
Session	Topic	Coverage	Reading/Reference
4hrs	Disaster & Emergencies : Concept & Fundamentals of Disaster Management	<ul style="list-style-type: none"> ✓ Introduction/ Brain storming/ Group formation ✓ History of Disasters ✓ Concepts and Definitions ✓ Hazard, Risk, Vulnerability, Capacity, Disaster & Equations of Disaster Management 	
		<ul style="list-style-type: none"> ✓ Types & Classification of Disasters ✓ Factors responsible for disasters like flood, cyclone and Earthquake. 	
UNIT II – Effect and Impact of Disaster (4 Hrs)			
1hr	Effect and Impacts of Disasters (Group work)	<ul style="list-style-type: none"> ✓ Disasters Impact – Social, Economic, Political, Environmental, Health, Psychosocial, etc. ✓ Differential impacts- in terms of Caste, Class, Gender, Age, Location, Disability. 	Disaster Mgmt. and India: Responding Internally and Simultaneously in Neighboring Countries Kailash Gupta, BE (Elec.), MBA(IIMA)

1 hr	Disaster vs Development	<ul style="list-style-type: none"> ✓ Disaster is the causes of destruction ✓ Disaster leads to development 	
2 hrs	Global warming and climate change	<ul style="list-style-type: none"> ✓ Concept and understanding of global warming and climate change ✓ Causes and factors ✓ Remedial measures 	
Module – II		✓	
UNIT III – Disaster Risk Management - (6 hours)			
2 hrs	Community Managed Disaster Risk Reduction And Village Contingency Plan (Group work) Role of Task force/ ODRAF/ NDRF for DRR at community level.	<ul style="list-style-type: none"> ✓ Hazard analysis and assessment ✓ Vulnerability analysis ✓ Resource capability assessment ✓ Mapping & Seasonality Calendar ✓ Structural and Non Structural assessment. ✓ Task forces with various roles for DRR. 	CBDRM for Local Authorities: PARTICIPANT'S WORKBOOK – adpc www.adpc.net
2 hours	Rapid Need Assessment Pre and Post Disaster (Group work and Practical demo)	<ul style="list-style-type: none"> ✓ Meaning and Importance ✓ Rapid Need Assessment in emergency and its significance ✓ Process and Methods 	
2 hrs	Stress Management	<ul style="list-style-type: none"> ✓ Causes and consequences of Stress ✓ What are the best ways to handle pressure ✓ Psychosocial Support 	
UNIT IV – Disaster Management (8 hrs)			
2 hrs	Disaster Management Cycle	<ul style="list-style-type: none"> ✓ Disaster Management Cycle ✓ Phases of Disasters ✓ Prevention, Mitigation Preparedness, Warning, Response, Rehabilitation, Reconstruction 	
2 hrs	Fire safety (Practical)	<ul style="list-style-type: none"> ✓ Practical 	
2 hours	First Aid & Driving Learning (Theory and Practical)	<ul style="list-style-type: none"> ✓ ABCD of First Aid ✓ Dressing and Bandages Practical session ✓ Emerging need and importance of learning driving 	
2hrs	Building Rescue operation or Demonstration of ODRAF/NDRAF rescue	<ul style="list-style-type: none"> ✓ Practical 	

	materials		
Module – III		✓	
UNIT V – Humanitarian Charter and Minimum Standards in Humanitarian Response (4 hrs)			
2hrs	Sphere Standards (Group Work)	<ul style="list-style-type: none"> ✓ The Humanitarian Charter ✓ Protection Principles ✓ Core Standards 	
2hrs	Restoring Life Line Services (WASH) (Group work)	<ul style="list-style-type: none"> ✓ Water , Sanitation & Hygiene Promotion ✓ Food Security & Nutrition ✓ Health Services ✓ Health Services ✓ Shelter and Settlement 	The Sphere Project , Humanitarian Charter and Minimum Standards In Humanitarian Response
UNIT VI – Disaster Management Projects –(6 hours)			
6hrs	Seminars / Workshop	<ul style="list-style-type: none"> ✓ Adapting Climate Change ✓ Disaster Resilience Structures and Buildings ✓ IT in Disaster Management ✓ Inter-relationship between Disasters and Development ✓ Urban Disaster ✓ Rain Water Harvesting ✓ Inclusions – Disability, Aged, Social etc 	
		✓	
		✓	

- ✓ Team of 10 – 15 members would be formed
- ✓ Each Team would take up a project work in one of the topics above or related topics with prior approval : 2 Weeks
- ✓ Each Team would organize one Seminar / Workshop during the session

FCMG1202MS Excel

<i>Pre – requisites</i>	<i>Course Type</i>	<i>Credits</i>
<i>Nil</i>	<i>Workshop</i>	<i>2</i>

Course Objective		
<p>The aim is to impart knowledge on</p> <ul style="list-style-type: none"> ✓ Indicate the names and functions of the Excel interface components. ✓ Enter and edit data. ✓ Format data and cells. ✓ Construct formulas, including the use of built-in functions, and relative and absolute references. ✓ Create and modify charts. ✓ Preview and print worksheets. ✓ Use the Excel online Help feature. 		
Course Outcome		
<ul style="list-style-type: none"> ✓ Navigate your way around Microsoft Excel ✓ Work with data analysis and presentation ✓ Create and work with formulas and functions, understand and use formula cell ✓ Use Excel for Business application 		
GUIDELINES ON GRADING AND STANDARDS OF ASSESSMENT		
A continuous evaluation system will be adopted to evaluate the students. There will be an individual and group assignments and presentations.		

Course Contents:

Unit 1: Excel Introduction, direct right, The Excel Interface, direct right, Basic Navigation and Editing,

Unit 2: Getting Going, Orientation & efficiency, Editing, Viewing, Spreadsheet Structure, Cell References, Named Ranges, Basic Macros, Design

Unit 3: Administration, Customising Excel, Housekeeping, Connecting Workbooks Documentation, Protecting and Sharing, Google Docs, Excel Troubleshooting, Data Handling, Sorting and Filtering, Controlling User Input, - Working with Dates & Times

Unit 4: U- Working with Text, Lookup and Reference, Logical Functions, Data Analysis, Working with Numbers, Summarising Data, PivotTables 1 - Simple Summaries, PivotTables 2 - Manipulating Data,

Unit 5: PowerPivot: Handling Big Data, Formula Auditing, Advanced Macros and VBA, Modelling, Presentation, Cell Formatting, Number Formatting, Conditional Formatting, Graphs and Charts, Page and print setup

Gender Issues in Development

Subject Name	Code	Type of course	T-P-Pr (Credit)	Prerequisite
Gender Issues in Development	FCMG0401	Theory & Project	1-0-0 (1 credit)	None

1. Objective

- ✓ In the traditional social order women have been assigned a subordinate status in society for centuries. They have been deprived of many social privileges and suffered from discriminations that prevented them from contributing to the development process. They have remained marginalized in society. To remedy the prevailing situation, gender concerns have become increasingly important in the development agenda in the last few decades. In spite of special policies and programmes being implemented, gender based injustice continues to exist and hinder development

2. Course outcome

- i) Develop an understanding of perspectives on gender and development
- ii) Discuss in detail the gender question in selected development sectors and globalisation
- iii) Familiarise with the different tools and techniques for gender planning, analysis and evaluation in the development sector

The course has three modules covering these three aspects of gender and development.

3. Evaluation Systems

<i>Internal Examination</i>	<i>Component</i>	<i>% of Marks</i>	<i>Method of Assessment</i>
	Midterm Test	20	Written examination
	Assignment		Report and Presentation
	Experiments		Lab work, report
	Project	20	Report and presentation
	Quiz	20	Surprise/preannounced ones
<i>External Examination</i>		40	Written examination
<i>Total</i>		100	

4. Course outline

Module I

UNDERSTANDING AND CONCEPTUALISING GENDER RELATIONS

Module II

GENDER ISSUES IN DEVELOPMENT SECTORS

Module III

GENDER ANALYSIS, TOOLS, TECHNIQUES AND FRAMEWORKS

5. References

- a) “Why Gender is a Development Issue”, Handout 4, Oxfam Gender Training Manual (1994)
- b) Freedman, Jane. (2002), “Introduction: Feminism or Feminisms?” in *Feminism*, Viva Books, N. Delhi.
- c) Chafetz, J.S. (1990), “The Coercive Bases of Gender Inequality”, in *Gender Equity: An Integrated Theory of Stability and Change*, Sage.
- d) Kabeer, Naila. (1994), “Connecting, Extending, Reversing: Development from a Gender Perspective”, in *Reversed Realities*, Verso, London.

- e) Moser, C.O.N. (1991), “Gender Planning in the Third World: Meeting Practical and Strategic Gender Needs”, in T. Wallace & C. March (eds.) *Changing Perceptions: Writings on Gender and Development*, Oxfam.

- f) Boonsue, K. (1992), “Development Models of WID, WAD and GAD” in *Women’s Development Models and Gender Analysis: A Review*, Gender Studies (AIT, Bangkok).
- g) Agarwal, B. (1994), “Conceptualising Gender Relations” in *A Field of One’s Own: Gender and Land Rights in South Asia*, Cambridge University Press.
- h) “Women and the Economy” in *Human Development in South Asia 2000: The Gender Question*, MahbubUIHaq Development Centre/OUP, Islamabad.
- i) Rajagopal, S. (1999), “Closing the Gender Gap in Education: The Shikshakarmi Programme” in N. Kabeer & R. Subrahmanian (eds.), *Institutions, Relations and Outcomes*, Kali for Women, Delhi.
- j) Thakur, S.G. (1995), “Access to Health Care – A Gender Perspective” *The Administrator*, Vol 11, April-June, pp 169-181.
- k) Kusum, K & Barua, K. (2001), “Gender Equality and Women’s Health – A Human Rights Perspective”, *Indian Journal of Adult Education*, Jan-Mar, pp 44-49.
- l) Mohanty, B. (1995), “Panchayati raj, 73rd Constitutional Amendment and Women”, *Economic and Political Weekly*, Dec 30, 3346-3350.
- m) Kapoor, N. (2002), “Women and Governance”, *Participation & Governance*, Vol. 8, No.23, pp 11.
- n) Resurreccion, B.P. (2005), “Women in-between: Gender, Transnational and Rural-Urban Mobility in the Mekong Region”, *Gender, Technology and Development*, Vol.9, No.1, Jan-April, pp 31-51.
- o) Gender and Globalisation – A Note
- p) Overholt, C.A. et.al. (1991), “Gender Analysis Framework”, in A. Rao et.al. (eds.), *Gender Analysis in Development Planning*, Kumarian Press.
- q) Handouts to be given in the class on Gender Assessment Study.
- r) The Gender Analysis Matrix: A Teaching Note.
- s) March. C. et.al (1999), “Women’s Empowerment (Longwe) Framework”, in *A Guide to Gender Analysis Frameworks*, Oxfam: Oxford.
- t) Gender and Organisations – Handout in the class.

6. Session Plan

Topic coverage and Internal Test	No. of Sessions (in hrs.)	Activity (lecture, tutorial, field-practice, field trip, Workshop etc.)	Assignment (project, assignment, field study, seminar, etc.)	Suggested Reading (Book, Video, Online source, etc.)
Module 1				

Difference between Sex and Gender	1	Lecture		Lecture Notes and Book chapters
Why gender is a development issue?	1	Lecture		Lecture Notes and Book chapters
Gender system and inequality	1	Lecture		Lecture Notes and Book chapters
Understanding gender relations	1	Lecture		Lecture Notes and Book chapters
Gender planning – practical and strategic gender needs	1	Lecture		Lecture Notes and Book
Approaches to address gender inequality – WID, GAD and GID	1	Lecture		Lecture Notes and Monograph
Module 2				
Gender issues in the economic sector	1	Quiz 1 and Lecture		Lecture Notes and Articles
Gender issues in the education sector	1	Lecture		Lecture Notes and Articles
Gender issues in the health sector	1	Lecture		Lecture Notes and Articles
Gender issues in the governance sector	1	Lecture		Lecture Notes and Articles
Gender issues in globalisation	1	Lecture		Lecture Notes and Articles
Module 3				
Harvard Analytical Framework	1	Lecture		Handouts and Book chapter
Gender Assessment Study and Gender Analysis Matrix	1	Lecture		Handouts and Book Chapters
Gender Empowerment Framework	1	Quiz 2 and Lecture		Handouts and Book Chapters
Gender and Organisations	1	Lecture		Handouts and Book Chapters
Student Presentations based on group projects	Extra classes			

<i>Total (hrs)</i>	15 hours +3 hours			
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Centurion University of Technology and Management Odisha

Choice Based Credit System

Course Structure & Syllabus

BASKET - III



CENTURION UNIVERSITY OF TECHNOLOGY AND MANAGEMENT

School of Engineering & Technology

2018-19

**Course Structure
Basket-III**

Course Code	Course Title	Course Type	Credits	Prerequisite	Remarks
ENFC0101	Engineering Mechanics	Theory	3	Nil	
ENFC0102	Material Sciences	Theory	3	Nil	
ENFC0103	Thermodynamics	Theory	3	Nil	
ENFC0104	Introduction to Communication Engineering	Theory	3	Nil	
ENFC0105	Introduction to Aerospace Engineering	Theory	3	Nil	
FCEN0120	Introduction to Computer Networks	Theory	3	Nil	CTIS
FCEN0118	Computer Fundamental and Organization	Theory	3	Nil	CTIS
FCEN0119	Operating System Building Blocks	Theory	3	Nil	CTIS
FCEN0115	Introduction To Biotechnology	Theory	3	Nil	
FCEN0116	Introduction to Biophysics	Theory	3	Nil	
FCEN0117	Biosafety, bioethics, IPR and Patents	Theory	2	Nil	
FCEN0111	Earth System Science	Theory	3		
FCEN0112	Introduction to Mining	Theory	3		
FCEN0113	Mine Development	Theory	3		
FCEN0114	Mine Surveying I	Theory	3		
ENFC0201	Workshop Practice	Practice	2	Nil	
ENFC0202	Geometric Modelling Lab	Practice	2	Nil	
ENFC0203	Introduction to Robotics	Practice	2	Nil	
ENFC0204	3D Modeling	Practice	2	Nil	
ENFC0205	Electrical Workshop Practice	Practice	2	Nil	
FCEN0214	Mine Surveying-I Lab	Practice	2		
ENFC0208	Aerodynamics Laboratory	Practice	2	Nil	

ENFC0401	Engineering Metrology and Measurements	Theory+ Practice	3	Nil	
ENFC0402	Basic Fluid Mechanics	Theory + Practice	3	Nil	
ENFC0403	Basic Surveying	Theory + Practice	3	Nil	
ENFC0404	Basic Electrical Engineering	Theory+ Practice	3	Nil	
ENFC0405	Electrical Machines	Theory+ Practice	3	Nil	
ENFC0406	Introduction to automation	Theory+ Practice	3	Nil	
ENFC0407	Introduction to Web Technology	Theory + Practice	3	Nil	CTIS
ENFC0408	Information Security I	Theory+ practice	3	Nil	CTIS
ENFC0409	Programming in C	Theory+ practice	3	Nil	CTIS
ENFC0410	Desktop Operating System (Windows 10)	Theory+ Practice	3	FCEN0119 Operating System Building Blocks	CTIS
FCEN0408	Principles of Biochemistry	Theory + Practice	5	Nil	
FCEN0409	Cell Biology	Theory + Practice	5	Nil	
ENFC0412	Programming for Problem Solving – Java	Theory + Practice	3	Nil	
ENFC0414	Data Base Management System	Theory + Practice	3	Nil	
ENFC0415	Electronics and Its Application	Theory & Practice	3	Nil	
ENFC0416	Electronic Devices	Theory & Practice	3	Nil	
ENFC0417	Sensors and IOT	Theory & Practice	3	Nil	
ENFC0418	Problem Solving & Programming	Theory & Practice	3	Nil	

ENFC0419	Data Structures and C Programming	Theory & Practice	3	Nil	
ENFC0420	Switching Theory and Logic Design	Theory + Practice	3	Nil	
ENFC0422	Operating System	Theory + Practice	3	Nil	
ENFC0423	Big Data Analytics	Theory + Practice	3	Nil	
ENFC0424	Block Chain and Smart Contracts	Theory + Practice	2	Nil	
ENFC0601	Product Development	Practice + Project	3	Nil	
ENFC0603	AI Tools, Techniques and applications	Practice + Project	3	Nil	
ENFC0602	Cloud Computing and its applications using Linux OS	Practice + Project	3	Nil	
ENFC0901	Problem Solving using Python	Theory + Practice	3	Nil	
ENFC0902	Object Oriented Programming through Java	Theory + Practice+ Project	3	Nil	
ENFC0903	Web Technologies	Theory & Practice+ Project	3	Nil	
ENFC0904	Software Engineering using Agile	Theory + Practice+ Project	3	Nil	
ENFC1407	Internet of Things	Workshop	2	Nil	
ENFC1402	Build your own Computer	Workshop	2	Nil	
ENFC1403	Cloud Computing Application	Workshop	2	Nil	
ENFC1405	Design thinking and Innovation	Workshop	2	Nil	
ENFC1406	Problem solving Technique	Workshop	2	Nil	

Syllabus

Engineering Mechanics

Course Title	Code	Type of course	T-P-PJ	Prerequisite
Engineering Mechanics	ENFC0101	Theory	3-0-0	Nil

Objective

- To provide the students with a clear and thorough understanding on theory and application of principles of mechanics as applied in engineering problems.

Course Outcome

- Students will acquire knowledge and skill to analyze the effect of force and motion on rigid bodies to solve engineering problems through application of basic laws of mechanics.

Evaluation Systems

	Component	% of Marks	Method of Assessment
Internal Examination	Internal Theory	30	Written examination
	Assignment	5	Report or Presentation + Learning Record
	Attendance	5	Based on class attended
External Examination	External Theory	60	Written examination
Total		100	

Course Outline

Module: I (9 Hrs)

Coplanar Forces : Principles of Statics, Law of Transmissibility of a Force, Composition and Resolution of Forces, Resultant and Equilibrant, Free Body Diagram, Equilibrium of Concurrent Coplanar Forces, Lami's Theorem (Case Studies : - Analysis of a Boom, Analysis of a Tripod Stand, Equilibrium Analysis of a Wall Bracket)

To Understand the Equilibrium of a Particle under the Action of Forces in a Plane using Gravesand's Apparatus or Coplanar Force Setup. (The theory can be taught in practice mode)

Module: II (6 Hrs)

Moment and Couple, Varignon's Principle of Moment, General Conditions of Equilibrium, Types of Supports and Support Reactions,

Friction :Equilibrium of Bodies on Rough Inclined Planes, Ladder Friction, Applications of Friction (Friction in Square Threaded Screw, Disc and Bearing Friction, Belt Friction)

To Determine the Coefficient of Static Friction between two given Material with the Help of an Inclined Plane. (The theory can be taught in practice mode)

Module : III (10 Hrs)

Center of Gravity : General Case of Parallel Forces in a Plane, Centre of Parallel Forces in a Plane, Centroid and Centre of Gravity, Axis of Symmetry, Centroid of Composite Plane Figures and Curves.

Moment of Inertia : Rectangular and Polar Moment of Inertia, Radius of Gyration, Parallel Axis Theorem and Perpendicular Axis Theorem, Moment of Inertia of Plane Composite Figures and Material Bodies. Determination of Moment of Inertia of a Flywheel. (The theory can be taught in practice mode)

Module : IV (6 Hrs)

Linear Motion : Motion under Gravity and Variable Acceleration, Principles of Dynamics such as Newton's Second Law, D'Alembert's Principle, Work-Energy Relation, Impulse-Momentum Relation, Law of Conservation of Momentum and Energy, Impact and its Types, Impact of a Body on a Fixed Plane.

Module : V (5 Hrs)

Concept of Stress and Strain :Types of Stresses and Strains, Hooke's Law, Stress-Strain Diagrams for Ductile and Brittle Materials, Analysis of Axially Loaded Bars. Stress Strain Curve of a Ductile Material (Mild Steel) using UTM.

Module: VI (5Hrs)

Bars of Varying Cross-section, Composite Bars, and Poisson's Ratio, Complimentary Shear Stress, Volumetric Strain, Elastic Constants and their Relationship. Longitudinal and Hoop Stress in Thin-walled Pressure Vessels Subjected to Internal Pressure.

Module : VII (4 Hrs)

Principal Stresses and Strains : Transformation of Stress and Strain, Principal Stresses, Principal Strains, Mohr's Circle for Stress and Strain.

Text Books :

Engineering Mechanics by D.S. Kumar, S.K. Kataria and Sons Strength of Materials by S.S. Rattan, Tata Mc-Graw Hill Publication. Reference Books : Engineering Mechanics by S. Timoshenko, D.H. Young and J.V. Rao, Tata McGraw Hill. Online Source : NPTEL, You tube

Session Plan

Topic coverage and Internal Test	No. of Sessions (in hrs.)	Activity (lecture, tutorial, lab practice, field studies/field -trip, Workshop)	Assignment (project, assignment, field study, seminar, etc.)	Suggested Reading (Book, Video, Online source, etc.)
Module I				
Principles of statics, law of transmissibility of a force, composition and resolution of forces	3	Lecture	Assignment	Engineering Mechanics by D.S. Kumar
Resultant and equilibrant, free body diagram	2	Lecture	Assignment	Engineering Mechanics by D.S. Kumar
Equilibrium of concurrent coplanar forces,	1	Lecture	Assignment	Engineering Mechanics by D.S. Kumar
Lami's theorem, (case studies : - analysis of a boom, analysis of a tripod stand, equilibrium analysis of a wall bracket)	1+2	Lecture + practice	Assignment	Engineering Mechanics by D.S. Kumar
Module II				
Moment and couple, Varignon's principle of moment, general conditions of equilibrium	2	Lecture	Assignment	Engineering Mechanics by D.S. Kumar
Types of supports and support reactions.	1	Lecture	Assignment	Engineering Mechanics by D.S. Kumar
Equilibrium of bodies on rough inclined planes, ladder friction	2	Lecture	Assignment	Engineering Mechanics by D.S. Kumar
Wedge friction, applications of friction (friction in square threaded screw, disc and	1	Lecture	Assignment	Engineering Mechanics by D.S. Kumar

bearing friction, belt friction				
Module III				
Center of Gravity : General case of parallel forces in a plane, centre of parallel forces in a plane, centroid and centre of gravity, axis of symmetry, centroid of composite plane figures and curves.	5	Lecture	Assignment	Engineering Mechanics by D.S. Kumar
Moment of Inertia : Rectangular and polar moment of inertia, radius of gyration, parallel axis theorem and perpendicular axis theorem, moment of inertia of plane composite figures and material bodies. Determination of moment of inertia of a flywheel.	5	Lecture	Assignment	Engineering Mechanics by D.S. Kumar
Module IV				
Linear Motion : Motion under gravity and variable acceleration, principles of dynamics such as Newton's second law, D'Alembert's principle, work-energy relation, impulse-momentum relation, law of conservation of momentum and energy, impact and its types, impact of a body on a fixed plane.	6	Lecture	Assignment	Engineering Mechanics by D.S. Kumar http://vlab.amrita.edu/?sub=1&brch=74&sim=189&cnt=4
Module V				
Concept of stress and strain : Types of stresses	3	Lecture	Assignment	Strength of materials by

and strains, Hooke's law, stress-strain diagrams for ductile and brittle materials, analysis of axially loaded bars.				S.S. Rattan
Stress-strain curve of a ductile material (mild steel) using UTM	2	Practice		Strength of materials by S.S. Rattan
Module VI				
Mechanical properties of materials Rockwell and Brinell hardness tests	2	Practice		Strength of materials by S.S. Rattan
Bars of varying cross-section, composite bars, Poisson's ratio, complimentary shear stress, volumetric strain, Elastic constants and their relationship.	2	Lecture	Assignment	Strength of materials by S.S. Rattan
Longitudinal and hoop stress in thin-walled pressure vessels subjected to internal pressure.	1	Lecture	Assignment	Strength of materials by S.S. Rattan
Module VII				
Principal stresses and strains : Transformation of stress and strain, principal stresses, principal strains, Mohr's circle for stress and strain.	2+2	Lecture + Practice	Assignment	Strength of materials by S.S. Rattan
Total				45

Material Sciences

Course Title	Code	Type of course	T-P-PJ	Prerequisite
Material Sciences	ENFC0102	Theory	3-0-0	Nil

Objective

- To study classification and properties of materials used in day to day life
- To understand the material application and it's needed.

Course Outcome

- Students will able to identify materials for engineering use.
- Students will able to select best materials for a specific design and production.

Evaluation Systems

	Component	% of Marks	Method of Assessment
Internal Examination	Internal Theory	30	Written examination
	Assignment	5	Report or Presentation + Learning Record
	Attendance	5	Based on class attended
External Examination	External Theory	60	Written examination
Total		100	

Course Outline

Module: I (8 Hrs)

Steel, Stainless Steel & Types, HSLA Steels, Dual Phase Steels, Tool and Die Steels. Nonferrous Alloys- Aluminum & Alloys, Copper & Alloys, Zinc & alloys, Nickel & Alloys , Magnesium Alloys, Titanium Alloys, Super Alloys.

Module: II (7 Hrs)

Polymer- Thermosetting, Thermoplastics; Elastomers- Natural & Synthetic Rubber; Composites Material- Classification Based on Matrix and Topology, Particle Reinforced Composites, Fiber Reinforced Composites. Structural Composites, Constituents of Composites, MMC, PMC and FRP. Ceramic Composites, Geosynthetics, Pre-stressed Hollow Concrete Panel, Carbon Composites Fullerenes, C64, Bucky Ball Structures, Graphene.

Module: III (5 Hrs)

Prefabricated Materials: Types and Applications, Autoclaved Aerated Concrete (AAC), Cellular Lightweight Concrete (CLC).

Module: IV (8 Hrs)

Electrical & Magnetic Materials: Classifications, Properties, Advantages & Applications, Photo Voltaic Material, Dielectric Materials.

Module: V (6 Hrs)

Solar Cell and Super Conductivity, Ferro Electricity, Electro-active Polymers, Piezoelectric Material, Magneto Electric Materials, Electrorheological Fluids.

Module: VI (6 Hrs)

Fiber Optic Sensors, Photoconductivity; Introduction to Nano-materials, CNTs Production Process and Uses, Fibers Production and Uses.

Module: VII (8Hrs)

Smart Material, Shape Memory Alloys, Piezoelectric Ceramics, Biomaterials, Bioactive Glass & Ceramic, Polymer & Composite, UHTC, Soft Materials, Energy Materials.

Text Books:

1. Materials Science and Engineering, W D Callister, 2014, 2nd Edition, Wiley India Private Limited, India.

Reference Books:

1. Material Science and Engineering, V Raghavan, 2013, 5th Edition, PHI publication, India.
2. Material Science and Engineering, S Chawla, 2011, 1st Edition, Dhanpat Rai & co Private Ltd., India.

Session Plan

Topic coverage and Internal Test	No. of Sessions (in hrs.)	Activity (lecture, tutorial, lab practice, field studies/field-trip, Workshop etc.)	Assignment (Project, assignment, field study, seminar, etc.)	Suggested Reading (Book, Video, Online source, etc.)
Module I				

Steel	01	Lecture	field study	<p>nptel.ac.in/courses/113104059/lecture_pdf/Lecture%201.pdf</p> <p>Materials Science and Engineering, W D Callister, 2014, 2nd Edition, Wiley India Private Limited, India.</p> <p>https : //www.youtube.com/watch?v=917JqonyoKA https : //www.youtube.com/watch?v=sc24cSZJQcg</p> <p>https : //www.youtube.com/watch?v=hTw9LVMBLns</p>
Stainless Steel & Types	01	Lecture	field study	<p>https : //en.wikipedia.org/wiki/Stainless_steel</p> <p>Materials Science and Engineering, W D Callister, 2014, 2nd Edition, Wiley India Private Limited, India.</p> <p>http : //nptel.ac.in/courses/113104059/</p>
HSLA Steels, Dual Phase steels	01	Lecture		<p>https : //www.metalsupermarkets.com/what-is-hsla-steel/</p> <p>https : //en.wikipedia.org/wiki/High-strength_low-alloy_steel</p> <p>https : //mme.iitm.ac.in/vsarma/mm5025/TRI-P-DP-TWP-Notes.pdf</p> <p>https : //www.worldautosteel.org/steel-basics/steel-types/dual-phase-dp-steels/</p>
Tool and Die Steels	01			<p>https : //www.hitachi-metals.co.jp/e/products/auto/ml/pdf/ys_s_tool_steels_d.pdf</p> <p>http : //www.substech.com/dokuwiki/doku.php?id=tool_and_die_steels</p>
Aluminium & Alloys	01	Lecture		<p>https : //materialsdata.nist.gov/.../Aluminum%20and%20Aluminum%20Alloys%20Davis</p> <p>nptel.ac.in/.../16%20-%20Properties%20and%20Applications%20of%20Materials.pdf</p> <p>nptel.ac.in/courses/112104203/12</p>

				Raghavan, V, Material science and Engineering, 2013, 5th Edition, PHI publication, India.
Copper & Alloys	02	Lecture		Material science and Engineering, V Raghavan, 2013, 5th Edition, PHI publication, India. nptel.ac.in/courses/103106109/.../Lecture%202%20Material%20of%20construction.pdf.
Magnesium Alloys, Titanium Alloys, Super Alloys	01	Lecture		W D Callister, Materials Science and Engineering, 2014, 2nd Edition, Wiley India Private Limited, India. https : //www.sciencedirect.com/topics/materials-science/aluminum-magnesium-alloys https : //uknowledge.uky.edu/cgi/viewcontent.cgi?article=1036&context=cme_etds nptel.ac.in/courses/113105057/25 http : http://megamex.com/superalloys.html
Module II				
Polymer- Thermosetting, Thermoplastics	02	Lecture	field study	1.nptel.ac.in/courses/112107086/13 2.nptel.ac.in/courses/112104229/15 3. W D Callister. Materials Science and Engineering, 2014, 2nd Edition, Wiley India Private Limited, India.
Elastomers- Natural & Synthetic Rubber	01	Lecture		1.WD Callister, Materials Science and Engineering, 2014, 2nd Edition, Wiley India Private Limited, India.
Classification based on matrix and topology, Particle Reinforced Composites, Fiber Reinforced Composites	01	Lecture		1.W D Callister, Materials Science and Engineering 2014 2nd Edition Wiley India Private Limited, India. 2. https : //onlinecourses.nptel.ac.in/noc18_me03 3.nptel.ac.in/downloads/112104168

				4.http : //nptel.ac.in/courses/101104010
Structural Composites, Constituents of Composites	01	Lecture		1.nptel.ac.in/courses/112108150/pdf/PPTs/MTS_12_m.pdf
MMC, PMC and FRP	01	Lecture	field study	http : http : http :
Ceramic Composites, Geosynthetics, Pre-stressed Hollow Concrete Panel, Carbon Composites Fullerenes, C64,Bucky ball Structures, Grapheme	01	Lecture	field study	nptel.ac.in/courses/112107085/module6/lecture6/lecture6.pdf nptel.ac.in/courses/112104122/22
Module –III				
Prefabricated Materials : Types and Applications	02	Lecture	field study	https : https : 2. http : //www.hollowcore.com.au/ 3. https : https :
Autoclaved Aerated Concrete (AAC), Cellular Lightweight Concrete (CLC).	03	Lecture	field study	https : https : www.understandingnano.com/what-is-buckyball-c60.html https : https : textofvideo.nptel.ac.in/105102012/lec41.pdf nptel.ac.in/courses/105102088/27 https : https :
Module IV				

Electrical & Magnetic Materials : Classifications, Properties, Advantages & Applications, Dielectric Materials	08	Lecture		1. nptel.ac.in/courses/115104088/42 2. V Raghavan, Material science and Engineering, 2013, 5th Edition, PHI publication, India.
Module V				
Photo Voltaic Material, Semi conductivity, Solar Cell and Super Conductivity	03	Lecture	field study	nptel.ac.in/courses/113106062/Lec19.pdf 2.nptel.ac.in/courses/113105025/40 3.nptel.ac.in/courses/113104012/34
Ferro electricity, Electro-active polymers	01	Lecture		https : //en.wikipedia.org/wiki/Electroactive_ polymers https : //www.azom.com/article.aspx?ArticleID=13516
Piezoelectric Material , Magneto Electric Materials, Electrorheological Fluids	02	Lecture		1.nptel.ac.in/courses/113104005/69 2.nptel.ac.in/courses/112107088/module1/lecture28/lecture28.pdf
Module –VI				
Fiber optic Sensors, Photoconductivity	02	Lecture	field study	nptel.ac.in/courses/112104158/lecture 39.pdf https : //onlinecourses.nptel.ac.in/noc18_ph06
Introduction to Nano-Materials, CNTs Production Process and Uses	02	Lecture	field study	http : //www.nptel.ac.in/courses/103103033/ 38 2.nptel.ac.in/courses/118104008/ 3.nptel.ac.in/courses/103103026/42 4. https : //www.cheaptubes.com/carbon- nanotubes-history-and-production- methods-2/ https : //www.youtube.com/watch?v=CuqS8GSpC-4

Fiber Production and Uses.	02	Lecture	field study	https : //www.youtube.com/watch?v=IIvveb58PCo
Module –VII				
Smart Material, Shape Memory Alloys	02	Lecture		nptel.ac.in/courses/112104173/Mod_1_smart_mat_lec_5.pdf 2. W D Callister, Materials Science and Engineering, 2014, 2nd Edition, Wiley India Private Limited, India.
Piezoelectric Ceramics	02	Lecture		1.https : //www.youtube.com/watch?v=qXLStQQxHzU
Biomaterials, Bioactive glass & Ceramic, Polymer & Composite	02	Lecture		1.https : //www.youtube.com/watch?v=XqFS1G6WKO0 2.https : //www.youtube.com/watch?v=yZKdFVAJcrE 3.https : //www.youtube.com/watch?v=s5mDURF8YuQ
UHTC	01	Lecture		1.https : //www.youtube.com/watch?v=A-pd3ia8Y4g 2.https : //www.youtube.com/watch?v=XllkWh1nYQ 3.ceramics.org/wp-content/uploads/2011/08/applications-uhtc-johnson.pdf 4.https : //en.wikipedia.org/wiki/Ultra-high-temperature_ceramics
Soft Materials, Energy Materials	01	Lecture		https : //www.youtube.com/watch?v=HdwFkEV8dek https : //www.youtube.com/watch?v=Od4g5kcWsu0 https : //www.youtube.com/watch?v=IipCijIBHeQ https : //www.youtube.com/watch?v=f5RwX_plgw
Total				48 Hrs

Thermodynamics

Course Title	Code	Type of Course	T-P-PJ	Prerequisite
Thermodynamics	ENFC0103	Theory	3-0-0	Nil

Objective

- To know the Laws of Thermodynamics and Conditions for Energy Transformation.
- To get Familiar with Different Thermodynamic Properties of Pure Substances.

Course Outcome

- Students will be able to prepare Energy Balance Sheet.
- Students will be able to determine Efficiency of Various Thermal Devices.

Evaluation Systems

	Component	% of Marks	Method of Assessment
Internal Examination	Internal Theory	30	Written examination
	Assignment	5	Report or Presentation + Learning Record
	Attendance	5	Based on class attended
External Examination	External Theory	60	Written examination
Total		100	

Course outline

Module: I (6 Hours)

Introduction : Difference between Statistical Thermodynamics and Classical Thermodynamics, Concept of Continuum, Traceability of Thermodynamic Change, Concept of Reversibility, Concept of Equilibrium, Design of Thermometers with Three Different Liquids Having Different Coefficient of Thermal Expansion, To Explain Zeroth Law of Thermodynamics. Ideal Gas Temperature Scale and Calibration of Thermometers.

Module: II (9 Hours)

Work Transfer Calculations: Various Modes of Displacement Work. Calculation of Work for Various Processes & Cycles.

Application of First Law of Thermodynamics : Closed Systems & Open Systems. Concept of Internal Energy, Enthalpy & Its Calculation Using Specific Heats.

Module: III (3 Hours)

Energy Balance analysis: Sheet for Opens Systems and Closed Systems : Nozzle, Diffuser, Compressor, Turbine, Heat Exchanger, Throttling Devices, Boilers and Condensers.

Module: IV (10 Hours)

Second Law of Thermodynamics: Working of Refrigerator and Heat Pump. Kelvin Planck and Clausius Statement of Second Law, Corollaries, Clausius Inequality.

Entropy : Definition, Principle of Increase of Entropy. Change of Entropy of Perfect Gas in Various Processes.

Module: V (5 Hours)

Properties of Pure Substance :P-V, P-T, T-S, H-S Diagram for Steam, Triple Point of Water. Different Types of Steam.

Introduction to Steam Tables : Specific Volume, Pressure, Temperature, Enthalpy and Entropy.

Module: VI (6 Hours)

IC Engines : Working Of IC Engines. Classification of IC Engines : 2 Strokes & 4 Strokes Engine, Petrol & Diesel Engines. Engine Nomenclature.

Module: VII (6 Hours)

Gas Power Cycles : Carnot Cycle, Air Standard Cycles-Otto, Diesel, Dual Combustion.

Introduction to Gas Turbine Cycles : Open & Closed Cycle.

Text Books:

1. A Text Book of Engineering Thermodynamics: R K Rajput,4th Edition. Laxmi Publications
2. Thermodynamics an Engineering Approach, Y.A Cengel, M. A Boles, Tata Mcgraw Hill Companies

Reference Books:

1. Fundamentals of Thermodynamics, C. Borgnakke, R. E. Sonntag, Wiley Publication.

Session Plan

Topic coverage and Internal Test	No. of Sessions (in hrs.)	Activity (lecture, tutorial, lab practice, field studies/field-trip, Workshop etc.)	Assignment (project, assignment, field study, seminar, etc.)	Suggested Reading (Book, Video, Online source, etc.)
Module I (6 Hrs)				

Difference between statistical thermodynamics and classical thermodynamics.	1	CRT	Assignment-I	A text book of Engineering Thermodynamics : R K Rajput, 4 th edition. Laxmi publications. Thermodynamics Engineering. Approach, Y.A Cengel, M. A Boles, Tata McGraw Hill Companies.
Concept of continuum. Traceability of thermodynamic change : Concept of reversibility. Concept of equilibrium.	2	CRT	Assignment-I	A text book of Engineering Thermodynamics : R K Rajput, 4 th edition. Laxmi publications. Thermodynamics An Engineering. Approach, Y.A Cengel, M. A Boles, Tata McGraw Hill Companies
Design of thermometers with 3 different liquids having different coefficient of thermal expansion to explain zeroth law of thermodynamics.	2	CRT & Video presentation	Assignment-I	A text book of Engineering Thermodynamics : R K Rajput, 4 th edition. Laxmi publications Thermodynamics An Engineering. Approach, Y.A Cengel, M. A Boles, Tata McGraw Hill Companies <u>https : //www.youtube.com/watch?v=1nECy2s_qEo</u>
Ideal gas temperature scale and calibration of thermometers.	1	CRT	Assignment-I	A text book of Engineering Thermodynamics : R K Rajput, 4 th edition. Laxmi publications. Thermodynamics An Engineering. Approach, Y.A Cengel, M. A Boles, Tata McGraw Hill Companies.
Module II (9 Hrs)				
Work Transfer Calculations : Various modes of displacement work.	5	CRT	Assignment-I	A text book of Engineering Thermodynamics : R K Rajput, 4 th edition. Laxmi publications.

Calculation of work for various processes & cycles.				Thermodynamics An Engineering. Approach, Y.A Cengel, M. A Boles, Tata McGraw Hill Companies.
Application of first law of thermodynamics to closed systems & open systems. Concept of internal energy, enthalpy & its calculation using specific heats	4	CRT	Assignment-I	A text book of Engineering Thermodynamics : R K Rajput, 4 th edition. Laxmi publications. Thermodynamics An Engineering. Approach, Y.A Cengel, M. A Boles, Tata McGraw Hill Companies.
Module III (3 Hrs)				
Energy balance sheet for open systems and closed systems : Nozzle, Diffuser, compressor, turbine, heat exchanger, throttling devices, boilers and condensers.	3	CRT & Video presentation	Assignment-I	A text book of Engineering Thermodynamics : R K Rajput, 4 th edition. Laxmi publications. Thermodynamics An Engineering. Approach, Y.A Cengel, M. A Boles, Tata McGraw Hill Companies. <u>https : //www.youtube.com/watch? v=Nv2G8Dpruxc</u> <u>https : //www.youtube.com/watch? v=-CRiNmIOdZo</u>
Module IV (10 Hrs)				
Working of refrigerator and heat pump.	3	CRT	Assignment-II	A text book of Engineering Thermodynamics : R K Rajput, 4 th edition. Laxmi publications. Thermodynamics An Engineering. Approach, Y.A Cengel, M. A Boles, Tata McGraw Hill Companies.
Kelvin Planck and Clausius statement	2	CRT	Assignment-	A text book of Engineering Thermodynamics : R K

of second law, corollaries.			II	Rajput, 4 th edition. Laxmi publications. Thermodynamics An Engineering. Approach, Y.A Cengel, M. A Boles, Tata McGraw Hill Companies.
Clausius inequality.	1	CRT & Video Presentation	Assignment-II	A text book of Engineering Thermodynamics : R K Rajput, 4 th edition. Laxmi publications. Thermodynamics Engineering. Approach, Y.A Cengel, M. A Boles, Tata McGraw Hill Companies. <u>https : //www.youtube.com/watch?v=wd0Rghxf3M</u> <u>https : //www.youtube.com/watch?v=MbyfTw5YFZs</u>
Entropy : Definition, principle of increase of entropy.	2	CRT	Assignment-II	A text book of Engineering Thermodynamics : R K Rajput, 4 th edition. Laxmi publications. Thermodynamics Engineering. Approach, Y.A Cengel, M. A Boles, Tata McGraw Hill Companies.
Change of entropy of perfect gas in various processes	2	CRT	Assignment-II	A text book of Engineering Thermodynamics : R K Rajput, 4 th edition. Laxmi publications. Thermodynamics An Engineering. Approach, Y.A Cengel, M. A Boles, Tata McGraw Hill Companies.
Module V (5 Hrs)				
Properties of pure substance : p-v, p-T, T-S, h-S	3	CRT & Video	Assignment-II	A text book of Engineering Thermodynamics : R K Rajput, 4 th edition. Laxmi

<p>diagram for steam, Triple point of water. Different types of steam.</p>		<p>presentation</p>		<p>publications. Thermodynamics Engineering. Approach, Y.A Cengel, M. A Boles, Tata McGraw Hill Companies. <u>https : //www.youtube.com/watch?v=pP2HuLPkrkY</u> <u>https : //www.youtube.com/watch?v=p.IM9Fh9Fp-I</u></p>
<p>Introduction to steam table with respect to specific volume, pressure, temperature, enthalpy and entropy</p>	<p>2</p>	<p>CRT</p>	<p>Assignment-II</p>	<p>A text book of Engineering Thermodynamics : R K Rajput, 4th edition. Laxmi publications. Thermodynamics An Engineering. Approach, Y.A Cengel, M. A Boles, Tata McGraw Hill Companies.</p>
<p>Module VI (6 Hrs)</p>				
<p>IC Engines :Working of IC engines. Classification of IC engines.</p>	<p>2</p>	<p>CRT & Videopresentation</p>	<p>Assignment-III</p>	<p>A text book of Engineering Thermodynamics : R K Rajput, 4th edition. Laxmi publications. Thermodynamics Engineering. Approach, Y.A Cengel, M. A Boles, Tata McGraw Hill Companies. <u>https : //www.youtube.com/watch?v=emSXIjwGfOU</u> <u>https : //www.youtube.com/watch?v=Pu7g3uIG6Zo</u> <u>https : //www.youtube.com/watch?v=fD7GOrF7laY</u> <u>https : //www.youtube.com/watch?</u></p>

				<u>v=rhzgeNAXvfs</u>
2 strokes & 4 strokes engine, Petrol & diesel engines. Engine nomenclature.	4	PRA	Assignment-III	A text book of Engineering Thermodynamics : R K Rajput, 4 th edition. Laxmi publications. Thermodynamics Engineering. Approach, Y.A Cengel, M. A Boles, Tata McGraw Hill Companies.
Module VII (6 Hrs)				
Gas Power Cycles : Carnot cycle, Air standard cycles- Otto, Diesel and Dual Combustion cycle.	4	CRT	Assignment-III	A text book of Engineering Thermodynamics : R K Rajput, 4 th edition. Laxmi publications. Thermodynamics An Engineering. Approach, Y.A Cengel, M. A Boles, Tata McGraw Hill Companies.
Introduction to Gas Turbine Cycles : Open & Closed Cycle	2	Video	Assignment-III	<u>https : //www.youtube.com/watch? v=m4kvSLlxAaI</u> <u>https : //www.youtube.com/watch? v=eTJkz99Jjx8</u> <u>https : //www.youtube.com/watch? v=zcWkEKNvqCA</u>
Total (hrs)				45

Introduction to Communication Engineering

Course Title	Code	Type of Course	T-P-PJ	Prerequisite
Introduction to Communication Engineering	ENFC0104	Theory	3-0-0	Nil

Objective

<ul style="list-style-type: none"> The objective of this subject is to impart the fundamentals of modern digital & analog communication systems.

Course Outcome

<ul style="list-style-type: none"> Upon successful completion of this subject students should be able to : understand important concepts in communication engineering and an insight into modern communication standards.
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Evaluation Systems

	Component	% of Marks	Method of Assessment
Internal Examination	Internal Theory	30	Written examination
	Assignment	5	Report or Presentation + Learning Record
	Attendance	5	Based on class attended
External Examination	External Theory	60	Written examination
Total		100	

Course Outline

Module: I (06 Hours)

Land Line Communication :

Evolution of telecommunications, simple telephone communication, basics of switching system, switching system parameters, signaling tones, electronic space division switching centralized and distributed SPC

Module : II (06 Hours)

Optical Communication:

Fiber-Optic Cable, Optical Principles, Optical Communication System, Fiber Optical Cables.

Module: III (07 Hours)

Elements of a Television System : Picture Transmission, Sound Transmission, Picture Reception, Sound Reception, Synchronization, Receiver Controls, Color Television.

Signal Transmission and Channel Bandwidth : Amplitude Modulation, Channel Bandwidth, Vestigial Sideband, Transmission, Transmission Efficiency Complete Channel Bandwidth, Reception of Vestigial Sideband Signals, Frequency Modulation, FM Channel Bandwidth, Channel Bandwidth for Colour Transmission, Allocation of Frequency Bands for Television Signal Transmission, Television Standards.

Module: IV (06 Hours)

Mobile Communication: Overview of Cellular Systems and Evolution of 2G/3G/4G/5G, Cellular Concepts – Cellular Systems, Hexagonal Cell Geometry, Frequency reuse, Co-channel and Adjacent channel Interference, Cell Splitting, Handoff, Blocking, GSM& CDMA Standards. WLAN, Bluetooth, Infrared Wireless, Wi-fi, Wi-Max.

Module: V (06 Hours)

Radar Communication : RADAR, Applications, Types, Frequency Bands, Basic Radar, RADAR range equation, Pulsed RADAR, CW RADAR, MTI RADAR, Tracking RADAR, Global Positioning System.

Module: VI (06 Hours)

Satellite Communication: Basic Satellite Systems, Indian Scenario, Satellite Orbits, Satellite Communication Systems, satellite link design,

Module: VII (08 Hours)

Internet Communication:

Data Communication Architecture, Link To Link Layers, End-To-End Layers, Switching Techniques for Data Transmission, LAN, MAN, ISDN, BISDN.

Text Books:

1. Telecommunication Switching Systems and Networks, Thiagarajan Vishwanathan PHI Publisher .
2. Fiber-Optic Communication Systems, 3ed Paperback – 2007 by Govind P. Agrawal.
3. Monochrome and colour television by R.R.Gulati
4. Satellite Communication by T. Pratt, C. Bostian and J. Allnutt. 2nd Edition, John Wiley Co.
5. Radar engineering by G. S. N. Raju

Session Plan

Topic Coverage and Internal Test	No. of Sessions (in hrs.)	Activity (lecture, tutorial, lab practice, field studies/field-trip, Workshop etc.)	Assignment (Project, assignment, field study, seminar, etc.)	Suggested Reading (Book, Video, Online source, etc.)
Module-I [06 hrs. Lecture]				
Evolution of telecommunications, simple telephone communication,	1	Lecture		Text Book-1
Basics of switching system,	1	Lecture		Text Book-1
switching system parameters,	1	Lecture		Text Book-1
signaling tones,	1	Lecture		Text Book-1
electronic space division switching	1	Lecture		Text Book-1
centralized and distributed SPC	1	Lecture		Text Book-1
Module-II [06 hrs. Lecture]				
Fiber-Optic Cable	1	Lecture		Text Book-2
Optical Principles	1	Lecture		Text Book-2
Optical Communication System	2	Lecture		Text Book-2
Fiber Optical Cables.	2	Lecture		Text Book-2
Module-III [07 hrs. Lecture]				
Elements of a Television System : Picture Transmission, Sound Transmission, Picture Reception	1	Lecture		Text Book-3
Sound Reception, Synchronization, Receiver Controls , Colour Television.	1	Lecture		Text Book-3

Signal Transmission and Channel Bandwidth : Amplitude Modulation , Channel Bandwidth	1	Lecture		Text Book-3
Vestigial Sideband ,Transmission , Transmission Efficiency	1	Lecture		Text Book-3
Complete Channel Bandwidth , Reception of Vestigial Sideband Signals , Frequency Modulation	1	Lecture		Text Book-3
FM Channel Bandwidth, Channel Bandwidth for Colour Transmission	1	Lecture		Text Book-3
Allocation of Frequency Bands for Television Signal Transmission, Television Standards.	1	Lecture		Text Book-3
Module-IV [06 hrs. Lecture]				
Overview of Cellular Systems and Evolution of 2G/3G/4G/5G	1	Lecture		Text Book-4
Cellular Concepts – Cellular Systems, Hexagonal Cell Geometry	1	Lecture		Text Book-4
Frequency reuse, Co-channel and Adjacent channel Interference	1	Lecture		Text Book-4
Cell Splitting, Handoff, Blocking, GSM & CDMA	1	Lecture		Text Book-4
Standards. WLAN, Bluetooth	1	Lecture		Text Book-4
Infrared Wireless, Wi-fi, Wi-Max	1	Lecture		Text Book-4
Module-V [06 hrs. Lecture]				
RADAR, Applications, Types, Frequency Bands	1	Lecture		Text Book-5
Basic Radar , RADAR range equation,	1	Lecture		Text Book-5
Pulsed RADAR,	1	Lecture		Text Book-5
CW RADAR,	1	Lecture		Text Book-5
MTI RADAR, Tracking RADAR	1	Lecture		Text Book-5
Global Positioning System.	1	Lecture		Text Book-5
Module-VI [06 hrs. Lecture]				

Basic Satellite Systems	1	Lecture		Text Book-4
Indian Scenario	1	Lecture		Text Book-4
Satellite Orbits	1	Lecture		Text Book-4
Satellite Communication Systems	2	Lecture		Text Book-4
Satellite link design	1	Lecture		Text Book-4
Module-VII [08hrs. Lecture]				
Data Communication Architecture	1	Lecture		Text Book-1
Link To Link Layers	1	Lecture		Text Book-1
End-To-End Layers	1	Lecture		Text Book-1
Switching Techniques for Data Transmission	2	Lecture		Text Book-1
LAN, MAN	1	Lecture		Text Book-1
ISDN	1	Lecture		Text Book-1
BISDN.	1	Lecture		Text Book-1
Total (hrs.)				45 hr.

Introduction to Aerospace Engineering

Course Title	Code	Type of course	T-P-PJ	Prerequisite
Introduction to Aerospace Engineering	ENFC0105	Theory	3-0-0	Nil

Objective

- To familiarize with the Basic Concepts of Flying, Aircraft Structures, Systems, Instruments and Power Plants used in Airplanes.

Course Outcome

- To Identify the Component of Flight and Suitable Materials for Aircraft Structure.
- To Perform Basic Calculation on Mechanics using Newton Law for Lift, Drag and Moment.

Evaluation Systems

	Component	% of Marks	Method of Assessment
Internal Examination	Internal Theory	30	Written examination
	Assignment	5	Report or Presentation + Learning Record
	Attendance	5	Based on class attended
External Examination	External Theory	60	Written examination
Total		100	

Course Outline

Module: I (08 Hrs)

History of Flight:

Early flying vehicles by Wright brothers, hot air balloons, Classification of flight vehicles, biplanes and monoplanes, developments in aerodynamics airplanes and Helicopters, Components of an airplane and their functions.

Module: II (06 Hrs)

Basics of Aeronautics: Physical properties and structure of the atmosphere, temperature, pressure and altitude relationships.

Module: III (08 Hrs)

Newton's law of motions applied to aeronautics - evolution of lift, drag and moment. aerofoils, mach number, subsonic, transonic, supersonic, hypersonic flows.

Module: IV (06 Hrs)

Airplane Structures and Materials :General types of construction, monocoque and semi-monocoque constructions, typical wing and fuselage structure.

Module: V (06 Hrs)

Airplane Structures and Materials:Materials used in aircraft metallic and non-metallic materials, use of aluminium alloy, titanium, stainless steel and composite materials.

Module: VI (06 Hrs)

Systems and Instruments:Conventional control, Powered controls, Basic instruments for flying, typical systems for control actuation.

Module: VII (08 Hrs)

Power Plants : Basic ideas about piston, turboprop and jet engines - use of propeller and jets for thrust production - comparative merits, principles of operation of rocket, types of rockets and typical applications, exploration into space.

References

Text Books :

J.D. Anderson, Introduction to Flight, McGraw Hill

A.C. Kermode, Mechanics of Flight, Himalayan Book

Reference Books :

E.H.J. Pallet, Aircraft Instruments & Principles, Pitman & Co

Online Source : NPTEL, You tube

Introduction to Computer Networks

Course Title	Code	Type of course	T-P-PJ	Prerequisite
Introduction to Computer Networks	FCEN0120	Theory	3-0-0	Nil

Objective

<ul style="list-style-type: none"> This course introduces the architecture, functions, and components of the Internet and computer networks, the principles and structure of IP addressing and sub netting, the fundamentals of Ethernet, the architecture, components and operations of routers, routing protocols and switches in a network. Topics include TCP/IP, Ethernet, IPv4, routers, switches.
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Course Outcome

<ul style="list-style-type: none"> Upon successful completion of this course students will be able to define layers of the OSI model and identify the protocols, and services associated with each layer, identify the purpose, features, and functions of current common network hardware and the OSI layer with which each is associated Explain the operation principles of current common network hardware devices, describe current common protocols in terms of their function, routing, addressing schemes, interoperability, and naming conventions, justify information security issues in computer net works.

Evaluation Systems

	Component	% of Marks	Method of Assessment
Internal Examination	Internal Theory	30	Written examination
	Assignment	5	Report or Presentation + Learning Record
	Attendance	5	Based on class attended
External Examination	External Theory	60	Written examination
Total		100	

Course outline

Module I Computer Networking Fundamentals

(8Hrs.)

Networking fundamentals, Internet, Access Networks, Physical Media, Switching techniques, Layered Architecture, Introduction to the Seven layers of the OSI model, concept of the OSI model, TCP/IP model and comparison with OSI model, the Application Layer, the Presentation Layer, the Session Layer, the Transport Layer, the Network Layer, the Data Link Layer & the Physical layer.

Module II (Part-1) Security Protocols - Application Layer (5 Hrs.)

Introduction to Protocol concepts, Important Protocols, File Transfer Protocol, Socket Secure (OCS), Secure Shell (SSH), Remote Terminal Control Protocol (Telnet), HTTP.

Module III (Part -2) Security Protocols - Application Layer (2) (4 Hrs.)

Transport Layer Security/Secure Sockets Layer (TLS/SSL), Extensible Messaging & Presence Protocol (XMPP), Wireless Application Protocol (WAP) & Internet Relay Chat (IRC), SMTP.

Module IV (Part-1) Transport Layer (4 Hrs.)

Introduction to Transport Layer, TCP/IP, User Datagram Protocol (UDP), Real-time Transport Protocol (RTP)

Module V (Part-2) Transport Layer (4 Hrs)

Datagram Congestion Control Protocol (DCCP), Stream Control Transmission Protocol (SCTP), Resource reservation Protocol (RSVP)&Explicit Congestion Notification (ECN)

Module VI Network Layer (8Hrs.)

Introduction to Network Layer, Internet Protocol Version 4 (IPv4), Internet Protocol Version 6 (IPv6), internet Protocol Security (IPSEC), Internet Control Message Protocol (ICMP) & Internet Group Management Protocol (IGMP)

Module VII: Data Link Layer (8Hrs.)

Introduction to Data Link Layer, Error correction and detection, CRC, the Address Resolution Protocol (ARP), Tunneling Protocol (Tunnels) &the Point to Point Protocol (PPP), HDLC.

E-content: LMS Content

Reference Books/Text Books:

1. Information Systems Security: Security Management, Metrics, Frameworks and Best Practices by Nina Godbole
2. Network Security Bible by Eric Cole.
3. Computer Networking by Kurose, Ross

Online Source:

1. <https://www.lifewire.com/layers-of-the-osi-model-illustrated-818017>
2. https://www.webopedia.com/quick_ref/OSI_Layers.asp
3. https://www.tutorialspoint.com/network_security/network_security_application_layer.htm
4. https://www.tutorialspoint.com/data_communication_computer_network/transport_layer_introduction.htm
5. <https://www.studytonight.com/computer-networks/osi-model-network-layer>
6. https://www.tutorialspoint.com/data_communication_computer_network/data_link_layer_introduction.htm

Session Plan

Topic coverage and Internal Test	No. of Sessions (in hrs.)	Activity (lecture, tutorial, lab practice, field studies/field-trip, Workshop etc.)	Assignment (project, assignment, seminar, etc.)	Suggested Reading (Book, Video, Online source, etc.)
Module-1 Computer Networking Fundamentals (Total = 8hrs)				
Networking fundamentals, Internet,	2	Lecture + PPT	Assignment	Book, Online Sources, LMS
Access Networks, Physical Media	1	Lecture + PPT	Assignment	Book, Online Sources, LMS
Switching techniques, Layered Architecture,	1	Lecture + PPT	Assignment	Book, Online Sources, LMS
Introduction to the Seven layers of the OSI model, concept of the OSI model, TCP/IP model and comparison with OSI model,	2	Lecture + PPT	Assignment	Book, Online Sources, LMS
<ul style="list-style-type: none"> the Application Layer, the Presentation Layer, the Session Layer, 	1	Lecture + PPT	Assignment	Book, Online Sources, LMS
<ul style="list-style-type: none"> the Transport Layer, the Network Layer, the Data Link Layer & the Physical layer. 	1	Lecture + PPT	Assignment	Book, Online Sources, LMS
Module-2 (Part -1) Security Protocols - Application Layer (2) (Total = 5hrs)				
Introduction to Protocol concepts, Important Protocols	2	Lecture + PPT	Assignment	Book, Online Sources, LMS
,File Transfer Protocol, Socket Secure (SOCKS), Secure Shell (SSH), Remote Terminal Control Protocol (Telnet). HTTP	3	Lecture + PPT	Assignment	Book, Online Sources, LMS

Module-3 (Part -2) Security Protocols - Application Layer (2) (Total = 4 hrs)				
Transport Layer Security/Secure Sockets Layer (TLS/SSL),	2	Lecture + PPT	Assignment	Book,Online Sources,LMS
Extensible Messaging & Presence Protocol (XMPP), Wireless Application Protocol (WAP) & Internet Relay Chat (IRC), SMTP	2	Lecture + PPT	Assignment	Book,Online Sources,LMS
Module-4 (Part-1) Transport Layer (Total = 4 hrs)				
Introduction to Transport Layer, TCP/IP, User Datagram Protocol (UDP), Real-time Transport Protocol (RTP)	4	Lecture + PPT	Assignment	Book,Online Sources,LMS
Module-5 (Part-2) Transport Layer (Total = 4 hrs)				
Datagram Congestion Control Protocol (DCCP)	1	Lecture + PPT	Assignment	Book,Online Sources,LMS
Stream Control Transmission Protocol (SCTP),	1	Lecture + PPT	Assignment	Book,Online Sources,LMS
Resource reservation Protocol (RSVP)&Explicit Congestion Notification (ECN)	2	Lecture + PPT	Assignment	Book,Online Sources,LMS
Module-6 Network Layer (Total = 8hrs)				
Introduction to Network Layer, Internet Protocol Version 4 (IPv4), Internet Protocol Version 6 (IPv6),	4	Lecture + PPT	Assignment	Book,Online Sources,LMS
Internet Protocol Security (IPSEC), Internet Control Message Protocol (ICMP) & Internet Group Management Protocol (IGMP)	4	Lecture + PPT	Assignment	Book,Online Sources,LMS

Module-7 Data Link Layer (Total = 8hrs)				
Introduction to Data Link Layer, Error correction and Detection, CRC the Address Resolution Protocol (ARP), the Open Shortest Path First (OSPF), the Neighbor Discovery Protocol (NDP).	5	Lecture + PPT	Assignment	Book,Online Sources,LMS
The Tunneling Protocol (Tunnels) & the Point to Point Protocol (PPP), HDLC	3	Lecture + PPT	Assignment	Book,Online Sources,LMS
<i>Total (hrs)</i>	Total = 41 Hours (Theory)			

Computer Fundamental and Organization

Course Title	Code	Type of course	T-P-PJ	Prerequisite
Computer Fundamental and Organization	FCEN 0118	Theory	3-0-0	Nil

Objective

- To explore the organization of computer system and its working.
- To understand the basics of computer networks.
- To use office packages like MS Office.

Course Outcome

- After completing the course students will able to
- Explain different components of computer system and their functions.
- Know the basics about computer networks.
- Use word processing, spreadsheet, and power point applications.

Evaluation Systems

	Component	% of Marks	Method of Assessment
Internal Examination	Internal Theory	30	Written examination
	Assignment	5	Report or Presentation + Learning Record
	Attendance	5	Based on class attended
External Examination	External Theory	60	Written examination
Total		100	

Course outline

Module: I (7 hrs)

General Features of a Computer: General features of a computer, Generation of computers, Personal computer, workstation, mainframe computer and super computers. Computer applications – data processing, information processing, commercial, office automation, industry and engineering, healthcare, education, graphics and multimedia.

Module: II (6 hrs)

Computer Organization: Computer organization, central processing unit, computer memory – primary memory and secondary memory. Secondary storage devices – Magnetic and optical media. Input and output units. OMR, OCR, MICR, scanner, mouse, modem.

Module: III (5 hrs)

Computer Hardware and Software Computer hardware and software. Machine language and high level language. Application software, computer program, operating system. Computer virus, antivirus and computer security. Elements of MS DOS and Windows OS.

Module IV: (5 hrs)

Computer Arithmetic and Number System :Computer arithmetic, Binary, octal and hexadecimal number systems.

Module V: (6 hrs)

Logic Gates: Algorithm and flowcharts, illustrations, elements of a database and its applications
Basic Gates (**De Morgan's** theorems, duality theorem, NOR, NAND, XOR, XNOR gates), Boolean expressions and logic diagrams, Types of Boolean expressions.

Module: VI: (5 hrs)

MS Office: Word processing and electronic spread sheet. An overview of MSWORD, MSEXCEL and MSPOWER POINT.

Module VII : (5 hrs)

Introduction to Networking: Network of computers. Types of networks, LAN, Intranet and Internet. Internet applications. World Wide Web, E-mail, browsing and searching, search engines, multimedia applications.

Reference

E-content : LMS

Reference Books:

Alexis Leon and Mathews Leon (1999) : Fundamentals of information Technology, Leon Techworld Pub.

Jain, S K (1999) : Information Technology “O” level made simple, BPB Pub

Jain V K (2000) “O” Level Personal Computer software, BPB Pub.

Rajaraman, V (1999) : Fundamentals of Computers, Prentice Hall India

Hamacher, Computer Organization McGrawhill

Alexis Leon : Computers for everyone. Vikas, UBS

Anil Madaan : Illustrated Computer Encyclopedia. Dreamland Pub

Sinha. Computer Fundamentals BPB Pub.

Online Source : Microsoft academy, Edx

Session Plan

Topic coverage and Internal Test	No. of Sessions (in hrs.)	Activity (lecture, tutorial, lab practice, field studies/field-trip, Workshop etc.)	Assignment (project, assignment, field study, seminar, etc.)	Suggested Reading (Book, Video, Online source, etc.)
Module I Lecture=7 Hrs.				
General features of a computer, Generation of computers, Personal computer, workstation mainframe computer and super computers	3	lecture	assignment	Book, Online Source, SLM
Mainframe computer and super computers	2	lecture	assignment	Book, Online Source, SLM
Computer applications – data processing, information processing, commercial, office automation, industry and engineering, healthcare, education, graphics and multimedia.	2	lecture	assignment	Book, Online Source, SLM
Module II Lecture=6 Hrs.				
Computer organization, central processing unit, computer memory – primary memory and secondary memory.	3	lecture	assignment	Book, Online Source, SLM
Secondary storage devices – Magnetic and optical media. Input and output units. OMR, OCR, MICR, scanner, mouse, modem.	3	lecture	assignment	Book, Online Source, SLM
Module III Lecture=5 Hrs.				

Computer hardware and software. Machine language and high level language.	2	lecture	assignment	Book, Online Source, SLM
Application software, computer program, operating system. Computer virus, antivirus and computer security. Elements of MS DOS and Windows OS.	3	lecture	seminar	Book, Online Source, SLM
Module IV Lecture=5 Hrs.				
Computer arithmetic, Binary, octal and hexadecimal number systems.	5	lecture	assignment	Book, Online Source, SLM
Module V Lecture=6 Hrs.				
Algorithm and flowcharts, illustrations, elements of a database and its applications.	3	lecture	assignment	Book, Online Source, SLM
Basic Gates (De Morgan's theorems, duality theorem, NOR, NAND, XOR, XNOR gates), Boolean expressions and logic diagrams, Types of Boolean expressions.	3	lecture	assignment	Book, Online Source, SLM
Module VI Lecture=5 Hrs.				
Word processing and electronic spread sheet. An overview of MS WORD, MS EXCEL and MS POWER POINT	5	lecture	assignment	Book, Online Source, SLM
Module VII Lecture=5 Hrs.				
Network of computers. Types of networks, LAN, Intranet and Internet.	2	lecture	assignment	Book, Online Source, SLM

Internet applications. World Wide Web, E-mail, browsing and searching, search engines, multimedia applications.	3	lecture	Assignment	Book, Online Source, SLM
Total (hrs)	39			

Operating System Building Blocks

Course Title	Code	Type of course	T-P-PJ	Prerequisite
Operating System Building Blocks	FCEN 0119	Theory	3-0-0	Nil

Objective

- The operating system is the most important program that runs on a computer. Every general-purpose computer must have an operating system to run other programs.
- Operating systems perform basic tasks, such as recognizing input from the keyboard, sending output to the display screen, keeping track of files and directories on the disk, and controlling peripheral devices such as disk drives and printers.
- This course covers the concept of operating system and its applications.

Course Outcome

- After learning the fundamental concepts in Operating system including how OS has evolved over the years and different components of OS, students will continue to more significant functions of OS like Process management, storage and memory management etc.
- This will provide the necessary information for students to extract maximum benefits out of the OS while developing programs, working with applications etc.

Evaluation Systems

	Component	% of Marks	Method of Assessment
Internal Examination	Internal Theory	30	Written examination
	Assignment	5	Report or Presentation + Learning Record
	Attendance	5	Based on class attended
External Examination	External Theory	60	Written examination
Total		100	

Course outline

Module I: (5 Hrs.)

Introduction to Operating System: Objectives and Functions of OS, Evolution of OS, OS Structures, OS Components, OS Services, System calls, System programs, Virtual Machines.

Module II: (8 Hrs.)**Process Management – Processes and Threads**

Processes: Process concept, Process scheduling, Co-operating processes, Operations on processes, Inter process communication, Communication in client-server systems. Threads : Introduction to Threads, Single and Multi-threaded processes and its benefits, User and Kernel threads, Multithreading models, threading issues. CPU Scheduling : Basic concepts, Scheduling criteria, Scheduling Algorithms, Multiple Processor Scheduling, Real-time Scheduling, Algorithm Evaluation, Process Scheduling Models.

Module III: (6 Hrs.)

Process Management – Synchronization : Process Synchronization : Mutual Exclusion, Critical – section problem, Synchronization hardware, Semaphores, Classic problems of synchronization, Critical Regions, Monitors, OSS Synchronization, Atomic Transactions.

Module IV: (4 Hrs)

Deadlock Handling Deadlocks: System Model, Deadlock characterization, Methods for handling Deadlocks, Deadlock prevention, Deadlock Avoidance, Deadlock, Detection, Recovery from Deadlock.

Module V: (8 Hrs.)

Memory Management: Memory Management: Logical and physical Address Space, Swapping, Contiguous Memory Allocation, Paging, Segmentation with Paging. Virtual Management : Demand paging, Process creation, Page Replacement Algorithms, Allocation of Frames, Thrashing, Operating System Examples, Page size and other considerations, Demand segmentation.

Module VI: (4 Hrs.)

Device and File Management File-System Interface : File concept, Access Methods, Directory structure, File- system Mounting, File sharing, Protection and consistency semantics. File-System Implementation: File-System structure, File-System Implementations, Directory Implementation, Allocation Methods, Free-space Management, Efficiency and Performance, Recovery. Disk Management Disk Structure, Disk Scheduling, Disk Management, Swap-Space Management, Disk Attachment, stable-storage Implementation.

Module VII : (4 Hrs.)

Protection and Security Protection : Goals of Protection, Domain of Protection, Access Matrix, Implementation of Access Matrix, Revocation of Access Rights, Capability- Based Systems, Language – Based Protection. Security : Security Problem, User Authentication, One – Time Password, Program Threats, System Threats, Cryptography, Computer – Security Classifications.

E-content: LMS Content

Text Books:

1. Operating System by Silberschatz / Galvin / Gagne, 6th Edition, WSE (WILEY Publication)
2. Operating System by Abraham Silberschatz and peter Baer Galvin, 8th Edition, Pearson Education 1989 (Chapter 1,3.1,3.2,3.3,3.4,3.6,4,5,6 (Except 6.8,6.9), 7, 8,9,10,11,13, (Except 13.6) 19 (Except 19.6),20(Except 20.8, 20.9), 22,23).

Reference Books:

1. Operating System Concepts and design by Milan Milonkovic, II Edition, McGraw Hill 1992.
2. Operation System Concepts by Tanenbaum, 2nd Edition, Pearson Education.
3. Operating System by William Stallings, 4th Edition, Pearson Education.
4. Operating System by H.M. Deitel , 2nd Edition Pearson Education.
5. Operating Systems by Nutt, 3/e Pearson Education 2004.

Online Source:

<http://www.sci.brooklyn.cuny.edu/~jniu/teaching/csc33200/files/0915-OperatingSystemsOverview.pdf>
<http://codex.cs.yale.edu/avi/os-book/OS8/os8c/slide-dir/PDF-dir/ch1.pdf>
<http://www.ddegjust.ac.in/studymaterial/mca-3/ms-08.pdf>
<http://www2.latech.edu/~box/os/ch06a.pdf>
<http://www.cs.ucsb.edu/~rich/class/cs170/notes/IntroThreads>
<http://codex.cs.yale.edu/avi/os-book/OS8/os8c/slide-dir/PDF-dir/ch5.pdf>
<https://www.kernel.org/doc/gorman/html/understand/understand014.html>
https://www.cs.uic.edu/~jbell/CourseNotes/OperatingSystems/14_Protection.html
<http://www.slideshare.net/Colin058/network-security-threats-and-solutions-1018888>
<http://www.openbsd.org/papers/crypt-service.pdf>

Session Plan

Topic coverage and Internal Test	No. of Sessions (in hrs.)	Activity (lecture, tutorial, lab practice, field studies/field-trip, Workshop etc.)	Assignment (project, assignment, field study, seminar, etc.)	Suggested Reading (Book, Video, Online source, etc.)
Module - I (5 Hrs.)				
Introduction to Operating System : Objectives and Functions of OS,	3	Lecture	Assignment	Book, Online Source

Evolution of OS				
OS Structures, OS Components, OS Services	1	Lecture	Assignment	Book, Online Source
System Calls	1	Lecture	Assignment	Book, Online Source
Module - II (8 Hrs.)				
Process Management – Processes and Threads : Processes : Process concept, Process scheduling, Co-operating processes, Operations on processes	2	Lecture	Assignment	Book, Online Source
Inter process communication, Communication in client-server systems.	2	Lecture	Assignment	Book, Online Source
Threads : Introduction to Threads, Single and Multi-threaded processes and its benefits, User and Kernel threads, Multithreading models, Threading issues.	1	Lecture	Assignment	Book, Online Source
CPU Scheduling : Basic concepts, Scheduling criteria, Scheduling Algorithms, Multiple Processor Scheduling, Real-time Scheduling, Algorithm Evaluation, Process Scheduling Models.	3	Lecture	Assignment	Book, Online Source

Module - III (6 Hrs.)				
Process Management – Synchronization Mutual Exclusion, Critical – section problem, Synchronization hardware, Semaphores	3	Lecture	Assignment	Book, Online Source
Classic problems of synchronization, Critical Regions.	3	Lecture	Assignment	Book, Online Source
Module - IV (4 Hrs.)				
Deadlock Handling : System Model, Deadlock characterization, Methods for handling Deadlocks, Deadlock prevention, Deadlock Avoidance.	2	Lecture	Assignment	Book, Online Source
Deadlock Detection, Recovery from Deadlock.	2	Lecture	Assignment	Book, Online Source
Module - V (8 Hrs.)				
Memory Management : Logical and physical Address Space, Swapping.	3	Lecture	Assignment	Book, Online Source
Contiguous Memory Allocation	2	Lecture	Assignment	Book, Online Source
Paging, Segmentation with Paging.	3	Lecture	Assignment	Book, Online Source
Module - VI (4 Hrs.)				
Device and File Management : File-System Interface: File concept, Access Methods, Directory structure, File- system Mounting, File sharing, Protection and	1	Lecture	Assignment	Book, Online Source

consistency semantics.				
File-System Implementation: File-System structure, File-System Implementations, Directory Implementation, Allocation Methods, Free-space Management, Efficiency and Performance, Recovery.	1	Lecture	Assignment	Book, Online Source
Disk Management: Disk Structure, Disk Scheduling, Disk Management, Swap-Space Management, Disk Attachment, stable-storage Implementation.	2	Lecture	Assignment	Book, Online Source
Module-VII (4 Hrs.)				
Protection and Security: Protection: Goals of Protection, Domain of Protection, Access Matrix, Implementation of Access Matrix, Revocation of Access Rights, Capability-Based Systems, Language – Based Protection.	2	Lecture	Assignment	Book, Online Source
Security : Security Problem, User Authentication, One – Time Password, Program Threats, System Threats, Cryptography, Computer – Security Classifications	2	Lecture	Assignment	Book, Online Source
Total (hrs)	39 Hrs.			

Introduction to Biotechnology

Course Title	Code	Type of course	T-P-PJ	Prerequisite
Introduction To Biotechnology	FCEN0115	Theory	3-0-0	Nil

Objective

- To introduce students basic knowledge about biotechnology

Course Outcome

- To impart a sound knowledge on the principles of Biotechnology involving the different application oriented topics required for all engineering branches.

Evaluation Systems

	Component	% of Marks	Method of Assessment
Internal Examination	Internal Theory	30	Written examination
	Assignment	5	Report or Presentation + Learning Record
	Attendance	5	Based on class attended
External Examination	External Theory	60	Written examination
Total		100	

Course outline

Module: I

Biochemistry: Component of the cell, structure and biochemical functions,

Module: II

Biomolecules-Carbohydrates, lipids, proteins, Nucleic acids, Structure and classification of enzymes

Module: III

Cell Biology Eukaryotic, Prokaryotic cells, Cell cycle – Mitosis and Meiosis,

Module: IV

Cell fractionation and flow cytometry.

Module: V

Introduction to nucleic acids: Nucleic acids as genetic material, Structure and physicochemical properties of elements in DNA and RNA, Biological significance of differences in DNA and RNA.

Module: VI

Immunology: Cells of immune system, Development, maturation, activation and differentiation of Tcells and Bcells, Phagocytosis process

Module VII

Biotechnology Applications: Industrial production, Drug discovery and development

Text Books:

1. Lehninger A.L., Nelson D.L. and Cox M.M. Principles of Biochemistry. CBS publishers and distributors.
2. Murray R.K., Granner D.K., Mayes P.A. and Rodwell V.W. Harpers Biochemistry. Appleton and Lange ,Stanford ,Conneticut.

Reference Books:

1. Lodish, Harvey etal., “ Molecular Cell Biology,” 6th Edition. W.H.Freeman, 2008
2. Alberts, Bruce, “Molecular Biology of Cell”, 5th Edition, Garland Science, 2008.
3. Satyanarayana, U. “Biotechnology” Books & Allied (P) Ltd., 2005.
4. Friefelder, David. “Molecular Biology.” Narosa Publications, 199

Session Plan

Topic coverage and Internal Test	No. of Sessions (in hrs.)	Activity (lecture, tutorial, lab practice, field studies/field-trip, Workshop etc.)	Assignment (project, assignment, field study, seminar, etc.)	Suggested Reading (Book, Video, Online source, etc.)
Module I		lecture, tutorial	assignment	Book, Video, Notes
Component of the cell	1			
Cell structure	1			
biochemical functions	1			
Module II				
Carbohydrates	3			
lipids	3			
Proteins	3			

Nucleic Acids	3			
Structure of Enzymes	3			
Module III				
Eukaryotic, Prokaryotic cells	5	lecture, tutorial	assignment	Book, Video, Notes
Cell Cycle	5			
Nucleic acids as genetic material				
Cells of immune system	3	lecture, tutorial	assignment	Book, Video, Notes
activation and differentiation of Tcells and Bcells	3			
Drug discovery and development	2			
Module IV				
Cell fractionation and flow cytometry.	2	lecture, tutorial	assignment	Book, Video, Notes
Module V				
Nucleic acids as genetic material	1	lecture, tutorial	assignment	Book, Video, Notes
Structure and physicochemical properties of elements in DNA and RNA	2			
Biological significance of differences in DNA and RNA.	1			
Module VI				
Cells of immune system, Development, ,	1	lecture, tutorial	assignment	Book, Video, Notes
maturation, activation and differentiation of Tcells and Bcells	2			

Phagocytosis process	1			
Module VII		lecture, tutorial	assignment	Book, Video, Notes
Industrial production	1			
Drug discovery and development	2			
Total (hrs)	45			

Introduction to Biophysics

Course Title	Code	Type of course	T-P-PJ	Prerequisite
Introduction To Biophysics	FCEN0116	Theory	3-0-0	Nil

Objective

- Learn the structures of biological molecules
- To understand the concept of structural analysis
- Learn the techniques for analysis and determination of structure of biomolecules.

Course Outcome

- To introduce the theories and concepts of biophysics of biomolecules which are considered important in biotechnology applications

Evaluation Systems

	Component	% of Marks	Method of Assessment
Internal Examination	Internal Theory	30	Written examination
	Assignment	5	Report or Presentation + Learning Record
	Attendance	5	Based on class attended
External Examination	External Theory	60	Written examination
Total		100	

Course outline

Module: I

Structures of Biological macromolecules: Levels of structures in proteins, nucleic acids and polysaccharides - primary, secondary, tertiary and quaternary structures

Module: II

Conformational analysis of proteins: Polypeptide chain geometries, internal rotation angles, Ramachandran plot, potential energy calculations, forces that determine protein structure – hydrogen bonding

Module: III

Hydrophobic interactions, ionic interactions, disulphide bonds – prediction of protein structure.

Module: IV

Conformational analysis of Nucleic acid: General characteristics of nucleic acid structure – geometric Glycosidic bond – rotational isomers, ribose puckering–backbone rotation angles and steric hindrances – forces stabilizing ordered forms – base pairing and base stacking.

Module V

Techniques for the study of Biological structures, Electron Microscopy, Ultracentrifuge, Viscometry

Module VI

Molecular –sieve chromatography, electrophoresis, NMR and EPR. X-Ray crystallography

Module VII

X-ray fiber diffraction, light scattering, Neutron scattering

Text Books:

Biophysical Chemistry, Cantor and Schimmel, part I and II, W.H. Freeman and co 1997.

Reference Books:

1. Physical Biochemistry : David Friefelder, 5th Ed, PHI
2. Physical Biochemistry : Kensal E van Holde. PHI

Session Plan

Topic coverage and Internal Test	No. of Sessions (in hrs.)	Activity (lecture, tutorial, lab practice, field studies/field-trip, Workshop etc.)	Assignment (project, assignment, field study, seminar, etc.)	Suggested Reading (Book, Video, Online source, etc.)
Module I		lecture, tutorial	assignment	Book, Video, Notes
Levels of structures in proteins	2			
nucleic acids and polysaccharides	2			
primary, secondary, tertiary and quaternary structures	2			
Module II		lecture, tutorial	assignment	Book, Video, Notes
Polypeptide chain geometries,	2			
internal rotation angles, Ramachandran plot,	2			

potential energy calculations	2			
forces that determine protein structure – hydrogen bonding	2			
Module III		lecture, tutorial	assignment	Book, Video, Notes
Hydrophobic interactions,	2			
ionic interactions, disulphide bonds	2			
prediction of protein structure.	2			
Module IV		lecture, tutorial	assignment	Book, Video, Notes
General characteristics of nucleic acid structure – geometric	2			
Glycosidic bond – rotational isomers	2			
ribose puckering– backbone rotation angles and steric hindrances	2			
forces stabilizing ordered forms – base pairing and base stacking.	2			
Module V		lecture, tutorial	assignment	Book, Video, Notes
Techniques for the study of Biological structures	2			
ElectronMicroscopy, Ultracentrifuge	2			
Viscometry	1			
Module VI		lecture, tutorial	assignment	Book, Video, Notes
Molecular–sieve chromatography	2			
Electrophoresis	2			
NMR and EPR.	2			
X-Ray crystallography	1			

Module VII				
X-ray fiber diffraction	2	lecture, tutorial	assignment	Book, Video, Notes
light scattering	2			
Neutron scattering	1			
Total (hrs)	45			

Biosafety, Bioethics, IPR & Patents

Subject Name	Code	Type of course	T-P-PJ	Prerequisite
Biosafety, Bioethics, IPR & Patents	FCEN0117	Theory	2-0-0	Nil

Objective

- To introduce the biosafety regulations and ethical concepts in biotechnology
- To emphasize on IPR issues and need for knowledge in patents in biotechnology

Course Outcome

- This course creates awareness on the Biosafety, bioethics, Intellectual property rights and patenting of biotechnological processes.

Evaluation Systems

	Component	% of Marks	Method of Assessment
Internal Examination	Internal Theory	30	Written examination
	Assignment	5	Report or Presentation + Learning Record
	Attendance	5	Based on class attended
External Examination	External Theory	60	Written examination
Total		100	

Course outline

Module: I

Bioethics: Bioethics – Necessity of Bioethics, different paradigms of Bioethics – National & International. Ethical issues against the molecular technologies.

Module: II

Biosafety: Biosafety– Introduction to biosafety and health hazards concerning biotechnology.

Module: III

Good Laboratory Practices :Introduction to the concept of containment level and Good Laboratory Practices (GLP) and Good Manufacturing Practices (GMP).

Module IV

Introduction to Patent: Objectives of the patent system - Basic principles and general requirements of patent law biotechnological inventions.

Module V

Patent Laws: Introduction to Indian Patent Law. World Trade Organization and its related intellectual property provisions.

Module VI

Intellectual/Industrial property and its legal protection in research, design and development. Patenting in Biotechnology, economic, ethical and depository considerations.

Module VII

Intellectual Property Rights: Intellectual property rights-TRIP- GATT-International conventions patents and methods of application of patents Legal implications-Biodiversity and farmer rights.

Text Books:

1. Singh K, Intellectual Property rights on Biotechnology, BCIL, New Delhi
2. Regulatory Framework for GMOs in India (2006) Ministry of Environment and Forest, Government of India, New Delhi

Reference Books:

1. Beier, F.K., Crespi, R.S. and Straus, T. Biotechnology and Patent protection-Oxford and IBH Publishing Co. New Delhi.
2. Sasson A, Biotechnologies and Development, UNESCO Publications.

Session Plan

Topic coverage and Internal Test	No. of Sessions (in hrs.)	Activity (lecture, tutorial, lab practice, field studies/field-trip, Workshop etc.)	Assignment (project, assignment, field study, seminar, etc.)	Suggested Reading (Book, Video, Online source, etc.)
Module I		lecture, tutorial	assignment	Book, Video, Notes
Bioethics – Necessity of Bioethics,	1			
different paradigms of Bioethics – National & International	2			
Ethical issues against the molecular technologies	1			
Module II		lecture, tutorial	assignment	Book, Video, Notes
Biosafety– Introduction to biosafety	1			

health hazards concerning biotechnology.	2			
Module III		lecture, tutorial	assignment	Book, Video, Notes
Introduction to the concept of containment level	1			
Good Laboratory Practices (GLP) and Good Manufacturing Practices (GMP).	2			
Module IV		lecture, tutorial	assignment	Book, Video, Notes
Objectives of the patent system	2			
Basic principles and general requirements of patent law biotechnological inventions.	2			
Module V		lecture, tutorial	assignment	Book, Video, Notes
Introduction to Indian Patent Law	2			
World Trade Organization and its related intellectual property provisions	2			
Module VI		lecture, tutorial	assignment	Book, Video, Notes
Intellectual/Industrial property and its legal protection in research,	2			
design and development. Patenting in	2			
Biotechnology, economic, ethical and depository considerations	1			
Module VII		lecture, tutorial	assignment	Book, Video, Notes
Intellectual property rights-TRIP	1			
GATT-International conventions patents and methods of application of patents	2			
Legal implications-Biodiversity and farmer rights.	1			
Total (hrs)	30			

Earth System Science

Course Title	Code	Type of course	T-P-PJ	Prerequisite
Earth System Science	FCEN0111	Theory	3- 0 - 0	Nil

Objective:

<ul style="list-style-type: none"> ● To make the students have a clear knowledge on : ● Space Science ● Earth Dynamics ● Geological Oceanography ● Geological bodies and structure ● Hydrogeology ● Glaciology ● Earth's Atmosphere ● Biosphere ● Natural Resources

Course Outcome:

<ul style="list-style-type: none"> ● Students will be able to understand the earth's interior, its composition, various dynamic processes, oceanography, hydrogeology, glaciology, structural geology earth's atmosphere, biosphere and the natural resources. ● A clear understanding of the basics of geology as a prerequisite for mining engineering.

Evaluation System

	Component	% of Marks	Method of Assessment
Internal Examination	Internal Theory	30	Written examination
	Assignment	5	Report or Presentation + Learning Record
	Attendance	5	Based on class attended
External Examination	External Theory	60	Written examination
Total		100	

Course outline:

Module: I

Space Science: Solar System, Age of the Earth, Origin of Solar system. Meteors and Meteorites.

Earth Dynamics: Interior of the Earth, Composition of the Earth, Seismic waves, Seismograph, Plate Tectonics, Basics of Earthquake Engineering, Landslides, Volcanoes.

Module: II

Geological Oceanography: Sea waves, Tides, Ocean currents, Geological work of seas and oceans, Tsunami and its causes, Warning system and mitigation

Hydrogeology: Water table, Aquifer, Groundwater fluctuations and groundwater composition, Hydrologic cycle.

Module: III

Glaciology: Glacier types, Different type of glaciers, Landforms formed by glacier.

Geological bodies and their structures: Rock, mineral, batholiths, dyke, sill, fold, fault, joint, unconformity.

Module: IV

Earth's Atmosphere: Structure and composition of atmosphere, Atmospheric circulation, Geological work of wind, Greenhouse effect and global warming, Carbon dioxide sequestration.

Module: V

Steps to maintain clean and pollution free atmosphere with governing laws, precautionary measures against disasters.

Module: VI

Biosphere: Origin of life, Evolution of life through ages, Geological time scale, biodiversity and its conservation.

Module VII

Natural Resources: Renewable and non-renewable resources, Mineral and fossil fuel resources and their Geological setting, mining of minerals and conservation, effect of mining on surface environment.

Reference Book

1. W Kenneth Hamblin; Eric H Christiansen "Earth's dynamic systems" Publisher: Upper Saddle River, N.J. : Prentice Hall, Pearson Education
2. Jon P Davidson; Walter E Reed; Paul M Davis "Exploring earth: An introduction to physical geology" Upper Saddle River, NJ : Prentice Hall

Text Book:

1. Michael C Jacobson "Earth System Science: from biogeochemical cycles to global changes" London [England] ; San Diego, California : Academic Press

Session Plan:

Topic coverage and Internal Test	No. of Sessions (in hrs.)	Activity (lecture, tutorial, lab practice, field studies/field-trip, Workshop etc.)	Assignment (project, assignment, field study, seminar, etc.)	Suggested Reading (Book, Video, Online source, etc.)
Solar System, Age of the Earth	1	Lecture	assignment	book
Origin of Solar system. Meteors and Meteorites	1	lecture	assignment	book
Interior of the Earth, Composition of the Earth,	1	lecture	assignment	book
Seismic waves, Seismograph, Plate Tectonics,	1	Lecture	assignment	book
Basics of Earthquake Engineering,	1	lecture	assignment	book
Landslides, Volcanoes.	1	lecture	assignment	book
Sea waves, Tides, Ocean currents	2	lecture	assignment	book
Geological work of seas and oceans	1	lecture	assignment	book
Tsunami and its causes, Warning system and mitigation.	1	lecture	assignment	book
Water table, Aquifer,	1	lecture	assignment	book
Groundwater fluctuations and groundwater composition	1	lecture	assignment	book
Hydrologic cycle.	1	lecture	assignment	book
Glacier types, Different type of glaciers,	1	lecture	assignment	book
Landforms formed by glacier.	1	lecture	assignment	book
Rock, mineral	1	lecture	assignment	book
batoliths, dyke, sill,	1	lecture	assignment	book

fold, fault,	1	lecture	assignment	book
Structure and composition of atmosphere,	1	lecture	assignment	book
Atmospheric circulation	1	lecture	assignment	book
Geological work of wind,	1	lecture	assignment	book
Greenhouse effect and global warming	1	lecture	assignment	book
Carbon dioxide sequestration.	1	lecture	assignment	book
Steps to maintain clean and pollution free atmosphere with governing laws,	1	lecture	assignment	book
Precautionary measures against disasters.	1	lecture	assignment	book
Origin of life	1	lecture	assignment	book
Evolution of life through ages,	1	lecture	assignment	book
Geological time scale,	1	lecture	assignment	book
Biodiversity and its conservation.	1	lecture	assignment	book
Renewable and non-renewable resources,	1	lecture	assignment	book
Mineral and fossil fuel resources and their geological setting,	2	lecture	assignment	book
mining of minerals and conservation,	2	lecture	assignment	book
effect of mining on surface environment	1	lecture	assignment	book
Total (hrs)	35			

Introduction to Mining

Course Title	Code	Type of course	T-P-PJ	Prerequisite
Introduction to Mining	FCEN0112	Theory	3-0-0	Nil

Objective:

<ul style="list-style-type: none"> ● Mines ● Types of mining methods ● Mineral deposits ● Types of mineral deposits ● Mine life cycle ● Overview of surface mining ● Overview of underground mining ● Transport system in mines ● Ventilation in mines ● Illumination in mines ● Support system in mines

Course Outcome

<ul style="list-style-type: none"> ● Students will be able to understand about mines, different types of mining methods and mineral deposits. ● A clear understanding of the basics of mining engineering.
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Evaluation System

	Component	% of Marks	Method of Assessment
Internal Examination	Internal Theory	30	Written examination
	Assignment	5	Report or Presentation + Learning Record
	Attendance	5	Based on class attended
External Examination	External Theory	60	Written examination
Total		100	

Course outline

Module: I

Mining: Definition and economic importance; Mine – definition, different types and classification;
 Mine life cycle,

Module: II

Mineral deposit-different types and their classification, Modes of entry to a mine- shaft, incline, decline, adit and box-cut.

Module: III

Overview of surface mining: Types of surface mines, unit operations, basic bench geometry,

Module: IV

Applicability& limitations, advantages and disadvantage

Module: V

Overview of underground mining: Different coal mining methods and their applicability & limitations

Module VI

Different metal mining methods and their applicability & limitations;

Module VII

Basic concepts of transportation, ventilation, illumination and support in underground mines.

Text Book:

1. D J Deshmukh “Elements of mining technology” Publisher: Ramdaspath, Nagpur : Vidyasewa Prakashan,

Reference Book.

1. Howard L Hartman; Jan M Mutmanky “Introductory mining engineering” Publisher: New York : John Wiley & Sons, 2002

Session Plan

Topic coverage and Internal Test	No. of Sessions (in hrs)	Activity (lecture, tutorial, lab practice, field studies/field-trip, Workshop etc.)	Assignment (project, assignment, seminar, etc.)	Suggested Reading (Book, Video, Online source, etc.)
Definition and economic importance of mining	1	lecture	assignment	book
Mine – definition, different types and classification	2	lecture	Assignment, field study	book

Mine life cycle	1	lecture	assignment	book
Mineral deposit – different types and their classification	2	lecture	Assignment, field study	book
Mineral resources of India	2	lecture	assignment	book
Modes of entry to a mine – shaft	1	lecture	Assignment, field study	book
	1	lecture	assignment	book
incline, decline, adit and box-cut.	1	lecture	assignment	book
Overview of surface mining : definition	1	lecture	assignment	book
Types of surface mines,	1	lecture	assignment	book
Unit operation	1	lecture	assignment	book
basic bench geometry	2	lecture	Assignment, field study	book
applicability & limitations	1	lecture	assignment	book
advantages & disadvantage	1	lecture	assignment	book
Overview of underground mining : definition	1	lecture	assignment	book
Different coal mining methods and their applicability & limitations	2	lecture	Assignment, field study	book
Different metal mining methods and their applicability & limitations	2	lecture	assignment	book
Basic concepts of transportation	1	lecture	Assignment, field study	book
ventilation	1	lecture	assignment	book
illumination and support in underground mines	2	lecture	assignment	book
Total	27Hrs.			

Mine Development

Course Title	Code	Type of course	T-P-PJ	Prerequisite
Mine Development	FCEN0113	Theory	3 0 0	Nil

Objective:

<ul style="list-style-type: none"> ● To make the students have knowledge on : ● Opening-up of Deposits ● Vertical and Inclined Shafts ● Shaft Sinking Operations ● Insets ● Mechanized Sinking ● Shaft Boring ● Special Attributes ● Main Haulage Drifts and Tunnels ● High Speed Drifting/Tunneling ● Recent Developments ● Layouts
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Course Outcome:

<ul style="list-style-type: none"> ● Students will be able to understand the choice of mode of entry their applicability, Number and disposition. ● Students will be able to understand vertical and Inclined Shafts ● Students will be able to understand methods and equipment of shaft boring. ● Students will be able to understand main Haulage Drifts and Tunnels. ● Students will be able to understand layouts of pit-top and pit-bottom, coal Handling Plant, Bunkers and Railway Sidings

Evaluation System

	Component	% of Marks	Method of Assessment
Internal Examination	Internal Theory	30	Written examination
	Assignment	5	Report or Presentation + Learning Record
	Attendance	5	Based on class attended
External Examination	External Theory	60	Written examination
Total		100	

Course outline

Module: I

Opening-up of Deposits: Choice of mode of entry- adit, shaft, decline and combined mode, their applicability, number and disposition.

Vertical and Inclined Shafts: Location, shape, size, and organization of shaft sinking, construction of shaft collar, shaft fittings.

Module: II

Shaft Sinking Operations: Ground breaking and muck disposal- tools and equipment, lining; ventilation, lighting and dewatering; sinking in difficult and water-bearing ground.

Module III

Insets: Design, excavation and lining.

Mechanized Sinking: Simultaneous sinking and lining; slip - form method of lining; high speed sinking.

Module IV

Shaft Boring: Methods and equipment.

Special Attributes: Widening and deepening of inclined and vertical shafts; staple shafts, raised shafts.

Module V

Main Haulage Drifts and Tunnels : Purpose, shape, size and location; excavation ground breaking, muck disposal, ventilation and supporting.

Module VI

High Speed Drifting/Tunneling : Application of mechanized methods; road headers and tunnel boring machines.

Module VII

Recent Developments in shaft sinking and drifting/tunnelling. Layouts of pit-top and pit-bottom, Coal Handling Plant, Bunkers and Railway Sidings

Text Book

1. D J Deshmukh "Elements of mining technology" Publisher: Ramdaspath, Nagpur : Vidyasewa Prakashan,
2. R Agor "A text book of surveying and leveling" Author:, Publisher:Delhi : Khanna Publication

Reference Book

1. B C Punmia; Arun Kumar Jain; A K Jain "Surveying.Vol.I" , Author:, Publisher:New Delhi Laxmi Publications

Alak De "Plane surveying" Publisher: S. Chand & Co

Session Plan

Topic coverage and Internal Test	No. of Sessions (in hrs)	Activity (lecture, tutorial, lab practice, field studies/field-trip, Workshop etc.)	Assignment (project, assignment, seminar, etc.)	Suggested Reading (Book, Video, Online source, etc.)
Choice of mode of entry-adit, shaft, decline and combined mode, their applicability, number and disposition.	3	lecture	Assignment, field study	book
Location, shape, size, and organization of shaft sinking, construction of shaft collar, shaft fittings.	4	lecture	assignment	book
Ground breaking and muck disposal- tools and equipment, lining; ventilation, lighting and dewatering; sinking in difficult and water-bearing ground.	4	lecture	assignment	book
Insets : Design, excavation and lining.	2	lecture	assignment	book
Simultaneous sinking and lining; slip - form method of lining; high speed sinking. Shaft Boring : Methods and equipment.	4	lecture	assignment	book
Main Haulage Drifts and Tunnels : Purpose, shape, size and location; excavation ground breaking, muck disposal, ventilation and supporting	4	lecture	assignment	book
Application of mechanized methods; road headers and tunnel boring machines.	3	lecture	Assignment, field studies	book

Recent Developments in shaft sinking and drifting/tunneling. Layouts of pit-top and pit-bottom, Coal Handling Plant, Bunkers and Railway Sidings	4	lecture	assignment	book
Total Hrs	28			

Mine Surveying - I

Course Title	Code	Type of course	T-P-PJ	Prerequisite
Mine Surveying - I	FCEN0114	Theory	3- 0- 0	Nil

Objective

<ul style="list-style-type: none"> ● To make the students have knowledge on : ● Surveying ● Angular Measurement ● Leveling ● Total Station ● Plane Table Surveying ● Contours
--

Course Outcome

<ul style="list-style-type: none"> ● Students will be able to understand the classification and principles of surveying ● Students will be able to understand linear measurement. ● Students will be able to understand angular measurement ● Students will be able to understand leveling instruments types, Leveling staves, Underground leveling

Evaluation System

	Component	% of Marks	Method of Assessment
Internal Examination	Internal Theory	30	Written examination
	Assignment	5	Report or Presentation + Learning Record
	Attendance	5	Based on class attended
External Examination	External Theory	60	Written examination
Total		100	

Course outline

Module: I

Surveying: Definition, objective, classification and principles of surveying.

Module: II

Linear Measurement: Instruments for measuring distances; ranging and taping survey lines; Chain surveying – principle, field work, off-sets, booking and plotting, obstacles in taping.

Module: III

Angular Measurement: Bearing of lines; Rectangular coordinate system; Essentials of the micro-optic

Theodolite; Measurement of horizontal and vertical angles; Temporary and permanent adjustments;

Module: IV

Theodolite traversing; Computation of co-ordinates; Adjustment of traverse; Temporary and permanent adjustments.

Module: V

Leveling : Definition & terminology; Leveling instruments types - tilting, auto set and digital levels; Leveling staves; Different types of leveling - differential, profile, crosssectional and reciprocal leveling; Booking and reduction methods; Underground leveling; Temporary and permanent adjustments of levels.

Module: VI

Total Station: Principle of electronic measurement of distance and angles; construction and working with Total Station; Errors; Application and recent developments in Total Station.

Module VII

Plane Table Surveying: Methods Contours: Concepts; Characteristics of contour; Contour Interval; Methods of contouring and uses of contours.

Session Plan

Topic coverage and Internal Test	No. of Sessions (in hrs)	Activity (lecture, tutorial, lab practice, field studies/field-trip, Workshop etc.)	Assignment (project, assignment, field study, etc.)	Suggested Reading (Book, Video, Online source, etc.)
Surveying : Definition, objective, classification and principles of surveying.	3	Lecture	Assignment, field studies	book
Linear Measurement: Instruments for measuring distances; ranging and taping survey lines; Chain surveying – principle, field work, off-sets, booking and plotting, obstacles in	4	Lecture	Assignment, field studies	book

taping.				
Angular Measurement : Bearing of lines; Rectangular coordinate system; Essentials of the micro-optic theodolite; Measurement of horizontal and vertical angles; Temporary and permanent adjustments; Theodolite traversing; Computation of co-ordinates; Adjustment of traverse; Temporary and permanent adjustments.	5	Lecture	Assignment, field studies	book
Leveling : Definition & terminology; Leveling instruments types - tilting, auto set and digital levels; Leveling staves; Different types of leveling - differential, profile, crosssectional and reciprocal leveling; Booking and reduction methods; Underground leveling; Temporary and permanent adjustments of levels.	6	Lecture	Assignment, field studies	book
Total Station : Principle of electronic measurement of distance and angles; construction and working with Total Station; Errors; Application and recent developments in Total Station.	5	Lecture	Assignment, field studies	book
Plane Table Surveying : Methods Contours : Concepts; Characteristics of contour; Contour Interval; Methods of Contouring and uses of contours.	4	Lecture	Assignment, field studies	book
Total Hrs	27			

Workshop Practice

Course Title	Code	Type of course	T-P-PJ	Prerequisite
Workshop Practice	ENFC0201	Practice	0-2-0	Nil

Objective

- To provide the students hands-on-experience on manufacturing processes like fitting, carpentry, plumbing, casting, turning, joining and machining.

Course Outcome

- Students will be able to choose manufacturing technique for a given product and can perform simple operations.

Evaluation Systems

Internal Examination	Component	% of Marks	Method of Assessment
	Internal Practice	50 (40+10)	Lab work + Learning Record
External Examination	External Practice	50	Lab work
Total		100	

Course Outline

Experiment 1 : Workshop Safety Practice, Use of Personal Protective Equipment.

Fitting:

Experiment 2: Marking & Sizing of a 5mm thick Rectangular Plate with given dimensions using Scriber, Caliper, Steel Rule, Hack Saw & Holding Vice.

Experiment 3 : Preparing an Open V Fitting Joint.

Plumbing:

Experiment 4 : Use of Pipe Vice, Wrench, Tap and Die to make External Threads in ½”PVC Pipe for Basic Pipe Fittings and to do a Leak Test.

Experiment 5 : Fabrication of a Rectangular Loop using basic Pipe Fittings.

Experiment 6 : Fitting of Flow Measurement Water Meter.

Casting:

Experiment 7 : Sand Mold Preparation with Pattern for Casting Aluminum .

Experiment 8 : Casting of Aluminum Spur Gear.

Welding:

Experiment 9: Safety to Connect a Welding Transformer, Tools and SMAW Arcing.

Experiment 10: Oxy Acetylene 3 Types of Flames & Torch Brazing.

Experiment 11: Preparation of a Study Stool of Square Section. (4 student in a group)

Turning:

Experiment 12: Aligning a 20mm Cylindrical Job in Conventional Lathe, Use of Dial Gauge.

Experiment 13: Facing and Plain Turning of 20mm M.S Stock.

Electrical & Electronic:

Experiment 14: Domestic & Staircase Wiring Circuit Practice.

Experiment 15: PCB: Designing and Making of Simple Circuits.

Experiment 16: Measurement Power Consumption by Incandescent, CFL and LED Lamps.

Experiment 17: Use of Transducer and Sensors, Strain Gauge, Photovoltaic Cell.

Reference**Text Books:**

1. Elements of Workshop Technology, S.K. HazraChaudhary, A.K. HazraChaudhary, N. Roy, Vol. 1 & 2, 2007, 14th Edition, Media Promoters and Publishers Private Limited, India.
2. Workshop Technology, Volume 1 & 2, Chapman, W A J, Arnold, E, 2005, 4th Edition, CBS Publishers, India.

Reference Books:

1. Electrical Wiring & Estimating, S.L. Uppal, 2003, 5th Edition, Khanna Publishers.

.Session Plan

Topic coverage and Internal Test	No. of Sessions (in hrs.)	Activity (lecture, tutorial, lab practice, field studies/field-trip, Workshop etc.)	Assignment (project, assignment, field study, seminar, etc.)	Suggested Reading (Book, Video, Online source, etc.)
Demonstration of Various Safety Practice, Measuring Tools and Equipments used in Workshop.	3	Job Working in groups	Group Assignment and Evaluation.	HazraChaudhary, S K, HazraChaudhary and Chapman, W A J, Arnold, E, Workshop Technology

Preparing an Open V Fitting Joint	3	Job Working in groups	Group Assignment and Evaluation.	HazraChaudhary, Chapman, W A J, Arnold, E, Workshop Technology S K, HazraChaudhary
Use of Pipe Vice, Wrench, Tap and Die to make external threads in ½”PVC pipe for basic pipe fittings and to do a leak test	3	Job Working in groups	Group Assignment and Evaluation	HazraChaudhary, S K, HazraChaudhary and Chapman, W A J, Arnold, E, Workshop Technology
Fabrication of a Rectangular Loop using Basic Pipe Fittings	3	Job Working in groups	Group Assignment and Evaluation.	HazraChaudhary, S K, HazraChaudhary
Fitting of Flow Measurement Water Meter	3	Job Working in groups	Group Assignment and Evaluation.	HazraChaudhary, S K, HazraChaudhary
Sand Mold Preparation with Pattern for Casting Aluminum	3	Job Working in groups	Group Assignment and Evaluation.	HazraChaudhary, S K, HazraChaudhary
Casting of Aluminum Spur Gear	3	Job Working in groups	Group Assignment and Evaluation.	HazraChaudhary, S K, HazraChaudhary
Safety to Connect a Welding Transfer, Tools and SMAW Arcing	3	Job Working in groups	Group Assignment and Evaluation.	HazraChaudhary, S K, HazraChaudhary
Oxy Acetylene 3 Types of Flames & Torch Brazing	3	Job Working in groups	Group Assignment and Evaluation.	HazraChaudhary, S K, HazraChaudhary
Preparation of a Study Stool of Square Section	3	Job Working in groups	Group Assignment and Evaluation.	HazraChaudhary, S K, HazraChaudhary

Aligning a 20mm Cylindrical Job in Conventional Lathe, use of Dial Gauge	3	Job Working in groups	Group Assignment and Evaluation.	HazraChaudhary, S K, HazraChaudhary
Facing and Plain Turning of 20mm M.S Stock.	3	Job Working in groups	Group Assignment and Evaluation.	HazraChaudhary, S K, HazraChaudhary
Domestic & Staircase Wiring Circuit Practice	3	Job Working in groups	Group Assignment and Evaluation.	HazraChaudhary, S K, HazraChaudhary
PCB : Designing and Making of Simple Circuits	3	Job Working in groups	Group Assignment and Evaluation.	HazraChaudhary, S K, HazraChaudhary
Measurement Power Consumption by Incandescent, CFL and LED lamps	3	Job Working in groups	Group Assignment and Evaluation.	HazraChaudhary, S K, HazraChaudhary and Chapman, W A J, Arnold, E, Workshop Technology
Use of Transducer and Sensors, Strain Gauge, Photovoltaic Cell	3	Job Working in groups	Group Assignment and Evaluation.	HazraChaudhary, S K, HazraChaudhary
Total (hrs)	48			

Geometric Modeling Lab

Course Title	Code	Type of course	T-P-PJ	Prerequisite
Geometric Modeling Lab	ENFC0202	Practice	0-2-0	Nil

Objective

- To impart knowledge to students on conceptual design, 3D modeling, surface modeling and drafting through hands-on-practice mode using CATIA.
- To impart requisite knowledge and skills to the students on developing 3D assembly drawings and exploded views using CATIA.

Course Outcome

- Students will be able to study, understand and interpret engineering drawings used in industry
- Students will be able to use CATIA for creation of 3D models, assembly drawings and exploded view

Evaluation Systems

Internal Examination	Component	% of Marks	Method of Assessment
	Internal Practice	50 (40+10)	Lab work + Learning Record
External Examination	External Practice	50	Lab work
Total		100	

Course outline

Module: I (20 Hrs)

Part Modeling: Creation of Simple Solids, Parametric Modeling, Booleans and Functional Modeling, Rendering

Module: II (20 Hrs)

Assembly Modeling: Simple Assembly, Constraints, Digital Mockup

Module: III (20 Hrs) :

Drafting & Surface Modeling: Creation of Layout, Conversion of Part drawing to projection views, detailed drawing. Creation of Surfaces, Simple Surface Models, Converting Surface Models to Part Drawing.

(**Note:** All of the topics will be through learn by doing and laboratory mode.
Platform is CATIA)

MECHANICAL/CIVIL/ ELECTRICAL BRANCH STUDENTS ARE REQUIRED
TO DO PROJECTS RELATED TO THEIR OWN BRANCH

Text Books:

Geometrical Modelling, M.E. Morteson

Reference Books:

CAD CAM, M.P. Groover

Online Source:

Session Plan

(Total 12 experiments out of 17 to be conducted)

Sl. No.	Topic coverage and Internal Test	No. of Sessions (in hrs.)	Activity (lecture, tutorial, lab practice, field studies/field-trip, Workshop etc.)	Assignment (project, assignment, field study, seminar, etc.)	Suggested Reading (Book, Video, Online source, etc.)
1	Assembly of Quick Acting Hold Down Clamp	3	Lab practice		
2	Modeling parts of Quick Acting Hold Down Clamp Assembly	6	Lab practice		
3	Assembly of Pneumatic FRL	3	Lab practice		
4	Modeling parts of Pneumatic FRL Assembly	6	Lab practice		
5	Assembly of Roller Guide	3	Lab practice		
6	Modeling Parts of Roller Guide Assembly	6	Lab practice		
7	Assembly of Electrical Tower	3	Lab practice		
8	Modeling parts of Electrical Tower Assembly	6	Lab practice		
9	Assembly of Hitch Mount	3	Lab practice		
10	Modeling parts of Hitch mount Assembly	6	Lab practice		

11	Assembly of Trombon	3	Lab practice		
12	Modeling parts of Trombon Assembly	6	Lab practice		
13	Drafting all the parts of two Assemblies	6	Lab practice		
14	Production of Detailed Drawing of two Assemblies	6	Lab practice		
15	Surface Modeling of Automobile Tail Lamp	6	Lab practice		
16	Surface Modeling of Automobile Bonnet	6	Lab practice		
17	Conversion of Surface Model of Tail Lamp to Part Model	3	Lab practice		
Total (hrs)		60			

Introduction to Robotics

Course Title	Code	Type of course	T-P-PJ	Prerequisite
Introduction to Robotics	ENFC0203	Practice	0-2-0	Geometric Drawing

Objectives

<ul style="list-style-type: none"> ● To Provide An Overview To Students On Various Types of Industrial Robots and Their Configurations. ● To Educate The Students on Use Of DELMIA To Carryout Simulation Exercises of Various Types of Robotic Arms Suiting to Specific Applications.
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Course Outcome

<ul style="list-style-type: none"> ● Students Will Have Knowledge and Skill To Program Industrial Robots For Performing Various Tasks. ● Students Will Be Able To Undertake Simulation Exercises Of Various Types Of Robotic Arms As A Pre-Requisite Leading To A Safe, Cost Effective, Reliable And Optimum Design.
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Evaluation Systems

Internal Examination	Component	% of Marks	Method of Assessment
	Internal Practice	50 (40+10)	Lab work + Learning Record
External Examination	External Practice	50	Lab work
Total		100	

List of Experiments (45 Hours)

DELMIA: Simulated Models of Various Types Industrial Robots & Its Architecture.

DELMIA: Simulation of Activities Like: Pick and Place, Coordinated Movement, Spot Welding and Arc Welding.

DELMIA: Designing Own Robotic Arm with Insight to Robot Kinematics.

- i) A Prismatic Robotic Arm.
- ii) A Revolute Joint Robotic Arm.
- iii) Articulated Robotic Arm
- iv) Spherical Robotic Arm

Robot Programming: Use of Brabofor Pick and Place Actions.

An Understanding of Different Sensors, Their Operation and Application. Demonstration of Use of Sensors for At Least 3 Applications of Robot.

Commanding A Robot To Achieve Tasks On The Basis Of Sensor Information, A Description Of Motors, And How Their Velocity Is Set, And Other Robotic Actuators.

Reference

Text Books :

M.P. Groover, Industrial Robotics, Second Edition, TMH Publishers.

S.R. Deb and S. Deb, Robotics Technology and Flexible Automation, Second Edition, TMH Publishers.

Reference Books :

Y Koren, Robotics for Engineers, TMH Publishers.

Online Source:

Session Plan

Sl. No	Topic coverage and Internal Test	No. of Sessions (in hr)	Activity	Assignment	Suggested Reading (Book, Video, Online source, etc.)
1	Demonstration of various robotic arms available in DELMIA	3	Lab Demonstration	Collection of tutorials related various Robotic Arms	DELMIA help file
2	Robotic architecture. Demonstration of prismatic, revolute and SCARA	6	Lab Demonstration	Development of Robotic Arm in DELMIA & Demonstration of Application.	DELMIA help file
3	Robotic architecture. Demonstration of articulated robotic arm and Spherical robotic arm	3	Lab Demonstration	Development of Robotic Arm in DELMIA & Demonstration of Application.	DELMIA help file

4	Demonstration of application in spot welding and arc welding	3	Lab Demonstration	Development of Robotic Arm in DELMIA & Demonstration of application.	DELMIA help file
5	Demonstration of application in assembly line operation.	3	Lab Demonstration	Development of robotic arm in DELMIA & Demonstration of application.	DELMIA help file
6	Robotic Programming practice to do pick and place action.	3	Lab practice	Development of programs to do other actions like writing on the white board, Erasing the same with wiper. At least 3 such Activities	Brabo Manual
7	Demonstration of assignment Exercises	3	Lab practice	Recording of all assignments	BraboManual
8	Demonstration of application of sensors, At least 3 sensor based applications	3	Lab practice	Identifying different types of sensors that can be used in robot arm application	
9	Demonstration of use of sensors	3	Lab practice		
10	Demonstration of sensors to actuate motors and its speed control	3	Lab Practice		
11	Demonstration of sensors to actuate motors and its speed control	6	Lab Practice	A Mini project of designing to making a movement to robotic arm	

12	A mini Project Demonstration	6			
	Total (hours)	45			

3D Modelling

Course Title	Code	Type of course	T-P-PJ	Prerequisite
3D Modelling	ENFC0204	Practice	0-2-0	Nil

Objective

- The course covers modeling conceptual design, 3D modeling, Views and documentation of building drawing

Course Outcome

- 3D Solid Model and drawing
- 3D Building Model

Evaluation Systems

Internal Examination	Component	% of Marks	Method of Assessment
	Internal Practice	50 (40+10)	Lab work + Learning Record
External Examination	External Practice	50	Lab work
Total		100	

Course outline

Module I (12 Hrs)

Elements of planning building, fundamentals of Building Information Modelling (BIM). Generation of 2D (plan, section and elevation) and 3D modelling with detailed specification and dimensioning of the following using AutoCAD, Revit Architecture and CATIA :

Practice Session 1 : Generation of 3D modelling with detailed specification and dimensioning of a (G+20) multi-storeyed building with same floor plans using Revit Architecture and CATIA.

Practice Session 2 : Generation of elevation for with detailed specification and dimensioning of a multi-storeyed building with same floor plans using AutoCAD for (practice session 1).

Practice Session 3 : Generation of section for with detailed specification and dimensioning of a multi-storeyed building with same floor plans using AutoCAD, Revit Architecture and CATIA (practice session 1).

Module II (36 Hrs)

Practice Session 4 : Generation of 3D modelling with detailed specification and dimensioning of a (G+20) multi-storeyed building with varying floor plans using Revit Architecture and CATIA.

Practice Session 5 : Generation of elevation for with detailed specification and dimensioning of a multi-storeyed building with varying floor plans using AutoCAD (practice session 4).

Practice Session 6 : Generation of section for with detailed specification and dimensioning of a multi-storeyed building with varying floor plans using AutoCAD, Revit Architecture and CATIA (practice session 4).

Practice Session 7 : Generation of 3D modelling with detailed specification and dimensioning of a (G+5) shopping complex using Revit Architecture and CATIA.

Practice Session 8 : Generation of elevation for with detailed specification and dimensioning of a (G+5) shopping complex using AutoCAD (practice session 7).

Practice Session 9 : Generation of section for with detailed specification and dimensioning of a (G+5) shopping complex using AutoCAD, Revit Architecture and CATIA (practice session 7).

Practice Session 10 : Generation of 3D modelling with detailed specification and dimensioning of a (G+4) hospital building using Revit Architecture and CATIA.

Practice Session 11 : Generation of elevation for with detailed specification and dimensioning of a (G+4) hospital building using AutoCAD (practice session 10).

Practice Session 12 : Generation of section for with detailed specification and dimensioning of a (G+4) hospital building using AutoCAD, Revit Architecture and CATIA (practice session 10).

Module III (12Hrs)

Practice Session 13 : Generation of 3D modelling with detailed specification and dimensioning of a (G+4) hostel building using Revit Architecture and CATIA.

Practice Session 14 : Generation of elevation for with detailed specification and dimensioning of a (G+4) hostel building using AutoCAD (practice session 13).

Practice Session 15 : Generation of section for with detailed specification and dimensioning of a (G+4) hostel building using AutoCAD, Revit Architecture and CATIA (practice session 13).

Reference

Drawing book A-series.

Drawing book B-series

Session Plan

Topic coverage and Internal Test	No. of Sessions (in hrs.)	Activity (lecture, tutorial, lab practice, field studies/field-trip, Workshop etc.)	Assignment (Project, assignment, field study, seminar, etc.)	Suggested Reading (Book, Video, Online source, etc.)
Module I				
Generation of 3D modelling with detailed				

specification and dimensioning of a (G+20) multi-storeyed building with same floor plans using Revit Architecture and CATIA.	4	practice	assignment	
Generation of elevation for with detailed specification and dimensioning of a multi-storeyed building with same floor plans using AutoCAD for (practice session 1).	4	practice	assignment	
Generation of section for with detailed specification and dimensioning of a multi-storeyed building with same floor plans using AutoCAD, Revit Architecture and CATIA (practice session 1).	4	practice	assignment	
Sub-Total (hrs)	12			
Module II				
Generation of 3D modelling with detailed specification and dimensioning of a (G+20) multi-storeyed building with varying floor plans using Revit Architecture and	4	practice	assignment	

CATIA.				
Generation of elevation for with detailed specification and dimensioning of a multi-storeyed building with varying floor plans using AutoCAD (practice session 4).	4	practice	assignment	
Generation of section for with detailed specification and dimensioning of a multi-storeyed building with varying floor plans using AutoCAD, Revit Architecture and CATIA (practice session 4).	4	practice	assignment	
Generation of 3D modelling with detailed specification and dimensioning of a (G+5) shopping complex using Revit Architecture and CATIA.	4	practice	assignment	
Generation of elevation for with detailed specification and dimensioning of a (G+5) shopping complex using AutoCAD (practice session 7).	4	practice	assignment	
Generation of section for with detailed specification and dimensioning of a (G+5)	4	practice	assignment	

shopping complex using AutoCAD, Revit Architecture and CATIA (practice session 7).				
Generation of 3D modelling with detailed specification and dimensioning of a (G+4) hospital building using Revit Architecture and CATIA.	4	practice	assignment	
Generation of elevation for with detailed specification and dimensioning of a (G+4) hospital building using AutoCAD (practice session 10).	4	practice	assignment	
Generation of section for with detailed specification and dimensioning of a (G+4) hospital building using AutoCAD, Revit Architecture and CATIA (practice session 10).	4	practice	assignment	
Sub-Total (hrs)	36			
Module III				
Generation of 3D modelling with detailed specification and dimensioning of a (G+4) hostel building using Revit Architecture and CATIA.	4	practice	assignment	
Generation of elevation for with detailed specification and dimensioning of a (G+4) hostel building using	4	practice	assignment	

AutoCAD (practice session 13).				
Generation of section for with detailed specification and dimensioning of a (G+4) hostel building using AutoCAD, Revit Architecture and CATIA (practice session 13).	4	practice	assignment	
Sub-Total (hrs)	12			
Total (hrs)	60			

Electrical Workshop Practice

Course Title	Code	Type of course	T-P-PJ	Prerequisite
Electrical Workshop Practice	ENFC0205	Practice	0-2-0	Nil

Objective

- To develop skills for troubleshooting of electrical wiring and appliances at household level

Course Outcome

- Operation of instruments, hand tools and power tools.
- Comprehend the safety measures required to be taken while using the tools.
- Solving Electrical Problems at domestic level.

Evaluation Systems

Internal Examination	Component	% of Marks	Method of Assessment
	Internal Practice	50 (40+10)	Lab work + Learning Record
External Examination	External Practice	50	Lab work
Total		100	

Course outline

Lists of Experiments

1. To study safety precautions for electrical engineering, draw the electrical symbol and general electrical house wiring.
2. To study the various types of accessories and tools. Working of fuse and circuit breaker.
3. To setup a series, parallel and staircase wiring using the given lamps.
4. To study Earth-wire connection and Earth-wire measurement in electrical wiring.
5. To set-up residential house wiring using switches, socket, fuse, junction box, energy meter etc.
6. Study of Multimeter, voltmeter, ammeter, wattmeter (both AC&DC)
7. Connection & fault analysis in Domestic appliances (Fan, electric iron)
8. Connection & fault analysis in Domestic appliances (Air Condition)
9. Connection & fault analysis in Domestic appliances (fluorescent tube)
10. Study of Industrial wiring in the workshop and study of bimetallic relay.
11. Study of a 11/4 KV transformer substation
12. Concept of efficiency (Star rating) of electrical appliances

Session Plan

Topic coverage and Internal Test	No. of Sessions (in hrs.)	Activity (lecture, tutorial, lab practice, field studies/field-trip, Workshop etc.)	Assignment (project, assignment, field study, seminar, etc.)	Suggested Reading (Book, Video, Online source, etc.)
To study safety precautions for electrical engineering, draw the electrical symbol and general electrical house wiring.	4	Lab Practice	Experiment Result & Viva	
To study the various types of accessories and tools. Working of fuse and circuit breaker.	4	Lab Practice	Experiment Result & Viva	
To setup a series, parallel and staircase wiring using the given lamps.	4	Lab Practice	Experiment Result & Viva	
To study Earth-wire connection and Earth-wire measurement in electrical wiring.	4	Lab Practice	Experiment Result & Viva	
To set-up residential house wiring using switches, socket, fuse, junction box, energy meter etc.	8	Lab Practice	Experiment Result & Viva	
Study of Multimeter, voltmeter, ammeter, wattmeter (both AC&DC)	4	Lab Practice	Experiment Result & Viva	
Connection & fault analysis in Domestic appliances (Fan, electric iron)	4	Lab Practice	Experiment Result & Viva	
Connection & fault analysis in Domestic appliances (Air Condition)	4	Lab Practice	Experiment Result & Viva	
Connection & fault analysis in Domestic appliances (fluorescent tube)	4	Lab Practice	Experiment Result & Viva	
Study of Industrial wiring in the workshop and study of bimetallic relay.	4	Field Studies	Viva	
Study of a 11/4 KV transformer substation	4	Field Studies	Viva	
Concept of Star rating of electrical appliances	4	Lab Practice	Experiment Result & Viva	
Total : 52 Hours				

Mine Surveying –I Lab

Course Title	Code	Type of course	T-P-PJ	Prerequisite
Mine Surveying - Lab	FCEN0214	Practice	0-2-0	Nil

Objective :

- To make the students have practical knowledge on :
- Linear measuring instruments & carrying out Chain Surveying
- Carrying out Compass Traversing
- Vernier theodolite
- Tilting level & carrying out Fly Leveling
- Auto level & carrying out Profile Leveling

Course Outcome:

- Students will be able to have practical knowledge on linear measuring instruments & carrying out Chain Surveying, carrying out Compass Traversing, Vernier theodolite, Tilting level & carrying out Fly Leveling, Auto level & carrying out Profile Leveling and Total Station

Evaluation System

Internal Examination	Component	% of Marks	Method of Assessment
	Internal Practice	50 (40+10)	Lab work + Learning Record
External Examination	External Practice	50	Lab work
Total		100	

Course outline

Module I

Study and sketch the linear measuring instruments & carrying out Chain Surveying Prismatic Compass and carrying out Compass Traversing; Vernier theodolite & angle measurement by Repetition Method; Angle measurement by Reiteration Method using Micro-optic theodolite; Study and sketch of a Tilting level & carrying out Fly Leveling; Study and sketch of Auto level & carrying out Profile Leveling; Study and sketch of 1" Theodolite and angle measurement; Plane Table Surveying by Radiation Method and Contouring; Study and sketch of Total Station and measurement of angles, distance and determination of coordinates and RL using Total Station; Preparation of grid and plotting the field data.

Session Plan

Topic coverage and Internal Test	No. of Sessions (in hrs.)	Activity (lecture, tutorial, lab practice, field studies/field-trip, Workshop etc.)	Assignment (project, assignment, field study, seminar, etc.)	Suggested Reading (Book, Video, Online source, etc.)
Study and sketch the linear measuring instruments & carrying out Chain Surveying	3	lab practice	assignment, field study	book
Prismatic Compass and carrying out Compass Traversing	3	lab practice	assignment, field study	book
Vernier theodolite & angle measurement by Repetition Method; Angle measurement by Reiteration Method using Micro-optic theodolite;	6	lab practice	assignment, field study	book
Study and sketch of a Tilting level & carrying out Fly Leveling; Study and sketch of Auto level & carrying out Profile Leveling;	6	lab practice	assignment, field study	book
Study and sketch of 1" Theodolite and angle measurement; Plane Table Surveying by Radiation Method and Contouring	6	lab practice	assignment, field study	book
Study and sketch of Total Station and measurement of angles, distance and determination of coordinates and RL using Total Station; Preparation of grid and plotting the field data.	6	lab practice	assignment, field study	book
Total Hrs	30			

Aerodynamics Laboratory

Course Title	Code	Type of course	T-P-PJ	Prerequisite
Aerodynamics Laboratory	ENFC0208	Practice	0-2-0	Nil

Objective

- To Predict Different Aerodynamic Propulsion in Aero Applications

Course Outcome

- Ability to Use the Fundamental Dynamics Principles in Aircraft Applications.

Evaluation Systems

Internal Examination	Component	% of Marks	Method of Assessment
	Internal Practice	50 (40+10)	Lab work + Learning Record
External Examination	External Practice	50	Lab work
Total		100	

1. List of Experiments

1. Application of Bernoulli's Equation – venturimeter and orifice meter.
2. Frictional loss in laminar flow through pipes.
3. Frictional loss in turbulent flow through pipes.
4. Calibration of a subsonic Wind tunnel.
5. Determination of lift for the given airfoil section.
6. Pressure distribution over a smooth circular cylinder.
7. Pressure distribution over a rough circular cylinder.
8. Pressure distribution over a symmetric aerofoil.
9. Pressure distribution over a cambered aerofoil.
10. Flow visualization studies in subsonic flows.
11. Calculation of drag over smooth cylinder
12. Calculation of drag over rough cylinder

List of Equipment for a Batch of 30 Students

S.N	Name of Equipment	Quantity	Experiment No.
.		y	
1	Venturimeter	1	1
2	Orificemeter	1	1
3	Pipe friction apparatus	1	2, 3
4	Subsonic Wind tunnel	1	4, 5, 6, 7, 8, 9, 10, 11, 12

5	Models (aerofoil, rough and smooth cylinder, flat plate)	1	5, 6, 7, 8, 9
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Engineering Metrology and Measurements

Course Title	Code	Type of course	T-P-PJ	Prerequisite
Engineering Metrology and Measurements	ENFC0401	Theory + Practice	1-2-0	Nil

Course Objective

- To Make Students Familiar with the Measuring Systems, and the Standard of Measurements. Learns about Basic Measurement Devices.
- Understanding the Basic Measurement Systems in the Real Time Engineering Applications.
- Enables Students to Work in Quality Control and Quality Assurances Divisions Industries.

Course Outcomes

- Selecting Suitable Measuring Instruments for Basic and Typical Applications in the Industries.
- Analyze Measurement Requirement.
- Can Choose Transducer & Sensors for Products.

Evaluation System

Internal Examination	Component	% of Marks	Method of Assessment
	Internal Theory	20	Written examination
	Internal Practice	30(20+10)	Lab work + Learning Record
External Examination	External Theory	30	Written examination
	External Practice	20	Lab work
Total		100	

Course Outline

Module: I (6 Hours)

Introduction to Metrology; Importance and Need for Measurements and Metrology; Need for Inspection; Precision & Accuracy; Errors in Measurement.

Practice : (Laboratory Mode- Learn by Doing)

Calibration of Measuring Instruments Using Slip Gauge Blocks.

Module: II (9 Hours)

Limit System; Limits Fits & Tolerances; Allowances; Hole Basis & Shaft Basis Systems; Interchangeability; Gauge Design. (Class room Teaching and videos)

Practice : (Laboratory Mode- Learn by Doing)

1. Introduction to Metrology Laboratory (Steel Rule, Tape, Right Angle, Protractor, Surface Plate).
2. Gauges- Filler, Radius, Thread, Wire, Snap & GO-NOGO.

Module: III (9 Hours)

Standards of Measurement; Dial Indicators; Vernier Apparatus; Micrometers; Comparators (Mechanical, Electrical, Pneumatic).

Practice : (Laboratory Mode- learn by Doing)

3. Vernier Caliper- Inside, Outside, Depth Measurement & Height Gauge.
4. Micrometers, Outside, Inside Micrometer & Depth Micrometer.
5. Three Points Bore Micrometer

Module: IV (10 Hours)

Measurement of Angles & Tapers using Bevel Protractor; Angle Gauges; Sine Bars; Flatness Spirit Level & Surface Plate.

Practice: (Laboratory Mode- learn by Doing)

6. Sine Bar/Bevel Protractor-Measurement of Angles.
7. Flatness Test Using Sprit Level.
8. Use of Dial Indicators-in-lathe.

Module: V (9 Hours)

Gear Tooth Metrology; Inspection & Alignment Tests. Transducers; Variable Resistance Transducer; LVDT; Comparative Transducer; Piezoelectric Transducer; Photo Voltaic Cells; Devices for Pressure Measurement- Dead Weight Tester; Bourdon Tube Pressure Gauge; Diaphragm and Bellow Gauges.(Topics will be covered by explaining and fallowed by practice mode)

Practice: (Laboratory Mode- Learn by Doing)

9. Gear Tooth Metrology, Inspection & Alignment Tests.

Module: VI (10 Hours)

Low Pressure Measurements; Force Measuring Using Proving Rings; Torque Measuring Using Dynamometers; Strain Measurements; Profile Projector; Tool Maker's Microscope; Optical Flats; Laser Interferometers; Autocollimators.

Practice: (Laboratory Mode- Learn by Doing)

10. Optical Flat Use & Surface Plate Test Using Spirit Level & Dial Gauge.
11. Measurement of Template Using Profile Projector.

Module: VII (12 Hours)

Assessment of Surface Roughness; Machining Symbols for Surface Finish; Measuring Instruments; Tally-Surf; Screw Thread Measurement- Terminology; Precision Instruments Based on Laser Principles- Laser Interferometer Application; Coordinate Measuring Machine (CMM).

Practice: (Laboratory Mode- Learn by Doing)

12. Surface Finish by Taylor's Apparatus –LVDT.
13. Measurement of Tool angle in Tool Maker's Microscope.
14. Repeat Laboratory-1 or Test.

(50% of the topics will be covered by “Learn by Doing” principle and few video presentations)

Reference:

Text books :

1. Gupta, I C, A Text Book of ENGINEERING METROLOGY.2016. 8th Edition, Reprint, Dhanpat Rai Publication, New Dehi-110002
2. Narayana, K L, Engineering Metrology.2014. Third Edition, Scitech Publication(India) Privet Limited

Reference Books:

3. Mahajan, M, A Text Book of Metrology. 2010. DhanpatRai& Co (P) Ltd,ISBN 13 : 978-817700051

Session Plan

Topic coverage and Internal Test	No. of Sessions (in hrs.)	Activity (lecture, tutorial, lab practice, field studies/field-trip, Workshop etc.)	Assignment (Project, assignment, field study, seminar, etc.)	Suggested Reading (Book, Video, Online source, etc.)
Module I				
Introduction to metrology Importance and need for measurements and metrology	1	lecture	Assignment	https : //www.youtube.com/watch?v=xcvNl1HHY9o https : //www.youtube.com/watch?v=qXhOWXShHlw Mahajan, M, A Text Book of Metrology. 2010. DhanpatRai& Co (P) Ltd,ISBN 13 : 978-817700051
Need for Inspection	1	lecture	Assignment	https : //www.youtube.com/watch?v=YYrnjEo90fs Mahajan, M, A Text Book of Metrology. 2010. DhanpatRai& Co (P) Ltd,ISBN 13 : 978-817700051

Precision & Accuracy	1	lecture	Assignment	https : //www.youtube.com/watch?v=b38hFWvEjwI Mahajan, M, A Text Book of Metrology. 2010. DhanpatRai& Co (P) Ltd,ISBN 13 : 978-817700051
Errors in Measurement	1	lecture	Assignment	https : //www.youtube.com/watch?v=cGdbQeRSYTc Mahajan, M, A Text Book of Metrology. 2010. DhanpatRai& Co (P) Ltd,ISBN 13 : 978-817700051
Practice				
1. Calibration of measuring Instruments using slip gauge blocks	2	practice		
Module II				
Limit System, Limits Fits & Tolerances	2	lecture	Assignment	https : //www.youtube.com/watch?v=zxyER18KnnM&list=PL0uwpDY0Y8Q2aoPhDuEZLI1PVuKKUGb90 https : //www.youtube.com/watch?v=zxyER18KnnM&list=PL0uwpDY0Y8Q2aoPhDuEZLI1PVuKKUGb90&index=1 Mahajan, M, A Text Book of Metrology. 2010. DhanpatRai& Co (P) Ltd,ISBN 13 : 978-817700051
Allowances, Hole Basis & Shaft Basis Systems, Interchangeability	1	lecture	Assignment	https : //www.youtube.com/watch?v=AP_T7hf5Wv0&list=PL0uwpDY0Y8Q2aoPhDuEZLI1PVuKKUGb90&index=4 Mahajan, M, A Text Book of Metrology. 2010. DhanpatRai& Co (P) Ltd,ISBN 13 : 978-817700051

Design of Gauges- GO, NOGO	2	lecture	Assignment	https : //www.youtube.com/watch?v=uNOZ TmhsH1w https : //www.youtube.com/watch?v=mZH Hdim3hOY Mahajan, M, A Text Book of Metrology. 2010. DhanpatRai& Co (P) Ltd,ISBN 13 : 978-817700051
Practice				
2.Introduction to Metrology Laboratory(1hr) + Steel Rule, Tape, Right Angle Protractor, Surface Plate	2	Practice	field study	
3.Gauges- Filler ,Radius, Thread, Wire, Snap, GO- NOGO	2	Practice	field study	
Module III				
Standards of Measurement	1	lecture	Assignment	Mahajan, M, A Text Book of Metrology. 2010. DhanpatRai& Co (P) Ltd,ISBN 13 : 978-817700051
Dial Indicators, Vernier caliper &Micrometer	1	lecture	Assignment	https : //www.youtube.com/watch?v=FqSJh Y_lctc https : //www.youtube.com/watch?v=vkPlz malvN4 https : //www.youtube.com/watch?v=StBc5 6ZifMs Mahajan, M, A Text Book of Metrology. 2010. DhanpatRai& Co (P) Ltd,ISBN 13 : 978-817700051

Comparators Mechanical, Electrical, Pneumatic	1	lecture	Assignment	Mahajan, M, A Text Book of Metrology. 2010. Dhanpat Rai & Co (P) Ltd, ISBN 13 : 978-817700051
Practice				
ier Caliper- inside, outside, depth measurement, Height Gauge	2	Practice	Field Study	
5.Micrometers, Outside & Inside Micrometer, Depth Micrometer	2	Practice	Field Study	
6.Three point Bore Micrometer	2	Practice	Field Study	
Module IV				
Angular Measurements Measurement of Angles & Tapers using Bevel Protractor Angle Gauges, Sine Bars	3	lecture	Assignment	https : //www.youtube.com/watch?v=oJFUI _FHlio https : //www.youtube.com/watch?v=F7uC EeipdCw https : //www.youtube.com/watch?v=u- PLC3uKICM
Spirit Level, Surface Plate	1	lecture	Assignment	https : //www.youtube.com/watch?v=H- F2C5F78aw
Practice				
7.Sine Bar/Bevel Protractor- Measurement of Angles	2	Practice		

8.Flatness test using Sprit Level	2	Practice		
9.Use of Dial Indicators-in –Lathe.	2	Practice		
Module V				
Gear Tooth Metrology	2	lecture	Assignment	https : //www.youtube.com/watch?v=fb278 VIHICU
Inspection &Alignment Tests	1	lecture	Assignment	https : //www.youtube.com/watch?v=utZVv 7QvRt8
Transducers, Variable Resistance Transducer, LVDT, comparative transducer, piezoelectric transducer, photo voltaic cells.	2	lecture	Assignment	https : //youtu.be/vuVFbKsxsds
Devices for pressure measurement- dead weight tester, bourdon tube pressure gauge, diaphragm and bellow gauges.	1	lecture	Assignment	
Practice				
ar Tooth Metrology, Inspection & Alignment tests	3	Practice		
Module VI				
Low Pressure Measurements	1	lecture	Assignment	
Force Measuring Using Proving	2	lecture	Assignment	

Rings. Torque Measuring Using Dynamometers, Strain Measurements				
Profile Projector, Tool Maker's Microscope, Optical Flats, application.	1	lecture	Assignment	https : //www.youtube.com/watch?v=HGO9GXaeZFc https : //www.youtube.com/watch?v=hqsVXA5S2xM https : //www.youtube.com/watch?v=5JE7BV-XkSk
Laser Interferometers	1	lecture	Assignment	https : //www.youtube.com/watch?v=UA1qG7Fjc2A
Autocollimators	1	lecture	Assignment	https : //www.youtube.com/watch?v=XHEywuzl9sA
Practice				
tical Flat Use & Surface Plate test using Spirit Level & Dial Gauge	2	Pratice	Field study	
12.Measurement of template using Profile Projector	2	Practice	Field Study	
Module VII				
Assessment of Surface Roughness, Machining Symbols for	1	lecture	Assignment	https : //www.youtube.com/watch?v=omhoWIs2d-M

Surface Finish, Measuring Instruments, Tally- Surf,				https : //www.youtube.com/watch?v=VyeP ASErr5Q
Screw Thread Measurement- Terminology, Determination of Effective Diameter Using Two. three Wire Method	2	lecture	Assignment	https : //www.youtube.com/watch?v=N4pjj JMmk3A https : //www.youtube.com/watch?v=LjQf6 ISFISg
Coordinate measuring machine (CMM)	1	lecture	Assignment	https : //www.youtube.com/watch?v=844Uj RBVxIY
Practice				
11.Surface Finish by Taylor's Apparatus	2	Practice	field study	
13.Measurement of Tool angle in Tool Maker's Microscope	2	Practice	Field Study	
14.Repeat Laboratory-1	2	Practice	field study	
15. Repeat Laboratory-2	2	Practice	field study	
Total Hours	65			

Basic Fluid Mechanics

Course Title	Code	Type of course	T-P-PJ	Prerequisite
Basic Fluid Mechanics	ENFC0402	Theory + Practice	2-1-0	Nil

Objective

- To make students understand flow characteristics and different types of flow and application of dimensional analysis, different flow and velocity measuring device.

Course Outcome

- Understand flow characteristics and different types of flow
- Understand kinematics and dynamics of flow
- Understand about application of dimensional analysis

Evaluation Systems

Internal Examination	Component	% of Marks	Method of Assessment
	Internal Theory	20	Written examination
	Internal Practice	30(20+10)	Lab work + Learning Record
External Examination	External Theory	30	Written examination
	External Practice	20	Lab work
Total		100	

Course outline

Module I Fluid kinematics (9 Hours)

Types of flow, Continuity equation (in one, two & three dimension), velocity and acceleration, streamline, streakline, path line, velocity potential function and stream function, types of motion (Linear Translation and all deformations, rotation and vorticity, vortex flow).

Experiments:

1. Demonstration of different types of flow
2. Pressure Measurement

Module II Fluid Dynamics (7 Hours)

Rate of Flow Or Discharge, Euler's equation of motion along a stream line for ideal flow - Principle of conservation of energy Integration of Euler's equation along a stream line - Bernoulli's equation (**Derivation not to be included for external Examination**) - Practical applications of Bernoulli's Principle - Kinematics of free jets.

Experiments:

3. Bernoulli's experiment
4. Characteristics of free jet

Module III Principle of conservation of momentum (5 Hours)

Impulse momentum equation. Application of momentum principle for force on pipe bends and reducers. Angular momentum principle and its applications (Numerical problems on angular momentum principle not included. Only fundamental concepts.)

Experiments :

5. Impact of jet

Module IV Laminar Flow and Turbulent Flow : (6 Hours)

Reynolds's Experiment, Laws of Laminar and Turbulent Friction, Hagen Poiseuille Equation for laminar flow through pipe (**Derivation not to be included for external Examination**), Darcy-Weisbach Equation for Turbulent flow through pipe (**Derivation not to be included for external Examination**)

Experiments :

6. Pipe friction
7. Reynolds's no calculation and identification of laminar and turbulent flow

Module V Flow through Pipes (8 Hours)

Loss of Energy-Friction loss & Minor losses, HGL & TEL, Pipes in series and Parallel, Equivalent Length of pipe, Power transmission through pipes and nozzle, Hydro dynamically smooth & rough boundaries, Moody's Diagram.

Experiments :

8. HGL & TEL through simulation
9. Hardy Cross Method

Module VI Dimensional Analysis and Similitude : (5 Hours)

Fundamental and derived units, Dimensional formulae for various geometric, kinematic and dynamic parameters. Rayleigh and Buckingham's methods for arriving group of dimensionless parameters. Similarity laws - Reynolds, Froude, Mach Laws. Geometric, Kinematic and Dynamic similarities. Distorted Models.

Module VI Flow Measurement (18 Hours)

Flow through small orifice, Mouthpiece, Time of Emptying tanks. Velocity Measurement using Pitot tube, Prandtl tube, Flow measurement in pipes-Flow Meters-orifice Plate-Flow Nozzle Meter, Venturi Meter, Flow rate Measurement in channel- Weir and Notches.

Experiments :

10. Flow Measurement through V-Notch
11. Flow Measurement through Venturi Meter
12. Flow Measurement through Small Orifice
13. Flow Measurement through Orifice Meter
14. Flow Measurement through Rota meter
15. Flow Measurement through Pitot Tube

LIST OF THE EXPERIMENT THROUGH SIMULATION : -

1. Bernoulli's Equation
2. Venturi Meter
3. Orifice Meter
4. Reynolds's Experiment
5. Impact Of Jet
6. Discharge through Weir.
7. Mouth Piece

All this Experiment can be done using the link given below

<http://eerc03-iiith.virtual-labs.ac.in/index.php?section=Introduction>

http://vlab.co.in/ba_labs_all.php?id=7

E-content:

Text Books:

1. Fluid mechanics : A.K.JAIN, Khanna publishers

Reference Books:

1. Hydraulics and Fluid mechanics : P.N.MODI & S.M.SETH
2. Fluid Mechanics and Hydraulic Machines by R. K. Bansal,

Online Source:

Video Links : -

Bernoulli Equation : <https://www.youtube.com/watch?v=brN9citH0RA>

<https://www.youtube.com/watch?v=bC8v6hlXnSk> <https://www.youtube.com/watch?v=UJ3-Zm1wbIQ>

<https://www.youtube.com/watch?v=oUd4WxjoHKY> <http://www.efm.leeds.ac.uk/CIVE/FluidsLevel1/Unit03/T4.html>

<http://www.efm.leeds.ac.uk/CIVE/FluidsLevel1/Unit03/T4.html>

Flow Measurement : Venturi Meter Fabrication : <https://www.youtube.com/watch?v=Zpux9MvvDmw>

Venturi Effect : <https://www.youtube.com/watch?v=H3TcLoapJBo>

<https://www.youtube.com/watch?v=H3TcLoapJBo> <http://www.wermac.org/specials/venturiflowmeter.html>

Flow over Weirs : <https://www.youtube.com/watch?v=oXYHe-DGyVE>

<https://www.youtube.com/watch?v=oXYHe-DGyVE> **Flume demo** : <https://www.youtube.com/watch?v=awsnbnljy78>

<https://www.youtube.com/watch?v=awsnbnljy78> **Weirs** : https://www.youtube.com/watch?v=Ax38XN_XqCU

https://www.youtube.com/watch?v=Ax38XN_XqCU

V-Notch : <https://www.youtube.com/watch?v=2dZtIn7CUos>

Reynolds Experiment :

<https://www.youtube.com/watch?v=1wNmtle6qkE>

https://www.youtube.com/watch?v=0ThQ_nD97hY

Laminar Flow in a Pipe

[youtube=<http://www.youtube.com/watch?v=KqqtOb30jWs&NR=1>]

Turbulent Flow in a Pipe

[youtube=<http://www.youtube.com/watch?v=NplrDarMDF8&NR=1>]

Session Plan

Topic coverage and Internal Test	No. of Sessions (in hrs.)	Activity (lecture, tutorial, lab practice, field studies/field-trip, Workshop etc.)	Assignment (Project, assignment, field study, seminar, etc.)	Suggested Reading (Book, Video, Online source, etc.)
MODULE-1 FLUID KINEMATICS				
Types of flow, Continuity equation (in one, two & three dimension) video on types of flow	2	Lecture		
velocity and acceleration, streamline, streakline, path line	1	Lecture		
Velocity potential function and stream function, types of motion (Linear Translation and all deformations) rotation and vorticity, vortex flow.	2	Lecture		Video
Demonstration of different types of flow	2	Practice		
Pressure Measurement	2	Practice		
MODULE-2 FLUID DYNAMICS				
Rate of Flow Or Discharge, Euler's equation of motion along a stream line for ideal flow - Principle of conservation of energy Integration of Euler's equation along a stream line - Bernoulli's equation	1+2	Lecture+ Practice		
Practical applications of Bernoulli's Principle - Kinematics of free jets. Bernoulli's Principle	2+2	Lecture+ Practice		Video

MODULE-3 PRINCIPLE OF CONSERVATION OF MOMENTUM				
Impulse momentum equation. Application of momentum principle for force on pipe bends and reducers	2+2	Lecture+ Practice		
Angular momentum principle and its applications (Numerical problems on angular momentum principle not included. Only fundamental concepts.)	1	Lecture		
MODULE-4 LAMINAR FLOW & TURBULENT FLOW				
Reynolds's Experiment, Laws of Laminar and Turbulent Friction	1+2	Practice		Video
Hagen Poiseulle Equation for laminar flow through pipe, Darcy-Weisbach Equation for Turbulent flow through pipe	1+2	Lecture+ Practice		
MODULE-5 FLOW THROUGH PIPES				
Loss of Energy-Friction loss & Minor losses, HGL&TEL	1+2	Lecture+ Practice		
Pipes in series and Parallel, Equivalent Length of pipe	1+2	Lecture+ Practice		
Power transmission through pipes and nozzle	1	Lecture		
Hydrodynamically smooth & rough boundaries,	1	Lecture		

Moody's Diagram.				
MODULE-6 DIMENSIONAL ANALYSIS				
Fundamental and derived units, Dimensional formulae for various geometric, kinematic and dynamic parameters.	1	Lecture		
Rayleigh and Buckingham' methods for arriving group of dimensionless parameters.	2	Lecture		
Similarity laws - Reynolds, Froude, Mach Laws.Geometric, Kinematic and Dynamic similarities.Distorted Models.	2	Lecture		
MODULE-7 FLOW MEASUREMENT IN PIPES AND CHANNELS				
Flow through small orifice,MouthPiece,Time of Emptying tanks.	2+4	Lecture+ Practice		
Velocity Measurement using pitottube ,Prandtl tube	2+2	Lecture+ Practice		
Flow measurement in pipes-Flow Meters-orifice Plate-Flow Nozzle Meter,Venturimeter	2+4	Lecture+ Practice		
Flow rate Measurement in channel- Weir and Notches.	2+2	Lecture+ Practice		
Total (hrs.)	60			

Basic Surveying

Subject Name	Code	Type of course	T-P-PJ	Prerequisite
Basic Surveying	ENFC0403	Theory & Practice	2-1-0	Nil

Objective

- To make students able to understand the measurement techniques, equipment used in land surveying using Dumpy level, Theodolite and Total station.

Course Outcome

- Apply math, science, and technology in surveying activities.
- Measure horizontal distances across clear landscape and across obstacles.
- Prepare contour maps using Theodolite and Total station for projects(Road, Railway and water shade)

Evaluation Systems

Internal Examination	Component	% of Marks	Method of Assessment
	Internal Theory	20	Written examination
	Internal Practice	30(20+10)	Lab work + Learning Record
External Examination	External Theory	30	Written examination
	External Practice	20	Lab work
Total		100	

Module-I (2HRS)

Historical survey practice : Introduction to surveying : Classification, Basic Principle, List of Instruments used in surveying.

Module-II (8HRS)

Leveling: Use of dumpy level and leveling staff. Temporary and Permanent adjustment of dumpy level, Curvature and refraction error, types of leveling, reciprocal leveling, leveling difficulties and common errors.

Experiments:

1. Calculation of RL using HI and Rise and fall method.
2. Longitudinal and cross sectional Leveling
3. Check Leveling

Module--III (11HRS)

Theodolite: Use of theodolite, description, uses and adjustments – temporary and permanent, measurement of horizontal and vertical angles.

Experiments :

4. Theodolite traversing, checks and closing errors, balancing a traverse, adjustment of bearings, computation of area of closed traverse.
5. Measurement of Inaccessible points.

Module--IV (13Hrs)

Total station: Introduction to Total station, Functions, working principles of total station applications, Use of all parts and all options inside the machines.

Experiments:

6. Basic operation, setting up the instrument
7. Measurement of angle and Measurement of Distance
8. Setting up instrument station, Co-ordinate system
9. Traverse adjustment (With help of software)
10. Area calculation using Total station

Module--V (6Hrs)

Contouring: Characteristics, methods and types of contouring.

Experiments:

11. Preparation of contour map using total station and surfer software.

Module--VI (10HRS)

Curves: Types of curves, Properties– simple, compound, reverse and transition curve.

Experiments:

12. Setting out of different curves (simple, compound, reverse and transition) using Total Station.

Module -VI (10HRS)

Setting out of work using Total station.

Experiments:

13. Setting out of Building
14. Setting out of culvert.

Text Books:

1. Surveying Vol I & II, III B C Purnima, Laxmi Publication.
2. Surveying, volume 1&2 BY S.K.Duggal, TMH publisher.

Reference Books:

1. Surveying & Levelling by T.P Kanitkar& V S Kulkarni

Online Source :

<https://www.youtube.com/watch?v=-JgCfsooiu0>)

<https://www.youtube.com/watch?v=grvdEYmjSPc>)

[https://www.youtube.com/watch?v=A-kf1oX_xJ0&t=796s,](https://www.youtube.com/watch?v=A-kf1oX_xJ0&t=796s)

[https://www.youtube.com/watch?v=XsxJD79MR0s\)](https://www.youtube.com/watch?v=XsxJD79MR0s)

<https://www.youtube.com/watch?v=eRiSShpqm3U>

[**https://www.youtube.com/watch?v=hISmKTEfgXc**](https://www.youtube.com/watch?v=hISmKTEfgXc)

[**https://www.youtube.com/watch?v=zZL9MNsmSWo**](https://www.youtube.com/watch?v=zZL9MNsmSWo)

<https://www.youtube.com/watch?v=aqN8uDJoXFA&t=2s>

[**https://www.youtube.com/watch?v=50jrYYKKUCA**](https://www.youtube.com/watch?v=50jrYYKKUCA)

[https://www.youtube.com/watch?v=Yy-8e3sCr0U\)](https://www.youtube.com/watch?v=Yy-8e3sCr0U)

[https://www.youtube.com/watch?v=pVgDyh_YBcI,](https://www.youtube.com/watch?v=pVgDyh_YBcI)

[https://www.youtube.com/watch?v=rCLKEYD0_KA,](https://www.youtube.com/watch?v=rCLKEYD0_KA)

<https://www.youtube.com/watch?v=PZ7oUmD5DnU>

Online Source :

<https://www.youtube.com/watch?v=-JgCfsooiu0>)

<https://www.youtube.com/watch?v=grvdEYmjSPc>)

https://www.youtube.com/watch?v=A-kf1oX_xJ0&t=796s,

<https://www.youtube.com/watch?v=XsxJD79MR0s>)

<https://www.youtube.com/watch?v=eRiSShpm3U>

<https://www.youtube.com/watch?v=hISmKTEfgXc>

<https://www.youtube.com/watch?v=zZL9MNsmSWo>

<https://www.youtube.com/watch?v=aqN8uDJoXFA&t=2s>

<https://www.youtube.com/watch?v=50jrYYKKUCA>

<https://www.youtube.com/watch?v=Yy-8e3sCr0U>)

https://www.youtube.com/watch?v=pVgDyh_YBcl,

https://www.youtube.com/watch?v=rCLKEYD0_KA,

<https://www.youtube.com/watch?v=PZ7oUmD5DnU>

Lesson Plan

Module I

Topic coverage and Internal Test	No. of Sessions (in hrs.)	Activity (lecture, tutorial, lab practice, field studies/field-trip, Workshop etc.)	Assignment (Project, assignment, field study, seminar, etc.)	Suggested Reading (Book, Video, Online source, etc.)
Historical survey practice : Introduction to surveying : Classification, Basic Principle, List of Instruments used in surveying.	2	Lecture	Assignment	https://www.youtube.com/watch?v=-JgCfsooiu0)
Total (hrs.)	2			

Module-II

Topic coverage and Internal Test	No. of Sessions (in hrs.)	Activity (lecture, tutorial, lab practice, field studies/field-trip,	Assignment (Project, assignment, field study, seminar,	Suggested Reading (Book, Video, Online source, etc.)

		Workshop etc.)	etc.)	
Levelling : Use of dumpy level and levelling staff. Temporary and Permanent adjustment of dumpy level, Calculation of RL by HI and rise and fall method. Curvature and refraction error, types of levelling, reciprocal levelling, levelling difficulties and common errors.	2	lecture	Assignment	https : //www.youtube.com/watch?v=grvdEYmjSPc
Experiments : Calculation of RL using HI and Rise and fall method.	2	practice, field studies	field study	https : //www.youtube.com/watch?v=grvdEYmjSPc
Longitudinal and cross sectional levelling Check Levelling	4	practice, field studies	field study	https : //www.youtube.com/watch?v=grvdEYmjSPc
Total (hrs.)	8			

Module III

Topic coverage and Internal Test	No. of Sessions (in hrs.)	Activity (lecture, tutorial, lab practice, field studies/field-trip, Workshop etc.)	Assignment (Project, assignment, field study, seminar, etc.)	Suggested Reading (Book, Video, Online source, etc.)

Theodolite : Use of theodolite, description, uses and adjustments – temporary and permanent, measurement of horizontal and vertical angles.	2	(lecture, lab practice, field studies)	Assignment	<a href="https://www.youtube.com/watch?v=A-
kf1oX_xJ0&t=796s">https : //www.youtube.com/watch?v=A- kf1oX_xJ0&t=796s . <a href="https :
//www.youtube.com/watch?v=XsxJD79MR
0s">https : //www.youtube.com/watch?v=XsxJD79MR 0s)
Theodolite traversing, checks and closing errors, balancing a traverse, adjustment of bearings, computation of area of closed traverse. Experiments : Theodolite traversing, checks and closing errors, balancing a traverse, adjustment of bearings, computation of area of closed traverse.	3+2	Lecture ,lab practice, field studies)	Field study	<a href="https://www.youtube.com/watch?v=A-
kf1oX_xJ0&t=796s">https : //www.youtube.com/watch?v=A- kf1oX_xJ0&t=796s . <a href="https :
//www.youtube.com/watch?v=XsxJD79MR
0s">https : //www.youtube.com/watch?v=XsxJD79MR 0s)
Measurement of Inaccessible points using theodolite. Experiments : Measurement of Inaccessible points.	2+2	(lab practice, field studies)	Field study	<a href="https :
//www.youtube.com/watch?v=eRiSShpqm3
U">https : //www.youtube.com/watch?v=eRiSShpqm3 U)
Total (hrs.)	11			

Module IV

Topic coverage and Internal Test	No. of Sessions (in hrs.)	Activity (lecture, tutorial, lab practice, field studies/field-trip, Workshop etc.)	Assignment (Project, assignment, field study, seminar, etc.)	Suggested Reading (Book, Video, Online source, etc.)
Total station : Introduction to Total station, Functions, working principles of total station applications, Use of all parts and all options inside the machines. Electronic data recording & total station operation	3	Lecture	Assignment	<u>https : //www.youtube.com/watch? v=hISmKTEfgXc</u>
Experiments : 6. Basic operation, setting up the instrument 7. Measurement of angle and Measurement of Distance 8. Setting up instrument station, Co-ordinate system 9. Traverse adjustment (With help of software) 10. Area calculation using Total station	10	practice, field studies	field study	<u>https : //www.youtube.com/watch? v=hISmKTEfgXc</u> <u>https : //www.youtube.com/watch? v=zZL9MNsmSWo</u> <u>https : //www.youtube.com/watch? v=zZL9MNsmSWo</u>
Total (hrs.)	13			

Module V

Topic coverage and Internal Test	No. of Sessions (in hrs.)	Activity (lecture, tutorial, lab practice, field studies/field-trip, Workshop etc.)	Assignment (Project, assignment, field study, seminar, etc.)	Suggested Reading (Book, Video, Online source, etc.)
Contouring : Characteristics, methods and types of contouring	1	lecture	assignment	<u>https : //www.youtube.com/watch?v=50jrYYKKUCA</u>
Preparation of contour map using total station and surfer software Experiments : 11. Preparation of contour map using total station and surfer software.	5	lecture, lab practice, field studies	assignment, field study	<u>https : //www.youtube.com/watch?v=50jrYYKKUCA</u>
Total (hrs.)	6			

Module V

Topic coverage and Internal Test	No. of Sessions (in hrs.)	Activity (lecture, tutorial, lab practice, field studies/field-trip, Workshop etc.)	Assignment (Project, assignment, field study, seminar, etc.)	Suggested Reading (Book, Video, Online source, etc.)

Curves : Types of curves, Properties—simple, compound, reverse and transition curve. Experiments : 12. Setting out of different curves (simple, compound, reverse and transition) using Total Station.	10	lecture, tutorial, field studies	assignment, field study	https : //www.youtube.com/watch?v=aqN8uDJoXFA&t=2s https : //www.youtube.com/watch?v=HtSmKTEI2XC
Total (hrs.)	10			

Module VI

Topic coverage and Internal Test	No. of Sessions (in hrs.)	Activity (lecture, tutorial, lab practice, field studies/field-trip, Workshop etc.)	Assignment (Project, assignment, field study, seminar, etc.)	Suggested Reading (Book, Video, Online source, etc.)
Setting out of work using Total station. Experiments : 13. Setting out of Building 14. Setting out of culvert.	10	lecture, tutorial, field studies	assignment, field study	https : //www.youtube.com/watch?v=XPbWIp56zxY
Total (hrs.)	10			

Basic Electrical Engineering

Course Title	Code	Type of course	T-P-PJ	Prerequisite
Basic Electrical Engineering	ENFC0404	Theory & Practice	2-1-0	Nil

Objective

- Impart a basic knowledge of electrical quantities such as current, voltage, power, energy and frequency in the analysis of basic D.C. and A.C.
- Develop selection skill to identify the type of generators or motors required for particular application and highlight the importance of transformers in transmission and distribution of electric power.

Course Outcome

- Understand concept of electrical circuit and magnetic circuit configurations
- Understand fundamentals of single and three phase A.C circuits,
- Understand wiring schedule for residential, office and industrial loads, concept of earthing and will be acquainted with Distribution Transformer and LT lines to understand the fundamentals of distribution system.

Evaluation Systems

Internal Examination	Component	% of Marks	Method of Assessment
	Internal Theory	20	Written examination
	Internal Practice	30(20+10)	Lab work + Learning Record
External Examination	External Theory	30	Written examination
	External Practice	20	Lab work
Total		<i>100</i>	

Module I

Introduction to Electrical Engineering : Essence of electricity, Electric field; electric current, potential and potential difference, E.M.F, electric power, ohm's law, basic circuit components, Ideal and Practical Sources, Source Conversion, Induced EMF, Energy Stored in Inductor & Capacitor.

Practice:

1. Understanding working principle of DC potential (Lead-Acid battery). Specific gravity of electrolyte. Charging process of battery. Modern DC cells.
2. Plotting the V-I Characteristics of Incandescent lamp.

Module II

DC Networks : Laws and Theorems applicable to DC networks (KCL & KVL, Node voltage & Mesh current analysis, Delta-Star & Star-Delta conversion, Superposition principle, Thevenin's & Norton theorem), Transients in R-L and R-C circuits with DC excitation, Simple problems.

Practice:

3. Verification of Thevenin's theorem, Superposition and Nodal analysis (by experimental setup)
4. Verification of KCL and KVL in series and parallel circuits.
Observing current rise/fall due to transience in DC circuits in Oscilloscope.

Module III

Introduction to Electromagnetism : Magnetic Circuits, B-H curve, Permeability, Reluctance, Solution of simple magnetic circuits, Hysteresis and Eddy current loss. Methods of preventing such losses. Solenoids and field coils. Application of solenoids in different circuits in Automobiles in electrical protection Working principle of MCBs. Use of field coils in machines and instruments. Galvanometer.

Module IV**Practice:**

5. Study of operation of solenoids.
6. Study of operation of MCBs
7. Study of operation of field coils in machines.
8. Observation of generation of magnetic flux for different input current in a coil and plotting BH Curve.

Practice: Applications of electromagnetism.

9. Observing working of a coil, a Galvanometer.
10. Measurement of iron loss in a core from BH curve by using CRO
11. Observing Induction of Electro Motive Force in a DC generator with D.C Shunt Generator.

Module V

Single-Phase AC Circuits : Single-phase EMF Generation, Waveform and Phasor Representation, Average and Effective value of sinusoids, Peak factor & Form factor, Complex Impedance and Power using j-operator, Power factor.

Practice:

12. Connection & Measurement of power consumption of a fluorescent lamp/LED.
13. Calculation of current, voltage, power & power factor of series RLC circuit excited by 1- \emptyset A.C Supply.

Module VI

Three-Phase AC Circuits: Comparison between single-phase and three-phase systems, Three-phase EMF Generation, Line and Phase quantities in star and delta networks, Power and its measurement in three-phase balanced circuits.

Practice:

15. Measurement of power and power factor in a 3- \emptyset AC circuit by two wattmeter
16. Single-Phase Transformers : Construction and principle of operation, EMF Equation, Transformation ratio, Practical and Ideal transformers
Calculation of No-Load losses of a 1- \emptyset Transformer.

Module VII

Only Practice

17. Domestic Wiring; Switch Boards, Distribution boxes

18. Workshop wiring : Study of the wiring of electrical machine lab.

19. Concept of Earthing.

Reference

Text Books:

1. D C Kulshrestha, “Basic Electrical Engineering”, Tata Mc-Graw Hill Education
2. P K Sathpathy “Basic Electrical Engineering” Oxford

Reference Books :

1. Hughes, “Electrical & Electronic Technology”, Ninth Edition (Revised by J Hiley, K Brown, and I Smith), Pearson Education,

Session Plan

Topic coverage and Internal Test	No. of Sessions (in hrs.)	Activity (lecture, tutorial, lab practice, field studies/field-trip, Workshop etc.)	Assignment (project, assignment, field study, seminar, etc.)	Suggested Reading (Book, Video, Online source, etc.)
Introduction to Electrical Engineering : Essence of electricity, Electric field; electric current, potential and potential difference.	1	Lecture	Assignment	Book
Emf, electric power, ohm’s law	1	Lecture	Assignment	Video
basic circuit components, Ideal and Practical Sources	1	Lecture	Assignment	Book
Source Conversion	1	Lecture	Assignment	Book
Induced EMF	1	Lecture	Assignment	Book
Energy Stored in Inductor & Capacitor	1	Lecture	Assignment	Book
DC Networks : Laws and Theorems applicable to DC networks (KCL & KVL)	4	Practice	Experiments	Book
Node voltage	1	Lecture	Assignment	Book
Mesh current analysis	1	Lecture	Assignment	Book
Delta-Star & Star-Delta conversion	1	Lecture	Assignment	Book

Superposition principle	2	Practice	Experiments	Book
Thevenin's & Norton theorem	4	Practice	Experiments	Book
Transients in R-L and R-C circuits with DC excitation	2	Lecture	Assignment	Book
Simple problems	1	Tutorial	Assignment	Book
Magnetic Circuits : Introduction to Electromagnetism, B-H curve	1	Lecture	Assignment	Book
Permeability, Reluctance, Solution of simple magnetic circuits	1	Lecture	Assignment	Book
Hysteresis and Eddy current loss	1	Lecture	Assignment	Book
D.C. Machines : Construction	2	Practice	Experiments	Book
Classification and Principle of operation of DC machines, EMF equation of DC generator	1	Lecture	Assignment	Video
Speed Equation of DC Motor	4	Practice	Experiments	Book
Single-Phase AC Circuits : Single-phase EMF Generation, Waveform and Phasor Representation	2+1	Lecture (using videos) and Practice	Experiments	Video
Average and Effective value of sinusoids, Peak factor & Form factor	2	Lecture	Assignment	Video
Complex Impedance and Power using j-operator, Power factor.	2	Lecture	Assignment	Video
Three-Phase AC Circuits : Comparison between single phase and three-phase systems, Three-phase EMF Generation	2	Lecture	Assignment	Video
Line and Phase quantities in star and delta networks, Power and its measurement in three-phase balanced circuits.	1	Lecture	Assignment	Book
Single-Phase Transformers : Construction and principle of operation.	1+2	Lecture and Practice	Experiments	Book
EMF Equation, Transformation ratio	2	Lecture	Assignment	Book
Practical and Ideal transformers	1+2	Practice	Experiments	Book

Induction Motors : Introduction to Three-phase and Single-phase Induction Motors, Concept of Slip	2+2	Lecture and Practice	Experiments	Book
Concept of Slip, Slip-Torque characteristics	1	Lecture	Assignment	Book
Measuring Instruments : Introduction, PMMC Ammeters and Voltmeters with extension of range	2	Lecture	Assignment	Book
Moving-Iron Ammeters and Voltmeters	1	Lecture	Assignment	Book
Dynamometer type Wattmeter, Energy meter	4	Practice	Experiments	Book
Domestic Wiring; Switch Boards, Distribution boxes	2	Practice	Experiments	
Workshop wiring : Study of the wiring of electrical machine lab.	2	Practice	Experiments	
Concept of Earthing.	2	Practice	Experiments	
Total- 68 Hours (Theory- 35 hours, Practice- 33hours)				

Electrical Machines

Course Title	Code	Type of course	T-P-PJ	Prerequisite
Electrical Machines	ENFC0405	Theory & Practice	2-1-0	Nil

Objective

- To introduce the students about principles of electromagnetism applied to AC & DC Machines and its importance.

Course Outcome

- Able to distinguish the constructional similarity and dissimilarity between various machines.
- Able to test and certify the machines as per BIS
- Able to select appropriate transformer and electrical machines
- Able to develop selection skill to identify the type of generators or motors required for particular application.

Evaluation Systems

Internal Examination	Component	% of Marks	Method of Assessment
	Internal Theory	20	Written examination
	Internal Practice	30(20+10)	Lab work + Learning Record
External Examination	External Theory	30	Written examination
	External Practice	20	Lab work
Total		100	

Course outline

Module: I

D.C. Machines: Construction, Classification and Principle of operation of DC machines, EMF equation of DC generator, Dc Motor Characteristics, Speed Equation of DC Motor. Characteristic for Speed Armature Current, Torque Armature Current and Speed Torque of (i) Separately Excited DC Motor, (ii) DC Shunt Motor, (iii) DC Series Motor, and (iv) DC Compound Motor, Comparison between Different types of DC Motors and their Application. (Lecture & practice)

Practice:

- Determination of OCC (Open Circuit Characteristics) of D.C Shunt Generator.
- Starting & Speed Control of D.C Shunt motor by (i) Field flux control method & (ii) armature voltage control method.

Module: II

Single-Phase Transformers: Construction and principle of operation, EMF Equation, Transformation ratio, Practical and Ideal transformers, Transformer losses, Brief idea on Transformer Phasor diagram and transformer rating

Practice:

- Calculation of No-Load losses of a 1-Ø Transformer.

Module: III

Three Phase Transformers: Three-phase transformer connections- Star-star, Two Single-Phase Transformers connected in Open Delta (V-Connection) and their rating, T-Connection (Scott

Connection) of Two Single-Phase Transformers to convert Three-Phase balanced supply to Two-Phase balanced supply. Delta-delta, Star-delta, Delta-star, Zig-zag connections. Scott connection, Open delta connection. Auto Transformers

Module IV

Three Phase Induction Machines

Constructional Features of Squirrel Cage Rotor type and Slip Ring/Wound Rotor type of Induction Motors, Principle of Operation, and Slip Speed.

Practice:

4. Determination of Efficiency, Plotting of Torque-Slip Characteristics of Three Phase Induction motor by Brake Test.

Module: V

Three Phase Synchronous Generators: Synchronous Generator Construction (both Cylindrical Rotor and Salient Pole type), The Speed of Rotation of a Synchronous Generator, Induced voltage in A.C. Machines

Module: VI

Three Phase Synchronous Motors : Basic Principles of Motor operation, Construction, Starting Synchronous Motors, induction motor and Synchronous Motors, Synchronous Motor Ratings, Applications of synchronous motors(Class room teaching)

Module: VII

Single Phase Induction Motors: Starting of Single Phase Induction Motors, Speed Control of Single Phase Induction Motors, Circuit Model. Other types of Motors : Reluctance Motors.(Class room teaching)

Practice:

5. Determination of parameter of a single phase induction motor and study of

(a)Capacitor start induction motor

(b)Capacitor start and capacitor run induction motor

Text Books:

1. Electrical Machines – D P Kothari and I J Nagrath – Tata McGraw Hill.

Reference Books:

1. Electrical Machinery – P S Bimbhra – Khanna Publishers.

2. Electrical Machines - P. K. Mukherjee, S. Chakravarti, Dhanpat Rai & Sons

Session Plan

Topic coverage and Internal Test	No. of Sessions (in hrs.)	Activity (lecture, tutorial, lab practice, field studies/field-trip, Workshop etc.)	Assignment (project, assignment, field study, seminar, etc.)	Suggested Reading (Book, Video, Online source, etc.)
D.C. Machines : Construction	2	Lecture	Assignment	Book
Classification and Principle of operation of DC machines, EMF equation of DC generator	3	Lecture	Assignment	Video
Speed Equation of DC Motor	2	Practice	Experiments	Book
Characteristic for Speed Armature Current, Torque Armature Current	2	Lecture	Assignment	Book
Comparison between Different types of DC Motors and their Application.	1	Lecture	Assignment	Book
Speed Torque of (i) Separately Excited DC Motor, (ii) DC Shunt Motor, (iii) DC Series Motor, and (iv) DC Compound Motor	2	Lecture	Assignment	Book
Determination of OCC (Open Circuit Characteristics) of D.C Shunt Generator.	2	Practice	Experiments	Book
Starting & Speed Control of D.C Shunt motor by (i) Field flux control method & (ii) armature voltage control method.	2	Practice	Experiments	Book
Single-Phase Transformers : Construction and principle of operation, EMF Equation, Transformation ratio, Practical and Ideal transformers, Transformer losses, Brief idea on Transformer Phasor diagram and transformer rating	2	Lecture	Assignment	Book
Calculation of No-Load losses of a 1- \emptyset Transformer.	3	Practice	Experiments	Book
Three Phase Transformers : Three-phase transformer connections- Star-star	1+2	Lecture (using videos) and Practice	Experiments	Video

Two Single-Phase Transformers connected in Open Delta (V-Connection) and their rating,	2	Lecture	Assignment	Video	
T-Connection (Scott Connection) of Two Single-Phase Transformers to convert Three-Phase balanced supply to Two-Phase balanced supply.	2	Lecture	Assignment	Video	
Delta-delta, Star-delta, Delta-star, Zig-zag connections.	2	Lecture	Assignment	Video	
Scott connection, Open delta connection.	5	Practice	Experiments	Book	
Auto Transformers.	1	Lecture	Experiments	Book	
THREE PHASE INDUCTION MACHINES : Constructional Features of Squirrel Cage Rotor type and Slip Ring/Wound Rotor type of Induction Motors,	2	Lecture	Assignment	Book	
Principle of Operation, Slip Speed	1	Lecture	Assignment	Video	
THREE PHASE SYNCHRONOUS GENERATORS : Synchronous Generator Construction (both Cylindrical Rotor and Salient Pole type),	2+2	Lecture Practice	+	Experiments	Book
The Speed of Rotation of a Synchronous Generator, Induced voltage in A.C. Machines	3	Lecture	Assignment	Book	
THREE PHASE SYNCHRONOUS MOTORS Basic Principles of Motor operation, Construction	2+1	Lecture Practice	&	Assignment	Book
Starting Synchronous Motors, induction motor and Synchronous Motors, Synchronous Motor Ratings, Applications of synchronous motors(Class room teaching)	2	Lecture	Assignment	Book	
SINGLE PHASE INDUCTION MOTORS : Starting of Single Phase Induction Motors, Speed Control of Single Phase Induction Motors, Circuit Model. Other types of Motors : Reluctance	3+6	Lecture Practice	and	Experiments	Book

<p>Motors. Determination of parameter of a single phase induction motor and study of (a)Capacitor start induction motor (b) Capacitor start and capacitor run induction motor</p>				
Total : 57 Hours (Theory- 35 hours, Practice- 25 hours)				

Introduction to Automation

Course Title	Code	Type of course	T-P-PJ	Prerequisite
Introduction to Automation	ENFC0406	Theory & Practice	2-1-0	Nil

Objective

- To provide knowledge levels needed for PLC programming and operating.
- To train the students to develop a relay based control circuit.

Course Outcome

- Gain knowledge on Programmable Logic Controllers
- Understand different types of Devices to which PLC input and output modules are connected
- Provide the knowledge about understand various types of PLC registers

Evaluation Systems

Internal Examination	Component	% of Marks	Method of Assessment
	Internal Theory	20	Written examination
	Internal Practice	30(20+10)	Lab work + Learning Record
External Examination	External Theory	30	Written examination
	External Practice	20	Lab work
Total		100	

Module -: I (5 Hours)

Introduction to Automation

What is Automation, Brief history of Automation, Automation Uses, Automation - PLC Basics, Mechanical relays versus PLC, PLC Architecture, Functions of various blocks, and working principle of PLC?

Module: II (8 Hours)

PLC Hardware & Terminology

Various Types of Addressing Used within a PLC, PLC Programming input instructions

Practice:

Study of hardware of PLC.

Module: III (9Hours)

Programming PLC's

Differences between Types of Programming, construction of PLC ladder diagrams, Controlling Program Flow in a Ladder Logic Program.

Practice:

Basic programming using ladder logic program

Module: IV (11 Hours)

Timers and Counters

What is timers & Counters, Use of timers and counters within a ladder logic program, Basic concepts of function blocks.

Practice:

Study of latching and unlatching of motor.

Module: V (7 Hours)

PLC Communication

What are the common types of data communications and their characteristics and use of Ethernet TCP/IP protocol.

Practice:

Sequential operation.

Module: VI (5 Hours)

Introduction to SCADA

Introduction and SCADA Basics. Importance of SCADA in Industrial Automation.

Module: VII (15 Hours)

Basic operation of SCADA

Basic operations related to SCADA. How to work on windows property.

Practice:

Basic window property concepts of SCADA.

Session Plan

Topic coverage and Internal Test	No. of Sessions (in hrs.)	Activity (lecture, tutorial, lab practice, field studies/field-trip, Workshop etc.)	Assignment (project, assignment, field study, seminar, etc.)	Suggested Reading (Book, Video, Online source, etc.)
MODULE I (Introduction To Automation) (Theory- 5 hours)				
What is Automation, Brief history of Automation	1	Lecture	Assignment	Text Book 1
Automation Uses, Automation - PLC Basics	1	Lecture	Assignment	Text Book 1
Mechanical relays versus PLC, PLC Architecture	1	Lecture	Assignment	Text Book 1
Functions of various blocks, working principle of PLC.	2	Lecture	Assignment	Text Book 1
MODULE II (PLC Hardware & Terminology) (Theory- 04 hours, Practice - 04 hours)				
Various Types of Addressing Used within a PLC	2	Lecture	Assignment	Text Book 1
PLC Programming input instructions	2	Lecture	Assignment	Text Book 1
Study of hardware of PLC.	4	Practice	Result of Experiments and Viva	Text Book 1
MODULE III (Programming PLC's) (Theory- 4 hours, Practice –05 hours)				
Differences between Types of Programming	2	Lecture	Assignment	Text Book 1
Construction of PLC ladder diagrams. Controlling Program Flow in a Ladder Logic Program.	2	Lecture	Assignment	Text Book 1
Basic programming using ladder logic program	5	Practice	Result of Experiments and Viva	Text Book 1

MODULE IV(Timers and Counters) (Theory- 06 hours, Practice –05 hours)				
What is timers & Counters,	4	Lecture	Assignment	Text Book 1
Use of timers and counters within a ladder logic program, Basic concepts of function blocks.	2	Lecture	Assignment	Text Book 1
Study of latching and unlatching of motor.	5	Practice	Result of Experiments and Viva	Text Book 1
MODULE V(PLC Communication) (Theory- 02 hours, Practice –05 hours)				
What are the common types of data communications and their characteristic sand use of Ethernet TCP/IP protocol.	2	Lecture	Assignment	Text Book 1
Sequential operation	5	Practice	Result of Experiments and Viva	Text Book 1
MODULE VI(Introduction To SCADA) (Theory- 5 hours)				
Introduction and SCADA Basics	3	Lecture	Assignment	Text Book 1
How to work on windows property	2	Lecture		Text Book 1
MODULE VII(Basic operation of SCADA) Theory- 04 hours, Practice –11 hours)				
Basic operations related to SCADA	2	Lecture	Assignment	Text Book 1
How to work on windows property	2	Lecture	Assignment	Text Book 1
Basic window property concepts of SCADA.	11	Practice	Result of Experiments and Viva	Text Book 1
Total- 60 Hours (Theory- 30 hours Practice-30 hours)				

Introduction to Web Technology

Course Title	Code	Type of course	T-P-PJ	Prerequisite
Introduction to Web Technology	ENFC0407	Theory & Practice	2-1-0	Nil

Objective

- This course is intended to teach the basics involved in publishing content on the World Wide Web. This includes the fundamentals of how the Internet and the Web function, a basic understanding of graphic production with a specific stress on creating graphics for the Web and general grounding introduction to more advanced topics such as programming scripting. This will also explore expose students to the basic tools and applications used in Web publishing.

Course Outcome

- Students may also create web pages using XHTML and Cascading Style Sheets. Build dynamic web pages using JavaScript (Client side programming).
- Create XML documents and Schemas. Build interactive web applications using AJAX.

Evaluation Systems

Internal Examination	Component	% of Marks	Method of Assessment
	Internal Theory	20	Written examination
	Internal Practice	30(20+10)	Lab work + Learning Record
External Examination	External Theory	30	Written examination
	External Practice	20	Lab work
Total		100	

Module : I (5 hrs)

What is Web? What is WWW, Web site - Static and Dynamic web site, Web application - Client-server, Web development Technologies- Html, CSS, Js, XML, Servlet & JSP, PHP and Ajax.

Module : II (7 hrs)

Introduction to Html, Html structure, Html Editors, Html element/tag & attributes, Designing simple page - Html tag, Head tag, Body tag; More Html tags - Anchor tag, Image tag, Table tag, List tag, Frame tag, Div. tag, Html forms - Input type, Text area, Select, Button.

Module : III (5 hrs)

Introduction to CSS, Syntax, Selectors, Embedding CSS to Html, Formatting fonts, Text & background color, Borders & boxing

Module : IV (6 hrs)

Introduction to JS, Embedding JS into Html, Variables, Data types, Operators, Conditional statements, Looping statements, Strings, Arrays, Math Object, Date Object, Functions, Objects, Event Handling.

Module : V (3 hrs)

Introduction to XML, Difference b/w Html & XML, XML editors

Module : VI (3 hrs)

XML Elements & Attributes XML DTD, XML Schema

Module : VII (4 hrs)

XML Schema, XML DOM

E-content : LMS Content

Reference Books :

1. HTML, XHTML & CSS Bible, Brian Pfaffenberger, Steven M.Schafer, Charles White, Bill Karow- Wiley Publishing Inc, 2010 .
2. HTML Black Book by Steven Holzner 2011
3. Web Design with HTML, CSS, JavaScript and jQuery Set by Jon Duckett.
4. Beginning Java Script with DOM scripting and Ajax By Christian Heilmann- Apress Publisher, 2010.
5. Learning PHP & My SQL, Michele Davis, Jon Philips- O’Reilly Publisher, 2009.
6. PHP Cook book By : David Sklar, Adam Trachtenberg- O’Reilly Publisher, 2008

Introduction to Web Technology Lab List of Programs :

1. Create a simple web page using HTML
2. Create and HTML page with a table and a set of ordered and unordered list.
3. Use CSS in the above web page
4. Design a web page for a company XYZ
5. Develop a static web page that shows basic animation
6. Develop a web page for an audio company
7. Develop a dynamic web page
8. Develop a dynamic web page using DHTML and CSS
9. Consider a company ABC which is into selling movie CDs. Develop a web page for the company.
10. Create a web site in which you can navigate from one page to another
11. Create a dynamic web page for a college
12. Organize a set of data using XML

Session Plan

Topic coverage and Internal Test	No. of Sessions (in hrs.)	Activity (lecture, tutorial, lab practice, field studies/field-trip, Workshop	Assignment (project, assignment, field study, seminar, etc.)	Suggested Reading (Book, Video, Online source, etc.)

		etc.)		
Module-I (Total Theory = 5 Hours)				
What is Web?, What is WWW, Web site - Static and Dynamic web site,	2	Class Room Teaching+ PPT	Assignment	Book,Online Sources,SLM
Web application - Client-server, Web development Technologies- Html, CSS, Js, XML, Servlet & JSP, PHP and Ajax.	3	Class Room Teaching+ PPT	Assignment	Book,Online Sources,SLM
Module II (Total Theory = 7 Hour /Practical= 8 Hour)				
Introduction to Html, Html structure, Html, Editors, Html element/tag & attributes, Designing simple page - Html tag, Head tag, Body tag; More Html tags - Anchor tag, Image tag, Table tag, List tag	3+4	Class Room Teaching+ PPT+Practical	Assignment	Book,Online Sources,SLM
Frame tag, Div tag ; Html forms - Input type, Text area, Select , Button.	3+4	Class Room Teaching+ PPT+Practical	Assignment	Book,Online Sources,SLM
Module III (Total Theory = 5 Hours / Practical= 7 Hours)				
Introduction to CSS, Syntax, Selectors	2+3	Class Room Teaching+ PPT+Practical	Assignment	Book,Online Sources,SLM
Embedding CSS to Html, Formatting fonts, Text & background colour, Borders & boxing.	3+4	Class Room Teaching+ PPT+Practical	Assignment	Book,Online Sources,SLM
Module-IV (Total Theory= 6 hour / Practical = 7 Hour)				
Introduction to JS, Embedding JS into Html, Variables, Data types	2	Class Room Teaching+ PPT+Practical	Assignment	Book,Online Sources,SLM

Operators, Conditional statements, Looping statements, Strings, Arrays, Math Object, Date Object, Functions, Objects	2+5	Class Room Teaching+ PPT+Practical	Assignment	Book,Online Sources,SLM
Event Handling	2+2	Class Room Teaching+ PPT	Assignment	Book,Online Sources,SLM
Module-V (Total Theory= 3 Hour/ Practical = 1 Hour)				
Introduction to XML, Difference b/w Html & XML	3+1	Lecture	Assignment	Book,Online Sources,SLM
Module-VI (Total Theory= 3 Hour/ Practical = 1 Hour)				
XML editors, XML Elements. XML Schema	3+1	Class Room Teaching+ PPT+Practical	Assignment	Book,Online Sources,SLM
Module-VII (Total Theory = 4 Hour/ Practical = 0 Hour)				
XML Schema, XML DOM	4	Class Room Teaching + PPT + Practical	Assignment	Book, Online Sources, SLM
Total (hrs)	Total = 57 Hours (Theory 33 Hours + Practical 24 Hours)			

Information Security-I

Course Title	Code	Type of course	T-P-PJ	Prerequisite
Information Security-I	FCEN 0408	Theory & Lab	2-1-0	Nil

Objective

- Get a clear understanding of Types of Threats, Vulnerabilities, Risks and various terminologies in Information Security.
- Understand C I A of Security and Ease of Use Triangle in Information Security
- Understand Access Controls and Physical security measures to safeguard the Assets
- Understand System And Server Security And Internet Security
- Understand Cyber Law and its need

Course Outcome

- Students will understand the importance of CIA Traid (Confidentiality, Integrity and Availability) and advantage of Security
- The student will be able to safeguard their Assets

Evaluation Systems

Internal Examination	Component	% of Marks	Method of Assessment
	Internal Theory	20	Written examination
	Internal Practice	30(20+10)	Lab work + Learning Record
External Examination	External Theory	30	Written examination
	External Practice	20	Lab work
Total		100	

Module: I INTRODUCTION (7 Hours)

Security Definition, Why Security, Security and its need, Current Trends and Statistics, Basic Terminology, The C I A of Security the Relation : Security functionality and Ease of Use Triangle

Module : II USER IDENTITY AND ACCESS MANAGEMENT (4 Hours)

User identity and Access Management : Authentication, Account Authorization, Validation, Access Control and Privilege management.

Module : III HASHING AND CRYPTOGRAPHY (6 Hours)

Hashing and Cryptography- Encryption and Decryption

Module : IV SYSTEM AND SERVER SECURITY (9 Hours)

System Security, Desktop & Server Security, Firewalls, Password cracking Techniques, Key-logger, viruses and worms, Malwares & Spy wares, Windows Registry

Module : V INTERNET SECURITY (5 Hours)

Internet Security : LAN Security, Email Security, Hacking attacks, preventive measures

Module : VI RISK ASSESSMENT (6 Hours)

Vulnerability Assessment, Penetration Testing, Risk Assessment, Threat, Vulnerability

Module : VII CYBER LAWS (3 Hours)

Cyber Laws – India Context

E-content : LMS Content

Text Books :

Information Systems Security : Security Management, Metrics, Frameworks And Best Practices - Nina Godbole, ISC2 Press, 2010

Mark Stamp's Information Security : Principles and Practice (WIND) Paperback – 2009 by Deven N. Shah, Wiley (2009)

Information Security Risk Analysis - Thomas R. Peltier, Third Edition, Pub : Auerbach, 2012

Information Security : The Complete Reference by Mark Rhodes-Ousley, McGraw Hill Education; Second edition (1 May 2013)

Cyber Security by Nina Godbole, Sunit Belapure, Wiley, 2011

Online Sources :

[http : //www.cengage.com/resource_uploads/downloads/1111138214_259146.pdf](http://www.cengage.com/resource_uploads/downloads/1111138214_259146.pdf)

[http : //www.eecs.yorku.ca/course_archive/2013-4/F/4482/CSE4482_01_Introduction_2013_posted.pdf](http://www.eecs.yorku.ca/course_archive/2013-4/F/4482/CSE4482_01_Introduction_2013_posted.pdf)

[http : //iso-27001-2013.blogspot.in/2015/05/information-security-professionals.html](http://iso-27001-2013.blogspot.in/2015/05/information-security-professionals.html)

[https : //www.sans.org/reading-room/whitepapers/services/identity-access-management-solution-1640](https://www.sans.org/reading-room/whitepapers/services/identity-access-management-solution-1640)

[http : //searchsecurity.techtarget.com/definition/access-control](http://searchsecurity.techtarget.com/definition/access-control)

[http : //searchsecurity.techtarget.com/definition/access-control](http://searchsecurity.techtarget.com/definition/access-control)

[http : //www.slideshare.net/ColMukteshwarPrasad/cyber-law-crime-m](http://www.slideshare.net/ColMukteshwarPrasad/cyber-law-crime-m)

ftp://mail.im.tku.edu.tw/Prof_Liang/IRM/10%20An%20Introduction%20to%20Factor%20Analysis%20of%20Information%20Risk.pdf

[http : //www.wciapool.org/pdf/Tab_5_10_Immutable_Laws_of_Security.pdf](http://www.wciapool.org/pdf/Tab_5_10_Immutable_Laws_of_Security.pdf)

[https : //www.sans.org/reading-room/whitepapers/basics/vulnerability-assessment-421](https://www.sans.org/reading-room/whitepapers/basics/vulnerability-assessment-421)

Session Plan

Topic coverage and Internal Test	No. of Sessions (in hrs)	Activity (lecture, tutorial, lab practice, field studies/field-trin Workshop etc.)	Assignment (project, assignment, field study, seminar, etc.)	Suggested Reading (Book, Video, Online source, etc.)
MODULE 1 : Introduction (Theory- 7 hours, Practice- 8 hours)				
Security Definition, Why Security, Security and its need	2	Lecture	Assignment	Book, Online source,SLM
Current Trends and Statistics, Basic Terminology	2	Lecture	Assignment	Book, Online source,SLM
The C I A of Security the Relation : Security functionality and Ease of Use Triangle	3	Lecture	Assignment	Book, Online source,SLM
System Security Configuration in Windows 7 I & II	2	Practice	Experiments	Online source,Video
DOS attacks and its prevention	2	Practice	Experiments	Online source,Video
Password Based Authentication Process	2	Practice	Experiments	Online source,Video
Service Management of Windows 7 for prevention of attacks.	2	Practice	Experiments	Online source,Video
MODULE II USER IDENTITY AND ACCESS MANAGEMENT (Theory- 4 hours)				
User identity and Access Management : Authentication, Account Authorization	2	Lecture	Assignment	Book, Online source

Validation, Access Control and Privilege management.	2	Lecture	Assignment	Book, Online source
MODULE II I HASHING AND CRYPTOGRAPHY(Theory- 6 hours, Practice- 3 hours)				
Hashing	2 + 1	Lecture + Practice	Experiment	Book, Online source
Cryptography-Encryption and Decryption	4	Lecture	Assignment	Book, Online source
Event logger analysis	2	Practice	Experiment	Book, Online source
Module IV SYSTEM AND SERVER SECURITY (Theory- 9 hours, Practice- 7 hours)				
System Security, Desktop & Server Security	2	Lecture	Assignment	Book,Online ,SLM
Firewalls	2+2	Lecture + Practice	Experiment	Book,Online ,SLM
Password cracking Techniques	2+2	Lecture + Practice	Experiment	Book,Online ,SLM
Key-logger	1+2	Lecture + Practice	Experiment	Book,Online ,SLM
viruses and worms, Malwares & Spy wares	1	Lecture	Assignment	Book,Online ,SLM
Windows Registry	1+1	Lecture + Practice	Experiment	Book,Online ,SLM
Module V INTERNET SECURITY (Theory- 5 hours, Practice- 0 hours)				
LAN Security	2	Lecture	Assignment	Book,Online,SLM
Hacking attacks, preventive measures	2	Lecture	Assignment	Book,Online,SLM
Security on E-mail	1	Lecture	Assignment	Book,Online,SLM
Module VI INTERNET SECURITY (Theory- 6 hours, Practice-2 hours)				
Vulnerability Assessment	2 +2	Lecture + Practice	Experiment	Book,Online ,SLM
Penetration Testing	2	Lecture	Assignment	Book,Online,SLM

Risk Assessment	1	Lecture	Assignment	Book,Online,SLM
Threat, Vulnerability	1	Lecture	Assignment	Book,Online,SLM
Module VII Cyber Law (Theory- 3 hours)				
Cyber Laws – Indian Context.	2	Lecture	Assignment	Book,Online,SLM
Importance of Cyber Law	1	Lecture	Assignment	Book,Online,SLM
Total (hrs) : 60 Hours (Theory- 40 hours, Practice- 20 hours)				

Programming in C

Course Title	Code	Type of course	T-P-PJ	Prerequisite
Programming in C	ENFC0409	Theory & Practice	2-1-0	Nil

Objective

- To provide basic knowledge of programming tools and techniques.
- To familiarize the programming environment and syntax of C programming.
- To understand the working of basic programming constructs.

Course Outcome

- The students will able to apply programming skills to problem solving.
- The student will able to write 150 to 200 line programs without any error.

Evaluation Systems

Internal Examination	Component	% of Marks	Method of Assessment
	Internal Theory	20	Written Examination
	Internal Practice	30 (20+10)	Lab Work + Learning Record
External Examination	External Theory	30	Written Examination
	External Practice	20	Lab Work
Total		<i>100</i>	

Course outline

Module I : Problem Solving Techniques (10Hours)

Problem solving techniques : Algorithm, flow chart; Structure of C program, Character set, Identifiers, Keywords, Data Types, Constants and Variables, Input-output statements, relational and logical operators, increment and decrement operators, conditional operator, bit-wise operators, assignment operators, expressions, type conversions, conditional expressions, precedence and order of evaluation.

Module II : Control Structures (7Hours)

Statements and blocks, if and switch statements, loops : -while, do-while and for statements, break, continue, goto.

Module III : Array(7Hours)

Arrays-concepts, declaration, definition, accessing elements, two-dimensional and multi-dimensional arrays, applications of arrays.

Module IV : Functions(15 Hours)

Designing structured programs Functions, parameter passing, user defined functions, recursive functions, storage classes- extern, auto, register, static, scope rules.

Module V : Pointern (15 Hours)

Pointers- concepts, initialization of pointer variables, pointers and function arguments, address arithmetic, Character pointers and functions, pointers to pointers, pointers and multidimensional arrays, dynamic memory management functions, command line arguments.

Module VI : Structures(11Hours)

Derived types-structures-declaration, definition and initialization of structures, accessing structures, nested structures, arrays of structures, structures and functions, pointers to structures, self referential structures, unions,

Module VII : Files (10Hours)

Typedef, bit fields, C program examples. Input and output–concept of a file, text files and binary files, streams, standard I/O, Formatted I/O, file I/O operations.

Text Books :

1. E. Balaguruswamy “Programming in C”, Tata McGraw Hill 3rd Edition
2. Y. Kanetkar, “Let us C”, BPB Publications-9th edition.

Reference Books :

1. H. Scheldt, “C The Complete Reference”, Tata McGraw Hill
2. B.W. Kernighan & D.M. Ritchie, "C Programming Language", PHI.
3. Gotterfried, Schaum Series-“C Programming”.

Session Plan

Topic coverage and Internal Test	No. of Sessions (in hrs)	Activity (lecture, tutorial, lab practice, field studies/field-trip, Workshop etc.)	Assignment (project, assignment, seminar, etc.)	Suggested Reading (Book, Video, Online source, etc.)
Module I 5 hrs lectures + 3 hrs practice				
Problem solving techniques : Algorithm Problem solving techniques : flow chart	1	lecture	assignment	Book
Structure of C program Character set, Identifiers Keywords, Data Types, Constants and Variables,	1+1	lecture, quiz	assignment	Book

Input-output statements				
Relational and logical operators, increment and decrement operators	1	lecture	assignment	Book
Conditional operator, bit-wise operators, assignment operators	1+2	lecture, practice	assignment	Book
Expressions, type conversions Conditional expressions, precedence and order of evaluation	1	lecture		Book
Module II 4 hrs lectures + 5 hrs practice				
Statements and blocks, if and switch statements	2+1	lecture, practice	assignment	Book
loops : -while, do-while	1+2	lecture, practice	assignment	Book
for statements, break, continue, goto	1+2	lecture, practice	assignment	Book
Module III 5 hrs lectures + 5 hrs practice				
Arrays-concepts Declaration, definition, accessing elements, programs	1+2	lecture, practice, quiz	assignment	Book
two-dimensional arrays multi-dimensional arrays	2+2	lecture, practice	assignment	Book
applications of arrays	2+1	lecture, practice	assignment	Book
Module IV 5 hrs lectures + 4 hrs practice				
Designing structured programs : -Functions	1	lecture, practice	assignment	Book
parameter passing, user defined functions	2+2	lecture, practice	assignment	Book

recursive functions	1+1	lecture, practice	assignment	Book
storage classes-extern, auto, register, static, scope rules	1+1	lecture, practice	assignment	Book
Module V 5 hrs lectures + 4 hrs practice				
pointers-concepts, initialization of pointer variables	1	lecture	assignment	Book
pointers and function arguments, address arithmetic, Character pointers and functions	2+2	lecture, practice	assignment	Book
pointers to pointers, pointers and multidimensional arrays	1+1	lecture, practice	assignment	Book
dynamic memory management functions, command line arguments	1+1	lecture, practice	assignment	Book
Module VI 6 hrs lectures + 5 hrs practice				
Derived types-structures- declaration, definition and initialization of structures, accessing structures	2+2	lecture, practice	assignment	Book
nested structures, arrays of structures	2+1	lecture, practice	assignment	Book
pointers to structures, self referential structures	1+1	lecture, practice	assignment	Book
unions	1+1	lecture, practice	assignment	Book
Module VII 4 hrs lectures + 6 hrs practice				
Typedef, bit fields Input	2+2	lecture,	assignment	Book

and output–concept of a file, text files and binary files, streams		practice		
standard I/O, Formatted I/O	1+2	lecture, practice	assignment	Book
file I/O operations	1+2	lecture, practice	assignment	Book
Total (hrs)	34+32			

Desktop Operating System (Windows 10)

Course Title	Code	Type of course	T-P-PJ	Prerequisite
Desktop Operating System (Windows 10)	ENFC0410	Theory & Practice	2-1-0	FCEN0119 Operating System Building Blocks

Objective

- To install and configure Windows 10 enterprise.
- Configure networks, security settings in Windows 10 enterprise.

Course Outcome

- Student will able to install windows 10 enterprise.
- Student will able to configure devices, security settings, firewall in Windows 10 enterprise.

Evaluation Systems

Internal Examination	Component	% of Marks	Method of Assessment
	Internal Theory	20	Written examination
	Internal Practice	30(20+10)	Lab work + Learning Record
External Examination	External Theory	30	Written examination
	External Practice	20	Lab work
Total		100	

Module : I Installing, upgrading and managing Windows (4 Hrs.)

Gathering hardware devices, preparing to install windows, upgrading and migrating, Clean and Image based installation, Configuring Application Compatibility

Module : II Windows Features ,device drivers and disk managemnt (4 Hrs.)

Administrating windows features, Disk management, and installing and configuring device drivers.

Module : III File Access, Printers with Windows (4 Hrs.)

Introduction to Authentication and Authorization, Managing file access, Shared Folders, File compression, file archiving, managing printers

Module : IV Network connectivity with Windows (4 Hrs.)

Connecting windows client with server, configuring ipv4 & ipv6 connectivity, Implementing APIPA, Introduction to Name resolution, troubleshooting network issues, Overview of wireless network, configuring wireless network.

Module : V Securing, Optimizing and maintaining windows Client (5 Hrs.)

Overview of local security management, local security policy settings, EFS and Bitlocker, Application restrictions, UAC, Windows Firewall, Windows Defender.

Module : VI Configuring Browser and Mobile Computing in Windows (3 Hrs)

Administrating IE8, Configure Mobile computer and device settings

Module : VII Configuring Remote Access in windows (4 Hrs.)

Remote desktop, remote assistance, direct access, branch cache.

LAB EXERCISES : ANY TEN LABS

Navigating and Customizing the User Interface

Navigating the Windows 10 User Interface

Configuring Start

Configuring the Desktop

Installing Windows 10

Upgrading Windows 7 to Windows 10

Migrating User Settings

3 .Configuring Windows 10

Using the Settings App

Using Control Panel

Using Windows Power Shell

Using GPOs

Synchronizing Settings with One Drive

Connecting a Microsoft Account

Synchronizing Settings between Devices

Configuring Network Connectivity

Verifying and Testing IPv4 Settings

Configuring Automatic IPv4 Settings

Configuring and Testing Name Resolution

Managing Storage

Adding a Disk

Creating a Simple Volume

Compressing a Folder

Enabling Disk Quotas

Creating a Storage Space

Configuring and Managing Permissions and Shares

Creating, Managing, and Sharing a Folder

Using Conditions to Control Access and Effective Permissions

Installing and Managing a Printer

Managing and Using a Printer

Configuring Windows 10 Web Browsers

Configuring and Using Microsoft Edge

Configuring and Using Internet Explorer

Data Security

Using EFS

Using Bit Locker

Device Security

Creating Security Policies Testing

Security Policies Configuring UAC

Prompts Configuring and Testing

AppLocker

Network Security
 Creating and Testing Inbound Rules
 Creating and Testing Outbound Rules
 Creating and Testing Connection Security Rules
 Configuring Windows Defender
 Troubleshooting and Recovery
 Managing Device Drivers
 Using File History to Recover Files
 Using Previous Versions to Recover Files
 Recovering a Device with a Restore Point
 Using the Advanced Start-up Options to Recover a Device

Reference

E-content : www.krackin.com

Text Books :

1. Milan Milenkovic, “Operating Systems”, TATA McGraw Hill, 2009
2. Andrew Bettany, Andrew Warren, “Installing and Configuring Windows 10” , Microsoft Press, 2016D. Irtegov, “Operating Systems Fundamentals”, Charles River Media, 2002
1. Microsoft Official Academic Course, “Installing and Configuring Windows 10 Lab Manual”, Microsoft Press, 2017

Online Source : Microsoft academy, [http : //technet.microsoft.com](http://technet.microsoft.com)

Session Plan

Topic coverage and Internal Test	No. of Sessions (in hrs.)	Activity (lecture, tutorial, lab practice, field studies/field-trip, Workshop etc.)	Assignment (project, assignment, field study, etc.)	Suggested Reading (Book, Video, Online source, etc.)
Module : I Lecture=4 Lab Practice=2				
Installing, upgrading and managing Windows 10 : Gathering hardware devices, preparing to install windows.Up grading and migrating, Clean and Image based installation.Configuring Application Compatibility,	4+2	Lecture, lab practice	experiment	Book, Online source
Module : II Lecture=4 Lab Practice=4				

Configuring Application Compatibility, administrating windows features, Disk management, and installing and configuring device drivers.	4+4	Lecture, lab practice	experiment	Book, Online source
Module : III Lecture=4 Lab Practice=3				
Introduction to Authentication and Authorization, Managing file access, Shared Folders, File compression, file archiving, managing printers	2+1	Lecture, lab practice	Experiment	Book, Online source
File compression, file archiving, managing printers.	2+2	Lecture, lab practice	Experiment	Book, Online source
Module : IV Lecture=4 Lab Practice=2				
Connecting windows client with server, configuring ipv4 & ipv6 connectivity, Implementing APIPA.	2+1	Lecture, lab practice	Experiment	Book, Online source
Introduction to Name resolution, troubleshooting network issues, Overview of wireless network, configuring wireless network.	2+1	Lecture, lab practice	Experiment	Book, Online source
Module : V Lecture=5 Lab Practice=3				
Securing, Optimizing and maintaining windows 10 Client : Overview of local security management	1	Lecture		Book, Online source
local security policy settings.	1+1	Lecture, lab practice	Experiment	Book, Online source
EFS and Bit locker, Application restrictions. UAC,.	2+1	Lecture, lab practice	Experiment	Book, Online source

Windows Firewall. Windows Defender	1+1	Lecture, lab practice	Experiment	Book, Online source
Module : VI Lecture=3 Lab Practice=2				
Configuring Mobile Computing and Remote Access in windows 10 : Configure Mobile computer and device settings.	3+2	Lecture, lab practice	Experiment	Book, Online source
Module : VII Lecture=3 Lab Practice=2				
Remote desktop, remote assistance, direct access, branch cache.	3+2	Lecture, lab practice	Experiment	Book, Online source
Total (hrs)	46			

Principles of Biochemistry

Course Title	Code	Type of course	T-P-PJ	Prerequisite
Principles Of Biochemistry	FCEN0408	Theory & Practice	3-2-0	Nil

Objective

- To study the structure and properties of carbohydrates.
- Discuss the structure, properties and reactions of proteins and amino acids
- Discuss the structure, properties of fats and lipids
- To study the composition, structure and functions of nucleic acids

Course Outcome

- Aims at providing an elementary knowledge of bio molecules and its application

Evaluation Systems

Internal Examination	Component	% of Marks	Method of Assessment
	Internal Theory	20	Written examination
	Internal Practice	30(20+10)	Lab work + Learning Record
External Examination	External Theory	30	Written examination
	External Practice	20	Lab work
Total		100	

Course outline

Module : I

Biochemical Organization

Scope of clinical biochemistry, component of the cell, structure and biochemical functions, membrane structure and functions, transport through biological cell membrane

Module : II

Bioenergetics

Concept of free energy, determination of change in free energy from equilibrium constant and reduction potential, bioenergetics and biological oxidation – general concept of oxidation and reduction

Module : III

Electron transport chain, oxidative phosphorylation, uncouplers and theories of biological oxidation and oxidative phosphorylation.

Module : IV

Carbohydrates :

Classification, properties. Starch, glycogen, dextrin, inulin, cellulose, metabolism of carbohydrates, gluconeogenesis, glycogenolysis, glycolysis. citric acid cycle and its biological significance, role of sugar in nucleotide biosynthesis and pentose phosphate pathway.

Module : V**Lipids :**

Classification, properties. sterols, essential fatty acids, eicosanoids, phospholipids, sphingolipids, metabolism of lipids, oxidation of fatty acids, α, β - oxidation and biosynthesis of ketone bodies, cholesterol, porphyrin biosynthesis, metabolism of bile pigments.

Module : VI**Amino acids and nucleic acids :**

Classification, properties, biosynthesis of amino acids and proteins, essential amino acids, metabolism of amino acids and proteins, Nitrogen balance, genetic code, nucleic acids, and structure of DNA and RNA, purine biosynthesis and pyrimidine biosynthesis.

Module : VII**Macromolecules, Vitamins, Hormones, Enzymes**

Physical and chemical properties, structure of haemoglobin, immunoglobulins and nucleoprotein, classification and their properties, occurrence, functions, requirements, deficiency manifestations and role of vitamins as coenzyme, chemical nature and properties, hormones, Nomenclature, enzyme kinetics, Michelles-Menten equation, classification and their properties, mechanism of action, enzyme inhibition, coenzyme significance and enzymes of clinical importance.

LIST OF EXPERIMENTS (Any 8)

1. pH measurements and preparation of buffers.
2. Qualitative tests for Carbohydrates.
3. Estimation of sugars.
4. Estimation of proteins by Lowry's method / Biuret method.
5. Estimation of cholesterol by Zak's method.
6. Determination of saponification number of lipids.
7. Estimation of Amino acids.
8. Separation of amino acids - Thin layer chromatography.
9. Separation of sugars - Paper chromatography
10. Biochemical estimation of DNA /RNA using Spectrophotometer

Text Books :

1. Biochemistry by Jeremy M.Berg, John L.Tymozko, Lubert Stryer, Fifth edition, W.H.Freeman and Company, 1514 pages.
2. Thomas M. Devlin.Textbook of Biochemistry with clinical correlations. Wiley Liss Publishers

Reference Books :

1. Burtis & Ashwood W.B. Tietz Textbook of Clinical chemistry. Saunders Company
2. Lubert Stryer W.H. Biochemistry. Freeman and company, New york.
3. Donald Voet & Judith G. Voet. Biochemistry. John Wiley and Sons, Inc.

Session Plan

Topic coverage and Internal Test	No. of Sessions (in hrs.)	Activity (lecture, tutorial, lab practice, field studies/field-trip, Workshop etc.)	Assignment (project, assignment, field study, seminar, etc.)	Suggested Reading (Book, Video, Online source, etc.)
Module I		lecture, tutorial, lab practice	assignment	Book, Video, Online source
Scope of clinical biochemistry	2			
component of the cell,	1			
membrane structure and functions, transport through biological cell membrane	2			
structure and biochemical functions	1			
Module II		lecture, tutorial. lab practice	assignment	Book, Video, Online source
Concept of free energy,	1			
determination of change in free energy from equilibrium constant and reduction potential,	2			
bioenergetics and biological oxidation	2			
general concept of oxidation and reduction	2			
Module III		lecture, tutorial. lab practice	assignment	Book, Video, Online source
Electron transport chain,	1			
oxidative phosphorylation, uncouplers	1			
theories of biological oxidation	1			
oxidative phosphorylation.	2			
Module IV		lecture,	assignment	Book, Video,

classification, properties. starch, glycogen, dextrin, inulin, cellulose	2	tutorial, lab practice		Online source
metabolism of carbohydrates, gluconeogenesis, glycogenolysis,	1			
glycolysis. citric acid cycle and its biological significance	1			
role of sugar in nucleotide biosynthesis and pentose phosphate pathway	2			
Module V		lecture, tutorial, lab practice	assignment	Book, Video, Online source
Classification, properties. sterols, essential fatty acids, eicosanoids	1			
phospholipids, sphingolipids	1			
metabolism of lipids, oxidation of fatty acids	2			
α, β - oxidation and biosynthesis of ketone bodies	1			
cholesterol, porphyrin biosynthesis	1			
metabolism of bile pigments.	1			
Module VI		lecture, tutorial, lab practice	assignment	Book, Video, Online source
Classification, properties, biosynthesis of amino acids and proteins,	2			
essential amino acids, metabolism of amino acids and proteins,	2			
Nitrogen balance, genetic code, nucleic acids, and structure of DNA and RNA,	1			
purine biosynthesis and pyrimidine biosynthesis.	2			

Module VII		lecture, tutorial, lab practice	assignment	Book, Video, Online source
Physical and chemical properties, structure of haemoglobin, immunoglobulins and nucleoprotein	2			
classification and their properties, occurrence, functions, importance	2			
requirements, deficiency manifestations and role of vitamins as coenzyme, chemical nature and properties,	1			
hormones, Nomenclature, enzyme kinetics,	1			
Michelles-Menten equation, classification and their properties,	2			
mechanism of action, enzyme inhibition, coenzyme significance and enzymes of clinical	1			
Total (hrs)	45+20			

Cell Biology

Course Title	Code	Type of course	T-P-PJ	Prerequisite
Cell Biology	FCEN0409	Theory & Practice	3-2-0	Nil

Objective

- To study cell structure and functions of organelle functions
- Exposure on transportations through cell membrane
- To focus on different receptors and model of signaling
- To introduce the concept of cell signaling

Course Outcome

- The course is aimed to make the student understand the basic concept of cell structure, membrane, cellular functions of different types of cell, modes of cellular signaling and signal amplification

Evaluation Systems

Internal Examination	Component	% of Marks	Method of Assessment
	Internal Theory	20	Written examination
	Internal Practice	30(20+10)	Lab work + Learning Record
External Examination	External Theory	30	Written examination
	External Practice	20	Lab work
Total		<i>100</i>	

Course outline

Module : I

Cell Structure and function

Origin and evolution of cells, molecular composition of cells, central role of enzymes, metabolic energy, biosynthesis of cell constituents, cell membrane

Module : II

Nucleus, Endoplasmic reticulum, Golgi apparatus and Lysosomes, Bioenergetics and Metabolism – Mitochondria, chloroplasts, Peroxisomes.

Module : III

Cell Division

Cell cycle – Mitosis, Meiosis, Molecules controlling cell cycle

Module : IV

Extra cellular matrix, role of matrix in cell enthore : Gap junctions, Tight junctions, Plasmodesmata.

Module : V**Transport across cell membrane**

Passive and Active Transport, Permeases, Ion channels, ATP pumps. Na⁺ / K⁺ / Ca²⁺ pumps uniport, symport antiporter system. Ligand gated / voltage gated channels, Agonists and Antagonists.

Module : VI**Signal Transductions**

Receptors – extracellular signaling, Cell surface / cytosolic receptors and examples, Different classes of receptors autocrine / paracrine / endocrine models, Secondary messengers molecules.

Module : VII

The Development and causes of cancer, tumour viruses, oncogenes, prevention and treatment

LIST OF EXPERIMENTS (Any 8)

1. Microscopic study of cell and cell organelles
2. Cell fractionation
3. Fixation, Dehydration, embedding and sectioning of tissues
4. Histology of extracellular matrix
5. Quantitative analysis of lipid classes by TLC
6. Isolation of microtubules
7. Isolation of actin and Myosin filaments
8. Isolation of Mitochondria
9. Nuclear staining
10. Stages of cell cycle.

Text Books :

1. The Cell : A molecular approach by Geoffrey M. Cooper. ASM Press, Pages : 673

Reference Books :

1. Molecular Biology of the Cell Edition 4, Roberts, Keith Alberts, Bruce Johnson, Alexander Raff, Martin Walter, Peter Lewis, Julian, Garland
2. Molecular Cell Biology, Lodish, Harvey Krieger, Monty Kaiser, Chris A. Berk, Arnold, W H Freeman & Co

Session Plan

Topic coverage and Internal Test	No. of Sessions (in hrs.)	Activity (lecture, tutorial, lab practice, field studies/field-trip, Workshop etc.)	Assignment (project, assignment, field study, seminar, etc.)	Suggested Reading (Book, Video, Online source, etc.)
Module I		lecture, tutorial, lab practice,	assignment	Book, Video, Notes
Origin and evolution of cells	2			
molecular composition of cells, cell membrane	1			
central role of enzymes, metabolic energy, biosynthesis of cell constituents	2			
Module II		lecture, tutorial, lab practice,	assignment	Book, Video, Notes
Nucleus, Endoplasmic reticulum	2			
Golgi apparatus and Lysosomes	2			
Bioenergetics and Metabolism	2			
Mitochondria chloroplasts	1			
Peroxisomes	1			
Module III		lecture, tutorial, lab practice,	assignment	Book, Video, Notes
Cell cycle – Mitosis	2			
Meiosis	2			
Molecules controlling cell cycle	1			
Module IV		lecture, tutorial, lab	assignment	Book, Video, Notes
Extra cellular matrix, role of matrix in cell enthore	2			

Gap junctions	1	practice,		
Tight junctions, Plasmodesmata.	1			
Module V		lecture, tutorial, lab practice,	assignment	Book, Video, Notes
Passive and Active Transport,.	2			
Permeases, Ion channels,	2			
ATP pumps. Na ⁺ / K ⁺ / Ca ²⁺ T pumps uniport,	2			
Symport antiporter system	1			
Ligand gated / voltage gated channels	1			
Agonists and Antagonists	1			
Module VI		lecture, tutorial, lab practice,	assignment	Book, Video, Notes
Receptors – extracellular signaling	2			
Cell surface / cytosolic receptors and examples,	2			
Different classes of receptors antocrine / paracrine / endocrine models	1			
Secondary messengers molecules	2			
Module VII		lecture, tutorial, lab practice,	assignment	Book, Video, Notes
The Development and causes of cancer	2			
tumour viruses, oncogenes,	1			
prevention and treatment	2			
Total (hrs)	45+20			

Programming for Problem Solving- Java

Course Title	Code	Type of course	T-P-PJ	Prerequisite
Programming for Problem solving- Java	ENFC0412	theory + Practice	1-2-0	Nil

Objective

- Learn problem solving using object-oriented concepts
- Implement object oriented programming using Java
- Analyze several alternative solutions to determine the best approach

Course Outcome

- Able to use object oriented concept to solve problems
- Write an error free program of minimum 200 lines of code

Evaluation Systems

	Component	% of Marks	Method of Assessment
Internal Examination	Internal Theory	20	Written examination
	Internal Practice	30(20+10)	Lab work + Learning Record
External Examination	External Theory	30	Written examination
	External Practice	20	Lab work
Total		100	

Projects :

1. Simple Currency Converter
2. Designing a Calculator
3. Generating the mark sheet of a student
4. Create a phone directory and search a number
5. Create a tic tac toe game
6. Developing a library maintenance system
7. Desktop applications
8. Exam System (Without Database)
9. Create Country MAP and Different banners

Course outline

Module: I (10Hrs) :

Problem Solving Techniques: Ask Questions, Look for things that are familiar, solve by analogy, Means-Ends Analysis, Divide and Conquer, The building block approach, Merging solutions, Mental Block : The Fear of Starting, Object Oriented Problem Solving, and Case Study.

Programming: Programming Language, Skeleton, Compilation, Interpretation, and Execution of Program.

Object-Oriented Programming : Object Oriented Concepts, Java Programming Environment, Feature of Java, Elements of Java Program : Identifier, Naming Conventions, Build-in Type, Variable, Operators, Control Statements, Loops, Typecasting, Arrays,

Module : II(15 Hrs)

Classes : Concept of Objects and Classes, Using Methods, Local Variables, Instance Variables, Constructor, Overloading Constructor, Overloading Methods, Garbage Collection, The Finalize Method, Static, Final and this Keyword.

Inheritance and Polymorphism: Basics, Access Modifier, The super Keyword, Method Overriding, Dynamic Method Dispatch, Abstract Classes, Inner Classes.

Module :III (10 Hrs) :

Packages : Packages, Access Protection, Importing Package

Interfaces : Interface, Implementing Interfaces.

Module :IV (10 Hrs) :

String Handling : String, String Buffer, String Builder.

Exception Handling : Fundamentals, Checked and Unchecked Exceptions, Using Try, Catch, Multiple Catches, Throw, Throws, Finally, Java's Built-In Exceptions, User-Defined Exception.

Module :V (10 Hrs) :

Multi-Threading : Java Thread Lifecycle Model, Thread Priorities, Synchronization, Creating Threads, Using Different Thread Methods, Wrapper Classes, Clone (java.lang), Collection API, Vectors (java.util).

Module-VI (10 Hrs) :

Java.IO : I/O Streams, Serialization

AWT : AWT Classes, Window Fundamental, Component, Container, Panel, Window, Frame, Canvas, Control Fundamentals, Layout Managers.

Module :VII (10 Hrs) :

Event Handling : Delegation Event Model, Event Classes, Event Listener Interfaces, and Adapter Classes, Handling Events by Extending AWT Components.

Text Books:

1. Mark Lassoﬀ, Java Programming for Beginners, Packt Publishing Limited, October 2017
2. Walter Savitch, “Java-An Introduction to Problem Solving & Programming”, 8th edition, Pearson, 2017
3. Herbert Schildt, “Java Complete Reference”, 10th edition, in McGraw-Hill Education, 2017

Reference Books:

1. Dr. Edward Lavieri, Peter Verhas, Mastering Java 9, Packt Publishing Limited, October 2017
2. Nell Dale, Chip Weems, “Programming and problem solving with Java”, in Jones and Bartlett, 2008
3. Bhave & Patekar, “Programming with Java” in Pearson Education, 2008
4. H.M. Deitel & Paul J. Deitel, “Java How to Program” in PHI, 9th Edition, 2012

Online Source :

jvatpoint.com,

[http : //www.corejavaguru.com](http://www.corejavaguru.com)

[https : //www.w3schools.in/java-tutorial/](https://www.w3schools.in/java-tutorial/)

Session Plan

Topic coverage and Internal Test	No. of Sessions (in hrs.)	Activity (lecture, tutorial, lab practice, field studies/field-trip, Workshop etc.)	Assignment (project, assignment, field study, seminar, etc.)	Suggested Reading (Book, Video, Online source, etc.)
Problem Solving Techniques : Ask Questions, Look for things that are familiar,	4	Lecture		Book

solve by analogy, Means-Ends Analysis, Divide and Conquer, The building block approach, Merging solutions, Mental Block : The Fear of Starting, Object Oriented Problem Solving, and Case Study				
Installation of JDK,Configure runtime environment and Visualizing Java programming Environment (architecture)	1+1	Practice		
What is Programming, Programming Language, Skeleton, Compilation, Interpretation, and Execution of Program	1	Lecture	Assignment	Book
Constructing skeleton of Java Program, Object Oriented Concepts, Java Programming Environment, Feature of Java	2+2	Lecture, Practice	Assignment	Book
Share and execute India Map & CUTM Banner Sharing and Execute Calculator program	2	Practice	Assignment	

Elements of Java Program : Identifier, Naming Conventions, Build-in Type, Variable, Operators, more example	2	Practice	Assignment	Book
Conditional statement, looping statement,	2	Practice	Assignment	Book
Sharing and Execute calculate grade of students	2	Practice		
Concept of Objects and Classes, Using Methods, Local Variables, Instance Variables, Constructor, Overloading Constructor With Examples	2+2	Lecture, Practice	Assignment	Book
Overloading Methods, Garbage Collection, The Finalize Method, Static, Final and this Keyword	2	Practice	Assignment	Book
Sharing and Execute area of shapes	1	Practice		
Inheritance and Polymorphism : Basics, Access Modifier, The super Keyword, Method Overriding, Dynamic Method Dispatch	1+2	Lecture, Practice	Assignment	Book
Abstract Classes, Inner Classes	1+2	Lecture, Practice	Assignment	Book

ToDo list where you can calculate the completed task vs. pending tasks.	1	Practice		
Packages, Access Protection, Importing Package, Interface, Implementing Interfaces	1+4	Lecture, Practice	Assignment	Book
StringHandling : String, StringBuffer, StringBuilder	1+2	Lecture, Practice	Assignment	Book
Create a phone directory and search for a number.	1	Practice		
Excepting Handling : Fundamentals, Checked and Unchecked Exceptions, Using Try, Catch, Multiple Catches, Throw, Throws, Finally, Java's Built-In Exceptions, User-Defined Exception	1+4	Lecture, Practice	Assignment	Book
Create a tic tac toe game	1	Practice		

java.io : I/O streams, Serialization	1+4	Lecture, Practice	Assignment	Book
Producer/Consumer Problem	1	Practice		
Multi-Threading : Java Thread Lifecycle Model, Thread Priorities, Synchronization, Creating Threads, using Different Thread Methods	1+2	Lecture, Practice	Assignment	Book
Wrapper Classes, Clone (java.lang), Collection API, Vectors (java.util)	1+2	Lecture, Practice	Assignment	Book
Developing a library maintenance system.	1	Practice		
Event Handling : Delegation Event Model, Event Classes, Event Listener Interfaces, and Adapter Classes, Handling Events by Extending AWT Components	1+2	Lecture, Practice	Assignment	Book
AWT : AWT Classes, Window Fundamental, Component, Container, Panel, Window, Frame, Canvas, Control Fundamentals, Layout Managers	2+6	Lecture, Practice	Assignment	Book
Total (Hrs)	75	(Theory -24 hrs + Practice -51 hrs =75)		

Database Management System

Course Title	Code	Type of course	T-P-PJ	Prerequisite
Database Management System	ENFC0414	Theory + Practice	1-2-0	Nil

Objective

- Introduce the fundamental concepts of database systems & their importance in practical life and the basic concepts necessary for designing, using and implementing database systems & applications
- Make the students understand the principles behind relational database management systems, including the database environment, the relational model, relational languages, develop simple SQL queries

Course Outcome

- Demonstrate the underlying concepts of database technology, identify the appropriate data model for the given problem
- Write SQL queries for performing database operations
- Design, implement and normalize a relational model for a given problem domain

Evaluation Systems

Internal Examination	Component	% of Marks	Method of Assessment
	Internal Theory	20	Written examination
	Internal Practice	30(20+10)	Lab work + Learning Record
External Examination	External Theory	30	Written examination
	External Practice	20	Lab work
Total		100	

Module: I

General introduction to database systems; Database - DBMS distinction, approaches to building a database, data models, database management system, three-schema architecture of a database, challenges in building a DBMS, various components of a DBMS.

File Based Systems and Database Systems : File Based Approach, Database Systems, File-oriented Systems vs. Database Systems Database Approach : Database, Database Management System (DBMS), Components of DBMS Environment, Advantages and Disadvantages of DBMS Roles in Database Environment : Database Users, Database Administrators(DBA)

Module: II

Database System Architecture: Three Level Architecture, External Level, Conceptual Level, Internal Level, Schemas, Mappings, Instances, Data Independence, Data Abstraction

E/R Model - Conceptual data modeling - motivation, entities, entity types, various types of attributes, relationships, relationship types, E/R diagram notation, examples.

Module: III

Relational Data Model: Concept of relations, schema-instance distinction, keys, referential integrity and foreign keys, relational algebra operators : selection, projection, cross product, various types of joins, division, example queries, tuple relation calculus, domain relational calculus, converting the database specification in E/R notation to the relational schema.

Module: IV

Database installation procedure: Database table creation & insertion of values Database Languages : SQL - DDL, DML, TCL, DCL

SQL - Introduction, data definition in SQL, table, key and foreign key definitions, update behaviors. Querying in SQL - basic select-from-where block and its semantics, nested queries - correlated and uncorrelated, notion of aggregation, aggregation functions group by and having clauses, embedded SQL.

Data Definition Language : Creating a Database, Table Operations (Create, Alter, Drop, Truncate, Comment and Rename), Creating and Removing an Index

Data Manipulation Language : Using different DML commands (Insert, Delete, Update, and Select), Sorting Results (Order By), Aggregate Functions, Join, Grouping Results (Group By)

Data Control Language & Transaction Control Language : Using different DCL commands (Grant, Revoke) & using different TCL commands (Commit, Rollback and Savepoint).

Module: V

Dependencies and Normal forms - Importance of a good schema design, problems encountered with bad schema designs, motivation for normal forms, dependency theory - functional dependencies, Armstrong's axioms for FD's, closure of a set of FD's, minimal covers, definitions of 1NF, 2NF, 3NF and BCNF, decompositions and desirable properties of them, algorithms for 3NF and BCNF normalization, multi-valued dependencies and 4NF, join dependencies and definition of 5NF.

Module :VI

Data Storage and Indexes - file organizations, primary, secondary index structures, various index structures - hash-based, dynamic hashing techniques, multi-level indexes, B+ trees.

Terminologies of Relational Model : Relational Data Structure, Relational Keys, Representing Relational Database Schema Integrity Constrains and Views : Nulls, Entity Integrity, Referential Integrity, General Constraints, Views, Purpose of Views

Module: VII

Transaction processing and Error recovery - concepts of transaction processing, ACID properties, concurrency control, locking based protocols for CC, error recovery and logging, undo, redo, undo-redo logging and recovery methods.

PL/SQL : SQL vs PL/SQL, Practice different basic PL/SQL programs

Text Book:

1. Raghuram Ramakrishnan, Johames Gerkhe “ Data Base Management Systems, Mc Graw Hill
2. Gaurav Gupta, Sarika Gupta “ Data Base Management Systems” Khanna Book Publisher

Electronics and its Application

Course Title	Code	Type of course	T-P-PJ	Prerequisite
Electronics and Its Application	ENFC0415	Theory & Practice	2-1-0	Nil

Objective

- The objective of this course is to provide a good understanding on the components used in today's electronics circuits and systems.

Course Outcome

- Student will able to Identify Electronic Components.
- Learn the functionality and application of the components.
- Assemble components to implement circuits and systems.

Evaluation Systems

Internal Examination	Component	% of Marks	Method of Assessment
	Internal Theory	20	Written Examination
	Internal Practice	30(20+10)	Lab Work + Learning Record
External Examination	External Theory	30	Written Examination
	External Practice	20	Lab Work
Total		100	

Course Outline

Module I: RECENT TRENDS IN ELECTRONIC APPLICATION

(9 Hours)

Theory

a. Smart Electronics : Few Case Studies

- Wearable Electronic Devices / Wearable Technology
- Home Automation
- Driverless Car / Self-driving Car
- Inside a Smart Phone

b. Electronics in Transdisciplinary Applications

- Automotive
- Space
- Underwater
- Medical
- Mining
- Manufacturing
- Industrial Automation

- Robotics
- Agriculture
- Entertainment
- c. **New Trends**
- Green Electronics
- Organic Electronics
- Bio-Electronics
- Nano Electronics
- Polymer Electronics
- Molecular Electronics

Practice

1. Familiarization with different components inside a smart phone

Module II: ELECTRONIC MANUFACTURING

(11 Hours)

Theory

Electronic Manufacturing:

- a. Semiconductor devices
- b. Integrated Circuits (IC)
- c. System-on-Chip (SoC)
- d. System-in-Package (SiP)
- e. Network on Chip (NoC)
- f. Printed Circuit Board (PCB)
- g. Single layer PCB, Double layer PCB, Multi-Layer PCB
- h. Aluminum Backed PCB
- i. 3D Printed PCB

Practice

2. Familiarization with different ICs.
3. Familiarization with PCB design software.
4. Familiarization with 3-D printer.

Module III: COMPONENTS FOR ELECTRONIC CIRCUITS

(12 Hours)

Theory

a. Passive Components :

Resistor, potentiometer, capacitor, inductor, connectors, switches and relays.

b.Active Components :

PN junction diode, Zener diode, Photo diode, Light Emitting Diode (LED), Bipolar Junction Transistor (BJT) and Field Effect Transistor (FET)

Practice:

5. Familiarization with different Components - Resistor, Potentiometer, Capacitor, Inductor, Connectors, switches & Relays. Measurement of Resistance and Capacitance.
6. Application of PN junction diode, Zener Diode
7. Application of LED and photodiode
8. Application of BJT and FET

Module IV: SENSOR & ACTUATOR**(4 Hours)****Theory****a. Sensors : Types and Applications**

- Analog Sensors
- Digital Sensors
- Special Sensors

b. Actuators

- Types of Actuators
- Applications

Practice

9. Familiarization with all types of available sensors.

Module V:SENSOR APPLICATION**(8 Hours)****Theory**

- a. Sensors and Smart Sensors
- b. Reading Sensor Input
- c. Sensor Wiring
- d. Understanding sensors and its application
 - **Infrared Reflectance Sensor.**
 - **Resistance Temperature Detectors**
 - **Temperature Sensor (LM35, Thermistor)**
 - **Motion Sensor**
 - **Limit Switch/Sensor**
 - Touch Sensor Circuit

Practice:

10. Sensor Wiring
11. Application of any of the above sensors.

Module VI:VOLTAGE REGULATOR & AMPLIFIER**(8 Hours)****Theory**

Assembling and Testing (Hardware/Multisim) for Different Circuits (Any one from each category by different groups)

a. Voltage Regulator

- Linear Regulators (LM723,78XX,79XX)
- Switching Regulators (LM2676)
- SMPS
- Hybrid Regulators

b.Amplifier

- Voltage Amplifier
- Current Amplifier
- Power Amplifier

Practice

12. Design of a voltage divider circuit
13. Design of an amplifier

Module VII: SWITCH & OSCILLATOR

(8 Hours)

Theory

Assembling and Testing (Hardware/Multisim) for Different Circuits (Any one from each category by different groups)

Switch

- Relay
- Diode as a Switch
- Transistor as a Switch

Oscillator

- Harmonic Oscillator
- Voltage Controlled Oscillator

Practice

12. Design of a switch
13. Design of an oscillator circuit

Practice will be through hardware implementation and software simulation using Multisim / OrCad PSpice/ Matlab.

Reference : -

Text Books :

- 1.Ian Sinclair and John Dunton,“ Practical Electronics Handbook”, 6th Edition, Elsevier.
- 2.J. Hughes, “Practical Electronics : Components and Techniques”, O'Reilly Media, 2015.
- 3.Basic Principle, Donald A. Neamen,“Semiconductor Physics and Devices”, TMH publication

Reference Books :

- 1.Principles of electronics, V K Meheta, Rohit Meheta, S Chand publication

Session Plan

Topics	No. of Sessions (in hrs.)	Activity	Assignment	Suggested Reading
Module-I [7 hrs. Lecture + 2 hrs. Practice]				
Smart Electronics : Few Case Studies Wearable Electronic Devices Wearable Tech Home Automation Driverless Car / Self-driving Car	2	Lecture		Online source
Inside a Smart Phone [Familiarization with different components inside a smart phone]	2	Practice		Online source
Electronics in Transdisciplinary Applications : Automotive Space Underwater	1	Lecture		Online source
Medical Mining Manufacturing	1	Lecture		Online source
Industrial Automation Robotics Agriculture	1	Lecture		Online source
Green Electronics Organic Electronics Bio-Electronics	1	Lecture		Reference Book-1 + Online reference
Nano Electronics Polymer Electronics Molecular Electronics	1	Lecture		Reference Book-1 + Online reference
Module-II [5 hrs. Lecture+6 hrs. Practice]				
Electronic Manufacturing				
Semiconductor devices [Overview only]	1	Lecture		Text Book-3
Integrated Circuits (IC) [Familiarization with all	2	Practice		Text Book-3

available ICs in Lab]			
System on Chip (SoC), System on Package, Network on Chip [Overview and advantage]	1	Lecture	
Single layer PCB, Double layer PCB, Multi-Layer PCB, Aluminum Backed PCB [Overview of design software and application]	4	2hr. Lecture+ 2 hrs. Practice	
3D Printed PCB	3	1hr. Lecture +2hrs. Practice	Te Cl
Module-III [4hrs. Lecture+8 hrs. Practice]			
Passive Components : Resistor, Potentiometer, capacitor, Inductor, Connectors, switches & Relays. [Definition, Function and Application]	4	2hrs. Lecture+ 2hrs. Practice	Te Cl Te Cl
Active Components : PN junction diode, Zener diode, Photo diode, LED, BJT & FET [Function and application]	8	2hrs. Lecture+ 6 hrs. Practice	Te Cl Te Cl
Module-IV [2hrs. Lecture+2 hrs. Practice]			
Sensors : - Types and Applications Analog Sensors Digital Sensors Special Sensors [Overview, Types and Applications]	3	1 hr. Lecture+ 2 hrs. Practice	Te Cl
Actuators : - Types of Actuators Applications	1	Lecture	Te or re
Module-V [4hrs. Lecture+4 hrs. Practice]			
Sensors and Smart Sensors [overview]	1	Lecture	Te or re
Reading Sensor Input, Sensor Wiring	3	1hr. Lecture + 2 hrs. Practice	Te or re
• Infrared Reflectance Sensor	4	2hrs. Lecture +	Te

<ul style="list-style-type: none"> • Resistance Temperature Detectors • Temperature Sensor (LM35, Thermistor) • Motion Sensor • Limit Switch/Sensor • Touch Sensor Circuit <p>[Each group will practice any one of the above]</p>		2 hrs. Practice		online reference
Module-VI [4hrs. Lecture+4 hrs. Practice]				
Voltage Regulator Linear Regulators (LM723, 78XX, 79XX) Switching Regulators (LM2676) SMPS, Hybrid Regulators	4	2hrs. Lecture + 2hrs. Practice		Reference Book-1 + Online reference
Amplifier : Voltage Amplifier, Current Amplifier, Power Amplifier	4	2hrs. Lecture + 2hrs. Practice		Reference Book-1 + Online reference
Module-VII [4hrs. Lecture+4 hrs. Practice]				
Switch Relay, Diode as a Switch, Transistor as a Switch	4	2hrs. Lecture + 2hrs. Practice		Reference Book-1 + Online reference
Oscillator Harmonic Oscillator Voltage Controlled Oscillator	4	2hrs. Lecture + 2hrs. Practice		Reference Book-1 + Online reference
Total (hrs.)	60	29 hr. Lecture + 31 hrs. Practice		

Electronic Devices

Course Title	Code	Type of course	T-P-PJ	Prerequisite
Electronic Devices	ENFC0416	Theory + Practice	2-1-0	Nil

Objective

- The objective of this subject is to provide in-depth understanding on construction and characteristics of three major components of electronics-diode, BJT, FET.

Course Outcome

- Learn construction and characteristics of different semiconductor devices.
- Design different rectifier and voltage regulator circuits using diodes.
- Design and analyze different amplifier circuits using BJT and FET.

Evaluation Systems

Internal Examination	Component	% of Marks	Method of Assessment
	Internal Theory	20	Written examination
	Internal Practice	30(20+10)	Lab work + Learning Record
External Examination	External Theory	30	Written examination
	External Practice	20	Lab work
Total		100	

Course Outline

Module I: INTRODUCTION

(4 Hours)

Theory

Various properties of conductor, semiconductor and insulator, n-type and p-type semiconductors. Formation of PN junction, depletion region, drift and diffusion.

Module II: SEMICONDUCTOR DIODE

(8 Hours)

Theory

Open-circuited, forward bias and reverse bias of p-n junction diode, Diode equation, Volt-ampere characteristics of p-n junction diode (forward and reverse bias), Temperature dependence of VI characteristic, Transition and Diffusion capacitances.

Practice

1. Volt-Ampere characteristics of a Forward bias PN Diode.
2. Volt-Ampere characteristics of a Reverse bias PN Diode.

**Module III: SEMICONDUCTOR DIODE
Hours)**

(5

Theory

Breakdown mechanisms in semiconductor (Avalanche and Zener breakdown), Zener diode characteristics, LED and photo diode.

Practice

3. Volt-Ampere characteristics of a Zener Diode

Module IV: RECTIFIERS, FILTERS AND REGULATORS

(11 Hours)

Theory

Half wave rectifier, full wave rectifier and ripple factor. Application of p-n diode as clipper and clamper. Simple circuit of a regulator using Zener diode, series and shunt voltage regulators.

Practice

4. Implementation of half wave rectifier. Tracing of waveforms, measurement of DC load voltage, AC load voltage and ripple factor values
5. Implementation of full wave rectifier. Tracing of waveforms, measurement of DC load voltage, AC load voltage and ripple factor values
6. Implementation of clipper circuits using PN-junction diode. Tracing of waveforms at the clipper circuits output.

Module V: TYPES OF FILTER

(10 Hours)

Theory

Inductor filter, Capacitor filter, L- section filter, PI- section filter, Multiple L- section and Multiple PI-section filter.

Practice

7. Implementation of clamper circuits using PN-junction diode. Tracing of waveforms at the clamper circuits output.
8. Design and implementation of a capacitor Filter.
9. Design and implementation of Voltage Regulator using Zener diode

Module VI: BJT CONSTRUCTION AND CHARACTERISTICS

(12 Hours)

Theory

Bipolar Junction Transistor (BJT), Types, Construction and it's working principle., Transistor as an amplifier, Detailed study of currents in a Transistor, VI characteristics of transistor in

Common Base (CB), Common Emitter (CE) and Common collector (CC) configurations; Comparison of CE, CB and CC transistor configuration. Relation between Alpha, Beta & Gamma.

Practice

- 10. Plot and verify VI Characteristics of BJT in CB configuration.
- 11. Plot and verify VI Characteristics of BJT in CC configuration.
- 12. Plot and verify VI Characteristics of BJT in CE configuration.

Module VII: MOSFET CONSTRUCTION & CHARACTERISTICS (10 Hours)

Theory

MOSFET –Types, Construction, working Principle, characteristics (Enhancement and depletion mode), Symbols of MOSFET, VI characteristics of CS, CD and CG configuration; Introduction to SCR and UJT; Thermal run away and thermal stability

Practice

- 13. Plot and verify VI Characteristics of FET in CS configuration.
- 14. Plot and verify VI Characteristics of FET in CD configuration.
- 15. Plot and verify VI Characteristics of FET in CG configuration.

Practice will be done through hardware implementation and software simulation using OrCAD PSpice/ Multisim/ LTspice.

Text Book

- 1. R.L. Boylestad and Louis Nashelsky, “Electronic Devices and Circuits”, Pearson/Prentice Hall, 11th Edition, 2013.

Reference Books

- 1. J. Millman, C. C. Halkias, and Satyabrata Jit, “Electronic Devices and Circuits” ,Tata McGraw Hill, 4th Edition, 2015.
- 2. Prof G S N Raju, “Electronic Devices and Circuits”, I K International Publishing House Pvt. Ltd, 2008.

Session Plan

Topics	No. of Sessions (in hrs.)	Activity	Assignment	Suggested Reading
Module I [4 hrs. Lecture]				
Various properties of Conductor, Semiconductor & Insulator, n and p – type semiconductors, Formation of PN junction	2	Lecture	Assignment- 1.1	Text Book-1

Depletion region, Drift and diffusion	1	Lecture	Assignment-1.2	Text Book-1
Diode equation	1	Lecture	Assignment-1.3	Text Book-1
Module II [4 hrs. Lecture + 4 hrs. Practice]				
Volt-ampere characteristics of p-n diode (Forward and Reverse bias)	4	Practice		Text Book-1 and Lab Manual
Temperature dependence of VI characteristic, Transition and Diffusion capacitances,	2	Lecture	Assignment-2.1	Text Book-1
Breakdown Mechanisms in Semiconductor (Avalanche and Zener breakdown)	2	Lecture	Assignment-2.2	Text Book-1
Module III [3 hrs. Lecture + 2 hrs. Practice]				
Zener diode characteristics	2	Practice		Text Book-1 and Lab Manual
LED and photo diode	3	Lecture	Assignment-3.1	Text Book-1
Module IV [5 hrs. Lecture + 6 hrs. Practice]				
Half wave rectifier	1	Lecture	Assignment-4.1	Text Book-1
Implementation of half wave rectifier. Tracing of waveforms, measurement of DC load voltage, AC load voltage and ripple factor values	2	Practice		Lab Manual
Full wave rectifier	1	Lecture	Assignment-4.2	Text Book-1
Ripple factor	1	Lecture	Assignment-4.3	Text Book-1
Implementation of full wave rectifier. Tracing of waveforms, measurement of DC load voltage, AC load voltage and ripple factor values	2	Practice		Lab Manual
Application of p-n diode as clipper	2	Lecture	Assignment-4.4	Text Book-1

Implementation of clipper circuits using PN-junction diode. Tracing of waveforms at the clipper circuits output.	2	Practice		Lab Manual
Module V [4 hrs. Lecture + 6 hrs. Practice]				
Clamper	1	Lecture	Assignment-5.1	Text Book-1
Implementation of clamper circuits using PN-junction diode. Tracing of waveforms at the clamper circuits output.	2	Practice		Lab Manual
Types of filter, Inductor filter, Capacitor filter, L- section filter, PI- section filter, Multiple L- section and Multiple PI-section filter.	1	Lecture	Assignment-5.2	Text Book-1
Design and implementation of a capacitor Filter.	2	Practice		Lab Manual
Simple circuit of a regulator using Zener diode	1	Lecture	Assignment-5.3	Text Book-1
Design and implementation of Voltage Regulator using Zener diode	2	Practice		Lab Manual
Series and shunt voltage regulators	1	Lecture	Assignment-5.4	Text Book-1
Module-VI [6 hrs. Lecture + 6 hrs. Practice]				
Bipolar Junction Transistor, Types, Construction & it's working principle	2	Lecture	Assignment-6.1	Text Book-1
Transistor as an amplifier, Detailed study of currents in a Transistor	2	Lecture	Assignment-6.2	Text Book-1
VI Characteristics of transistor in Common Base (CB) configurations	2	Practice		Text Book-1
VI Characteristics of transistor Common collector (CC) configurations	2	Practice		Text Book-1
VI Characteristics of transistor Common Emitter (CE) configurations	2	Practice		Text Book-1
Comparison of CE, CB and CC transistor configuration. Relation between Alpha, Beta & Gamma	2	Lecture	Assignment-6.3	Text Book-1

Module VII [4 hrs. Lecture + 6 hrs. Practice]				
MOSFET –Types, construction, working principle	2	Lecture	Assignment-7.1	Text Book-1
Characteristics of MOSFET (enhancement and depletion mode), Symbols of MOSFET,	1	Lecture	Assignment-7.2	Text Book-1
VI Characteristics of CS, configuration	2	Practice		Text Book-1
VI Characteristics of CD configuration	2	Practice		Text Book-1
VI Characteristics of CG configuration	2	Practice		Text Book-1
Introduction to SCR and UJT. Thermal run away and thermal stability	1	Lecture	Assignment-7.3	Text Book-1
Total (hrs.)	60	30hrs. Lecture + 30hrs. Practice		

Sensors and IOT

Course Title	Code	Type of Course	T-P-PJ	Prerequisite
Sensors and IOT	ENFC0417	Theory & Practice	2-1-0	NIL

Objective

- To teach how 'Internet of Things' works, how the Protocols Function, familiarization with different Sensors and their Working, how a Hardware Communicates with Internet and the way it Exchange Necessary Data Through Internet.

Course Outcome

- Students will gain knowledge on how 'Internet of Things' can be utilized and how different Sensors can help in making the System to Operate Effectively and Smartly.
- Students will develop skill in Designing Portable, Ease of Access, Smart, Effective and Efficient Systems to meet the need of Modern Society by using IOT and various Sensors.

Evaluation Systems

	Component	% of Marks	Method of Assessment
Internal Examination	Internal Theory	20	Written Examination
	Internal Practice	30(20+10)	Lab Work + Learning Record
External Examination	External Theory	30	Written Examination
	External Practice	20	Lab Work
Total		100	

Course Outline

Module I : SENSORS & IOT

(15 Hours)

Theory

What is Sensor? Types of Sensors, URM 37 Sensor (Ultrasonic Sensor), Electro-Mechanical Switches, IR, PIR, Laser, Accelerometers, MQ2, MQ3, Temperature and Humidity Sensors (DHT-11), Stress Sensors, LoadSensors, Force Sensors, Wi-Fi modules

What is IOT, What Device makes it to IOT, IOT Platforms, What IOT means for the Developer, Challenges of IOT

Practice

- Interfacing and Testing the Ultrasonic Module, Relay and Infra-Red Module
- Interfacing and Testing PIR, Laser LED, and Accelerometer
- Interface the LPG Sensor, Monoxide Sensor, Temperature and Humidity Sensor
- Interfacing and Testing Stress Sensor, Load Sensor, Force Sensor, Wi-Fi Modules

Module II: ARDUINO ENVIRONMENT, WEB CONNECTIVITY (12 Hours)

Theory

Introduction to Arduino, setting up the Arduino Development Environment, Options for Internet Connectivity with Arduino, Interacting with Basic Sensors, Interacting with Basic Actuators, Configuring your Arduino Board for the IOT

Practice

5. Installing the Arduino IDE
6. Learning the steps to Interface the Controller Board to the System through the Interface
7. Connecting the Arduino to the Internet
8. Interacting of various Sensors to the Internet through the Controller Board
9. Interfacing Actuators to the Controller Board and Control through the Internet

Module III: DATA EXTRACTION (5 Hours)

Theory

Grabbing the Content from a Web Page, Sending Data to the Web, Troubleshooting Basic Arduino Issues

Practice

10. Extracting Data from a Web Page
11. Sending Data to a Web Page

Module IV: INTERNET DATA MONITORING (10 Hours)

Theory

Introduction, Internet of Things Platforms for Arduino, Posting the Sensor Data Online, Retrieving your Online Data, Securing your Online Data, Monitoring Sensor Data from a Web based Dashboard, Monitoring several Arduino Boards at once, Troubleshooting Issues with Web Data Monitoring

Practice

12. Posting the data to the Internet through Internet on-line
13. Monitor the Sensor output from a remote computer through Internet
14. Parallel Monitoring multiple Controller Boards connected to the Internet

Module V:WEB SERVICES

(7 Hours)

Theory

Introduction, Discovering the Temboo Platform, Tweeting from an Arduino Board, Posting updates on Facebook, Automation with IFTTT, Sending Push Notifications

Practice

15. Posting an update to Facebook
16. Sending a Push notification through the Controller by Internet

Module VI: INTERACTING WITH WEB SERVICES

(15 Hours)

Theory

Sending Text Message Notifications, Storing data on Google Drive, Troubleshooting issues with Web Services

Practice

17. Sending a Text Notification through Internet
18. Control Light and Fan via Internet. (prototyped as LEDs)
19. Operate a DC Motor and Servo Motor to Simulate the opening and closing of door

Module VII:MACHINE-TO-MACHINE INTERACTIONS

(11 Hours)

Theory

Introduction, Types of IoT Interaction, Basic local M2M Interactions, Cloud M2M with IFTTT, M2M Alarm System, Automated Light Controller, Automated Sprinkler Controller, Troubleshooting basic M2M Issues

Practice

20. Operate the Smoke Detector from Internet
21. Extract the reading of Temperature, Humidity and Monitoring through Internet
22. Automating the Control of Light, Sprinkler
23. Operate the Robot through Internet which has facility of Communication to and fro through Web and the Sensor Data

Text Books :

1. Marco Schwartz,“Internet of Things with Arduino Cookbook”, Packt Publishing Ltd, 2016,ISBN 978-1-78528-658-2.
2. Arshdeep Bahga, Vijay Madisetti, “Internet of Things- A Hands on Approach”, Universities Press, 2015.

Reference :

1. Neil Cameron, “Arduino Applied: Comprehensive Projects for Everyday Electronics”, Apress Publication, 2019, ISBN-13(pbk):978-1-4842-3959-9, ISBN-13(electronic):978-1-4842-3960-5
2. Marco Schwartz, “Internet of Things with Arduino Yun: Projects to help you build a world of smarter things”, Packt Publishing Ltd, 2014, ISBN:978-1-78328-800-7

Online Resource

1. <https://www.arduino.cc/reference/en>. [Viewed on 14-06-2019]

Session Plan :

Topics	No. of Sessions (in hrs.)	Activity	Assignment	Suggested Reading
Module I [3 hrs. Lecture + 12 hrs. Practice]				
What is Sensor? Types of Sensors	1	Lecture	Assignment 1.1	Text Book(TB)-1, Reference Book(RB)-1
URM 37 Sensor (Ultrasonic Sensor), Electro-Mechanical Switches, IR	1	Lecture	Assignment 1.2	TB-1, RB-1
Interfacing and Testing the URM 37, Relay, IR Module	4	Practice		TB-1
PIR, Laser, Accelerometers, MQ2, MQ3, Temperature and Humidity Sensors (DHT-11)	1	Lecture	Assignment 1.3	TB-1, RB-1
Interfacing and Testing PIR, Laser, Accelerometer, MQ2, MQ3, DHT-11	4	Practice		RB-1
Stress Sensors, LoadSensors, Force Sensors, Wi-Fi Modules	1	Lecture	Assignment 1.4	TB-1, RB-1
Interfacing and Testing stress Sensor, Load Sensor, force Sensor, Wi-Fi modules	4	Practice		TB-1
Background, What is IOT, What device makes it to IOT, IOT platforms, What IOT means for the Developer.	1	Lecture	Assignment 1.5	TB-1,
Module II [2 hrs. Lecture + 10 hrs. Practice]				
Introduction, Setting up the Arduino Development Environment.	2	Practice		TB-1

Interacting of various Sensors to the Internet through the Controller Board.	4	Practice		TB-1
Interacting with basic actuators, Configuring your Arduino Board for the IoT.	4	Practice		
Module III [1 hrs. Lecture + 4 hrs. Practice]				
Grabbing the content from a Web page, sending data to the Web, Troubleshooting basic	1	Lecture	Assignment 3.1	TB-2 RB-1,2
Extracting data from a Web page.	2	Practice		TB-2
Sending data to a Web page.	2	Practice		
Module IV [2 hrs. Lecture + 8 hrs. Practice]				
Introduction, Internet of Things platforms for Arduino	1	Lecture	Assignment 4.1	TB-2 RB-1,2
Posting the Sensor data online, retrieving your online data, and Securing your online data, Monitoring Sensor data from a Web-based dashboard.	4	Practice		TB-2 RB-1,2
Monitoring several Arduino Boards at once, Troubleshooting issues with Web data Monitoring.	1	Lecture	Assignment 4.2	TB-2 RB-1,2
Parallel Monitoring multiple Controller Boards connected to the Internet.	4	Practice		TB-2 RB-1,2
Module V [3 hrs. Lecture + 4 hrs. Practice]				
Introduction, Discovering the Temboo platform, Tweeting from an Arduino Board. Tweeting from an Arduino Board	2	Lecture	Assignment 5.1	TB-2
Posting updates on Facebook, Automation with IFTTT, Sending push notifications.	1	Lecture	Assignment 5.2	TB-2
Posting updates on Facebook, Sending push notifications	4	Practice		TB-2
Module VI [1 hrs. Lecture +14 hrs. Practice]				
Sending text message notifications, Storing data on Google Drive.	2	Practice		

Troubleshooting issues with Web services.	1	Lecture	Assignment 6.1	Text Book-1, Reference Book-1,2
Control Light & Fan from the Internet.	4	Practice		
Remote Controlled door (opening & closing) using servo Motor.	4	Practice		
Smoke detector and Remote Control room temperature from Internet.	2	Practice		
Extract the reading of Temperature, Humidity and Monitoring through Internet.	2	Practice		
Module VII [3 hrs. Lecture + 8 hrs. Practice]				
Introduction, Types of IoT interaction, Basic local M2M interactions.	1	Lecture	Assignment 7.1	Text Book-1, Reference Book-1,2
Cloud M2M with IFTTT, M2M alarm system, Troubleshooting basic M2M issues.	1	Lecture	Assignment 7.2	Text Book-1, Reference Book-1,2
Automated light Controller, Automated sprinkler Controller,	4	Practice		
Introduction, choosing a robotic platform, Building a mobile robot, Configuring your mobile robot, Basic robot Control, Using distance Sensors, Controlling your robot from anywhere, Troubleshooting basic robotic issues.	1	Lecture	Assignment 7.3	Text Book-1, Reference Book-1,2
Operate the robot through Internet which has facility of communication to and fro through Web and the Sensor data.	4	Practice		
Total (hrs.)	75	15 hrs. Lecture + 60 hrs. Practice		

Problem Solving and Programming

Course Title	Code	Type of course	T-P-PJ	Prerequisite
Problem Solving and Programming	ENFC0418	Theory +Practice	1-2-0	Nil

Objective:

- To introduce programming through Visual programming tool - SCRATCH
- To teach problem solving through Flow charting tool - RAPTOR
- To elucidate problem solving through python programming language
- To introduce function-oriented programming paradigm through PYTHON
- To train in development of solutions using modular concepts
- To teach practical Python solution patterns

Course Outcome:

- Develop a program controlled by a loop.
- Experiment with “costumes” to change the appearance of sprites
- Perform Input, Output Operations using scratch
- Perform computation using common mathematical formulas.
- Develop programs by passing messages between sprites.
- Build Mobile apps using App Inventor
- Select flowchart symbols for solving problems.
- Develop basic flowcharts for performing Input, Output and Computations
- Solve numerical problems using Raptor

Evaluation Systems

	Component	% of Marks	Method of Assessment
Internal Examination	Internal Theory	20	Written Examination
	Internal Practice	30 (20+10)	Lab Work + Learning Record
External Examination	External Theory	30	Written Examination
	External Practice	20	Lab Work
Total		100	

Course Outline

Module I : SCRATCH (10 Hours)

Introduction to programming concepts with scratch, Scratch environment, sprites looks and motion, Angles and directions, repetition and variation, changing costumes, adding background, Input/Output, variables and operators. Working with sounds and sprite communication and creating stories, App Generation.

Module II : RAPTOR (10 Hours)

RAPTOR: Flow chart symbols, Input/Output, Assignment, operators, conditional if, repetition, function and sub charts.

Module III : Programming Languages (9 Hours)

Various types of Programming Languages(PL), Types of PL, Characteristics of PL, Syntax, Semantics, Pragmatics Analysis Procedure based languages : General features, Data types, Abstract Data Types (ADT), Structuring, Syntax, Semantics, RAM model of computation, Example : C language

Module IV : Object Oriented Concepts (10 Hours)

Object based languages: Concepts of objects, Class vs ADT, control structures, methods, General features-inheritance, polymorphism, derived classes & information hiding, Example : C++ and Java, Difference with C.

Module V : Programming Concepts (12 Hours)

Logic programming: Predicate calculus- Logical operators, Propositional forms, Rules of inference, Logical equivalence, Quantification, Wellformed formula, Disproofs; Prolog- Syntax, Lists, Operators and arithmetic, Control, i/o, data structures. Functional programming : Lisp- Control constructs, List processing, Files and i/o, Generic functions, Objects,Exceptions.

Module VI : PYTHON Basic concepts (12 Hours)

Python – Numbers, Strings, Variables, operators, expressions, statements, String operations, Math function calls, Input/Output statements, Conditional If, while and for loops, User defined Functions, parameters to functions, recursive functions, Turtle Graphics.

ModuleVII : PYTHON Data Structures (12 Hours)

Lists, Tuples, Dictionaries, Strings, Files and their libraries.Beautiful Idiomatic approach to solve Turtle Bar Chart, Event Driven programming. Key press events, Mouse events, timer events.

Online Resources

- 1.<https://www.cse.msu.edu/~stockman/ITEC/Scratch/BGC2011Scratch-Rev1.pdf>
- 2.<https://nostarch.com/scratchplayground> [Viewed on Dt- 13-06-2019]
3. <http://www.ict.ru.ac.za/Resources/cspw/thinkcspy3/thinkcspy3.pdf>[Viewed on Dt- 13-06-2019]
- 4.https://zhanxw.com/blog/wp-content/uploads/2013/03/BeautifulCode_2.pdf [Viewed on Dt- 13-06-2019]

Data Structure and C Programming

Course Title	Code	Type of course	T-P-PJ	Prerequisite
Data Structure and C Programming	ENFC0419	Theory +Practice	1-2-0	Nil

Course Objective:

- To impart the basic concepts of data structures and algorithms
- To understand concepts about searching and sorting techniques
- To understand basic concepts about stacks, queues, lists, trees and graphs

Course Outcome:

- Student will be able to choose appropriate data structure as applied to specified problem definition
- Ability to analyze algorithms and algorithm correctness.

Evaluation Systems

	Component	% of Marks	Method of Assessment
Internal Examination	Internal Theory	20	Written Examination
	Internal Practice	30 (20+10)	Lab Work + Learning Record
External Examination	External Theory	30	Written Examination
	External Practice	20	Lab Work
Total		100	

Course Outline

Module I : Introduction to Algorithm and Control Structures (15 Hours)

Algorithm / pseudo code, flowchart, structure of C program, identifiers, keywords, data types, variables, Constants and operators, Input-output statements, expressions, type conversions, conditional expressions, operator precedence and order of evaluation

Control flow statements - if and switch statements, loops- while, do-while and for statements, break, continue, go to and Nested loops (Patterns).

ModuleII : Functions and Storage Classes (10 Hours)

Designing structured programs, Functions, user defined functions, standard library functions, parameter passing, storage classes- extern, auto, register, static, scope rules, recursive functions.

ModuleIII : Arrays and Pointers (15 Hours)

Arrays- concepts, declaration, definition, accessing elements, storing elements, arrays and functions, two-dimensional and multi-dimensional arrays, applications of arrays. Pointers- initialization of pointer variables, address arithmetic, pointers to pointers, pointers and functions, pointers and arrays, dynamic memory managements functions.

Module IV : Structures (08 Hours)

Derived types- structures- declaration, definition and initialization of structures, accessing

structures, nested structures, arrays of structures, structures and functions, pointers to structures, self-referential structures, unions, typedef, bitfields, Enumeration, C pre-processor, command line arguments.

Module V : Files Data Structures (08 Hours)

Input and output - concept of a file, text files and binary files, streams, standard I/o, Formatted I/o, file I/o operations, error handling, C program examples.

Module VI : Data Structures (15 Hours)

Data Structures : Introduction to data structures, Array and Linked List (singly linked lists, doubly linked lists, circular list).Module - VI

STACK & QUEUE : Representing stacks and queues in C using arrays and linked lists, infix to post fix conversion, postfix expression evaluation.

TREES- Binary trees, terminology, representation, traversals, BST, AVL and HEAP tree.

Module VII : Graphs(12 Hours)

GRAPHS- terminology, representation, graph traversals (dfs & bfs)

Searching - Linear and binary search methods, sorting - Bubble sort, selection sort, Insertion sort, Quick sort, merge sort.

Text Books

1. Kanetkar, Yashavant, B P B Publications, Let Us C, 15th Edition
2. Lipschutz, Seymour, Schaum Series, 4th Edition

Switching Theory & Logic Design

Course Title	Code	Type of course	T-P-PJ	Prerequisite
Switching Theory & Logic Design	ENFC0420	Theory + Practice	2-1-0	Nil

Objective:

- The Objective of this Subject is to Provide Good Understanding on Digital Logic and Different Combinational and Sequential Circuits Design and their Implementations.

Course Outcome:

- Student will able to Develop, Analyze, Design and Implement Combinational and Sequential Logic Circuits.
- Students will be able to Design Various Logic Gates Starting From Simple Ordinary Gates to Complex Programmable Logic Devices & Arrays.

Evaluation Systems:

Internal Examination	Component	% of Marks	Method of Assessment
	Internal Theory	20	Written Examination
	Internal Practice	30(20+10)	Lab Work + Learning Record
External Examination	External Theory	30	Written Examination
	External Practice	20	Lab Work
Total		100	

Course Outline

Module I: NUMBER SYSTEMS AND CODES (3 Hours)

Number Systems, Base Conversion Methods, Complements of Numbers, Codes- Binary Codes, Binary Coded Decimal Code and its Properties, Module Distance Codes, Alphanumeric Codes, Error Detecting and Correcting Codes.

Module II: BOOLEAN ALGEBRA AND LOGIC MINIMIZATION (9 Hours)

Basic Theorems and Properties, Switching Functions, Canonical and Standard Form, Algebraic Simplification of Digital Logic Gates, Properties of XOR Gates, Universal Gates, Multilevel NAND/NOR realizations

Module III: LOGIC MINIMIZATION AND COMBINATIONAL CIRCUIT DESIGN (13 Hours)

Introduction, The Minimization with theorem, The Karnaugh Map Method, Five and Six Variable Maps, Prime and Essential Implications, Don't Care Map Entries, Using the Maps for Simplifying, Tabular Method Partially Specified Expressions, Multi-output Minimization, Minimization and Combinational Design, Arithmetic Circuits, Comparator, Multiplexers, Code Converters, Wired Logic, Tristate Bus System, Practical Aspects related to Combinational

Logic Design, Hazards and Hazard Free Relations.

Module IV: SEQUENTIAL CIRCUIT DESIGN

(9 Hours)

Introduction, Basic Architectural Distinctions Between Combinational and Sequential Circuits, The Binary Cell, Fundamentals of Sequential Machine Operation, The Flip-Flop, The D-Latch & Flip-Flop, The “Clocked T” Flip-Flop, The “Clocked J-K” Flip-Flop, Design of a Clocked Flip-Flop, Conversion From One Type of Flip-Flop to Another, Timing and Triggering Consideration, Clock Skew

Module V: REGISTER AND COUNTER

(10 Hours)

Introduction, State Diagram, Analysis of Synchronous Sequential Circuits, Approaches to the Design of Synchronous Sequential Finite State Machines, Design Aspects, State Reduction, Design Steps, Realization Using Flip-Flops Counters – Design of Single Mode Counter, Ripple Counter, Ring Counter, Shift Register, Shift Register Sequences, Ring Counter Using Shift Register.

Module VI: FINITE STATE MACHINE

(8 Hours)

Finite State Machine-Capabilities and Limitations, Mealy and Moore Models-Minimization of Completely Specified and Incompletely Specified Sequential Machines, Partition Techniques, and Merger Chart Methods-Concept of Minimal Cover Table.

Module VII: ALGORITHMIC STATE MACHINES

(8 Hours)

Salient Features of the ASM Chart-Simple Examples-System Design Using Data Path and Control Subsystems-Control Implementations-Examples of Weighing Machine and Binary Multiplier.

Text Book

1. M.Morris Mano., “Digital Design”, Pearson Education, 4th Edition.
2. Zvi Kohavi & Niraj K. Jha, “Switching and Finite Automata Theory”, 3rd Edition, Cambridge.

Reference Book

1. Kumar, A.A., Fundamentals of digital circuits. PHI Learning Pvt. Ltd,2014.
2. Jain, R.P. and Floyd, T.L., Digital fundamentals, Dorling Kindersley Pvt Ltd, 2009.
3. Donald, P.L., Albert, P.M., Goutam. Saha, Malvino, A.P. and Saha, G.K., Digital Principles & Applications. Tata McGraw-Hill, 2010.

Operating Systems

Course Title	Code	Type of course	T-P-PJ	Prerequisite
Operating Systems	ENFC0422	Theory + Practice	1-2-0	Nil

Course Objective

- Provide knowledge about the services rendered by operating systems
- Present details discussion on processes, threads and scheduling algorithms
- Discuss various file-system design and implementation issues
- Provide good insight on various memory management techniques
- Expose the students with different techniques of handling deadlocks
- Familiarize students with the basics of linux operating system and perform administrative tasks on Linux servers

Course Outcome:

- Understand operating system structure and functions, services and system calls
- Differentiate between preemptive, non-preemptive and real time CPU scheduling
- Understand how to achieve mutual exclusion in uniprocessor systems
- IPC outcome
- Demonstrate the ability to implement various memory management techniques
- Illustrate various demand paging techniques.
- Understand file systems in various operating systems
- Analyse different disk scheduling algorithms
- Understand various schemes available for achieving system protection and system security

Evaluation Systems

	Component	% of Marks	Method of Assessment
Internal Examination	Internal Theory	20	Written examination
	Internal Practice	30(20+10)	Lab work + Learning Record
External Examination	External Theory	30	Written examination
	External Practice	20	Lab work
Total		100	

Course Outline

Module :I

Introduction: (8hrs)

Architecture, Goals & Structures of O.S, Basic functions, Interaction of O. S. & hardware architecture, System calls, Batch, multiprogramming. Multitasking, time sharing, parallel, distributed & real -time O.S.

Module: II

Process Management: (13hrs)

Process Concept, Process states, Process control, Threads, Uni- processor Scheduling: Types of scheduling : Preemptive, Non preemptive, Scheduling algorithms : FCFS, SJF, RR, Priority, Thread Scheduling, Real Time Scheduling. System calls like ps, fork, join, exec family, wait.

Module :III(12hrs)

Concurrency control :

Concurrency : Principles of Concurrency, Mutual Exclusion : S/W approaches, H/W Support, Semaphores, pipes, Message Passing, signals, Monitors, Classical Problems of Synchronization : Readers-Writers, Producer Consumer, and Dining Philosopher problem. Deadlock :Principles of deadlock, Deadlock Prevention, Deadlock Avoidance, Deadlock Detection, System calls like signal,kill.

Module :IV

Memory Management : (12hrs)

Memory Management requirements, Memory partitioning : Fixed and Variable Partitioning, Memory Allocation : Allocation Strategies (First Fit, Best Fit, and Worst Fit), Fragmentation, Swapping, and Paging. Segmentation, Demand paging

Module V

Virtual Memory : (8hrs)

Concepts, management of VM, Page Replacement Policies (FIFO, LRU, Optimal, Other Strategies), Thrashing.

Module :VI

I/O management & Disk scheduling : (8hrs)

I/O Devices, Organization of I/O functions, Operating System Design issues, I/O Buffering, Disk Scheduling (FCFS, SCAN, C-SCAN, SSTF), RAID, Disk Cache.

Module :VII

Inter Process Communication :(10hrs)

Basic Concepts of Concurrency, Cooperating process, Advantage of Cooperating process, Bounded- Buffer - Shared-Memory Solution, Inter- process Communication (IPC), Basic Concepts of Inter-process Communication and Synchronization.

Text Book:

Operating System Conceptsby Abraham Silberschatz , Peter B. Galvin , Wiley Publication

Big Data Analytics

Course Title	Code	Type of course	T-P-PJ	Prerequisite
Big Data Analytics	ENFC0423	Theory +Practice	1-2-0	Nil

Course Objective

- Learn understand and practice big data analytics approaches with the study of modern computing big data technologies and focus on industry application
- Conceptualize and summarize big data computing technologies machine learning, trivial data vs big data and scale of the approaches

Course Outcome:

- Identify the characteristics of data set and compare trivial data and big data for various applications
- Recognize and implement different ways of selecting parameters and integrate with the mathematical and statistical tools

Evaluation Systems

	Component	% of Marks	Method of Assessment
Internal Examination	Internal Theory	20	Written examination
	Internal Practice	30(20+10)	Lab work + Learning Record
External Examination	External Theory	30	Written examination
	External Practice	20	Lab work
Total		100	

Course Outline

Module: 1 Introduction to Big Data (10 hrs)

Big Data-definition, Characteristics of Big Data (Volume, Variety, Velocity, Veracity, Validity), Importance of Big Data, Patterns for Big Data Development, Data in the Warehouse and Data in Hadoop.

Module: II Introduction to Hadoop (10 hrs)

Hadoop- definition, Understanding distributed systems and Hadoop,Comparing SQL databases and Hadoop, Understanding MapReduce, Counting words with Hadoop—running your first program, History of Hadoop, Starting Hadoop - The building blocks of Hadoop, NameNode, DataNode, Secondary NameNode, JobTracker and Task Tracker.

Module: III MapReduce (10 hrs)

A Weather Dataset, Analyzing the Data with Unix Tools, Analyzing the Data with Hadoop, Scaling Out, Hadoop Streaming, Hadoop Pipes, Developing a MapReduce Application - The Configuration API, Configuring the Development Environment, Running Locally on Test Data, Running on a Cluster, Tuning a Job, MapReduce Workflows.

Module: IV HDFS (13 hrs)

Components of Hadoop -Working with files in HDFS, Anatomy of a MapReduce program, Reading and writing the Hadoop Distributed File system -The Design of HDFS, HDFS Concepts, The Command-Line Interface, Hadoop Filesystem, The Java Interface, Data Flow, Parallel Copying with distcp, Hadoop Archives

Module: V MapReduce Programming (12 hrs)

Writing basic Map Reduce programs - Getting the patent data set, constructing the basic template of a Map Reduce program, Counting things, Adapting for Hadoop's API changes, Streaming in Hadoop, Improving performance with combiners.

Module : VI MapReduce Advanced Programming (10 hrs)

Advanced MapReduce - Chaining MapReduce jobs, joining data from different sources, creating a Bloom filter, Passing job-specific parameters to your tasks, probing for task-specific information, Partitioning into multiple output files, Inputting from and outputting to a database, keeping all output in sorted order.

Module: VII Graph Representation in MapReduce (10 hrs)

Modeling data and solving problems with graphs, Shortest Path Algorithm, Friends-of-Friends Algorithm, PageRank Algorithm, Bloom Filter, Parallelized Bloom filter creation in MapReduce, Map-Reduce semi-join with Bloom filters.

Text Books:

1. Anil Maheswari, “ Big Data” TMH Publication
2. Thomas Erl, Wajid Khattak, Paul Buchler “ Big Data Fundamentals: Concepts, Drivers & Techniques Prentice Hall

Block Chain & Smart Contracts

Course Title	Code	Type of course	T-P-PJ	Prerequisite
Block Chain & Smart Contracts	EN FC0424	Theory +Practice	1-1-0	Nil

Course Objective

- This course aims to provide conceptual understanding of the function of Block chains as a method of securing distributed ledgers, how consensus on their contents is achieved, and the new applications that they enable
- It covers the technological underpinnings of block chain operations as distributed data structures and decision making systems, their functionality and different architecture types

Course Outcome :

- Understand the structure of a block chain and why/when it is better than a simple distributed database
- Analyze the incentive structure in a block chain based system and critically assess its functions, benefits and vulnerabilities
- Evaluate the setting where a block chain based structure may be applied, its potential and its limitations
- Analyze to what extent smart and self-executing contracts can benefit automation, governance, transparency and the Internet of Things (IOT)
- Attain awareness of the new challenges that exist in monetizing businesses around block chains and smart contracts

Evaluation Systems

	Component	% of Marks	Method of Assessment
Internal Examination	Internal Theory	20	Written examination
	Internal Practice	30(20+10)	Lab work + Learning Record
External Examination	External Theory	30	Written examination
	External Practice	20	Lab work
Total		100	

Course Outline

Module I

Introduction to Distributed system, Challenges in Centralized networks. Fundamentals of cryptography, Introduction to Hashing Algorithms, Family of SHA Algorithms and its applications. Course overview and logistics Bitcoin The big picture of the industry – size, growth, structure, players. The key terms that are used. Bitcoin versus Cryptocurrencies versus Block chain, Distributed Ledger Technology (DLT). Strategic analysis of the space – who are the major players (Block chain platforms, regulators, application providers, etc.) Bitcoin,

HyperLedger, Ethereum, Litecoin, Zcash. Etc. The major application : currency, identity, chain of custody.

Module: II

Introduction to blockchain, Blockchain eco system, Introduction to consensus algorithms and its importance, Proof of work, Proof of stake. Mining, Rewards, Forking – hard and soft .Types of blockchain – Public, private, permissioned, permissionless.

Module: III

Smart contract – Writing a simple smart contract – deploying a contract. Applications of smart contracts – real time use cases in Banking & Insurance, Supplychain management.

Module: IV

Cryptocurrency, Introduction to tokens – Security Token, Utility token and payment tokens, ERC 20 and ERC 721. Case study on token usage in gaming and e-commerce industry. Creating our own virtual currency using smart contracts. Scaling Blockchain – reading and writing data. Differentiate nodes, sparse data and Merkle trees. Fixing on the fly – fixes to current implementations : Layer 2 solutions (Lightning and Ethereum state channels.) Bitcoin scaling debate (Segwit2x etc.). The realities of hard forks for scaling, and bugs.

Module: V

Case study on Blockchains – Ethereum, Hyperledger and EOS. Blockchain Dynamics, Public and private blockchains, Hard and soft forks, Sharding Side chains, Distributed Virtual Machines, Smart Contracts, Oracles

Module: VI

Basics of contract law. Smartcontracts and their potential Trust in Algorithms, the impact on society. How existing legal systems could be integrated? OpenZeplin, OpenLaw.

Module: VII

Assets (fiat currencies, property, equity, securities). Supply and demand. Inflation and deflation Valuations and bubbles. Cyrptoconomics – moving beyond its use in verifying the blockchain– motivating participants, creating investment funds, storing value Creating and using tokens and coins.

Text Book:

1. Melanie Swan “ Block Chain Blue Print for new economy” Keilly Publication
2. Tiana Laurence “ Block Chain for Dummies” Wiley Publication
3. Debajani Mohanty “ Block Chain” BPB Publication

Product Development

Course Title	Code	Type of course	T-P-PJ	Prerequisite
Product Development	ENFC0601	Practice + Project	0-2-1	Nil

Objectives

- To educate the students on various stages of development of design of a product beginning from intent-to-actual design.
- Educate the students on usage of design software like ENOVIA, SIMULIA.

Course Outcome

- Students will have knowledge and skills to undertake design projects through making design decisions and evolve design of a product using the theoretical knowledge and hands-on-experience provided on design software.

Evaluation Systems

	Component	% of Marks	Method of Assessment
Internal Examination	Internal Practice	50(40+10)	Lab Work + Learning Record
	Internal Project	50	Project Work
External Examination	External Practice	50	Lab Work
	External Project	50	Project Work + Report
Total		200	

Course Outline

Module : I (08 Hours)

Intent, Impact, Import & Use of Core Mechanical Principles for Concept Design, Engineering Design, Problems Engineering can Solve, How to Identify Opportunities for Design, Needs Assessment & Problem Definition.

Module : II (10 Hours)

Defining Requirements & Problem Definition, Analytical Process Hierarchical Analysis, Developing Possible Design Solutions, Making Design Decisions.

Module : III (08 Hours)

Introduction to CAD Process through 3D Experience Free Modeling, Modeling & Managing Subassemblies in the Robot

Module : IV PLM through ENOVIA(09 Hours)

Modeling a Lathe Machine. Introduction to PLM through ENOVIA, Steps Involved in Controlling the Product Updates in ENOVIA.

Module : V (20 Hours)

Introduction to FEA in Industry, Pre-Processing Using SIMULIA.

Module : VI (15 Hours)

Understanding the Mathematical Modeling for Product in Physical Behavior

Module :VII (15 Hours)

Introduction to Design of Experiments, How to Use SIMULIA to Make an Incremental Design Decision. Type of Engineering Analysis.

E-content: Peer Learning Experience by Dassault Systemes.

Text Books:

1. Chitale, A K, Product Design & Manufacturing, 2013, 6th Edition, PHI publication, India.
2. Ulrich, K T, Eppinger, S D, Product Design & Development, 2016, 5th edition, Tata McGraw-Hill Companies, Inc.

Reference Books:

1. Kumar, P, Product Design - Creativity, Concepts & Usability, 2011, 2nd Edition, PHI publication, India.

Session Plan

Topic coverage and Internal Test	No. of Sessions (in hours.)	Activity (lecture, tutorial, lab practice, field studies/field -trip, Workshop etc.)	Assignment (project, assignment, field study, seminar, etc.)	Suggested Reading (Book, Video, Online source, etc.)
Module-I				
Intent, Impact, Import, Use of core Mechanical Principles for concept Design, What is Engineering Design, Problems Engineering can solve, How to	08	Tutorial	Project	

identify opportunities for design, Needs Assessment & Problem Definition,				
Module-II				
Defining requirements & Problem Definition, Analytical Process Hierarchical Analysis, Developing a possible design Solutions, Making Design Decisions.	10	Tutorial	Project	
Module-III				
Introduction to CAD Process through 3D Experience free modeling, Modeling & managing subassemblies in the Robot,	08	Tutorial , Practice	Project	
Module-IV				
Modeling a Lathe Machine. Introduction to PLM through ENOVIA, Steps involved in controlling the product updates in ENOVIA. Module-V	09	Tutorial , Practice	Project	
Introduction to FEA in Industry, Pre-processing using SIMULIA, Understanding the Mathematical modeling for Product in physical behavior, Introduction to design of experiments, How to use SIMULIA to make a incremental design decision. Type of Engineering analysis. Projects such as Disc Brake analysis by DOE, Door trim Substrate by DOE, MBD of Suspension by DOE.	20	Practice, tutorial	Project	
Module-VI				
Consumer Sentimental Analysis, Behavior Loyalty Metric, Emotional Loyalty Metric, Understanding decision making dashboards in NetVibes,	15	Lecture, Practice	Project	
Interpreting the Real time social data, Creation of different metric for business condition in Net Vibes, Automate Business logic to respond.	15	Lecture, Practice	Project	
Total (hours)	85			

Artificial Intelligence Tools, Techniques and Application

Course Title	Code	Type of course	T-P-PJ	Prerequisite
Artificial intelligence Tools, Techniques and Application	ENFC0603	Practice + Project	0-2-1	Nil

Objective

- Introduce fundamental concepts in AI
- Demonstrate the capability to create simple AI applications using Natural Language Processing, Audio engineering & Speech, Computer Vision, pattern recognition and machine learning.
- Present various modeling and formulation techniques to solve problems using AI techniques.
- Introduce state-of-art AI tools and techniques to solve various problems faced by Engineers in design and analysis.

Course Outcome:

- Understand the importance of AI.
- Explain the concepts of Natural Language Processing.
- Understand concepts of Machine Learning algorithms and their limitations.
- Compare different Machine Learning Algorithms
- Summarize applications of Speech Recognition and Synthesis.
- Explain the applications of, Computer Vision and Image Processing.

Evaluation Systems

	Component	% of Marks	Method of Assessment
Internal Examination	Internal Practice	50(40+10)	Lab Work + Learning Record
	Internal Project	50	Project Work
External Examination	External Practice	50	Lab Work
	External Project	50	Project Work + Report
Total		200	

Course Outline

Module :I Introduction to Artificial Intelligence (10 hrs)

Basics of AI. Applications of AI. Advanced search, Constraint satisfaction problems, Knowledge representation & reasoning, Non-standard logics, Uncertain and probabilistic reasoning

Conceptual introduction to **Machine Learning: Introduction** to Neural Networks, Supervised, Unsupervised, and Semi-Supervised Learning, Deep Learning, Reinforcement Learning, Linear Regression.

Module :II Conceptual introduction to Natural Language Processing : (10 hrs)

Natural language Understanding, Sentiment Analysis, Segmentation and recognition. Conceptual introduction to **Speech Recognition & Synthesis: Speech** Fundamentals, Speech Analysis, Speech Modeling, Speech Recognition, Speech Synthesis, Text-to-Speech

Module : III Conceptual introduction to Image Processing & Computer Vision : (10 hrs)

Introduction to Image processing, Image Noise, Removal of Noise from Images, Color Enhancement, Segmentation, Edge Detection, Optical Character Recognition, Feature Detection & Recognition

Module :IV BOT Technologies and Virtual Assistants : (10 hrs)

Chatbots: Introduction to a Chatbot, Architecture of a Chatbot. NLP in the cloud, NL Interface, How to Build a Chatbot, Transformative user experience of chatbots, Designing elements of a chatbot, Best practices for chatbot development. NLP components. NLP wrapper to chatbots. Audiobots and Musicbots.

Virtual Assistants :Architecture of a Virtual Assistant.

Module :V Image Processing & Computer Vision : (10 hrs)

Image - Definition and Tagging. Classification of images. Tagging. Image formation, Deep Learning algorithms for Object detection & Recognition. Face recognition, Instance recognition, Feature detection and matching, Segmentation, Recognition Databases and test sets Applications -- Feature extraction, Shape identification. Face detection,.

Applications :Automation, Agriculture[Crop and Soil Monitoring, Grading farm produce, Predictive Analytics], Retail and Retail Security[Amazon Go], Autonomous vehicles,

Module: VI Reinforcement Learning(10 hrs)

Introduction to Reinforcement Learning, Game Playing [Deep Blue in Chess, IBM Watson in Jeopardy, Google's DeepMind in AlphaGo], Agents and Environment, Action-Value Function, Deep Reinforced Learning

Module :VII Smart Applications (10 hrs)

Smart Manufacturing, Smart Agriculture, Smart Healthcare, Smart Education, Smart Grids, Smart Transportation and Autonomous Vehicles, Smart Homes, Smart Cities

Text Books:

2. Prateek Joshi, Artificial Intelligence with Python, 1st Edition, Packt Publishing Limited, January 2017.
3. Stuart J.Russell, Peter Norving, Artificial Intelligence, Pearson Publishing, 2015

Note: 14 hrs will be assigned for Project.

Cloud Computing and its Applications Using Linux OS

Course Title	Code	Type of course	T-P-PJ	Prerequisite
Cloud Computing and its Applications using Linux	ENFC0602	Practice + Project	0-2-1	Nil

Course Objective

- To learn how to use Cloud Services.
- To implement Virtualization
- Apply Map-Reduce concept to applications.
- To build Private Cloud.
- Broadly educate to know the impact of engineering on legal and societal issues involved.

Course Outcome

- Analyze the Cloud computing setup with it's vulnerabilities and applications using different architectures.
- Design different workflows according to requirements and apply map reduce programming model.
- Apply and design suitable Virtualization concept, Cloud Resource Management and design scheduling algorithms.
- Access cloud Storage systems and Cloud security, the risks involved, its impact and develop cloud application

Evaluation Systems

Internal Examination	Component	% of Marks	Method of Assessment
	Internal Practice	50(40+10)	Lab Work + Learning Record
	Internal Project	50	Project Work
External Examination	External Practice	50	Lab Work
	External Project	50	Project Work + Report
Total		200	

Course Outline

Module: I Introduction to User Permissions

(10 Hours)

Users, Groups and Permissions, Using the bash Shell, Std. I/O and Pipes, Text Editor, Basic System Configuration Tools, Investigating and Managing Processes, Configuring the Bash Shell, Finding and Processing Files, Network Clients.

Module: II Basics Commands of OS

(15 Hours)

Basic Commands & OS Basics, browsing root and various directories, ext3 and ext4 file system, chmod, chgrp, bash, set, shell basics, less, more, tail, head, sort, cut, grep, awk, sed, tr, etc., vi, ps, kill, top, jobs, shell scripting – branching, looping, find, locate and advanced find, network related scripts, cron, tar, and additional tools

Module: III File System Management

(10 Hours)

Package Management, Kernel Services, and System Services, File system Management, User Administration, Network Configuration, Installation, and Troubleshooting, Minor Project for develop a file system, System Performance and Security, Web Service and website configuration,

Module: IV Commands of Linux

(10 Hours)

Rpm , yum, apt-get, lspci, lsmod, systemctl services, chkconfig, creating partition, format and mount, LVM useradd, userdel, groupadd, groupdel, passwd,chage, acl, raid, iscsi etc, Basic Installation and Configuration Breaking SU passwd, services check Electronic Mail Services, Account Management, Design and develop a network using packet tracer. Cloud Computing

Module: V Introduction to Cloud

(10 Hours)

Introduction to Cloud, Amazon EC2 and EBS, Amazon S3, RRS, Auto Scaling and load distribution in AWS, Route53, AWS VPC, IAM. Services and resources life cycle, AWS Architecture and Design, Cloud Migration and Implementation

Module: VI Introduction to Kali Linux

(15 Hours)

Using Kali Linux - Footprinting and Reconnaissance - FP Terminology, What is FP, Why FP, Objectives of FP, Types of Threats, FP through Search Engines, Competitive Intelligence Gathering, Footprinting using google hacking WHOIS Lookup, DNS Information, Network FP, Traceroute, FP through Social Engineering, Pen Testing, FP Countermeasures. DN Analyzer Pro, Web Data Extractor.

Social Engineering : What is SE, Types of SE, Human-based, Computer-based and Mobile based SE, SE Countermeasures.

Module: VII Networking Concepts**(15 Hours)**

Scanning Networks : Identifying hosts, ports and services, Scanning Methodology, Checking Live Systems, Ping Sweep, Check for Open Ports, Scanning Techniques, scanning beyond IDS, Banner Grabbing, Scan for Vulnerability, Draw Network Diagrams, Prepare Proxies, Pen Testing. Sniffing: Wiretapping, Packet Sniffing, CAM Table, MAC Flooding Tool : macof -i eth0, Yersinia, DHCP Packet Format, Starvation Attack Tool. Rogue DHCP Server Attack ARP, ARP Spoofing Techniques, ARP Spoofing Attack, and Wireshark.

Online Resources

<https://www.aws.training/>

<https://www.aws.educate/>

Problem Solving Using Python

Course Title	Code	Type of course	T-P-PJ	Prerequisite
Problem Solving Using Python	ENFC0901	Theory +Practice	1-2-0	Nil

Objective:

- Learn core Python scripting elements such as variables and flow control structures.
- Understand the concepts of file I/O.
- Plot data using appropriate Python visualization libraries such as Numpy, Matplotlib and SciPy etc.

Course Outcome:

- Able to use object oriented concept to solve problems.
- To quickly and easily draw plot or visualize the information through visualization technique.
- Write an error free program of minimum 200 lines of code.

Evaluation Systems

Internal Examination	Component	% of Marks	Method of Assessment
	Internal Theory	20	Written examination
	Internal Practice	30(20+10)	Lab work + Learning Record
External Examination	External Theory	30	Written examination
	External Practice	20	Lab work
Total		<i>100</i>	

Course Outline

Module I : Familiarization of Python (12 Hours)

Features and Installation, Setting up Path, Working with Python Basic Syntax, Variable and Data types, Basic operators, Numbers, Array, Tuples, Dictionary, Date and Time. **String Manipulation** :Accessing Strings, Basic Operations, String slices.

List :Accessing lists, Operations, Working with lists List (Functions).

Decision Making Statement :Boolean Expressions, if-else Statement, Nested if Else Statement, elif Statement, Switch Statement. **Iteration Statement** :The while Statement, for Statement, Nested Loops, Break and Continue statement.

Module II : Functions Operation (10 Hours)

Types of Function, Function Arguments, Passby reference vs value, Recursion Function. Files Operation : Create Text & Binary Files, Different modes of opening a file, Reading and Writing into Files, FilePositions.

Module III : NumPy (10 Hours)

Arrays, Array indexing, Data types, Array math operation, Sequences, Repetitions and Random number, Broadcasting, Polynomial, unique items and the counts.

Module IV : Functional Programming (12 Hours)

Lists, Tuples, Dictionaries, Strings, stacks, queues, lambda function, Standard library functions, multithreading.

Module V : SciPy (12 Hours)

Numpy VS SciPy, File input/output, Special Function, Linear Algebra, Operation, Interpolation, Optimization and fit, Statistics and random numbers, Numerical Integration, Fast Fourier transforms, Image manipulation.

Module VI : GUI Programming (08 Hours)

Example GUI Program, Environment Variables, Label, Message Widget, Text Area, Button, Radio Button, CheckBox, Listbox/ DropDown Box, Frames, Menu Widget, Menu Button Widget, Scrollbar, Forms, Sliders, Database access, Sending email.

Module VII: Data Visualization (11 Hours)

Visualization Libraries, Data frame : Data types, Attributes, methods (mean(), median(), std(), var(), cor(), min()/ max(), describe()), groupby method, Selecting Column, Filtering, Selecting row and column, Missing values, Data read from excel, CSV and txt file. **Plotting using Matplotlib** :Basic plot(), Histogram, Bar Plot, Box Plots, Area Plot, Scatter Plot, PieChart.

Text Books:

1. Fabrizio Romano, Learn Python Programming - Second Edition, Packt Publishing Limited, June 2018
2. Mark Lutz , Learning Python, O'Reilly 5th edition
3. Robert Johansson, Numerical Python, Apress 2nd edition
4. Kirthi Raman, Mastering Python Data Visualization, PACKT publishing 2015

Reference Books:

1. Wes McKinney , "Python for Data Analysis, O'Reilly 2nd edition 2017
5. SciPy and NumPy , Eli Bressert,O'Reilly 1st edition

Online Source:

1. Michael Dawson, Python Programming for the Absolute Beginner, Premier Press (ebook)
2. J.R. Johansson, Introduction to scientific computing with Python (<http://www-star.st-and.ac.uk/~pw31/CompAstro/IntroToPython.pdf>)

Object Oriented Programming Using Java

Course Title	Code	Type of course	T-P-PJ	Prerequisite
Object Oriented Programming using Java	ENFC0902	Theory + Practice + Project	1-1-1	Nil

Objective:

- To learn why Java is useful for the design of desktop and web applications.
- To learn how to implement object-oriented designs with Java.
- To identify Java language components and how they work together in applications.
- To design and program stand-alone Java applications.
- To learn how to design a graphical user interface (GUI) with Java Swing.
- To understand how to use Java APIs for program development.

Course Outcome:

- Able to understand the use of OOPs concepts.
- Able to solve real world problems using OOP techniques.
- Able to understand the use of abstraction.
- Able to understand the use of Packages and Interface in java.
- Able to develop and understand exception handling, multithreaded applications with synchronization.

Able to **design** GUI based applications and **develop** applets for web applications.

Evaluation Systems

Internal Examination	Component	% of Marks	Method of Assessment
	Internal Theory	40 (30+5+5)	Written examination + Assignment + Attendance
	Internal Practice	50 (40+10)	Lab Work
	Internal Project	50	Project Work
External Examination	External Theory	60	Written examination
	External Practice	50	Lab Work
	External Project	50	Project Work + Report
Total		300	

Course Outline

Module: I Problem Solving Techniques & OOP (10 hrs)

Problem Solving Techniques: Ask Questions, Look for things that are familiar, solve by analogy, Means Ends Analysis, Divide and Conquer, The building block approach, Merging solutions, Mental Block : The Fear of Starting, Object Oriented Problem Solving, and Case Study. Programming: Programming Language, Skeleton, Compilation, Interpretation, and Execution of Program.

Object-Oriented Programming: Object Oriented Concepts, Java Programming Environment,

Feature of Java, Elements of Java Program : Identifier, Naming Conventions, Build-in Type, Variable, Operators, Control Statements, Loops, Typecasting, Arrays,

Module : II Class & Characteristics of OOPs (12 hrs)

Classes : Concept of Objects and Classes, Using Methods, Local Variables, Instance Variables, Constructor, Overloading Constructor, Overloading Methods, Garbage Collection, The Finalize Method, Static, Final and this Keyword. Inheritance and Polymorphism : Basics, Access Modifier, The super Keyword, Method Overriding, Dynamic Method Dispatch, Abstract Classes, Inner Classes.

Module :III Package and Interface (12 hrs)

Packages : Packages, Access Protection, Importing Package Interfaces : Interface, Implementing Interfaces.

Module :IV String Handling and Exception Handling (10 hrs)

StringHandling : String, String Buffer, String Builder. Excepting Handling :Fundamentals, Checked and Unchecked Exceptions, Using Try, Catch, MultipleCatches, Throw, Throws, Finally, Java’s Built-In Exceptions, User-Defined Exception.

Module-V : Multi-Threading (10 hrs)

Multi-Threading : Java Thread Lifecycle Model, Thread Priorities, Synchronization, Creating Threads, Using Different Thread Methods, Wrapper Classes, Clone (java.lang), Collection API, Vectors(java.util).

Module-VI:Java.IO and AWT (10 hrs)

Java.IO : I/O Streams, Serialization AWT : AWT Classes, Window Fundamental, Component, Container, Panel, Window, Frame, Canvas, Control Fundamentals, Layout Managers.

Module: VIIEvent Handling (10 hrs)

Event Handling : Delegation Event Model, Event Classes, Event Listener Interfaces, and Adapter Classes, Handling Events by Extending AWT Components

Text Books:

1. Walter Savitch, “Java-An Introduction to Problem Solving& Programming”, 8th edition, in Pearson, 2017.
2. Herbert Schildt, “Java Complete Reference”, 10th edition, in McGraw-Hill Education, 2017.

Reference Books:

1. Bhavé & Patekar, “Programming with Java” in Pearson Education, 2008.
2. H.M. Deitel & Paul J. Deitel, “Java How to Program” in PHI, 9th Edition, 2012.

Online Source: javatpoint.com,

<http://www.corejavaguru.com>

<https://www.w3schools.in/java-tutorial/>

Web Technologies

Course Title	Code	Type of course	T-P-PJ	Prerequisite
Web Technologies	ENFC0903	Theory + Practice + Project	1-1-1	Nil

Objective:

- Understand client server architecture and able to use the skills for web project development

Course Outcome:

- Develop a static, interactive and well-formed webpage using JavaScript, CSS3 and HTML5
- Use PHP7 to improve accessibility of a web document

Evaluation Systems

Internal Examination	Component	% of Marks	Method of Assessment
	Internal Theory	40 (30+5+5)	Written examination + Assignment + Attendance
	Internal Practice	50 (40+10)	Lab Work
	Internal Project	50	Project Work
External Examination	External Theory	60	Written examination
	External Practice	50	Lab Work
	External Project	50	Project Work + Report
Total		300	

Course Outcome

Module: I HTML5: (10 hrs)

Editors, Attributes, Head, Meta, Body, Style, Paragraphs, Headings, Bold, Line Breaks, Horizontal Rule, Upload, Textarea, Charset, URL Encoding, XHTML, Semantics, Migration, Syntax, Canvas, SVG, Audio, Video, API's, Geolocation, Drag/Drop, Local Storage, Web Workers, App Cache

Module: II CSS3 (10 hrs)

Introducing CSS3, What is CSS3?, The History of CSS, Browser Support, Selectors and Pseudo Classes, Attribute Selectors, The Target Pseudo-Class, UI Element States Pseudo-Classes, Negation Pseudo-Class, Structural Pseudo-Classes, Fonts and Text Effects, Fonts on the Web, Font Services, Gradients, Rounded Corners, Box Shadow, Transitions, Transforms, and Animations, Transitions and Transforms, Transitions.

Module: III Java Script, XML (12 hrs)

Basics, Functional programming, Object oriented programming, Client-side applications, Server-side applications, Design patterns and Idioms, Popular frameworks.
XML Basics, SAX, DOM, Xpath, Digester, XUL, SOAP, WSDL

Module: IV PHP (12 hrs)

Introduction to PHP, Installation of PHP and MySQL, PHP configuration in IIS & Apache Web Server and features of PHP, Writing PHP, How PHP code is parsed, Embedding PHP and HTML, Executing PHP and viewing in Browser, Data types, Operators, PHP variables : static and global variables, Comments in PHP, Control Structures, Condition statements, If...Else Switch, ? Operator, Loops, While, Break Statement, Continue, Do... While, For, For each, Exit, Die, Return, Arrays in PHP

Module: V Advanced PHP(10 hrs)

Working With Data Form Element, Input Elements, Validating The User Input, Passing Variables Between Pages, Passing Variables Through A Get, Passing Variables Through A Post, Passing Variables Through A Request, Functions, Handling Sessions And Cookies, Concept Of Session, Starting Session, Modifying Session Variables, Unregistering And Deleting Session Variable, Concept Of Cookies, Handling Of Cookies, Introduction Of MySQL, Types Of Tables In MySQL, Query In MySQL : Select, Insert, Update, Delete, Truncate, Alias, Order By, Database Connectivity Of Php With MySQL

Module: VI Mysqli (10 hrs)

Data Definition Statements, Data Manipulation Statements, Transactional and Locking Statements, Replication Statements, Prepared SQL Statement Syntax, Compound-Statement Syntax, Database Administration Statements, Utility Statements, Connection with PHP and MySQL using PDOs

Module: VII CMS (10 hrs)

Bootstrap, Joomla, Wordpress, Drupal with project implementation

Text Books

1. HTML 5 Black Book (Covers CSS3, JavaScript, XML, XHTML, AJAX, PHP, jQuery) 2Ed By DT Editorial Services.
2. [Web Technologies: HTML, JAVASCRIPT, PHP, JAVA, JSP, ASP.NET, XML and Ajax, Black Book: HTML...](#) by Kogent Learning Solutions Inc.
3. MySQL(TM): The Complete Reference, Vikram Vaswani
4. PHP: The Complete Reference, Steven Holzner
5. Beginning HTML5 and CSS 3, Copyright © 2012 by Richard Clark, Oli Studholme, Christopher Murphy and Divya Manian.

Software Engineering using Agile

Course Title	Code	Type of course	T-P-PJ	Prerequisite
Software Engineering using Agile	ENFC0904	Theory + Practice + Project	1-1-1	Nil

Objective

- Explain the phases of Software Development.
- Teach the customer requirement gathering techniques.
- Familiarize with Agile software development methods.
- Demonstrate the testing techniques.
- Teach Software Design techniques

Course Outcome:

- List the steps involved in software development.
 - Interpret the myths of software.
 - Analyze various software process models
 - Explain agile software development model
 - Identify the functional and non-functional requirements for software development
 - Analyse user requirements for a software
- Apply agile software development model (L3)
 Identify different requirement modeling strategies (L2)
 Design UML Diagrams for the given problem (L6)

Evaluation Systems

	Component	% of Marks	Method of Assessment
Internal Examination	Internal Theory	40 (30+5+5)	Written examination + Assignment + Attendance
	Internal Practice	50 (40+10)	Lab Work
	Internal Project	50	Project Work
External Examination	External Theory	60	Written examination
	External Practice	50	Lab Work
	External Project	50	Project Work + Report
Total		300	

Course Outline

Module: I Software Engineering Process: (10 hrs)

The Nature of Software, The Unique Nature of WebApps, Software Engineering, The Software Process, Software Engineering Practice, Software Myths, How It All Starts. A Generic Process Model, Process Assessment and Improvement, Prescriptive Process Models, Specialized Process Models, The Unified Process, Personal and Team Process Models, Process Technology.

Module: II Agility (10 hrs)

What Is Agility?, Agility and the Cost of Change, What Is an Agile Process?, Extreme Programming (XP), Other Agile Process Models, A Tool Set for the Agile Process, Software Engineering Knowledge , Core Principles, Principles That Guide Each Framework Activity, Requirements Engineering, Establishing the Groundwork, Eliciting Requirements, Developing Use Cases, Building the Requirements Model, Negotiating Requirements, Validating Requirements.

Module: III UML Models (12 hrs)

Requirements Analysis, Scenario-Based Modeling, UML Models That Supplement the Use Case, Data Modeling Concepts, Class-Based Modeling, Requirements Modeling Strategies, Flow-Oriented Modeling, Creating a Behavioral Model, Patterns for Requirements Modeling, Requirements Modeling for WebApps.

Module: IV Software Design (12 hrs)

Design within the Context of Software Engineering, The Design Process, Design Concepts, The Design Model, Software Architecture, Architectural Genres, Architectural Styles, Assessing Alternative Architectural Designs, Architectural Mapping Using Data Flow.

Module: V Software Design

What Is a Component?, Designing Class-Based Components, Conducting Component-Level Design, Component-Level Design for WebApps, Designing Traditional Components, Component-Based Development.

Module: VI Software Interface (10 hrs)

The Golden Rules, User Interface Analysis and Design, Interface Analysis, Interface Design Steps, WebApp Interface Design, Design Evaluation, A Strategic Approach to Software Testing, Strategic Issues, Test Strategies for Conventional Software, Test Strategies for Object-Oriented Software, Test Strategies for WebApps, Validation Testing, System Testing.

Module: VII Software Testing (10 hrs)

The Art of Debugging, Software Testing Fundamentals, Internal and External Views of Testing, White-Box Testing, Basis Path Testing

Module: IV

Internet Principles; Internet Communications : An Overview IP; TCP; The IP Protocol Suite (TCP/IP); UDP ; IP Addresses; DNS ; Static IP Address Assignment ; Dynamic IP

Module: V

Address Assignment; IPv6 ; MAC Addresses ; TCP and UDP Ports An Example : HTTP Ports ; Other Common Ports; Application Layer Protocols- HTTP; HTTPS : Encrypted HTTP ; Other Application Layer Protocols

Module: VI

Getting Started with an API; Mashing Up APIs; Scraping; Legalities; Writing a New API; Clockodillo; Security; Implementing the API; Using Curl to Test; Going Further;

Module: VII

Real-Time Reactions; Polling; Comet; Other Protocols ; MQ Telemetry Transport; Extensible Messaging and Presence Protocol; Constrained Application Protocol

Build Your Own Computer

Course Title	Code	Type of course	T-P-PJ	Prerequisite
Build your Own Computer	ENFC1402	Workshop	0-2-0	Nil

Objective:

- Develop ability to understand the internals of Computer and peripherals
- To have an overall idea about networking concepts and devices
- To have an overall idea about secure computing

Course Outcome:

- Build your computing device
- Troubleshoot various faults in a computer system and network
- Construct small LAN for resource sharing

Evaluation Systems

	Component	% of Marks	Method of Assessment
Internal Examination	Internal Practice	100	Workshop
	Total	100	

Course Outline

Module: I

Firmware upgrades/flash BIOS, BIOS component information, BIOS configurations, Built-in diagnostics, Monitoring. Sizes of cabinet, Expansion slots, RAM slots, CPU sockets, Chipsets, CMOS battery, Power connections and types, Fan connectors, Front/top panel connectors, Bus speeds, Resetbutton.

Module :II

Types of RAM, Single channel vs. dual channel vs. triple channel, RAM compatibility. Sound cards, Video cards, Network cards, USB cards, Firewire cards, Thunderbolt cards, Storage cards, Modem cards, Wireless/cellular cards, TV tuner cards, Video capture cards, Risercards.

Module :III

Display types, Refresh/frame rates, Resolution, Native resolution, Brightness/lumens, Analog vs. digital, Privacy/antiglare filters, Multiple displays, Aspect ratios. Display cable and connector types.

Module :IV

Drives, Magnetic hard disk drives, Hot swappable drives, Solid state/flash drives, RAID

types, Tape drive, Media capacity.

Module :V

Socket types – Intel and AMD, Characteristics, Cooling – Heat sink, fans, thermal paste.
Connector type, characteristics and their voltages

Module :VI

Input and Output devices, network cable and connectors, crimping of network cable. Hardware and network troubleshooting. Assembling and disassembling of computer and laptop

Module :VII

Installation of DOS and Non-DOS operating system – Automatic and Manual Configurations

Cloud Computing Application

Course Title	Code	Type of course	T-P-PJ	Prerequisite
Cloud Computing Application	ENFC1403	Workshop	0-2-0	Nil

Objective

- Learn fundamentals of cloud computing
- Learn to build distributed applications and micro services with AWS Step Functions
- Learn step-by-step to setup up AWS platform

Course Outcome

- Setup AWS Account and AWS infrastructure
- Deploying serverless micro services
- Implementing scalability and implementing high availability

Evaluation Systems

	Component	% of Marks	Method of Assessment
Internal Examination	Internal Practice	100	Workshop
	Total	100	

Course outline

Module: I (8 Hrs)

UNDERSTANDING CLOUD BASICS

Defining cloud computing, Introducing public, private, and hybrid clouds, Introducing cloud service models – IaaS, PaaS, and SaaS, Introducing multi-tenancy models, Compare cloud value proposition with conventional models. Understand Global Infrastructure – Region, Availability Zones, Edge Locations; Setting up AWS account, Getting Familiarity with AWS Management Console; Understanding cloud-based workloads

Module: II (10 Hrs)

DESIGNING CLOUD APPLICATIONS

Introducing cloud-based multitier architecture, Designing for multi-tenancy, Understanding cloud applications design principles, Understanding emerging cloud-based application architectures, Estimating your cloud computing costs, A typical e-commerce web application

Module: III (8 Hrs)

INTRODUCING AWS COMPONENTS

AWS components, managing costs on AWS cloud, Application development environments
Setting up the AWS infrastructure

Module: IV (8 Hrs)

DESIGNING FOR AND IMPLEMENTING SCALABILITY

Defining scalability objectives, Designing scalable application architectures, Leveraging AWS infrastructure services for scalability, Evolving architecture against increasing loads, Event handling at scale, setting up Auto Scaling

Module: V (8 Hrs)

DESIGNING FOR AND IMPLEMENTING HIGH AVAILABILITY

Defining availability objectives, Nature of failures, Setting up high availability

Module: VI (8 Hrs)

DESIGNING FOR AND IMPLEMENTING SECURITY

Defining security objectives, Understanding the security responsibilities, Best practices in implementing AWS security, Setting up security

Module: VII (10 Hrs)

DEPLOYING TO PRODUCTION AND GOING LIVE

Managing infrastructure, deployments, and support at scale, Creating and managing AWS environments using CloudFormation, Using CloudWatch for monitoring, Using AWS solutions for backup and archiving, Planning for production go-live activities, Setting up for production

E-content : www.awseducate.com

https://aws.amazon.com/getting-started/use-cases/?awsf.getting-started-content=*default

Text Books :

Aurobindo Sarkar, Amit Shah, Learning AWS - Second Edition, Packt Publishing Limited, February 2018, ISBN 9781787281066

Reference Books:

Vipul Tankariya, AWS Certified SysOps Administrator - Associate Guide, Packt Publishing Limited August 2018, ISBN 9781788990776

John Stamper, Sean Senior, Kevin E. Kelly, Biff Gaut, Tim Bixler, Hisham Baz, Joe Baron, AWS Certified Solutions Architect Official Study Guide, John Wiley & Sons, October 2016, ISBN : 9781119138556

Online Source :

<https://aws.amazon.com/>

<https://www.awseducate.com/faqs?app=3>

Session Plan

Topic coverage and Internal Test	No. of Sessions (in hrs.)	Activity (lecture, tutorial, lab practice, field studies/field-trip, Workshop etc.)	Assignment (project, assignment, field study, seminar, etc.)	Suggested Reading (Book, Video, Online source, etc.)

Defining cloud computing, Introducing public, private, and hybrid clouds	2	Lecture	Assignment	Text Book -1
Introducing cloud Service models – IaaS, PaaS, and SaaS, Introducing multi-tenancy models	2	Lecture	Assignment	T.B-1
Understanding cloud-based workloads, Setting up AWS account	2	Lab Practice	Experiment	T.B-1
Introducing cloud-based multitier architecture, Designing for multi-tenancy	2	Lab Practice	Experiment	T.B-1
Understanding cloud applications design principles, Understanding emerging cloud-based application architectures	2	Lab Practice	Experiment	T.B-1
Estimating your cloud computing costs, A typical e-commerce web application	2	Lab Practice	Experiment	T.B-1
AWS components, Managing costs on AWS cloud	2	Lab Practice	Experiment	T.B-1
Application development environments	2	Lab Practice	Experiment	T.B-1
Setting up the AWS infrastructure	2	Lab Practice	Experiment	T.B-1
Defining scalability objectives, Designing scalable application architectures	4	Lab Practice	Experiment	T.B-1
Leveraging AWS infrastructure services for scalability	4	Lab Practice	Experiment	T.B-1
Evolving architecture against increasing loads	2	Lab Practice	Experiment	T.B-1
Event handling at scale , Setting up Auto Scaling	4	Lab Practice	Experiment	T.B-1
Defining availability objectives, Nature of failures, Setting up high availability	6	Presentation, Lab Practice	Assignment, Experiment	T.B-1

Defining security objectives, Understanding the security responsibilities	3	Lab Practice	Experiment	T.B-1
Best practices in implementing AWS security, Setting up security	4	Lab Practice	Experiment	T.B-1
Managing infrastructure, deployments, and support at scale	3	Lab Practice	Experiment	T.B-1
Creating and managing AWS environments using CloudFormation	3	Lab Practice	Experiment	T.B-1
Using CloudWatch for monitoring	2	Lab Practice	Experiment	T.B-1
Using AWS solutions for backup and archiving	2	Lab Practice	Experiment	T.B-1
Planning for production go-live activities, Setting up for production	3	Lab Practice	Experiment	T.B-1
Total (hrs)	60			

Centurion University of Technology and Management Odisha

Choice Based Credit System

Course Structure & Syllabus

BASKET - IV



CENTURION UNIVERSITY OF TECHNOLOGY AND MANAGEMENT

School of Engineering & Technology

2018

Electrical & Electronics Engineering

Course Structure

Basket-IV

Course Code	Course Title	Course Type	Credit	Pre-requisite
ELCC0101	Transmission & Distribution	Theory	3	Nil
ELCC0102	Power System Operation & Control	Theory	3	Nil
ELCC0103	Distributed Generation & Micro Grid	Theory	2	Nil
EECC0101	Soft Computing Techniques - I	Theory	2	Nil
ELCC0202	Electrical Circuit Drawing (Using Auto CAD)	Practice	2	Nil
ELCC0401	Network Theory	Theory+ Practice	3	Nil
EECC0409	Electronic Measurement & Instrumentation	Theory+ Practice	3	Nil
ELCC0403	Linear Integrated Circuits & Application	Theory+ Practice	3	Nil
EECC0405	Power Electronics	Theory + Practice	5	Nil
EECC0402	Micro Controllers for Industrial Application (PIC)	Theory+ Practice	4	Nil
ELCC0406	Control System	Theory + Practice	5	Nil
ELCC0407	Microprocessor and its Interfacing	Theory+ Practice	2	Nil
ECCC0402	Digital Electronic Circuits	Theory + Practice	4	Nil
ECCC0404	Digital Signal Processing	Theory+ Practice	4	Nil
	Total		45	

Transmission & Distribution

Course Title	Code	Type of course	T-P-P	Prerequisite
Transmission & Distribution	ELCC0101	Theory	3-0-0	Nil

Objective

- To make the students conversant with all the important aspects of overhead transmission and distribution system.

Course Outcome

- Understand the structure, components, calculations and design of transmission and distribution line parameters.
- Design power system components for a specified system and application

Evaluation Systems

	Component	% of Marks	Method of Assessment
Internal Examination	Internal Theory	30	Written examination
	Assignment	5	Report or Presentation + Learning Record
	Attendance	5	Based on class attended
External Examination	External Theory	60	Written examination
Total		100	

Course Outline

Module I: Transmission Line Parameters-Resistance and Inductance (10 hours)

Theory

Resistance: Series impedance of transmission line, Types of conductors, Resistance, Tabulated Resistance value, Skin and Proximity effects, **Inductance:** Inductance of a conductor due to Internal Flux, Flux linkages between two points External to an Isolated Conductor, Inductance of a Single-phase Two-wire Line, Flux Linkages of One Conductor in a group, Inductance of composite conductor lines, The use of tables, Inductance of Three-phase Lines with Equilateral Spacing, Inductance of Three-phase Lines with Unsymmetrical Spacing, Inductance calculations for Bundled Conductor

Module II: Capacitance of Transmission Lines (6 hours)

(6 hours)

Theory

Electric field of a long, straight conductor, The potential Difference between Two Points Due to a Charge, Capacitance of a Two wire Line, , Capacitance of Three-phase Lines with Equilateral Spacing, Capacitance of Three-phase Lines with Unsymmetrical Spacing, Effect of Earth on the Capacitance of Three-phase Transmission line, capacitance calculation for bundled conductors, Parallel-circuit Three-phase Lines.

Module III: Performance Of Transmission Lines (14 hours)

Theory

Current and Voltage Relations on a Transmission Line, Representation of Lines, Short Transmission Line, Medium Length Line, Long Transmission Line, Equivalent Circuit of a long Transmission Line, Ferranti effect, Power flow through a Transmission Line, Reactive compensation of Transmission Line, Transmission Line Transients, Travelling waves, Reflections, Direct current Transmission

Module IV: Overhead Line Insulators (3 hours) Theory

Types of Insulators, String efficiency and Methods for improvement of string efficiency.

Module V: Mechanical Design Of Overhead Transmission Lines (3 hours)

Theory

Sag and Tension Calculations- with equal and unequal heights of towers, Effect of Wind and Ice on weight of Conductor.

Module VI: Corona (3 hours)

Theory

Description of the phenomenon, factors affecting corona, critical voltages and power loss, Radio Interference

Module VII: Distribution (6 hours)

Theory

Comparison of various Distribution Systems, AC three-phase four-wire Distribution System, Types of Primary Distribution Systems, Types of Secondary Distribution Systems, Voltage Drop in DC & AC Distributors, Kelvin's Law & Limitations.

Text Books:

1. John J. Grainger and W. D. Stevenson, "Power System Analysis," Tata McGraw-Hill, 2003.
2. M..L. Soni, P.V.Gupta, U.S.Bhatnagar, and A .Chakrabarthy, "A Text Book on Power System Engineering" DhanpatRai & Co Pvt. Ltd.

Session Plan

Topics	No. of Sessions (in hrs.)	Activity	Assignment	Suggested Reading
Module – I :Transmission Line Parameters-Resistance and Inductance (10 hours)				
Series impedance of transmission line: Types of conductors, Resistance, Tabulated Resistance value,	1	Lecture	-	TB 1 4.1,4.2,4.3
Skin Effect and Proximity effect	1	Lecture	Assignment	

			1.2	
Inductance of a conductor due to Internal Flux,	1	Lecture	Assignment 1.3	TB 1 4.4
Flux linkages between two points - External to an Isolated Conductor,	1	Lecture	Assignment 1.4	TB 1 4.5
Inductance of a Single-phase Two wire Line	1	Lecture	Assignment 1.5	TB 1 4.6
Flux Linkages of One Conductor in a group,	1	Lecture	Assignment 1.6	TB 1 4.7
Inductance of composite conductor lines, The use of tables,	1	Lecture	Assignment 1.7	TB 1 4.8,4.9
Inductance of Three-phase Lines with Equilateral Spacing,	1	Lecture	Assignment 1.8	TB 1 4.10
Inductance of Three phase Lines with Unsymmetrical Spacing	1	Lecture	Assignment 1.9	TB 1 4.11
Inductance calculations for Bundled Conductor.	1	Lecture	Assignment 1.10	TB 1 4.12
Module – II Capacitance of Transmission Lines (6 hours)				
Capacitance of Transmission Lines: Electric field of a long straight conductor	1	Lecture	Assignment 2.1	TB 1 5.1
The potential Difference between Two Points Due to a Charge,	1	Lecture	Assignment 2.2-2.4	TB 1 5.2
Capacitance of a Two wire Line,	1	Lecture	Assignment 2.5-26	TB 1 5.3
Capacitance of Three-phase Lines with Equilateral Spacing,	1	Lecture	Assignment 2.7-2.9	TB 1 5.4
Capacitance of Three-phase Lines with Unsymmetrical Spacing,	1	Lecture	Assignment 2.10-2.12	TB 1 5.5
Effect of Earth on the Capacitance of Three-phase Transmission line	1	Lecture	Assignment 2.13-2.15	TB 1 5.6
Module – III Performance Of Transmission Lines (14 hours)				
Performance of transmission lines: Representation of Lines,	1	Lecture	Assignment 3.1	TB 1 6.1
Short Transmission Line,	1	Lecture	Assignment 3.2-3.5	TB 1 6.2
Medium Length Line: End condenser method	1	Lecture	Assignment 3.6	TB 1 6.3.1
Nominal T method	1	Lecture	Assignment 3.7-3.10	TB 1 6.3.2
Nominal Pie Method	1	Lecture	Assignment 3.11-3.15	TB 1 6.3.3
Long Transmission Line: Rigorous method of solving long transmission line	2	Lecture	Assignment 3.16-3.18	TB 1 6.4
Equivalent Circuit of a long Transmission Line, Equivalent T circuit	2	Lecture	Assignment 3.19	TB 1 6.5

Equivalent Circuit of a long Transmission Line, Equivalent pie circuit	2	Lecture		TB 1 6.6
Ferranti effect, Power flow through a Transmission Line,	1	Lecture	Assignment 3.20	TB 1 6.7,6.8
Reactive compensation of Transmission Line, Transmission Line Transients, Travelling waves	2	Lecture		TB 1 6.9
Module – IV Overhead Line Insulators (3 hours)				
Insulators: Types of Insulators,	1	Lecture	Assignment 4.1-4.3	TB 2 11.1,11.2
String efficiency calculation	1	Lecture	Assignment 4.4-4.8	TB 2 11.3,11.5
Methods for improvement of string efficiency	1	Lecture	Assignment 4.9-4.12	TB 2 11.6
Module – V Mechanical Design Of Overhead Transmission Lines (3 hours)				
Mechanical Design of Overhead Transmission Lines: Sag Calculations with equal heights of towers	1	Lecture	Assignment 5.1-5.6	TB 2 12.1,12.3
Sag Calculations with unequal heights of towers	1	Lecture	Assignment 5.7-5.10	TB 2 12.4
Effect of Wind & Ice on weight of Conductor,	1	Lecture	Assignment 5.11-5.15	TB 2 12.6,12.7
Module – VI Corona (3 hours)				
Corona: Description of the phenomenon	1	Lecture	Assignment 6.1	TB 2 15.1,15.2
Factors affecting corona	1	Lecture	Assignment 6.2	TB 2 15.3
critical voltages and power loss, Radio Interference	1	Lecture	Assignment 6.3-6.6	TB 2 15.4,15.5
Module – VII Distribution (6 hours)				
Distribution: Comparison of various distribution systems AC three-phase four-wire Distribution System,	1	Lecture	Assignment 7.1-7.4	TB 2 18.1,18.2
Types of Primary Distribution Systems, Types of Secondary Distribution Systems	1	Lecture	Assignment 7.5-7.6	TB 2 18.3,18.4
Voltage Drop in DC Distributors,	2	Lecture	Assignment 7.7-7.15	TB 2 18.5,18.6
Voltage Drop in AC Distributors,	1	Lecture	Assignment 7.16-7.20	TB 2 19.1-4
Kelvin's Law & Limitations	1	Lecture	Assignment 7.21-7.25	TB 2 7.5
Total (hrs)= 45Hours (Theory- 45 hours + Practice-0 hours)				

Power System Operation and Control

Course Title	Code	Type of course	T-P-P	Prerequisite
Power System Operation and Control	ELCC0102	Theory	3-0-0	Nil

Objective

<ul style="list-style-type: none"> · To learn the basic control technique involved in power system operation · To provide a solid foundation in mathematical and engineering fundamentals required to control the governing system in turbine models
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Course Outcome

<ul style="list-style-type: none"> · Make Economic operation of power system and importance of LFC · Analyze thermal and hydro power plant operation in meeting the load demand optimally · Analyze single area load frequency control and two area load frequency control

Evaluation Systems

	Component	% of Marks	Method of Assessment
Internal Examination	Internal Theory	30	Written examination
	Assignment	5	Report or Presentation + Learning Record
	Attendance	5	Based on class attended
External Examination	External Theory	60	Written examination
Total		100	

Course Outline

Module I :Load Flow Studies (3 hours)

Theory

Network model formulation, Y bus formation (MATLAB) and singular matrix transformation

Module II : Load Flow Solution (9 hours)

Theory

Load flow problem , Gauss Seidel (GS) method, Newton-Raphson method (NR) (Polar, Rectangular form), Decoupled, Fast Decoupled load flow and comparison, Concept of DC loads flow.(Topics on Gauss Seidel (GS) method, Newton-Raphson method (NR) and Y bus formation

Module III : Economic System Operation (8 hours)

Theory

Generator operating cost, input-output, Heat rate and IFC curve, Constraints in operation, Coordinate equation, Exact coordinate equation, B_{mn} coefficients, transmission loss formula, Economic operation with limited fuel supply and shared generators, Economic exchange of

power between the areas. Optimal unit commitment (MATLAB/SciLab) and reliability considerations

Module IV : Automatic Generation and control (6 hours)

Theory

Load frequency control problem, Thermal Governing system and transfer function, Steam Turbine and Power system transfer function, isolated power system static and dynamic response.

Module V : Load Frequency Control (6 hours)

Theory

Two area load frequency control, static and dynamic response, Frequency biased Tie line Bias control- implementation and effect, Implementation of AGC, AGC in restructured power system(media presentation), under frequency load shedding, GRC, Dead band and its effect.

Module VI : Power System Stability (6 hours)

Theory

Types of Stability Study, Dynamics of synchronous machine, Power angle equation, Node elimination technique, Simple Systems, Steady state stability, Transient stability

Module VII : Equal Area Criteria (7 hours)

Theory

Equal area criteria and its applications, Numerical solution of swing equation, Modified Euler’s method.(MATLAB/SciLab)

Text Books

1. W.D. Stevenson., G. J. Grainger. “Elements of Power System.”Mc-Graw-Hill Publication
2. Kothari. D. P, Nagrath. I. J., “Modern Power System Analysis,” TMH Publication, Third Edition, 2008
3. Olle.I.Elgerd, “Electric energy systems theory-An introduction”, Tata McGrawHill publishing Ltd, New Delhi,2008

Reference Books

1. P.Venkatesh, B.V. Manikandan,“Electrical Power Systems,” PHI Publication
2. Kimbark E W, “Power System Stability,” Volume I, and III, Wiley Publication.
3. HadiSaadat, “Power System Analysis,” TMH Publication ,Second Edition, 2002

Session Plan

<i>Topic coverage and Internal Test</i>	<i>No. of Sessions (in hrs.)</i>	<i>Activity</i>	<i>Assignment</i>	<i>Suggested Reading</i>
Module I : Load Flow Studies (Theory-3 hours, Practice-0)				
Load Flow Studies: Network model	01	Lecture	Assignment 1.1	TB- 1 Ch-7.1

formulation,				
Y bus formation and singular matrix transformation	02	Lecture	Assignment 1.1	TB- 1 Ch-7.3
Module II: Load Flow Solution (Theory-9 hours, Practice-0)				
Load flow problem, Gauss Seidel (GS) method	03	Lecture	Assignment 1.2	TB- 1 Ch-9.2
Newton-Raphson method (NR) (Polar, Rectangular form)	04	Lecture	Assignment 1.2	TB- 1 Ch-9.3
Decoupled, Fast Decoupled load flow and comparison. Concept of DC loads flow.	02	Lecture	Assignment 1.2	TB- 1 Ch-9.7
Module III : Economic System Operation (Theory-8 hours, Practice-0)				
Generator operating cost: input-output, Heat rate and IFC curve	02	Lecture	Assignment 2.1	TB- 1 Ch-13
Constraints in operation, Coordinate equation, Exact coordinate equation	01	Lecture	Assignment 2.1	TB- 1 Ch-13
Bmn coefficients, transmission loss formula	01	Lecture	Assignment 2.1	TB- 1 Ch-13
Economic operation with limited fuel supply and shared generators, Economic exchange of power between the areas.	02	Lecture	Assignment 2.1	TB- 1 Ch-13
Optimal unit commitment and reliability considerations	02	Lecture	Assignment 2.1	TB- 1 Ch-13
Module IV: Automatic Generation and control (Theory-6 hours, Practice-0)				
Automatic Generation and control:	01	Lecture	Assignment 2.2	TB- 3 Ch-4
Load frequency control problem	01	Lecture	Assignment 2.2	TB- 3 Ch-4
Thermal Governing system and transfer function	01	Lecture	Assignment 2.2	TB- 3 Ch-4
Steam Turbine and Power system transfer function, Isolated power system:-static and dynamic response , PI control and implementation.	03	Lecture	Assignment 2.2	TB- 3 Ch-4
Module V : Load Frequency Control (Theory-6 hours, Practice-0)				
Two area load frequency control, static and dynamic response,	02	Lecture	Assignment 2.3	TB- 3 Ch-5
Frequency biased Tie line Bias control-implementation and effect, Implementation of AGC	02	Lecture	Assignment 2.3	TB- 3 Ch-5
AGC in restructured power system, under frequency load shedding	01	Lecture	Assignment 2.3	TB- 3 Ch-5
GRC, Dead band and its effect	01	Lecture	Assignment	TB- 3 Ch-5

			2.3	
Module VI : Power System Stability (Theory-6 hours, Practice-0)				
Types of Stability Study, Dynamics of synchronous machine	02	Lecture	Assignment 3.1	TB- 1 Ch-16
Power angle equation	01	Lecture	Assignment 3.1	TB- 1 Ch-16
Node elimination technique	01	Lecture	Assignment 3.1	TB- 1 Ch-16
Simple Systems, Steady state stability, Transient stability,	02	Lecture	Assignment 3.1	TB- 1 Ch-16
Module VII : Equal Area Criteria (Theory-7 hours, Practice-0)				
Equal area criteria and its applications	03	Lecture	Assignment 3.2	TB- 1 Ch-16
Numerical solution of swing equation	02	Lecture	Assignment 3.2	TB- 1 Ch-16
Modified Euler's method	02	Lecture	Assignment 3.2	TB- 1 Ch-16
Total (hrs)= 45Hours (Theory- 45 hours + Practice-0 hours)				

Distributed Generation & Micro Grid

Course Title	Course Code	Course Type	T-P-Pr	Prerequisite
Distributed Generation & Micro Grid	ELCC0103	Theory	2-0-0	Nil

Objective

<ul style="list-style-type: none"> To make students understand the integration between renewable sources with Micro-Grid

Course Outcome

<ul style="list-style-type: none"> Understand the concepts behind distributed generation Understand the integration technique in micro grid

Evaluation Systems

Internal Examination	Component	% of Marks	Method of Assessment
	Internal Theory	30	Written examination
	Assignment	5	Report or Presentation + Learning Record
	Attendance	5	Based on class attended
External Examination	External Theory	60	Written examination
Total		100	

Course Outline

Module I: Introduction (5 hrs)

Theory

Conventional power generation: advantages and disadvantages, Non-conventional energy (NCE) resources: review of Solar PV, Wind Energy systems, Fuel Cells, micro-turbines, biomass, and tidal sources.

Module II: Distributed Generation (4 hrs)

Theory

Concept of distributed generations, Why integration of distributed generation? Active distribution network. Distributed generation, technology, value of distributed generation, application & issues, distributed resources, distributed capacity, factors of DG growth, general structure

Module III: Supply demand in Electric power grid (4 hrs)

Theory

Understanding the grid, reliability concept, electric power dynamic demand, need of spinning reserve, local load control

Module IV: Basics of a Micro-Grid (5 hrs)**Theory**

Concept and definition of micro grid, classification, need & application of micro-grid, formation of micro grid, typical structure and configuration of a micro grid, AC and DC micro grids, Power Electronics interfaces in DC and AC micro grids.

Module V:DC Micro Grids (4 hrs)**Theory**

PV sources control, storage control, grid connection control, DC load control, Power balancing principle

Module VI :Control & Operation of Micro Grid (4 hrs)**Theory**

Modes of operation and control of micro grid: grid connected and islanded mode, Active and reactive power control, protection issues

Module VII: Storage Technologies (4 hrs)**Theory**

Classification of electrical energy storage, mechanical storage system, batteries, flywheels, super conducting magnetic energy storage, super capacitors.

Text Books

1. Magdi S. Mahmoud, Fouad M. AL-Sunni, "Control and Optimization of Distributed Generation Systems,"
2. Gevork B. Gharehpetian, S. Mohammad Mousavi Aga, "Distributed Generation Systems: Design, Operation and Grid Integration,"

Session Plan

Topics	No. of Sessions (in hrs)	Activity	Assignment	Suggested Reading
Module – I: Introduction [Theory=5 Hrs Practice = 0Hrs]				
Conventional power generation: advantages and disadvantages, Non-conventional energy (NCE) resources: review of Solar PV, Wind Energy systems, Fuel Cells, micro-turbines, biomass, and tidal sources.	5	Lecture	Assignment 1	TB- 2 Ch-1,4,5
Module – II: Distributed Generation [Theory=4 Hrs Practice = 0Hrs]				
Concept of distributed generations, Why integration of distributed generation? Active distribution network. Distributed generation, technology, value of distributed generation, application & issues, distributed resources, distributed capacity, factors of DG growth, general	4	Lecture	Assignment 2	TB- 1 Ch-1.1

structure				
Module – III: Supply demand in Electric power grid [Theory=4 Hrs Practice = 0Hrs]				
Understanding the grid, reliability concept, electric power dynamic demand, need of spinning reserve, local load control	4	Lecture	Assignment 3	TB-1 Ch-1.2
Module – IV: Basics of A Micro-Grid [Theory=5 Hrs Practice = 0Hrs]				
Concept and definition of micro grid, classification ,need & application of micro-grid, formation of micro grid, typical structure and configuration of a micro grid, AC and DC micro grids, Power Electronics interfaces in DC and AC micro grids.	5	Lecture	Assignment 4	TB- 1 Ch-1.3 Ch-3
Module – V:DC Micro Grids [Theory=4 Hrs Practice = 0Hrs]				
PV sources control, storage control, grid connection control, DC load control, Power balancing principle	4	Lecture	Assignment 5	TB- 1 Ch-5
Module – VI :Control & Operation of Micro Grid[Theory=4 Hrs Practice = 0Hrs]				
Modes of operation and control of micro grid: grid connected and islanded mode, Active and reactive power control, protection issues.	4	Lecture	Assignment 6	TB- 1 Ch-6
Module – VII : Storage Technologies[Theory=4 Hrs Practice = 0Hrs]				
classification of electrical energy storage, mechanical storage system, batteries, flywheels, super conducting magnetic energy storage, super capacitors	4	Lecture	Assignment 7	TB- 2 Ch-7
Total (hrs)= 30Hours (Theory- 30 hours + Practice-0 hours)				

Soft Computing Techniques - I

Course Title	Code	Type of course	T-P-Pr	Prerequisite
Soft Computing-I	EECC0101	Theory	2-0-0	Nil

Objective

- To teach the Fuzzy Logic & Systems and Artificial Neural Networks

Course Outcome

- Students will gain knowledge of Artificial Neural Networks and soft computing techniques in classification
- Students will develop skill of optimization technique for particular application

Evaluation Systems

	Component	% of Marks	Method of Assessment
Internal Examination	Internal Theory	30	Written Examination
	Assignment	5	Report or Presentation + Learning Record
	Attendance	5	Based on Class Attended
External Examination	External Theory	60	Written Examination
Total		100	

Course Outline

Module I: Basic Tools of Soft Computing (04 Hours) **Theory**

Basic tools of soft Computing: Introduction, Fuzzy logic, Neural Networks and Evolutionary Computing, Approximations of Multivariate functions, Non – linear Error surface and optimization.

Module II: Fuzzy Logic (05 Hours) **Theory**

Fuzzy logic: Introduction, crisp sets, fuzzy sets, crisp relations; fuzzy relations: Cartesian product of relation – classical relation, fuzzy relations, tolerance and equivalence relations, non-iterative fuzzy sets.

Module III: Membership Functions (05 Hours) **Theory**

Membership functions: features, fuzzification, methods of membership value assignments, Defuzzification: lambda cuts methods, fuzzy arithmetic; fuzzy measures: fuzzy arithmetic, extension principle, fuzzy measures, measures of fuzziness and fuzzy integrals.

Module IV: Fuzzy Rule Base and Approximate Reasoning (04 Hours)
Theory

Fuzzy rule base and approximate reasoning: truth values and tables, fuzzy propositions, formation of rules-decomposition of rules, aggregation of fuzzy rules and fuzzy reasoning-fuzzy inference systems-overview of fuzzy expert system-fuzzy decision making.

Module V: Neural Networks (04 Hours)
Theory

Neural networks: Single layer networks, supervised learning network, Perceptron, Activation functions, Adalinc- its training and capabilities, weights learning.

Module VI: Multilayer Perceptron (04 Hours)
Theory

Multilayer Perceptron: Error back propagation, generalized delta rule; Radial basis function networks and least square training algorithm.

Module VII: Unsupervised Learning Networks (04 Hours)
Theory

Unsupervised learning networks: Kohonen self – organizing map and learning vector quantization networks; Recurrent neural networks, Simulated annealing neural networks; Adaptive neuro-fuzzy information; systems (ANFIS).

Text Books

1. J. S. R. Jang, C. T.Sun& E. Mizutani, “Neuro-Fuzzy and Soft Computing”, PHI-2013.
2. Satish Kumar, “Neural Networks: A Classroom Approach”, TMH Education-2014.

Reference Books

1. S. Rajasekaran & G.A. VijayaLaxmiPai, “Neural Networks Fuzzy Logic & Genetic Algorithms, Synthesis & Applications”, Prentice Hall-2006.
2. S.N. Sivanandan& S.N. Deepa, “Principle of Soft Computing”, Wiley India Edition-2010.

Session Plan

Topics	No. of Sessions (in hrs.)	Activity	Assignment	Suggested Reading
Module I: Basic Tools of Soft Computing (04 Hours)				
Basic tools of soft Computing: Introduction, Fuzzy logic, Neural Networks	1	Lecture	Assignment No.1.1	Text Book (TB)-1 Chapter (CH)-1
Evolutionary Computing	1	Lecture	Assignment No. 1.2	TB-1 CH- 1
Approximations of Multivariate functions	1	Lecture	Assignment No. 1.3	TB-1 CH- 1

Non – linear Error surface optimization.	1	Lecture	Assignment No. 1.4	TB-1 CH- 1
Module II: Fuzzy Logic(05 Hours)				
Fuzzy logic: Introduction, crisp sets, fuzzy sets, crisp relations and fuzzy relations	2	Lecture	Assignment No. 2.1-2.3	RB-1 CH- 6
Cartesian product of relation – classical relation, fuzzy relations, tolerance and equivalence relations	2	Lecture	Assignment No. 2.4-2.5	RB-1 CH- 6
Non-iterative fuzzy sets.	1	Lecture	Assignment No. 2.6	RB-1 CH- 6
Module III: Membership Functions (05 Hours)				
Membership functions: features, fuzzification, methods of membership value assignments	1	Lecture	Assignment No. 3.1-3.2	RB-1 CH- 7
Defuzzification: lambda cuts methods, fuzzy arithmetic and fuzzy measures	2	Lecture	Assignment No. 3.3-3.4	RB-1 CH- 7
Fuzzy arithmetic, extension principle, fuzzy measures, measures of fuzziness, fuzzy integrals	2	Lecture	Assignment No. 3.5-3.7	RB-1 CH- 7
Module IV: Fuzzy Rule Base and Approximate Reasoning (04 Hours)				
Fuzzy rule base and approximate reasoning: truth values and tables, fuzzy propositions, formation of rules-decomposition of rules, aggregation of fuzzy rules	2	Lecture	Assignment No. 4.1-4.2	RB-1 CH- 7
Fuzzy reasoning-fuzzy inference systems-overview of fuzzy expert system-fuzzy decision making.	2	Lecture	Assignment No. 4.3	RB-1 CH- 7
Module V: Neural Networks (04 Hours)				
Neural networks: Single layer networks, supervised learning network	2	Lecture	Assignment No. 5.1	RB-1 CH- 1
Perceptron; Activation functions; Adalinc- its training and capabilities, weights learning	2	Lecture	Assignment No. 5.2-5.3	RB-1 CH- 1
Module VI: Multilayer Perceptron (04 Hours)				
Multilayer perceptrons: Errorbackpropagation, generalized delta rule	2	Lecture	Assignment No. 6.1-6.2	RB-1 CH- 3.1-3.2
Radial basis function networks and least square training algorithm.	2	Lecture	Assignment No. 6.3	RB-1 CH- 3.1-3.2
Module VII: Unsupervised Learning Networks (04 Hours)				

Unsupervised learning networks: Kohonen self – organizing map and learning vector quantization networks	1	Lecture	Assignment No. 7.1	TB-1 CH-11.3
Recurrent neural networks, Simulated annealing neural networks	1	Lecture	Assignment No. 7.2-7.3	TB-1 CH-11.7
Adaptive neuro-fuzzy information; systems (ANFIS).	2	Lecture	Assignment No. 7.4	TB-1 CH-12.1-12.2
Total (hrs)= 30Hours (Theory- 30 hours + Practice-0 hours)				

Electrical Circuit Drawing (AutoCAD)

Course Name	Code	Type of course	T-P-Pr	Prerequisite
Electrical Circuit Drawing (AutoCAD)	ELCC0202	Practice	0-2-0	Nil

Objective

<ul style="list-style-type: none"> · To teach the 2D Design of Electrical-System-Layout drawing using AutoCAD
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Course Outcome

<ul style="list-style-type: none"> · Students will know the use of AutoCAD Software. · Students will develop skill of designing generalized electrical Machine blueprints

Evaluation Systems

Internal Examination	Component	% of Marks	Method of Assessment
	Internal Practice	50 (40+10)	Lab Work + Learning Record
External Examination	External Practice	50	Lab Work
Total		100	

Lists of Experiments (60 Hours)

1. Introduction to AutoCAD Electrical, Drawing Files, Electrical Components and Wires
2. Symbol creation
3. General lay out of a power system network
4. Simple house wiring (1-phase): light and fan
5. Simple house wiring (3-phase): light, fan, AC, geezer and 3-phase motor
6. Agricultural pump-set wiring (star-delta) with panel wiring
7. Workshop panel wiring for machine lab
8. Four wheeler electrical wiring
9. Forklift wiring harness
10. Substation lay out drawing with 4 incomer and 4 outgoing (Khordha Substation or nearby substation)
11. CIT new substation layout (Schneider) or JITM Substation
12. Differential protection of transformer
13. Layout drawing of a power plant
14. Layout drawing of a Electrical Automation system

Reference Books

Randy H. Shih, "AutoCAD 2013 Tutorial- First Level: 2D Fundamentals", SDC Publication, 2013.

Session Plan

Topics	No. of Sessions (in hrs.)	Activity	Assignment	Suggested Reading
Introduction to AutoCAD Electrical, Drawing Files, Electrical Components and Wires.	8	Practice	Designing	Reference Book (RB)
Symbol creation.	4	Practice	Designing	RB
General lay out of a power system network.	4	Practice	Designing	RB
Simple house wiring (1-phase): light and fan.	4	Practice	Designing	RB
Simple house wiring (3-phase): light, fan, AC, geezer and 3-phase motor.	4	Practice	Designing	RB
Agricultural pump-set wiring (star-delta) with panel wiring.	4	Practice	Designing	RB
Workshop panel wiring for machine lab.	4	Practice	Designing	RB
Four wheeler electrical wiring.	4	Practice	Designing	RB
Forklift wiring harness.	4	Practice	Designing	RB
Substation lay out drawing with 4 incomer and 4 outgoing (Khordha Substation or nearby substation)	4	Practice	Designing	RB
CIT new substation layout (Schneider) or JITM Substation.	4	Practice	Designing	RB
Differential protection of transformer.	4	Practice	Designing	RB
Layout drawing of a power plant.	4	Practice	Designing	RB
Layout drawing of a Electrical Automation system.	4	Practice	Designing	RB
Total- 60 Hours				

Network Theory

Course Title	Code	Type of course	T-P-Pr	Prerequisite
Network Theory	ELCC0401	Theory & Practice	2-1-0	Nil

Objective

- To deliver problem solving skills on circuits through the application of techniques and principles to common circuit problems.

Course Outcome

- Gain knowledge about the various components, theorems, parameters related to a circuit
- Get the skill of circuit solving and can analyze different types of circuits.

Evaluation Systems

Internal Examination	Component	% of Marks	Method of Assessment
	Internal Theory	20	Written examination
	Internal Practice	30(20+10)	Lab work + Learning Record
External Examination	External Theory	30	Written examination
	External Practice	20	Lab work
Total		<i>100</i>	

Course Outline

Module I: Network Topology

(7 hours)

Theory

Graph of a network, Concept of tree, Incidence matrix, Tie-set matrix, Cut-set matrix, Formulation and solution of network equilibrium equations on loop and node basis

Module II: Network Theorems

(9 hours)

Theory

Substitution theorem, Reciprocity theorem, Maximum power transfer theorem, Tellegen's theorem, Millman's theorem, Compensation theorem

Practice

1. Verification of Reciprocity theorem
2. Verification of Tellegen's theorem
3. Verification of Millman's theorem
4. Verification of Maximum power transfer theorem
5. Verification of Compensation theorem

Module III: Coupled Circuits

(8 hours)

Theory

Coupled Circuits, Dot Convention for representing coupled circuits, Coefficient of coupling, Series and parallel resonant circuits: Band Width and Q-factor

Practice

6. Self-inductance, mutual inductance and coefficient of coupling to be determined for a 1- \emptyset transformer representing coupled circuit.
7. Frequency response of a series and parallel resonant circuit by laboratory set up.

Module IV: Network Laplace Transform (8 hours) Theory

Application of Laplace transform: Circuit Analysis (Steady State and Transient)

Practice

8. AC and DC transient response analysis for RL, RC and RLC circuits

Module V: Two Port Network (10 hours) Theory

Z, Y, ABCD and h-parameters, Reciprocity and Symmetry, Interrelation of two-port parameters, Interconnection of two-port networks.

Practice

9. Determination of Z parameters
10. Determination of Y parameters
11. Determination of h parameters
12. Determination of ABCD parameters

Module VI: Fourier Series (8 hours) Theory

Fourier series, Fourier analysis and evaluation of coefficients, Steady state response of network to periodic signals, Fourier transform and convergence, Fourier transform of some functions

Module VII: Filters (10 hours) Theory

Brief idea about network filters (Low pass, High pass, Band pass and Band elimination) and their frequency response

Practice

13. Design and frequency response analysis of Low Pass filter
14. Design and frequency response analysis of High Pass filter
15. Design and frequency response analysis of Band Pass filter
16. Design and frequency response analysis of Band elimination filter

Text Books:

1. A K Chakraborty, "Network Theory," Dhanpat Rai Publication.
2. M.H.Hayt and J.R.J.E.Kemmerly, "Engineering Circuit Analysis," Tata McGraw Hill

3. Alexander & Sadiku "Fundamentals of Electric Circuits," Tata McGraw Hill.

Session Plan

Topics	No. of Sessions	Activity	Assignment	Suggested Reading
Module – I: Network Topology (Theory- 7 hours, Practice- 0 hours)				
Graph of a network, Concept of tree, Incidence matrix	2	Lecture	Assignment-1 (Question No 1 to 5)	Text Book(TB) 1- Chapter(C H)-16.1 to16.5
Tie-set matrix, Cut-set matrix	3	Lecture	Assignment-1 (Question No 6 to 8)	TB1-CH-16.6 to16.10
Formulation and solution of network equilibrium equations	2	Lecture	Assignment-1 (Question No 9 to 10)	TB1-CH-16.16
Module – II: Network Theorems (Theory- 4 hours, Practice- 5 hours)				
Substitution theorem	1	Lecture	Assignment-2 (Question No 1 to 3)	TB1-CH-6.8
Reciprocity theorem	2	1hr Lecture +1hr Practice	Assignment-2 (Question No 4,5)	TB1-CH-6.7
Maximum power transfer theorem	2	1hr Lecture +1hr Practice	Assignment-2 (Question No 6 to 9)	TB1-CH-6.5
Tellegen’s theorem,	1	Practice	Result of Experiments and Viva	TB1-CH-6.10
Millman’s theorem	1	Practice	Result of Experiments and Viva	TB1-CH-6.6
Compensation theorem	2	1hr Lecture +1hr Practice	Assignment-2 (Question No 10 to12)	TB1-CH-6.9
Module – III: Coupled Circuits (Theory- 1 hours, Practice- 7 hours)				
Dot Convention for representing coupled circuits	1	Lecture	Assignment-3 (Question No 1 to 3)	TB1-CH-11.7
Coefficient of coupling	2	Practice	Result of Experiments and Viva	TB1-CH-11.4
Series resonant circuits	2	Practice	Assignment-3 (Question No 4 to 8)	TB1-CH-11.8
Parallel resonant circuits	2	Practice	Assignment-3 (Question No 9 to 12)	TB1-CH-11.9
Band Width and Q-factor	1	Practice	Assignment-3 (Question No 13,14)	TB1-CH-11.9
Module – IV: Network Laplace Transform (Theory- 6 hours, Practice- 2 hours)				
Introduction to Laplace	1	Lecture	Assignment-4	TB1-CH-

Transform			(Question No 1 to 4)	9.1 to 9.3
Laplace transform of some basic functions	1	Lecture	Assignment-4 (Question No 5 to 8)	TB1-CH-9.4 to 9.5
Laplace transform of periodic functions	1	Lecture	Assignment-4 (Question No 9 to 11)	TB1-CH-9.6
Inverse Laplace transform	1	Lecture	Assignment-4 (Question No 12 to 16)	TB1-CH-9.9
Application of Laplace transform	1	Lecture		TB1-CH-9.8
Circuit Analysis (Steady State and Transient)	3	1hr Lecture + 2 hrsPractice	Result of Experiments and Viva	TB1-CH-9.10-9.11
Module – V: Two Port Network(Theory- 2 hours, Practice- 8 hours)				
Z -Parameter	2	Practice	Assignment-5 (Question No 1 to 6)	TB1-CH-12.6
Y- parameter	2	Practice	Assignment-5 (Question No 7 to 11)	TB1-CH-12.7
ABCD Parameter	2	Practice	Assignment-5 (Question No 12 to 15)	TB1-CH-12.9
H-Parameter	2	Practice	Assignment-5 (Question No 16 to 18)	TB1-CH-12.8
Reciprocity and Symmetry, Interrelation of two-port parameters	1	Lecture	Assignment-5 (Question No 17 to 19)	TB1-CH-12.10-12.11
Interconnection of two-port networks	1	Lecture	Assignment-5 (Question No 20 to 22)	TB1-CH-12.13
Module – VI: Fourier Series (Theory-8 hours, Practice- 0 hours)				
Fourier analysis and evaluation of coefficients	2	Lecture	Assignment-6 (Question No 1 to 4)	TB1-CH-15.1 to 15.4
Fourier analysis of periodic signals	2	Lecture	Assignment-6 (Question No 5 to 8)	TB1-CH-15.6 to 15.8
Fourier transform and convergence	2	Lecture	Assignment-6 (Question No 9,10)	TB1-CH-15.10
Fourier transform of some functions	2	Lecture	Assignment-6 (Question No 11 to 14)	TB1-CH-15.11
Module – VII: Filters(Theory-2 hours, Practice- 8 hours)				
Brief idea about network filters	2	Lecture		TB1-CH-19.1 to 19.7
Frequency response of Low pass s filters	2	Practice	Result of Experiments and Viva	TB1-CH-19.8,19.10
Frequency response High pass	2	Practice	Result of	TB1-CH-

filters			Experiments and Viva	19.12
Frequency response Band pass filters	2	Practice	Result of Experiments and Viva	TB1-CH-19.14
Frequency response Band elimination filters	2	Practice	Result of Experiments and Viva	TB1-CH-19.16
<i>Total (hrs)= 60 (Theory- 30 hours + Practice-30 hours)</i>				

Electronic Measurement & Instrumentation

Course Title	Code	Type of course	T-P-P	Prerequisite
Electronic Measurement & Instrumentation	EECC0409	Theory & Practice	2-1-0	Nil

Objective

<ul style="list-style-type: none"> To teach the students about various types of instruments their operation working of different electronic instruments viz. signal generators, signal analyzers, recorders and measuring equipment .
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Course Outcome

<ul style="list-style-type: none"> Gain knowledge to identify the various electronic instruments based on their specifications for carrying out a particular task of measurement. Gain skill to use various types of signal generators, signal analyzers for generating and analyzing various real-time signals.
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Evaluation Systems

Internal Examination	Component	% of Marks	Method of Assessment
	Internal Theory	20	Written examination
	Internal Practice	30(20+10)	Lab work + Learning Record
External Examination	External Theory	30	Written examination
	External Practice	20	Lab work
Total		<i>100</i>	

Module I : Basics of Measurements (3 Hours)

Theory

Accuracy, Precision, resolution, reliability, repeatability, validity, Errors and their analysis.

Module II: Temperature measurement (12 Hours)

Theory

Introduction to Temperature Measurement
 Non electrical type temperature sensor: Bimetallic Strip. Electrical type temperature sensors: Thermistor, RTD, Principles, Types, Selection of RTD's and signal conditioning circuits. Thermocouples, Principle, Types, Selection, Standard table of Thermocouples and signal conditioning circuits. Measurement of temperature using Diodes. IC temperature Transducer using LM35 and AD590.

Practice

1. Study of types of Thermocouple and characteristics of Thermocouple.
2. Study of RTD and characteristics of RTD
3. Temperature sensing using Diodes. Using LM35 and AD590 as temperature sensor
4. Study of ON OFF control using temperature controller using Thermocouple and RTD.

Module III : Pressure Measurement

(7 Hours)

Theory

Introduction to pressure measurement, Pressure Standards, Conventional Pressure sensors, Electrical and Electronic pressure transducers. Introduction to Calibration and Calibration of Pressure Gauge.

Practice:

5. Finding error in the given pressure gauge with respect to Digital Gauge
6. Finding error in the given pressure gauge with respect to Dead Weight Tester.

Module IV: Displacement measurement

(10 Hours)

Theory

Introduction to displacement measurement. Potentiometer Sensor, Types, Construction, Operation and Errors. LVDT, Principle, Operation and Application. Inductive Proximity Switch. Digital Encoder: Contact, Magnetic and Optical Encoder. Rotational Displacement/Angular position : Using optical Encoder and Signal Conditioning circuits.

Practice:

7. To determine output characteristics of LVDT and measure displacement using LVDT.
8. Familiarization of Inductive Proximity, Capacitive Proximity, IR and Reed Switch.

Module V: Converters and Flow measurement

(7 Hours)

Theory

Converters: Voltage to Frequency Converter and Frequency to Voltage Converter

Force, weight and flow measurement: Introduction to force, weight and flow measurement. Strain gauge and its function, Load Cell, principle and operation of load cell. Flow measurement using Orifice plate.

Practice:

9. V to F Converter using ICL 8038 F to V Converter using LM2907.
10. Measurement of load by using Load cell Expansion Method.
11. Measurement of load by using Load cell Compression method.

Module VI: Signal Analyzers

(9 Hours)

Theory

AF, HF Wave Analyzers, Harmonic Distortion, Heterodyne wave Analyzers, Spectrum Analyzers, Power Analyzers, Capacitance-Voltage Meters, Oscillators.

Signal Generators: AF, RF Signal Generators, Sweep Frequency Generators, Pulse and Square wave Generators, Function Generators, Arbitrary Waveform Generator, Video Signal Generators, and Specifications.

Practice:

12. Analyse sine/square wave in frequency domain using spectrum analyser.
13. To study block wise construction of an Function Generator.

Module VII: Oscilloscopes

(12

Hours) Theory

CRT, Block Schematic of CRO, Time Base Circuits, Lissajous Figures, CRO Probes, High Frequency CRO Considerations, Delay lines, Applications: Measurement of Time, Period and Frequency Specifications. Special Purpose Oscilloscopes: Dual Trace, Dual Beam CROs, Sampling Oscilloscopes, Storage Oscilloscopes, Digital Storage CROs.

Practice:

14. Measure voltage, frequency and phase using CRO.
15. Demonstrate features of digital storage oscilloscope.
16. Measure Unknown frequency using Lissajous patterns.

Text Books:

1. A K Sawhney ,“A Course in Electrical and Electronic Measurements and Instrumentation,” Dhanpat Rai & Co
2. H.S.Kalsi, “Electronic Instrumentation,” TMH, 2nd Edition 2004.

REFERENCE BOOKS:

David A. Bell, “Electronic Instrumentation and Measurements” Oxford Univ. Press, 1997

Session Plan

Topics	No. of Sessions (in hrs.)	Activity	Assignment	Suggested Reading
Module – I : Basics of Measurements(THEORY-3 HRS)				
Basics of Measurements: Accuracy, Precision, resolution, reliability, reneatability. validity. Errors and their analysis.	3	Lecture	Assignment 1.1-1.5	Text Book(TB) 1-Chapter(CH) -1and CH 3
Module – II : Temperature measurement(THEORY-4 HRS & PRACTICE-8 HRS)				
Temperature measurement: Introduction to Temperature Measurement, Non electrical type temperature sensor: Bimetallic Strip. Electrical type temperature sensors: Thermistor, RTD, Principles, Types, Selection of RTD's and signal conditioning circuits. Thermocouples, Principle, Types, Selection, Standard table of Thermocouples and signal conditioning circuits. Measurement of temperature using Diodes. IC temperature Transducer using LM35 and AD590.	4	Lecture	Assignment 1.6-1.10	TB 1-CH 13
Study of types of Thermocouple and characteristics of Thermocouple. Study of RTD and characteristics of RTD Temperature sensing using Diodes. Using LM35 and AD590 as temperature sensor	8	Practice	<i>Result of Experiments and Viva</i>	

Study of ON OFF control using temperature controller using Thermocouple and RTD.				
Module – III :Pressure Measurement(THEORY-3 HRS & PRACTICE-4 HRS)				
Pressure Measurement:Introduction to pressure measurement, Pressure Standards, Conventional Pressure sensors, Electrical and Electronic pressure transducers. Introduction to Calibration and Calibration of Pressure Gauge.	3	Lecture	Assignment 1.11-1.13	TB 1-CH 18
Finding error in the given pressure gauge with respect to Digital Gauge Finding error in the given pressure gauge with respect to Dead Weight Tester.	4	Practice	<i>Result of Experiments and Viva</i>	
Module – IV : Displacement measurement(THEORY-6 HRS & PRACTICE-4 HRS)				
Displacement Measurement: Introduction to displacement measurement. Potentiometer Sensor, Types, Construction, Operation and Errors. LVDT, Principle, Operation and Application. Inductive Proximity Switch. Digital Encoder: Contact, Magnetic and Optical Encoder. Rotational Displacement/Angular position : Using optical Encoder and Signal Conditioning circuits.	6	Lecture	Assignment 1.14-1.16	TB 1-CH 25
To determine output characteristics of LVDT and measure displacement using LVDT. Familiarization of Inductive Proximity, Capacitive Proximity, IR and Reed Switch.	4	Practice	<i>Result of Experiments and Viva</i>	TB 1-CH 25
Module – V : Converters and Flow measurement(THEORY-3 HRS & PRACTICE-4 HRS)				
Converters:Voltage to Frequency Converter and frequency to Voltage Converter Force, weight and flow measurement:Introduction to force,	3	Lecture	Assignment 1.17-1.20	TB 1-CH 26

weight and flow measurement. Strain gauge and its function, Load Cell, principle and operation of load cell. Flow measurement using Orifice plate.				
V to F Converter using ICL 8038 F to V Converter using LM2907 Measurement of load by using Load cell Expansion Method Measurement of load by using Load cell Compression method	4	Practice	<i>Result of Experiments and Viva</i>	
Module – VI: Signal Analyzers(THEORY-5 HRS & PRACTICE-4 HRS)				
Signal Analyzers:AF, HF Wave Analyzers, Harmonic Distortion, Heterodyne wave Analyzers, Spectrum Analyzers, Power Analyzers, Capacitance-Voltage Meters, Oscillators. Signal Generators: AF, RF Signal Generators, Sweep Frequency Generators, Pulse and Square wave Generators, Function Generators, Arbitrary Waveform Generator, Video Signal Generators, and Specifications	5	Lecture	Assignment 1.21-1.25	TB 1-CH 28
Analyse sine/square wave in frequency domain using spectrum analyser. To study block wise construction of an Function Generator	4	Practice	<i>Result of Experiments and Viva</i>	
Module – VII: Oscilloscopes (THEORY-6 HRS & PRACTICE-6 HRS)				
Oscilloscopes:CRT, Block Schematic of CRO, Time Base Circuits, Lissajous Figures, CRO Probes, High Frequency CRO Considerations, Delay lines, Applications: Measurement of Time, Period and Frequency Specifications.Special Purpose Oscilloscopes: Dual Trace, Dual Beam CROs, Sampling Oscilloscopes, Storage Oscilloscopes, Digital Storage	6	Lecture	Assignment 1.26-1.28	TB 1-CH 21

CROs.				
<p>Measure voltage, frequency, phase and modulation index (trapezoidal method) using CRO.</p> <p>Demonstrate features of digital storage oscilloscope.</p> <p>Measure Unknown frequency using Lissajous patterns.</p>	6	Practice	<i>Result of Experiments and Viva</i>	TB 1-CH 21
Total (hrs)= 60 (Theory- 30 hours + Practice-30 hours)				

Linear Integrated Circuit and its Application

Course Title	Code	Type of course	T-P-P (Credit)	Prerequisite
Linear Integrated Circuit And its Application	ELCC0403	Theory + Practice	2-1-0	Nil

Objective

- To make the students understand how to design a circuit using different ICs(Opamp, 555 Timer, PLL etc)

Course Outcome

- On successful completion of this course, students will be able to: Understand how to Design a linear circuit for different application.

Evaluation Systems

Internal Examination	Component	% of Marks	Method of Assessment
	Internal Theory	20	Written examination
	Internal Practice	30(20+10)	Lab work + Learning Record
External Examination	External Theory	30	Written examination
	External Practice	20	Lab work
Total		<i>100</i>	

Course Outline

Module I: Operational Amplifier And its Characteristics (6Hours) Theory

Operational Amplifier: Introduction, basic information of Op-Amp, The ideal operational amplifier. **Operational amplifier characteristics:** introduction, DC characteristics, AC characteristics, analysis of datasheet of an Op-amp.

Practice

1. Study of Op-Amp.
2. Study and design of a simple circuit using Op-Amp.

Module II: Operational Amplifier applications (12 Hours) Theory

Operational Amplifier applications: Introduction, basic op-amp applications, instrumentation amplifier, AC amplifier, V to I & I to V converter, sample and hold circuits, log and anti-log amplifier, multiplier and divider, differentiator, integrator, electronic analog computation

Practice

3. Design a Summing Amplifier, Subtractor
4. Design a Sample and hold circuits
5. Design Multiplier and divider, differentiator, integrator

Module III:Comparators and waveform generator

(10 Hours)

Theory

Comparators and waveform generator: introduction, comparator, regenerative comparator, square wave generator, mono stable multivibrator, triangular wave generator, sine wave generator.

Practice:

6. Design a Regenerative comparator
7. Design a Square wave generator
8. Design a Mono stable multi-vibrator
9. Design a Triangular wave generator

Module IV: Voltage regulator And Active filter

(10Hours)

Theory

Voltage regulator: introduction, series op-amp regulator, IC voltage regulators, 723 general purpose regulators. **Active filter:** Introduction, RC active filter.

Practice

10. Design of voltage regulator circuit using 78XX.
11. Design of voltage regulator circuit using 723IC.
12. Design of Active filter
13. Design of RC active filter

Module V :555 Timer

(7 Hours)

Theory

555 Timer: Introduction, description of functional diagram, monostable operation, astable operation

Practice

14. Design of Monostablemultivibrator using 555.
15. Design of Astablemultivibrator using 555.

Module VI:Phase locked Loop

(9 Hours)

Theory

Phase locked Loop: Introduction, basic principle, phase detector/comparator, VCO, LPF, monolithic PLL

Practice

16. Design of PLL using Op-Amp
17. Design of Phase comparator using Op-Amp.

Module VII: D-A & A-D converter

(8 Hours)

Theory

D-A & A-D converter: Introduction, Basic DAC Techniques, A-D converter.

Practice

18. Design DAC.
19. Design ADC

Text Books

1. D.RoyChoudhary, SheilB.Jani, 'Linear Integrated Circuits', II edition, New Age, 2003.

Reference Books

1. Fiore, "Opamps & Linear Integrated Circuits Concepts & Applications", Cengage, 2010.
2. Floyd, Buchla, "Fundamentals of Analog Circuits", Pearson, 2013.
3. Jacob Millman, Christos C. Halkias, 'Integrated Electronics - Analog and Digital circuits system', Tata McGraw Hill, 2003.
4. Robert F. Coughlin, Fredrick F. Driscoll, 'Op-amp and Linear ICs', PHI Learning, 6th edition, 2012.
5. Ramakant A. Gayakward, 'Op-amps and Linear Integrated Circuits', IV edition, Pearson Education, 2003 / PHI. 2000.

Session Plan

Topic	No. of Sessions	Activity	Assignment	Suggested reading
Module I: Operational Amplifier And its Characteristics (6 Hours)				
Operational Amplifier: Introduction, basic information of Op-Amp, The ideal operational amplifier. Operational amplifier characteristics: introduction, DC characteristics, AC characteristics, analysis of datasheet of an Op-amp.	2	Lecture	Assignment 1.1-1.3	TB-1 Ch-2,3
Study of Op-Amp.	2	Practice		TB-1 Ch-2
Study and design of a simple circuit using Op-Amp.	2	Practice		TB-1 Ch-2
Module II: Operational Amplifier applications (12 Hours)				
Operational Amplifier applications: Introduction, basic op-amp applications, instrumentation amplifier	3	Lecture+ Practice	Assignment 1.1-1.2	TB-1 Ch-4
AC amplifier, V to I & I to V converter, sample and hold circuits	3	Lecture+ Practice	Assignment 1.3-1.4	TB-1 Ch-4
Log and anti-log amplifier, multiplier and divider	3	Lecture+	Assignment 1.5	TB-1

		Practice		Ch-4
Differentiator, integrator, electronic analog computation	3	Lecture+ Practice	Assignment 1.6	TB-1 Ch-4
Module III: Comparators and waveform generator (10 Hours)				
Comparators and waveform generator: introduction, comparator, regenerative comparator	3	Lecture+ Practice	Assignment 3.1- 3.2	TB-1 Ch-5
Square wave generator	2	Lecture+ Practice	Assignment 3.3	TB-1 Ch-5
Mono stable multivibrator	2	Lecture+ Practice	Assignment 3.4	TB-1 Ch-5
Triangular wave generator, sine wave generator.	3	Lecture+ Practice	Assignment 3.5	TB-1 Ch-5
Module IV: Voltage regulator (10 Hours)				
Voltage regulator: introduction, series op-amp regulator, IC voltage regulators	3	Lecture+ Practice	Assignment 4.1- 4.2	TB-1 Ch-6
723 general purpose regulators	3	Lecture+ Practice	Assignment 4.3	TB-1 Ch-6
Active filter: Introduction	2	Lecture+ Practice	Assignment 4.4	TB-1 Ch-7
RC active filter	2	Lecture+ Practice	Assignment 4.5	TB-1 Ch-7
Module V : 555 Timer (7 Hours)				
555 Timer: Introduction, description of functional diagram	3	Lecture+ Practice	Assignment 5.1	TB-1 Ch-8
Monostable operation	2	Lecture+ Practice	Assignment 5.2	TB-1 Ch-8
Astable operation	2	Lecture+ Practice	Assignment 5.3	TB-1 Ch-8
Module VI :Phase locked Loop (9 Hours)				
Phase locked Loop: Introduction, basic principle	3	Lecture+ Practice	Assignment 6.1	TB-1 Ch-9

Phase detector/comparator VCO, LPF	3	Lecture+ Practice	Assignment 6.2	TB-1 Ch-9
Monolithic PLL	3	Lecture+ Practice	Assignment 6.3	TB-1 Ch-9
Module VII: D-A & A-D converter (8 Hours)				
D-A & A-D converter: Introduction	2	Lecture+ Practice	Assign ment 7.1	TB-1 Ch-10
Basic DAC Techniques,	3	Lecture+ Practice	Assignment 7.2	TB-1 Ch-10
A-D converter.	3	Lecture+ Practice	Assignment 7.3	TB-1 Ch-10
Total- 60 Hours				

Power Electronics

Course Title	Code	Type of course	T-P-Pr	Prerequisite
Power Electronics	EECC0405	Theory + Practice	3-2-0	Nil

Objective

<ul style="list-style-type: none"> To make the students meet industry requirement for power electronic engineers, adequate practical knowledge on power semiconductor devices, converters and their control techniques for typical applications in motor drives
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Course Outcome

<ul style="list-style-type: none"> Apply their knowledge of the electrical characteristics of power semiconductor devices, to select power semiconductor devices for a range of applications. Understand the basic topology of converters, inverters and power supplies and design calculations for drive and power converter applications, and understand the approximations used.

Evaluation Systems

Internal Examination	Component	% of Marks	Method of Assessment
	Internal Theory	20	Written examination
	Internal Practice	30 (20+30)	Lab work+ Learning Record
External Examination	External Theory	30	Written examination
	External Practice	20	Lab work
Total		100	

Course outline

Module I: Power semiconductor devices (12 Hours)

Theory

Power semiconductor devices: Introduction (difference between general semiconductor devices and Power semiconductor devices), characteristics and specifications of Power semiconductor switches, control characteristics of power semiconductor devices, Comparisons between different types of Power devices, Use of Power semiconductor devices in power electronic circuit, Different types of power electronics circuits.

Practice

- Study of switching characteristics of Power semiconductor device.
- Study and design of a simple power electronics circuit.

Module II Power Diode And Diode rectifier (14 Hours) Theory

Power Diode: Power Diode characteristics, power diode types, freewheeling diode

Diode rectifier: Introduction, single phase half wave rectifiers, single phase full-wave rectifiers with R & RL Load, three phase bridge rectifier.

Practice

- Study of V-I characteristics of diode.

4. Study of single phase half-wave and full-wave diode rectifier using R & L load.

Module III:Silicon controlled Rectifier

(10 Hours)

Theory

Silicon controlled Rectifier: Introduction, Principle of operation, triggering and firing techniques, Different type of commutation circuits and techniques.

Practice

5. Study of V-I characteristics of silicon controlled rectifier.
6. Study of different methods of triggering of SCR (a) RC-Triggering method (b) UJT-Triggering method.
7. Study of class-A, class-B, class-C, class-D, class-D, class-E commutation circuits.

Module IV:Phase controlled Converters

(24 Hours)

Theory

Phase controlled Converters: Introduction, control techniques, single phase half wave controlled converter, single phase full wave controlled converter, single phase semi converter, three phase controlled converters: three pulse converter(M3 Connection), six pulse converters(M6 Connection), three phase fully controlled bridge converter(with R and RL load), three phase semi converter (with R load only)

Practice

8. Study of single phase fully controlled converter using R & L load.
9. Study of single phase semi converter using R - L load.
10. Study of 3-phase bridge converter with R, R-L and D.C motor load with/ without freewheeling diodes.
11. Study of 3-phase semi converter with R, R-L and D.C motor load with/ without freewheeling diodes.

Module V:Chopper and Thyristor Chopper Circuit

(16 Hours)

Theory

Chopper: Introduction, basic chopper classification, basic chopper operation, control strategies, classA,B,C,D,E(principle of operation only) **Thyristor chopper circuit:** Voltage commutated chopper, current commutated chopper, load commutated chopper

Practice

12. Study of different types of chopper.

Module VI:Inverter

(10 Hours)

Theory

Inverter: classification of inverter, single phase half bridge voltage source inverters, single phase full bridge inverter, three phase inverter (180 degree and 120 degree conduction mode) with R Load.

Practice

13. Study of three phase bridge inverter(180 degree & 120 degree)
14. Study of IGBT based 3-ph voltage source inverter.

Module VII: Basic series inverter**(19 Hours)****Theory**

Basic series inverter: circuit analysis, design aspect, modified series inverter, parallel inverter, single phase SCR bridge inverter.

Practice

15. Study of parallel inverter.
16. Study of series inverter.
17. Study of single phase bridge inverter.

Text Book:

1. M H Rashid, "Power Electronics: Circuits, Devices and Applications" 3rd Edition, Pearson
2. MD Singh & K B Khanchandani, "Power electronics", Tata McGraw-Hill

Reference Books:

1. J. Vithayathil, "Power Electronics: Principles and Applications", TMH Edition
2. Mohan, Undeland and Robbins, "Power Electronics: Converters, Applications and Design" Wiley Student Edition.

Session Plan

<i>Topic</i>	<i>No. of Sessions</i>	<i>Activity</i>	<i>Assignment</i>	<i>Suggested Reading</i>
Module I: Power semiconductor devices (12 Hours)				
Power semiconductor devices, types of power electronic circuit, Comparisons of power devices	2	Lecture	Assignment 1.1	TB1(ch-1,5-9,20-22)TB2(ch-5,247-249)
Control characteristics of power devices Characteristics and specifications of switches,	6	Lecture+ Practice	Assignment 1.2	TB1(ch-1,10-19)
Design of power electronics equipment	4	Practice	Assignment 1.3	TB1(ch-1,23-24)
Module II Power Diode And Diode rectifier (14 Hours)				
Diode characteristics	3	Lecture+ Practice	Assignment 2.1	TB1(ch-2,33-34)
Power diode types	1	Lecture	Assignment 2.2	TB1(ch-2,38-39)
freewheeling diode	1	Lecture	Assignment 2.3	TB1(ch-2,56-57)
Diode rectifier: introduction, single phase half wave rectifiers	3	Lecture+ Practice	Assignment 2.4	TB1(ch-3,68-69)
Single phase full wave rectifier with R and RL Load	3	Lecture+ Practice	Assignment 2.5	TB1(ch-3,68-69)

Three phase bridge rectifier	3	Lecture+ Practice	Assignment 2.6	TB1(ch-3,92-100)
Module III: Silicon controlled Rectifier (10 Hours)				
Silicon controlled Rectifier: Introduction, Principle of operation	2	Lecture	Assignment 3.1	TB2(ch-2,17-18)
Triggering and firing techniques	4	Lecture+ Practice	Assignment 3.2	TB2(ch-3,71-75)
Different type of commutation circuits and techniques.	4	Lecture+ Practice	Assignment 3.3	TB2(ch-7,-311-312)
Module IV: Phase controlled Converters (24 Hours)				
Phase controlled Converters: Introduction, control techniques	1	Lecture	Assignment 4.1	TB2(ch-6,258-262)
single phase half wave controlled rectifier,	3	Lecture+ Practice	Assignment 4.2	TB2(ch-6,263-272)
Single phase full wave controlled rectifier	3	Lecture+ Practice	Assignment 4.3	TB2(ch-6,272-290)
Single phase semiconverter	4	Practice	Assignment 4.4	TB2(ch-6,291-301)
Three phase controlled converters	1	Lecture	Assignment 4.5	TB2(ch-6,307-308)
Three pulse converter(M3 Connection)	3	Lecture+ Practice	Assignment 4.6	TB2(ch-6,308-322)
Six pulse converters(M6 Connection)	3	Lecture+ Practice	Assignment 4.7	TB2(ch-6,323-328)
Three phase fully controlled bridge converter(with R and RL load)	3	Lecture+ Practice	Assignment 4.8	TB2(ch-6,329-345)
Three phase semiconverter (with R load only)	3	Lecture+ Practice	Assignment 4B.9	TB2(ch-6,346-358)
Module V: Chopper And Thyristor chopper circuit (16 Hours)				
Chopper: Introduction, basic chopper classification	2	Lecture	Assignment 5.1	TB2(ch-8,434-436)
Basic chopper operation, control strategies	8	Lecture+ Practice	Assignment 5.2	TB2(ch-8,444-447)
Thyristor chopper circuit: Voltage commutated chopper	2	Lecture	Assignment 5.3	TB2(ch-8,481-495)
Current commutated chopper	2	Lecture	Assignment 5.4	TB2(ch-8,496-505)
Load commutated chopper	2	Lecture	Assignment 5.5	TB2(ch-8,496-505)

Module VI: Inverter (10 Hours)				
Classification of inverter, single phase half bridge voltage source inverters	2	Lecture	Assignment 6.1	TB2(ch-9,535-544)
Single phase full bridge inverter, three phase inverter(180 and 120 conduction mode) with R Load	8	Lecture+ Practice	Assignment 6.2	TB2(ch-9,545-550)TB1(ch-6,237-247)
Module VII: Basic series inverter(19 Hours)				
Basic series inverter circuit analysis	1	Lecture	Assignment 7.1	TB2(ch-9,594-605)
Basic series inverter design aspect	5	Lecture+ Practice	Assignment 7.2	TB2(ch-9,594-605)
Modified series inverter	1	Lecture	Assignment 7.3	TB1(ch-8,253-261)
Parallel inverter	6	Lecture+ Practice	Assignment 7.4	TB2(ch-9,609-614)
Single phase SCR bridge inverter	6	Lecture+ Practice	Assignment 7.5	TB2(ch-9,615-642)

Microcontroller for Industrial Applications (PIC)

Course Name	Code	Type of course	T-P-P	Prerequisite
Micro Controllers for Industrial Application (PIC)	EECC0402	Theory +Practice	2-2-0	Nil

Objective

<ul style="list-style-type: none"> To make the students understand how to activate PIC Micro-controller using assembly language and embedded C.
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Course Outcome

<ul style="list-style-type: none"> On successful completion of this course, students will be able to write a PIC Microcontroller by assembly language and Embedded-C programming.
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Evaluation Systems

Internal Examination	Component	% of Marks	Method of Assessment
	Internal Theory	20	Written examination
	Internal Practice	30(20+10)	Lab work + Learning Record
External Examination	External Theory	30	Written examination
	External Practice	20	Lab work
Total		<i>100</i>	

Course outline

Module I: Introduction to Microcontroller (8 hours)

Theory

Introduction to Microcontroller: Introduction, Microcontroller versus microprocessors, CISC Vs RISC, Pipelining, Assembly Language vs Embedded C

Module II: PIC Microcontroller PIC16C6X/7X Architecture and Organization (10hours)

Theory

PIC Microcontroller PIC16C6X/7X Architecture and Organization:

Overview and Features, PIC16C6X/7X, PIC Reset Actions, PIC Oscillator Connections, PIC Memory Organization

Module III: PIC16C6X/7X in Assembly Language (27 hours)

Theory

PIC16C6X/7X in Assembly Language

PIC 16C6X/7X Instructions, Addressing Modes, I/O Ports, Interrupts in PIC 16C61/71, PIC 16C61/71 Timers, PIC 16C71 ADC.

Practice:

- Create delay using 'decsz' instruction
- Selecting Register Bank and loading value in specific Register.
- PORT A Initialization
- External Interrupt Programming
- AD Conversion

Module IV:PIC 16F8XX Flash Microcontrollers(5 hours)

Theory

PIC 16F8XX Flash Microcontrollers: Introduction, Pin Diagram of 16F8XX, STATUS Register, OPTION_REG Register, Power Control Register (PCON), PIC 16F8XX Program Memory, PIC 16F8XX Data Memory, DATA EEPROM and Flash Program EEPROM

Module V:PIC 16F8XX Flash Microcontrollers in Embedded C (9 hours)

PIC 16F8XX Flash Microcontrollers in Embedded C:Interrupts in 16F877, I/O Ports(94 - 99), Timers(108-113)

Practice:

6. Initializing and operating I/O Port
7. Stopwatch
8. Set-up counter using timer 0

Module VI:PIC 16F877 (19 hours)

Theory

PIC 16F877Capture/Compare/PWM (CCP) Modules in PIC 16F877, Master Synchronous Serial Port (MSSP) Module

Practice:

9. Initialize CCP1 module in capture mode
10. Initialize CCP1 module in compare mode
11. Generate PWM signal using CCP1 module
12. Transmit a byte serially on SDO line using SPI master mode
13. Receive a byte serially on SDO line using SPI master mode
14. Transmit a byte serially on SDO line using SPI slave mode
15. Initializing MSSP module in I2C master mode(including start condition, stop condition, Transmission of address, read and write operation)

Module VII:USART (12 hours)

Theory

USART: Universal Synchronous Asynchronous Receiver Transmitter (USART), Analog-to-Digital Converter (ADC)

Practice:

16. USART initialization to receive and transmit continuously in asynchronous mode
17. Initialize the AD module

Text Book:

1. Ajay V Deshmukh, "Microcontrollers-Theory and Applications", , Tata McGraw-Hill Publishing Company Limited, 2005.
2. Richard Barnett, Larry O’Cull, Sarah Cox "Embedded C Programming and the Microchip PIC", , Thomson Delmar Learning, 2006.

Online Resource

1. <http://microcontrollerslab.com/pic-microcontroller-architecture/> [Viewed on 17/6/2019]
2. http://www.islavici.ro/cursuriold/conducere%20sist%20cu%20calculatorul/PICbook/2_01chapter.htm [Viewed on 17/6/2019]
3. <http://teachers.teicm.gr/kalomiros/Mtptx/e-books/eBook%20-%20PIC%20Programming%20with%20C.pdf> [Viewed on 17/6/2019]

Data Sheet for controller

PIC16F877A<https://www.google.com/url?sa=t&rct=j&q=&esrc=s&source=web&cd=1&>

[cad=rja&uact=8&ved=0ahUKewjrcG25PzaAhUkSI8KHZHEdMQQFggsMAA&url=ht
tp%3A%2F%2Fww1.microchip.com%2Fdownloads%2Fen%2FDeviceDoc%2F39582b.p
df&usg=AOvVaw0fL8Y1WtiFSI3vFnHizLqJ](http://www.microchip.com/downloads/en/DeviceDoc/39582b.pdf) [Viewed on 17/6/2019]

Session Plan

Topic	No. of Sessions (in hrs.)	Activity	Assignment	Suggested Reading
Module I: Introduction to Microcontroller (8 hours)				
Introduction to Microcontroller: Introduction, Microcontroller versus microprocessors, CISC Vs RISC	4	Lecture	Assignment 1.1	Suggested Links
Pipelining, Assembly Language vs Embedded C	4	Lecture	Assignment 1.2	Suggested Links
Module II: PIC Microcontroller PIC16C6X/7X Architecture and Organization (10 hours)				
PIC Microcontroller PIC16C6X/7X Architecture and Organization: Overview and Features, PIC16C6X/7X, PIC Reset Actions	5	Lecture	Assignment 2.1	Text Book 1 (Pg. No.115-131)
PIC Oscillator Connections, PIC Memory Organization	5	Lecture	Assignment 2.2	Text Book 1 (Pg. No.115-131)
Module III: PIC16C6X/7X in Assembly Language (27 hours)				
PIC16C6X/7X in Assembly Language: PIC 16C6X/7X Instructions, Addressing Modes, I/O Ports in PIC 16C61/71, Interrupts in PIC 16C61/71, PIC 16C61/71 Timers, PIC 16C71 ADC.	3	Lecture	Assignment 3.1	Text Book 1 (Pg. No.132-147)
1. Create delay using 'decfsz' instruction 2. Selecting Register Bank and loading value in specific Register. 3. PORT A Initialization 4. External Interrupt Programming 5. AD Conversion	24	Practice (MPLA B & Proteus)		Text Book 1 (Pg. No.132-147)
Module IV: PIC 16F8XX Flash Microcontrollers (5 hours)				
PIC 16F8XX Flash Microcontrollers: Introduction, Pin Diagram of 16F8XX, STATUS Register, OPTION_REG Register, Power Control Register (PCON),	3	Lecture	Assignment 4.1	Text Book 1 (pg. No.150-165) Data sheet in Suggested link section
PIC 16F8XX Program Memory, PIC 16F8XX Data Memory, DATA EEPROM	2	Lecture	Assignment 4.2	Text Book 1 (pg.

and Flash Program EEPROM				No.150-165) Data sheet in Suggested link section
Module V: PIC 16F8XX Flash Microcontrollers in Embedded C (9 hours)				
PIC 16F8XX Flash Microcontrollers in Embedded C: Interrupts in 16F877, I/O Ports, Timers,	1	Lecture	Assignment 5.1	Text Book 2 (Pg. No.94-156)
6..Initializing and operating I/O Port 7..Stopwatch 8.Set-up counter using timer 0	8	Practice (MPLAB &Proteus)		
Module VI:PIC 16F877 (19 hours)				
PIC 16F877 Capture/Compare/PWM (CCP) Modules in PIC 16F877, Master Synchronous Serial Port (MSSP) Module,	2	Lecture	Assignment 6.1	Text Book 2 (Pg. No.113-119, Pg. No.123-127, Pg. No.138-149)
8.Initialize CCP1 module in capture mode 9.Initialize CCP1 module in compare mode 10.Generate PWM signal using CCP1 module 11.Transmit a byte serially on SDO line using SPI master mode 12.Receive a byte serially on SDO line using SPI master mode 13.Transmit a byte serially on SDO line using SPI slave mode 14.Initializing MSSP module in I2C master mode(including start condition, stop condition,	17	Practice (MPLAB &Proteus)		
Module VII:USART (12 hours)				
Universal Synchronous Asynchronous Receiver Transmitter (USART), Analog-to-Digital Converter (ADC)	1	Lecture	Assignment 7.1	Text Book 2 (Pg. No.129-137) (Pg. No.149-156) Data sheet in Suggested link section
15.USART initialization to receive and transmit continuously in asynchronous mode 16.Initialize the AD module	11	Practice (MPLAB &Proteus)		
Total- 90 Hours				

Control System

Course Title	Code	Type of course	T-P-Pr	Prerequisite
Control System	ELCC0406	Theory & Practice	3-2-0	Nil

Objective

<ul style="list-style-type: none"> To teach the Mathematical Models of Physical Systems, Analysis of System in Time Domain and Frequency Domain & Application of Controllers

Course Outcome

<ul style="list-style-type: none"> Students will gain knowledge of Physical Systems, Stability Analysis of System and Controller
<ul style="list-style-type: none"> Students will develop skill of designing Automatic Control System and Controller for a particular application

Evaluation Systems

Internal Examination	Component	% of Marks	Method of Assessment
	Internal Theory	20	Written Examination
	Internal Practice	30 (20+10)	Lab Work + Learning Record
External Examination	External Theory	30	Written Examination
	External Practice	20	Lab Work
Total		<i>100</i>	

Course Outline

Module I: Introduction and Mathematical Models of Physical Systems(23 Hours)

Theory

Introduction to Control Systems: Basic Concepts of Control Systems, Open loop and closed loop systems; Mathematical Models of Physical Systems: Differential Equations of Physical Systems, Mechanical Translational Systems, Rotational systems, Electrical Systems, Analogy between Mechanical and electrical quantities, Derivation of Transfer functions, Block Diagram Algebra, Signal Flow Graphs and Mason's Gain Formula; Control Components: D.C. Servomotors, Synchronos and Stepper Motors.

Practice: Hardware

1. Study of D.C. Servomotors
2. Study of AC Servomotor
3. Study of Synchronos
4. Study of Stepper Motors

Module II: Time Response Analysis (20 Hours)

Theory

Time Response Analysis: Type Test Signals, Time response of first order systems to unit step and unit ramp inputs, Time Response of Second order systems to unit step input, Time Response specifications, Steady State Errors and Static Error Constants of different types of systems.

Practice: Mat lab

5. Standard Test Signals
6. Time response of first order systems to unit step and unit ramp inputs
7. Time Response of Second order systems to unit step input
8. Time Response specifications
9. Simulate a D. C. position control system and obtain its step response

Module III: Stability in Time Domain (12 Hours)
Theory

Stability in Time Domain: Stability and Algebraic Criteria, concept of stability, Necessary conditions of stability, Hurwitz stability criterion, Routh stability criterion, Application of the Routh stability criterion to linear feedback system and Relative stability by shifting the origin in s-plane.

Practice: Mat lab

10. Study of stable and unstable system.

Module IV: Root Locus Technique (10 Hours)
Theory

Root Locus Technique: Root locus concepts, Rules of Construction of Root locus and Determination of Roots from Root locus for a specified open loop gain.

Practice: Mat lab

11. Construct the root locus for 2nd, 3rd and 4th order system and analyze its stability (Gain)

Module V: Frequency Response Analysis (20 Hours)
Theory

Frequency Response Analysis: Frequency domain specifications, correlation between Time and Frequency Response with respect to second order system, Polar plots, Bode plot, Determination of Gain Margin and Phase Margin from Bode plot.

Practice: Mat lab

12. Determine experimentally the frequency response of a 2nd system and evaluation of frequency domain specifications
13. Construct the polar plot for 2nd, 3rd and 4th order system and analyze its stability (PM & GM)
14. Construct the bode plot for 2nd, 3rd and 4th order system and analyze its stability (PM & GM)

Module VI: Stability in Frequency Domain (10 Hours)
Theory

Stability in Frequency Domain: Principle of argument, Nyquist stability criterion and Application of Nyquist stability criterion for linear feedback system.

Practice: Mat lab

15. Construct the Nyquist plot for 2nd, 3rd and 4th order system and analyze its stability (PM & GM)
16. Draw the frequency response characteristic of a given lag- lead compensating network

Module VII: Controllers**(10 Hours)****Theory**

Controllers: Concept of Proportional, Derivative and Integral Control actions, P, PD, PI and PID controllers.

Practice: Mat lab

17. Design of P,PD, PI and PID Controller for 2nd or 3rd order system
18. To study the effect of P, PI, PD and PID controller on step response of a feedback control system
19. To design a PI controller and study its effect on steady state error
20. Controller Tuning

Text Book

Saeed S. Hasan, "Automatic Control Systems," Kataria Publication, 9th Edition-2017.

Reference

Nagrath J. and Gopal M., "Control Systems Engineering," New Age International Publishers, 6th Edition-2017.

Session Plan

Topics	No. of Sessions (in hrs)	Activity	Assignment	Suggested Reading
Module I: Introduction and Mathematical Models of Physical Systems (23 Hours)				
Introduction to Control Systems: Basic Concepts of Control Systems, Open loop and closed loop systems.	03	Lecture	Assignment No. 1.1	Text Book (TB) Chapter (CH)-1
Mathematical Models of Physical Systems: Differential Equations of Physical Systems, Mechanical Translational Systems, Rotational systems, Electrical Systems, Analogy between Mechanical and electrical quantities, Derivation of Transfer functions, Block Diagram Algebra, Signal Flow Graphs and Mason's Gain Formula.	10	Lecture	Assignment No. 1.2-1.7	TB CH- 1
Control Components: D.C. Servomotors, Synchros and Stepper Motors.	02	Lecture	Assignment No. 1.8	TB CH- 9
1. Study of D.C. Servomotors 2. Study of AC Servomotor 3. Study of Synchros	08	Practice	Result of Experiments and Viva	TB CH- 9

4. Study of Stepper Motors			voce	
Module II: Time Response Analysis (20 Hours)				
Time response Analysis: Standard Test Signals, Time response of first order systems to unit step and unit ramp inputs, Time Response of Second order systems to unit step input, Time Response specifications, Steady State Errors and Static Error Constants of different types of systems.	08	Lecture	Assignment No. 2.1-2.5	TB CH- 2
5. Standard 6. Time response of first order systems to unit step and unit ramp inputs 7. Time Response of Second order systems to unit step input 8. Time Response specifications 9. Simulate a D. C. position control system and obtain its step response	12	Practice	Result of Experiments and Viva voce	
Module III: Stability in Time Domain (12 Hours)				
Stability in time domain: Stability and Algebraic Criteria, concept of stability, Necessary conditions of stability, Hurwitz stability criterion, Routh stability criterion, Application of the Routh stability criterion to linear feedback system, Relative stability by shifting the origin in s-plane	10	Lecture	Assignment No. 3.1-3.5	TB CH- 5
10. Study of stable and unstable system.	02	Practice	Result of Experiments and Viva voce	
Module IV: Root Locus Technique (10 Hours)				
Root locus Technique: Root locus concepts, Rules of Construction of Root locus and Determination of Roots from Root locus for a specified open loop gain.	06	Lecture	Assignment No. 4.1-4.3	TB CH- 5
11. Plot the root locus for 2 nd , 3 rd and 4 th order system and analyze its stability (Gain)	04	Practice	Result of Experiments and Viva voce	
Module V: Frequency Response Analysis (20 Hours)				
Frequency Response Analysis: Frequency domain specifications, correlation between Time and Frequency Response with respect to	04	Lecture	Assignment No. 5.1-5.2	TB CH- 4

second order system.				
Polar plots	02	Lecture	Assignment No. 5.3-5.5	TB CH- 4
Bode plot, Determination of Gain Margin and Phase Margin from Bode plot.	04	Lecture	Assignment No. 5.6-5.9	TB CH- 4
12. Determine experimentally the frequency response of a second - order system and evaluation of frequency domain specifications. 13. Construct the polar plot for 2 nd , 3 rd and 4 th order system and analyze its stability (PM & GM) 14. Construct the bode plot for 2 nd , 3 rd and 4 th order system and analyze its stability (PM & GM)	10	Practice	Result of Experiments and Viva voce	
Module VI: Stability in Frequency Domain (10 Hours)				
Stability in frequency domain: Principle of argument, Nyquist stability criterion, Application of Nyquist stability criterion for linear feedback system.	04	Lecture	Assignment No. 6.1-6.2	TB CH- 5
15. Construct the Nyquist plot for 2 nd , 3 rd and 4 th order system and analyze its stability (PM & GM). 16. Draw the frequency response characteristic of a given lag-lead compensating network.	06	Practice	Result of Experiments and Viva voce	
Module VII: Controllers (10 Hours)				
Controllers: Concept of Proportional, Derivative and Integral Control actions, P, PD, PI and PID controllers.	02	Lecture	Assignment No. 7.1	TB CH- 11
17. Design of P, PD, PI and PID Controller for 2 nd or 3 rd order system 18. To study the effect of P, PI, PD and PID controller on step response of a feedback control system 19. To design a PI controller and study its effect on steady state error 20. Controller Tuning	08	Practice	Result of Experiments and Viva voce	
Total- 105Hours (Theory- 55 hours Practice-50 hours)				

Microprocessor and its Interfacing

Course Title	Code	Type of course	T-P-P (Credit)	Prerequisite
Microprocessor and its Interfacing	ELCC0407	Theory + Practice	1-1-0	Nil

Objective

- Familiarization with architecture, instruction set and assembly language programming concept of a microprocessor for design of hardware interfacing circuit.

Course Outcome

- Design of microprocessors based systems.
- Analyze and design hardware and software for small digital systems involving microprocessors.

Evaluation Systems

Internal Examination	Component	Marks	Method of Evaluation
	Internal Theory	20	Written examination
	Internal Practice	30 (20+10)	Lab work+ Learning Record
External Examination	External Theory	30	Written examination
	External Practice	20	Lab work
Total		100	

Course Outline

Module I: 8085 Microprocessor Architecture (2 Hours) Theory

Introduction to Microprocessor, Components of a Microprocessor: Registers, ALU and control & timing, System bus (data,address and control bus), Microprocessor systems with bus organization.

Module II: 8085 Instruction set (11 Hours) Theory

Assembly Language Programming Basics, Classification of Instructions, Addressing Modes, Writing 8085 assembly language programs with decision, making and looping using, data transfer, logical and branch instructions.

Practice

- Data transfer and Arithmetic Group
- Logical and Branch Group

Module III: Stack and Subroutines (4 Hours) Theory

Stack& Subroutines stack and machine control groups of instruction set,

Practice:

- Stack, I/O and Machine Control Group

Module IV: Peripheral device and Interfacing (4 Hours)

Theory

Address space partitioning, memory and I/O interfacing, data transfer schemes

Module V: Interrupts of Intel 8085 (8 Hours)

Theory

Interrupt structure of 8085A microprocessor, processing of vectored and non-vectored interrupts.

Practice:

4. Find the calling location of different Interrupt
5. Solve a pending task (addition) when interrupt occurs

Module VI: Programmable peripheral Interface (Intel-8255) (8 Hours)

Theory

Intel 8255, pin configuration, internal structure of a port bit, modes of operation.

Practice:

6. Operate 8255 in Mode 0,1
7. Operate 8255 in Mode 2

Module VII: Programmable Counter/ Interval Timer (8 Hours)

Theory

Intel 8253, pin configuration, internal block diagram of counter and modes of operation

Practice:

8. Operate 8253 in Mode 0,1
9. Operate 8253 in Mode 3

Text Books

1. B. Ram, Fundamentals of Microprocessor & Microcontrollers, Dhanpat Rai Publication, 7th Edition, 2010.

Online Resources

1. Animated Working of 8085 Microprocessor with addition program: <https://www.youtube.com/watch?v=te5Xe3TgPC4> [Viewed on 13-6-2019]
2. 8085 Interrupt: https://www.youtube.com/watch?v=dc_1MEjMFJc [Viewed on 13-6-2019]
3. 8255 PPI: <https://www.youtube.com/watch?v=JXbkTHKJybw> [Viewed on 13-6-2019]
4. 8253 Timer & Counter: https://www.youtube.com/watch?v=7P_Y8oB9ICQ [Viewed on 13-6-2019]

Session Plan

Topics	No. of Sessions (in hrs)	Activity	Assignment	Suggested Reading
Module I: 8085 Microprocessor Architecture (2 Hours)				
Introduction to Microprocessor, Components of a Microprocessor: Registers, ALU and control & timing, System bus (data, address and control bus), Microprocessor systems with bus organization.	2	Lecture	Assignment 1.1	TB CH-3 Sec 3.1
Module II: 8085 Instruction set (11 Hours)				
Assembly Language Programming Basics	1	Lecture	Assignment 2.1	TB CH-3 Sec 3.2
Classification of Instructions	3	Lecture	Assignment 2.2	TB CH-4 Sec 4.3
Addressing Modes	2	Lecture	Assignment 2.3	TB CH-4 Sec (4.6.1-4.6.4)
8085 assembly language programs with decision, making and looping using, data transfer, logical and branch instructions.	5	Practice		TB CH-6
Module III: Stack and Subroutines (4 Hours)				
stack and machine control groups of instruction set	2	Lecture	Assignment 3.1	TB CH-4 Sec 4.6.5
Stack, I/O and Machine Control Group	2	Practice		TB CH-6
Module IV: Peripheral device and Interfacing (4 Hours)				
Address space partitioning	1	Lecture	Assignment 4.1	TB CH- 7 Sec 7.2
memory and I/O interfacing	1	Lecture	Assignment 4.2	TB CH- 7 Sec 7.3
data transfer schemes	2	Lecture	Assignment 4.3	TB CH- 7 Sec 7.4
Module V: Interrupts of Intel 8085 (8 Hours)				
Hardware Interrupts	2	Lecture	Assignment 5.1	TB TB CH- 7

				Sec 7.5.1
Software Interrupts	2	Lecture	Assignment 5.2	TB TB CH- 7 Sec 7.5.2
Find the calling location of different Interrupt Solve a pending task (addition) when interrupt occurs	4	Practice		
Module VI: Programmable peripheral Interface (Intel-8255) (8 Hours)				
Intel 8255, pin configuration, internal structure of a port bit, modes of operation	3	Lecture	Assignment 6.1	TB TB CH- 7 Sec 7.7
Operate 8255 in Mode 0,1	2	Practice		
Operate 8255 in Mode 2	1	Practice		
Module VII: Programmable Counter/ Interval Timer (8 Hours)				
Programmable Counter/ Interval Timer Intel 8253, pin configuration, internal block diagram of counter and modes of operation	3	Lecture	Assignment 7.1	TB CH 7 Sec (7.11.1- 7.11.2)
Operate 8253 in Mode 0,1	2	Lecture+Practice	Assignment 7.2	TB CH 7 Sec (7.11.3- 7.11.5)
Operate 8253 in Mode 2,3	3	Lecture+Practice	Assignment 7.3	TB CH 7 Sec (7.11.6- 7.11.7)
Total- 45 Hours				

Digital Electronic Circuits

Course Title	Code	Type of course	T-P-P	Prerequisite
Digital Electronic Circuits	ECCC0402	Theory +Practice	3-1-0	Nil

Objective:

- The objective of this subject is to provide a good understanding on digital logic and different combinational and sequential circuits

Course Outcome:

- Student will able to Develop, Analyze, Design and Implement combinational and Sequential Logic Circuits
- Student will able to acquire the skill on Simulating and implementing combinational and Sequential Circuits using Verilog

Evaluation Systems:

Internal Examination	Component	% of Marks	Method of Assessment
	Internal Theory	20	Written Examination
	Internal Practice	30(20+10)	Lab Work + Learning Record
External Examination	External Theory	30	Written Examination
	External Practice	20	Lab Work
Total		100	

Course Outline

Module I: NUMBER SYSTEMS AND CODES

(4 Hours)

Theory

Different number systems: Binary, Octal, Decimal and Hexadecimal, Interpretation of base r system, Number-Base Conversion. Binary Arithmetic, 1's and 2's Complements, subtraction using 2's complement, Signed Binary Numbers. Codes: BCD, Gray, Excess-3, ASCII Character Code, BCD Addition

Module II: BOOLEAN ALGEBRA AND LOGIC MINIMIZATION

(5 Hours)

Theory

Basic Theorems and Properties of Boolean Algebra, Boolean Functions, Complement of a function, Canonical and Standard forms- Minterms, Maxterms, SOP, POS, Conversion between canonical forms. Logic Minimization Techniques: 3, 4, 5 variable K-Map, POS simplification, don't care conditions

Practice

1. Study of different digital logic gates
2. Simplification of Boolean function, logic minimization and implementation with logic gates

Module III: LOGIC MINIMIZATION

(5 Hours)

Theory

Prime implicants, Essential prime implicants, Quine-McCluskey technique for simplification, Circuit Implementation, NAND and NOR implementation, AND-OR-INVERT, OR-AND-INVERT, Ex-OR function, Parity generation and checking

Practice

3. VERILOG/VHDL Tutorial
4. NAND-NOR implementation of logic circuits

Module IV: ARITHMETIC CIRCUITS

(6 Hours)

Theory

Combinational Circuit- Design and analysis, Code conversion, Binary Adder-Subtractor- Half Adder/ Subtractor, Full Adder/Subtractor, Ripple carry adder, Carry look ahead generator, Adder-Subtractor, BCD Adder, Binary Multiplier, Magnitude Comparator

Practice

5. Design, implement and test of Combinational Circuit- Parity Generator
6. Design, implement and test of Code Converters
7. Design, implement and test of Adders
8. Design, implement and test of Subtractor

Module V: COMBINATIONAL LOGIC

(6Hours)

Theory

Decoders, Function implementation using decoder, Encoders, Multiplexers, function implementation using multiplexer, De-multiplexers

Practice

9. Design, implement and test of Decoder circuits
10. Design, implement and test of LSB/ MSB Priority Encoder
11. Design, implement and test of Multiplexers
12. Design, implement and test of Magnitude Comparator

Module VI: SEQUENTIAL LOGIC

(6 Hours)Theory

Sequential Circuits, Latches-SR, JK, Flip-Flops-JK, D, T, Design and Analysis of Clocked Sequential Circuit, Introduction to FSM, Mealy and Moore Models, Design of sequence detector using both types of FSM; Registers- SISO, SIPO, PIPO and PISO Registers, Universal Shift Register.

Practice

13. Design, implement and test of Flip Flop Circuits
14. Design, implement and test of Shift Register

Module VII: COUNTERS, MEMORY AND PROGRAMMABLE LOGIC (10 Hours)

Theory

Counter- Asynchronous/Synchronous- Up/Down Counter, Termination of Count (MOD Counter), Ring Counter, Johnson Counter; Memory Characteristics, Memory hierarchy, Different types of memory, Concept of CPLD and FPGA, Programmable Read Only Memory, PLA, PAL, Error Detection and Correction- Hamming Code

Practice

15. Design, implementation and test of Counters

Practice will be through hardware implementation and software simulation using Xilinx.

Text Book

Mano, M.M., "Digital design", EBSCO Publishing, 2002

Reference Books

1. Kumar, A.A., Fundamentals of digital circuits. PHI Learning Pvt. Ltd, 2014.
2. Jain, R.P. and Floyd, T.L., Digital fundamentals, Dorling Kindersley Pvt Ltd, 2009.
3. Donald, P.L., Albert, P.M., Goutam. Saha, Malvino, A.P. and Saha, G.K., Digital Principles & Applications. Tata McGraw-Hill, 2010.

Session Plan

Topic coverage and Internal Test	No. of Sessions (in hrs.)	Activity	Assignment	Suggested Reading
Module I: Number Systems and Codes (5 hrs. lecture)				
Number System: - Binary, Octal, Decimal, Hexadecimal, Interpretation of base r system	1	Lecture	Assignment-1.1	Text Book-1 Chapter-1
Number-Base Conversion, Binary Arithmetic	1	Lecture	Assignment-1.2	Text Book-1 Chapter-1
1's and 2's Complements, subtraction using 2's complement, Signed Binary Numbers	1	Lecture	Assignment-1.3	Text Book-1 Chapter-1
Codes: - BCD, Gray, Excess-3, ASCII Character Code	1	Lecture	Assignment-1.4	Text Book-1 Chapter-1
BCD Addition	1	Lecture	Assignment-1.5	Text Book-1 Chapter-1

Module II: Boolean Algebra and Logic Minimization (6hrs. lecture+3 hrs. practice)				
Basic Theorems and Properties of Boolean Algebra	1	Lecture	Assignment No- 2.1	Text Book-1 Chapter-2
Boolean Functions, Complement of a Function	1	Lecture	Assignment No- 2.2	Text Book-1 Chapter-2
Canonical and Standard Forms- Minterms, Maxterms, SOP, POS, Conversion between two canonical form	1	Lecture	Assignment No- 2.3	Text Book-1 Chapter-2
Logic Gates	1	Practice		
The map method-3,4,5 variable K-Map	2	Lecture	Assignment No- 2.4	Text Book-1 Chapter-3
Simplification of Boolean function, logic minimization and implementation with logic gates	2	Practice		
POS simplification, Don't care conditions	1	Lecture	Assignment No- 2.5	Text Book-1 Chapter-3
Module III: Logic Minimization(6hrs. lecture+3 hrs. practice)				
Prime Implicants, Essential Prime Implicants	1	Lecture	Assignment No- 3.1	Text Book-1 Chapter-3
Quine-McCluskey Technique for simplification.	1	Lecture	Assignment No- 3.1	Text Book-1 Chapter-3
Circuit Implementation,	1	Lecture	Assignment No- 3.1	Text Book-1 Chapter-3
NAND and NOR implementation,	1	Lecture	Assignment No- 3.1	Text Book-1 Chapter-3
AND-OR-INVERT, OR-AND-INVERT,	1	Lecture	Assignment No- 3.1	Text Book-1 Chapter-3
Ex-OR function, Parity generation and checking.	1	Lecture	Assignment No- 3.1	Text Book-1 Chapter-3
VERILOG/VHDL Tutorial	1	Practice		
NAND-NOR implementation of logic circuits.	2	Practice		
Module IV [6 hrs. lecture+8 hrs. practice]				
Combinational Circuit-Design and Analysis	1	Lecture		Text Book-1 Chapter-4
Design, implement and test of Combinational Circuit- Parity Generator	2	Practice		
Code Conversion Circuits	1	Lecture	Assignment- 4.1	Text Book-1 Chapter-4

Design, implement and test of Code Converters	2	Practice		
Binary Adder-Subtractor- Half Adder/Subtractor, Full Adder/Subtractor	2	Lecture	Assignment-4.2	Text Book-1 Chapter-4
Design, implement and test of Adders	2	Practice		
Ripple Carry Adder, Carry Lookahead Generator	1	Lecture	Assignment-4.3	Text Book-1 Chapter-4
Design, implement and test of Subtractor	2	Practice		Lab Manual
Adder-Subtractor, BCD Adder	1	Lecture	Assignment-4.4	Text Book-1 Chapter-4
Module V [6hrs. Lecture+8 hrs. Practice]				
Binary Multiplier	1	Lecture	Assignment-5.1	Text Book-1 Chapter-4
Magnitude Comparator	1	Lecture	Assignment-5.2	Text Book-1 Chapter-4
Design, implement and test of Magnitude Comparator	2	Practice		Lab Manual
Decoders, Encoders	2	Lecture	Assignment-5.3	Text Book-1 Chapter-4
Design, implement and test of Decoder circuits	2	Practice		Lab Manual
Design, implement and test of LSB/ MSB Priority Encoder	2	Practice		Lab Manual
Multiplexers, Demultiplexers	2	Lecture	Assignment-5.4	Text Book-1 Chapter-4
Design, implement and test of Multiplexers	2	Practice		Lab Manual
Module VI [6hrs. Lecture+4 hrs. Practice]				
Sequential Circuits, Latches-SR,JK	1	Lecture	Assignment-6.1	Text Book-1 Chapter-5
Flip-Flops-JK,D,T	1	Lecture	Assignment-6.2	Text Book-1 Chapter-5
Design, implement and test of Flip Flop circuits	2	Practice		Lab Manual
Analysis and Design of Clocked Sequential Circuit	1	Lecture	Assignment-6.3	Text Book-1 Chapter-5
Introduction to FSM, Mealy and Moore Models, Design of sequence detector using both types of FSM.	1	Lecture	Assignment-6.4	Text Book-1 Chapter-5

Registers- SISO, SIPO, PIPO and PISO Registers	1	Lecture	Assignment-6.5	Text Book-1 Chapter-6
Universal Shift Register	1	Lecture	Assignment-6.6	Text Book-1 Chapter-6
Design, implement and test of Shift Register	2	Practice		Lab Manual
Module VII [7hrs. Lecture+3 hrs. Practice]				
Asynchronous/Synchronous-Up/Down Counter	2	Lecture	Assignment-7.1	Text Book-1 Chapter-6
Termination of Count (MOD Counter), Ring Counter, Johnson Counter	2	Lecture	Assignment-7.2	Text Book-1 Chapter-6
Design, implementation and test of Counters	2	Practice		Lab Manual
Memory Characteristics, Memory hierarchy, Different types of memory, Concept of CPLD and FPGA,	2	1 hr. Lecture + 1 hrs. Practice	Assignment-7.3	Text Book-1 Chapter-7
Programmable Read Only Memory, PLA, PAL,	1	Lecture	Assignment-7.4	Text Book-1 Chapter-7
Error Detection and Correction Code - Hamming Code.	1	Lecture	Assignment-7.5	Text Book-1 Chapter-7
Total (hrs.)	70	42 hrs. Lecture + 28 hrs. Practice		

Digital Signal Processing

Course Title	Code	Type of course	T-P-P	Prerequisite
Digital Signal Processing	ECCC0404	Theory +Practice	3-1-0	Nil

Objective

- To teach students the Time Domain to Frequency Domain Conversion for Discrete Time Signal and Digital Filter Design Technique

Course Outcome

- Students will gain the knowledge in handling DSP processor for real time signal processing
- Student will acquire skill on Developing and implementing new algorithm in signal processing

Evaluation Systems

Internal Examination	Component	% of Marks	Method of Assessment
	Internal Theory	20	Written Examination
	Internal Practice	30(20+10)	Lab Work + Learning Record
External Examination	External Theory	30	Written Examination
	External Practice	20	Lab Work
Total		100	

Course Outline

Module I: ANALYSIS OF LTI SYSTEMS USING Z-TRANSFORM (12 Hours)

Theory

The Z-Transform: The Direct Z-Transform, The inverse Z-Transform, Properties of The Z-Transform, Linearity, Time Shifting, Scaling, Time Reversal, Differentiation, Convolution, Correlation, Accumulation, Rational Z-Transforms: Poles and Zeros, Pole Location And Time-Domain Behavior for Causal Signals, The System Function of a Linear Time-Invariant System

Practice

1. Hands on to MATLAB & Simulink
2. Signal generation using MATLAB & Simulink
3. Analysis of LTI system using MATLAB and Z-transform of signal using MATLAB

Module II: INVERSION OF THE Z-TRANSFORMS (5 Hours)

Theory

The Inversion of the Z-Transform by Power Series Expansion, The Inversion of The Z-Transform by Partial-Fraction Expansion, The One-Sided Z-Transform: Definition and Properties, Analysis and Characterization Of LTI System using Z-Transform, Solution of Difference Equations.

Module III: THE DISCRETE FOURIER TRANSFORM (8 Hours)

Theory

Properties and applications, the discrete Fourier transform, Properties of the DFT: periodicity, linearity, and symmetry properties, relationship of the DFT to other transforms, DFT as a linear transformation, multiplication of two DFT and circular convolution

Practice

4. MATLAB simulation for DFT & IDFT.

Module IV: FAST FOURIER TRANSFORM (10 Hours)

Theory

Efficient Computation of the DFT, FFT Algorithms: Radix-2 FFT Algorithms: Decimation-in-Time (DIT), Decimation-in-Frequency (DIF)

Practice

5. DIT FFT by MATLAB simulation
6. DIF FFT by MATLAB simulation

Module V: DESIGN AND REALIZATION OF DIGITAL FIR FILTERS (14 Hours)

Theory

Design of FIR Filters: Symmetric and Anti-Symmetric FIR Filters, Design of Linear-Phase FIR Filters by Using Windowing Techniques, Design of FIR Filter by Frequency Sampling
Realization of FIR Filter: Recursive and Non-Recursive Structure, Factors Influencing Choice of Structure, Block Diagram Representation of Signal Flow Graph, FIR Filter Structure: Direct Form-I, Direct Form-II, Linear Phase Structure, Frequency Sampling Structure

Practice

7. MATLAB Simulation of FIR filters using windows technique (Rectangular, Hamming and Hanning)
8. MATLAB simulation of LPF and high pass filter by FIR filter

Module VI: DESIGN AND REALIZATION OF DIGITAL IIR FILTERS (14 Hours)

Theory

Design of IIR Filters from Analog Filters (Butterworth Approximation): IIR Filter Design by Impulse Invariance, IIR Filter Design By The Bilinear Transformation, Realization of Digital Filter by using Direct Form-I, Direct Form-II, Cascade Form and Parallel Form Structures.

Practice

9. MATLAB simulation for design of Butterworth filter
10. Design of IIR Butterworth filter from filter specification (both programming & by using FDA tool box)

- Design of IIR low pass Butterworth filter using impulse invariant transformation from filter specification

Module VII: DIGITAL SIGNAL PROCESSOR

(12 Hours)

Theory

Introduction, Evolution of Digital Signal Processor, Digital Signal Processor Architecture, Processor Hardware Unit, Fixed Point and Floating Format, Pipelining, Memory Access Scheme, VLIW, TMS320c Family

Practice

- Signal generation (sine wave, step signal) by using processor
- Linear convolution by using DSP processor
- Filter design and implementation by using DSP processor

Text Books

- V. K. Ingle and J.G. Proakis, J.G, "Digital Signal Processing-A MATLAB Based Approach", Cengage Learning Publisher
- S. Salivahanan, A. Vallavaraj and C. Gnanapriya, "Digital Signal Processing", McGraw-Hill Publication

Reference Book

Tarun K. Rawat, "Digital Signal Processing", Oxford University Press India

Online Resource

NPTEL Video: <http://nptel.ac.in/courses/117102060> [Viewed on 13-06-2019]

Session Plan

Topic coverage and Internal Test	No. of Sessions (in hrs.)	Activity	Assignment	Suggested Reading
Module-I [6 hrs. Lecture + 6 hrs. Practice]				
The Z-Transform: The Direct Z-Transform,	3	1hr. Lecture + 2 hrs. Practice	Assignment 1 QN-1	Text Book-1, Chapter 3
The Inverse Z-Transform,	1	Lecture	Assignment 1 QN-2	Text Book-1, Chapter 3
Properties of the Z-Transform	3	Lecture	Assignment 1 QN-3	Text Book-1, Chapter 3
Introduction to MatLab and Simulink.	2	Practice	Assignment 1 QN-4	Text Book-2, Chapter 15

Standard Signal Generation by MatLab& Simulink	2	Practice	Assignment 1 QN-4	Text Book- 2, Chapter 15
Rational Z-Transforms: Poles and Zeros, Pole Location and Time-Domain Behavior for Causal Signals	1	Lecture	Assignment 1 QN-5	Text Book- 1, Chapter 3
Module-II [5 hrs. Lecture]				
Inversion of the Z-Transforms: The Inversion of the Z-Transform by Power Series Expansion,	1	Lecture	Assignment 2 QN-1	Text Book- 1, Chapter 3
The Inversion of the Z-Transform by Partial-Fraction Expansion	1	Lecture	Assignment 2 QN-2	Text Book- 1, Chapter 3
The One-sided Z-Transform: Definition and Properties, Solution of Difference Equations.	3	Lecture	Assignment 2 QN-3	Text Book- 1, Chapter 3
Module-III [6 hrs. Lecture+ 2 hrs. Practice]				
Relationship of the DFT to other Transforms	1	Lecture	Assignment 3 QN-1	Text Book- 1, Chapter 5
Properties of the DFT: Periodicity problems on Properties of the DFT: Periodicity	1	Lecture	Assignment 3 QN-2	Text Book- 1, Chapter 5
Properties of the DFT, Linearity, and Symmetry Properties,	1	Lecture	Assignment 3 QN-3	Text Book- 1, Chapter 5
Multiplication of Two DFTs and Circular Convolution	3	1hr. Lecture + 2 hrs. Practice	Assignment 3 QN-4	Text Book- 1, Chapter 5
Twiddle factor, The DFT as a Linear transformation Overlap add method, Overlap Save method	2	Lecture	Assignment 3 QN-5	Text Book- 1, Chapter 5
Module-IV [6hrs. Lecture + 4 hrs. Practice]				
Fast Fourier Transform Algorithms, Efficient Computation of the DFT, problems on FFT Algorithms: Direct Computation of the DFT	2	Lecture	Assignment 4 QN-1	Text Book- 1, Chapter 6
Radix-2 FFT Algorithms: Decimation-In-Time (DIT), problems on Decimation-In-Time	4	2 hrs. Lecture + 2 hrs. Practice	Assignment 4 QN-2	Text Book- 1, Chapter 6
Radix-2 FFT Algorithms: Decimation-In-Frequency (DIF), problems on Decimation-In Frequency	4	2 hrs. Lecture + 2 hrs. Practice	Assignment 4 QN-3	Text Book- 1, Chapter 6

Module-V [10 hrs. Lecture + 4 hrs. Practice]				
Design of FIR Filters: Symmetric and Ant symmetric FIR Filters	2	Lecture	Assignment 5 QN-4	Text Book-1, Chapter 8
Design of Linear-Phase FIR Filters by using Windows	4	2 hrs. Lecture + 2 hrs. Practice	Assignment 5 QN-5	Text Book-1, Chapter 8
Design of FIR filter By Frequency Sampling Method	4	2 hrs. Lecture + 2 hrs. Practice	Assignment 5 QN-6	Text Book-1, Chapter 8
Realization of FIR Filter: recursive and non-recursive structure, factors influencing choice of structure, Block diagram representation of Signal flow graph	2	Lecture	Assignment 5 QN-7	Text Book-1, Chapter 8
FIR filter structure: Direct form-I, Direct form-II, Linear phase structure, frequency sampling structure.	2	Lecture	Assignment 5 QN-8	Text Book-1, Chapter 7
Module-VI [8 hrs. Lecture + 6 hrs. Practice]				
Implementation of Discrete-Time Systems, Structure for the Realization of Discrete-Time Systems	2	Lecture	Assignment 6 QN-1	Text Book-1, Chapter 7
Structure for IIR Systems: Direct Form Structures, Cascade-Form Structures, Parallel-Form Structures	2	Lecture	Assignment 6 QN-2	Text Book-1, Chapter 7
Design of IIR Filters: Design by Impulse Invariance method	4	2 hrs. Lecture + 2 hrs. Practice	Assignment 6 QN-3	Text Book-1, Chapter 8
Design by the Bilinear Transformation	3	1 hrs. Lecture + 2 hrs. Practice	Assignment 6 QN-4	Text Book-1, Chapter 8
Design and realization of IIR Butterworth filter from filter specification	3	1 hrs. Lecture + 2 hrs. Practice	Assignment 6 QN-7	Text Book-1, Chapter 8
Module-VII [4 hrs. Lecture + 8 hrs. Practice]				
Introduction, DSP processor memory Architecture	4	2 hrs. Lecture + 2 hrs. Practice	Assignment 7 QN-1	Text Book-2, Chapter 15
Examples of DSP processor, pipelining	1	Lecture	Assignment 7 QN-2	Text Book-2, Chapter 15

First generation TMS320c1x processors, second generation TMS320c2x processors, third generation TMS320c3x processors, fourth generation TMS320c4x processors	3	1 hrs. Lecture + 2 hrs. Practice	Assignment 7 QN-3	Text Book-2, Chapter 15
Filter design and implementation by using DSP processor	4	Practice	Assignment 6 QN-4	Text Book-2, Chapter 15
Total (hrs.)	75	45 hrs. Lecture + 30 hrs. Practice		

Domain- Industrial Automation

Course Code	Course Title	Course Nature	Credits
DEIA0101	General PLC	Theory	2
DEIA0201	Basic Electrical (Automation based) and Panel Designing	Practice	2
DEIA0401	Supervisory Control and Data Acquisition (SCADA)	Theory+ Practice	3
DEIA0402	Micro Range Programmable Logic Controller	Theory+ Practice	3
DEIA0403	Small Range Programmable Logic Controller	Theory+ Practice	3
DEIA0404	Medium Range Programmable Logic Controller	Theory+ Practice	3
DEIA0202	Human Machine Interface (HMI)	Practice	2
DEIA0203	Variable Frequency Drive	Practice	2
DEET0300	Project		6
DEET0800	Internship		4
		Total	30

General PLC

Course Title	Code	Type of course	T-P-PJ	Prerequisite
General PLC	DEIA0101	Theory	2-0-0	Nil

Objective

- To teach the concept of Programmable Logic Controller and the application of the controllers.

Course Outcome

- Students will gain knowledge of Programmable logic controller used in industries.
- Students will develop skill of designing Automatic Control System using PLC.

Evaluation Systems

	Component	% of Marks	Method of Assessment
Internal Examination	Internal Theory	30	Written Examination
	Assignment	5	Report or Presentation + Learning Record
	Attendance	5	Based on Class Attended
External Examination	External Theory	60	Written Examination
Total		100	

Course Outline

Module I: What Is PLC

(4 Hours)

Theory

Definition of PLC. Brief description about PLC. Why to use PLC in industry. How to choose a PLC for industry.

Module-II: Types of PLC

(5 Hours)

Theory

Block Diagram. Functional block diagram of PLC. Detail description of each component of PLC.

- a) Power Supply
- b) CPU & its role
- c) Memory and type
- d) Input & Output Modules and their role
- e) Rack & Slot.

Module-III: Operation of PLC (3 Hours)

Theory

Input & Output wiring. Signal flow. Internal structure of PLC.

Module-IV: Different PLC Brands (5 Hours)

Theory

Leading PLC Brands. Different CPUs series. Different groups of PLC.

Module-V: PLC Driver Communication (4 Hours)

Theory

Discussion on serial & parallel communication.

Description about:-

- a) Protocol.
- b) Standard.
- c) Baud rate.
- d) Bus system.
- e) Time Cycle
- f) Scan time

Module-VI: Programming Languages (7 Hours)

Theory

Programming standards. Programming rules. Different programming languages. NO-NC Concept. How to write a program (concept).

Module-VII: Number System (2 Hours)

Theory

Brief discussion on number systems and their conversions.

Reference Book

1. Madhuchhanda Mitra and Samarjit Sengupta, "Programmable Logic Controllers and Industrial Automation: An Introduction" 2nd Edition"

Session Plan

Topics	No. of Sessions (in hrs.)	Activity	Assignment	Suggested Reading
Module – 1 (WHAT IS PLC) (Theory- 1 hours)				
Definition of PLC. Description. Compact and modular PLC. Why to use PLC in industry. How to choose a PLC for industry	4	Lecture	Assignment 1.1	Reference Book (RB)

Module – 2 (TYPES OF PLC) (Theory- 5 hours)				
General Block Diagram. Functional block diagram of PLC. Detail description of each component of PLC. a) Power Supply b) CPU & its role c) Memory and type d) Input & Output Modules and their role e) Rack & Slot.	5	Lecture	Assignment 1.2	RB
Module – 3 (OPERATION OF PLC) (Theory- 3 hours)				
Input & Output wiring. Signal flow. Internal structure.	3	Lecture	Assignment 1.3	RB
Module – 4 (PLC BRANDS) (Theory- 4 hours)				
Leading brands of plc. Different CPUs series. Different groups of PLC.	4	Lecture	Assignment 1.4	RB
Module – 5 (PLC DRIVER COMMUNICATION) (Theory- 5 hours)				
Discussion on serial & parallel communication. Description about :- a) Protocol. b) Standard. c) Baud rate. d) Bus system. e) Time Cycle f) Scan time	5	Lecture	Assignment 1.5	RB
Module – 6 (PROGRAMMING LANGUAGE) (Theory- 7 hours)				
Programming standards. Programming rules. Different programming software. NO-NC Concept. How to write a program (concept).	7	Lecture	Assignment 1.6	RB
Module – 7 (NUMBER SYSYTEMS) (Theory- 2 hours)				
Discussion on number systems and their conversions.	2	Lecture+ Practice	Assignment 1.7	RB
Total- 30 Hours (Theory- 30 hours)				

Basic Electrical (Automation based) and Panel Designing

Course Title	Code	Type of course	T-P-PJ	Prerequisite
Basic Electrical (Automation based) and Panel Designing	DEIA0201	Practice	0-2-0	Nil

Objective

- To teach the concept of Programmable Logic Controller based electrical panel design.

Course Outcome

- Students will gain knowledge of PLC based wiring concept of panel as used in industries.
- Students will develop skill of designing electrical panels.

Evaluation Systems

Internal Examination	Component	% of Marks	Method of Assessment
	Internal Practice	50 (40+10)	Lab Work + Learning Record
External Examination	External Practice	50	Lab Work
Total		100	

Course Outline

Module-I: Introduction

(1 Hours)

Theory

Fundamentals of electrical and electronic components required for electrical panel designing using PLC.

Module-II: Power Supply

(7 Hours)

Theory

Power Supply Systems, Conversion of 230 Vac to 24 V dc and vice-versa with circuit description, Basic concept of SMPS.

Practice

1. Conversion of 230 Vac to 24Vdc
2. Transformers, diodes and regulator ICs.

Module-III: Basic Industrial Switches & Sensors

(4 Hours)

Theory

Pushbuttons, toggle switches, Limit switch, proximity switch, optical switch, pressure switch, etc

Practice

3. Checking the operations of different Sensors and switches.

Module-IV: RELAY

(10 Hours)

Theory

Basic description of RELAY, Practical uses of relay, Latching using relay, how to switch a 230Vac load using 24Vdc.

Practice

4. Latching and unlatching circuit using relay.
5. Interlocking circuit using relay.
6. Switching of 220Vac devices using (24Vdc).

Module-V: CONTACTOR

(10 Hours)

Theory

Basic description of CONTACTORS and auxiliary contacts, Holding(latching) circuit & interlocking with Aux contacts.

Practice

7. Latching and unlatching circuit using relay & contactor.
8. Interlocking circuit using relay & contactor..
9. Switching of 440Vac devices using PLC's output (24Vdc).

Module-VI: PANEL DESIGNING

(2 Hours)

Theory

Introduction to Control & Power Circuit, Control Wiring with PLC.

Module-VII: STARTER WIRING

(11 Hours)

Theory

Control circuit of starter using PLC, power circuit of starter.

Practice

10. DOL Starter control wiring, power wiring using PLC
11. FWD-REV Starter control wiring, power wiring using PLC
12. STAR-DELTA Starter control wiring, power wiring using PLC

Reference Book

1. Madhuchhanda Mitra and Samarjit Sengupta, "Programmable Logic Controllers and Industrial Automation: An Introduction" 2nd Edition"

Session Plan

Topics	No. of Sessions (in hrs.)	Activity	Assignment	Suggested Reading
Module – 1 (INTRODUCTION) (Theory- 4 hours)				
Fundamentals of electrical and electronic components required for electrical panel designing using PLC	1	Lecture	Assignment 1.1	Reference Book (RB)
Module – 2 (POWER SUPPLY) (Theory- 3 hours + Practice- 4 hours)				
Supply Systems. Conversion of 230 Vac to 24 V dc and vice-versa with circuit description. Basic concept of SMPS. Conversion of 230 Vac to 24Vdc transformers, diodes and regulator ICs	3+4	Lecture+ Practice	Assignment 1.2	RB
Module – 3 (BASIC INDUSTRIAL SWITCHES & SENSORS) (Theory- 2 hours + Practice- 2 hours)				
Pushbuttons, toggle switches, Limit switch, proximity switch, optical switch, pressure switch, etc. Checking the operations of different Sensors and switches	2+2	Lecture+ Practice	Assignment 1.3	RB
Module – 4 (RELAY) (Theory- 2 hours + Practice- 8 hours)				
Basic description of Relay, Practical uses of relay. Latching using relay, How to switch a 230Vac load using 24Vdc. a) Latching and unlatching circuit using relay. b) Interlocking circuit using relay. c) Switching of 220Vac devices using (24Vdc).	2+8	Lecture+ Practice	Assignment 1.4	RB
Module – 5 (CONTACTOR) (Theory- 2 hours + Practice- 8 hours)				
Basic description of contactors and auxiliary contacts. Holding (latching) circuit & interlocking with Aux contacts. a) Latching circuit using relay & contactor.	2+8	Lecture+ Practice	Assignment 1.5	RB

b) Interlocking circuit using relay & contactor.. c) Switching of 440Vac devices using PLC's output (24Vdc).				
Module – 6 (PANEL DESIGNING) (Theory- 2 hours)				
Introduction to Control & Power Circuit. Control Wiring with PLC	2	Lecture	Assignment 1.6	
Module – 7 (STARTER WIRING) (Theory- 3 hours + Practice- 8 hours)				
Control circuit of starter using PLC. Power circuit of starter. a) DOL Starter control using PLC, power wiring b) FWD-REV Starter control using PLC, power wiring c) STAR-DELTA Starter control wiring using PLC, power wiring	3+8	Lecture+ Practice	Assignment 1.7	RB
Total- 45 Hours(Theory- 15 hours + Practice- 30 hours)				

Supervisory Control and Data Acquisition (SCADA)

Schneider Wonderware in Touch & RS-VIEW-32

Course Title	Code	Type of course	T-P-PJ	Prerequisite
Supervisory Control and Data Acquisition (SCADA)	DEIA0401	Theory+ Practice	2-1-0	Nil

Objective

- To teach the concept of SCADA, total control system of industry.

Course Outcome

- Students will gain knowledge of SCADA designing.
- Students will develop skill of designing SCADA based control system..

Evaluation Systems

Internal Examination	Component	% of Marks	Method of Assessment
	Internal Theory	20	Written examination
	Internal Practice	30(20+10)	Lab work + Learning Record
External Examination	External Theory	30	Written examination
	External Practice	20	Lab work
Total		<i>100</i>	

Course Outline

Module-I: Introduction to SCADA

(2 Hours)

Theory

Introduction and SCADA Basics, General SCADA theory, Importance of SCADA in Industrial Automation, Benefit of SCADA, DATA ACQUISITION. Leading SCADA Vendors, Architecture of SCADA (Open & Proprietary)

Module-II: Introduction to INTOUCH & RS-VIEW-32

(4 Hours)

Theory

Introduction to InTouch, Basic operations related to Intouch Editor, types of windows, How to Open window, windows property.

Practice

1. Basic operation of Intouch SCADA software.

Module-III: TOOLBARS

(5 Hours)

Theory

General Toolbar, New window, Open window, close window, save window, save all, duplicate selection, cut to clipboard, copy, paste, undo and redo.

Practice

2. Operation & utility of general toolbars.

Module-IV: WIZARDS

(15 Hours)

Theory

Wizard toolbar, Alarm display, Buttons, clock, lights, meter, runtime tools (for alarm monitor), slider, switches, SYMBOL FACTORY, Text Display, Trend, Value Display Fonts, Bold/Italic/Underline, Enlarge/ reduce font, Left/Centre/Right.

Practice

3. Wizard toolbar details, value display, user input.
4. Symbol factory toolbar.
5. Different operational properties

Module-V: INTOUCH & RS-View 32 SCADA FEATURES

(14 Hours)

Theory

Dynamic graphical display, How to use the dynamic features, Alarms, Real Trend, Historical trend.

Practice

6. Dynamic graphical display.
7. Alarms
8. Real trends / Historical trends

Module-VI: INTOUCH RS-View 32 SCADA FEATURES

(11Hours)

Theory

Data base connectivity, Report generation, Recipe management, Security.

Practice

9. Data base connectivity
10. Report Generation
11. Recipe Management
12. Security

Module-VII: INTOUCH and RS-View 32 SCADA FEATURES

(9 Hours)

Theory

Script, Networking, Device connectivity.

Practice

13. Script.
14. Networking
15. Device connectivity.

Reference Book

1. K S Manoj, “Industrial Automation with SCADA: Concepts, Communications and Security”

Session Plan

Topics	No. of Sessions (in hrs.)	Activity	Assignment	Suggested Reading
Module – 1 (INTRODUCTION OF SCADA) (Theory- 2 hours)				
Introduction and SCADA Basics, General SCADA theory, Importance of SCADA in Industrial Automation, Benefit of SCADA, DATA ACQUISITION. Leading SCADA Vendors, Architecture of SCADA (Open & Proprietary).	2	Lecture	Assignment 1.1	Reference BOOK (IND)
Module – 2 (INTRODUCTION TO INTOUCH) (Theory- 2 hours + Practice- 2 hours)				
Introduction to InTouch & RS-View 32, Basic operations related to Intouch Editor, types of windows, How to Open window, windows property. a) Basic operation of Intouch & RS-View 32 SCADA software.	2+2	Lecture+ Practice	Assignment 1.2	RB
Module – 3 (TOOLBARS) (Theory- 3 hours + Practice- 2 hours)				
General toolbar, New window, Open window, close window, save window, save all, duplicate selection, cut to clipboard, copy, paste, undo and redo. a) Operation of general toolbars.	3+2	Lecture+ Practice	Assignment 1.3	RB
Module – 4 (WIZARDS) (Theory- 9 hours + Practice- 6 hours)				
Wizard toolbar, Alarm display, Buttons, clock, lights, meter, runtime tools (for alarm monitor), slider, switches, Text Display. SYMBOL FACTORY, Trend, Value Display. Fonts, Bold /Italic / Underline, Enlarge / reduce font,	9+6	Lecture+ Practice	Assignment 1.4	RB

Left/Centre/Right. a) Wizard toolbar details, value display, user input. b) Symbol factory toolbar. c) Different operational properties				
Module – 5 (INTOUCH & RS-VIEW FEATURES) (Theory- 4 hours + Practice-10 hours)				
Dynamic graphical display, How to use the dynamic features, Alarms, Real Trend, Historical trend. a) Dynamic graphical display. b) Alarms c) Real trends / Historical trends.	4+10	Lecture+ Practice	Assignment 1.5	RB
Module – 6 (INTOUCH & RS-VIEW FEATURES) (Theory- 5 hours + Practice- 6 hours)				
Data base connectivity, Report generation, Recipe management, Security a) Data base connectivity b) Report Generation c) Recipe Management d) Security	5+6	Lecture+ Practice	Assignment 1.6	RB
Module – 7 (INTOUCH & RS-VIEW FEATURES) (Theory- 5 hours + Practice- 4 hours)				
Script, Networking, Device connectivity. a) Script. b) Networking c) Device connectivity.	5+4	Lecture+ Practice	Assignment 1.7	RB
Total- 60 Hours(Theory- 30 hours + Practice- 30 hours)				

Micro Range Programmable Logic Controller

Course Title	Code	Type of course	T-P-PJ	Prerequisite
Micro range Programmable Logic Controller	DEIA0402	Theory+Practice	2-1-0	Nil

Objective

<ul style="list-style-type: none"> To teach the concept of Allen Bradley PLC Control system.

Course Outcome

<ul style="list-style-type: none"> Students will gain knowledge of AB PLC Programming & design. Students will develop skill of designing PLC based control system..

Evaluation Systems

Internal Examination	Component	% of Marks	Method of Assessment
	Internal Theory	20	Written examination
	Internal Practice	30(20+10)	Lab work + Learning Record
External Examination	External Theory	30	Written examination
	External Practice	20	Lab work
Total		100	

Allen Bradley SLC 500

Course Outline

Module-I: Introduction

(4 Hours)

Theory

Introduction to controller Family, SLC 500 features: Details about CPUs, Memory Organisation, Program files and Data files

Module-II: ARCHITECTURE OF AB CONTROLLERS

(3 Hours)

Theory

Architecture, Rack, slot, channel, full structure description and max expansion.

Module-III: ADDRESSING

(3 Hours)

Theory

Physical I/O addressing (both Digital & Analog), Memory Instructions Addressing like Timer, Counters, Binary, Integers etc.

Module-IV: HARDWARE LINKNING

(4 Hours)

Theory

Hardware linking Using RSLinx, details about protocols AB_DF1-1, TCP-1, EMU-500

Practice

1. Opening of RS-Linx software and setting the parameters.
2. Setting the communication protocol.

Module-V: PROGRAMMING BASICS

(8 Hours)

Theory

Programming concept using Ladder diagram, Basics of Ladder Programming (rung, rail, rules, New rung, Rung branch, XIC, XIO, OTE, OTL, OUT.), NO-NC concept, Logic Gates implementation .

Practice

3. Basic ladder logic programming .
4. NO-NC concept.
5. Digital gate's logic creation.

Module-VI: TIMERS, COUNTER, COMPARE

(18 Hours)

Theory

Timer basics, Detail programming of TON, TOF, RTO, RES with applications.

Basics of Counter, Detail Programming of CTU, CTD, RES with applications.

Basics of comparators, Implementation of LIM, MEQ, EQU, NEQ, LES, GRT, LEQ, GEQ.

Practice

6. TON / TOF / RTO / RES programming
7. CTU / CTD / RES programming
8. LIM, MEQ, EQU, NEQ, LES, GRT, LEQ, GEQ programming

Module-VII: DIFFERENT OPERATIONAL BLOCKS

(20 Hours)

Theory

Compute math block: CPT, ADD, SUB, MUL, DIV, SQR, NEG, TOD, FRD

Move logic block : MOV,MVM, AND, OR, XOR, NOT. CLR.

File shift block : BSL, BSR, SQC, SQL,SQO, FFL,FFU,LFL,LFU

Program control block : JMP,LBL,JSR,MCR

Practice

9. CPT, ADD, SUB, MUL, DIV, SQR, NEG, TOD, FRD
10. MOV,MVM, AND, OR, XOR, NOT. CLR
11. BSL, BSR, SQC, SQL,SQO, FFL,FFU,LFL,LFU
12. JMP,LBL,JSR,MCR

Reference Book

1. Gary D Anderson, “PLC Programming using RS Logix”

Session Plan

Topics	No. of Sessions (in hrs.)	Activity	Assignment	Suggested Reading
Module – 1 (INTRODUCTION) (Theory- 4 hours)				
Introduction to controller Family. SLC 500 features: Details about CPUs, Memo Organisation, Program files and Data files	4	Lecture+ Practice	Assignment 1.1	Reference Book (RB)
Module – 2 (ARCHITECTURE OF CONTROLLERS) (Theory- 3 hours)				
Architecture, Rack, slot, channel, full structure description and max expansion.	3	Lecture+ Practice	Assignment 1.2	RB
Module – 3 (ADDRESSING) (Theory- 3 hours)				
Physical I/O addressing (both Digital & Analog). Memory Instructions Addressing like Timer, Counters, Binary, Integers etc	3	Lecture+ Practice	Assignment 1.3	RB
Module – 4 (HARDWARE LINKING) (Theory- 2 hours + Practice- 2 hours)				
Hardware linking Using RSLinx. Details about protocols AB_DF1-1, TCP-1, EMU-500. a) Opening of RS-Linx software and setting the parameters. b) Setting the communication protocol.	2+2	Lecture+ Practice	Assignment 1.4	RB
Module – 5 (PROGRAMMING BASICS) (Theory- 4 hours + Practice- 4 hours)				
Programming concept using Ladder diagram. Basics of Ladder Programming (rung, rail, rules, New rung, Rung branch. XIC, XIO, OTE, OTL, OUT.), NO-NC concept, Logic Gates implementation. a) Basic ladder logic programming . b) NO-NC concept. c) Digital gate’s logic creation	4+4	Lecture+ Practice	Assignment 1.5	RB
Module – 6 (TIMERS, COUNTER, COMPARE) (Theory- 6 hours + Practice- 12 hours)				

<p>Timer basics, Detail programming of TON, TOF, RTO, RES with applications. Basics of Counter, Detail Programming of CTU, CTD, RES with applications. Basics of comparators, Implementation of LIM, MEQ, EQU, NEQ, LES, GRT, LEQ, GEQ.</p> <p>a) TON / TOF / RTO / RES programming b) CTU / CTD / RES programming. c) LIM, MEQ, EQU, NEQ, LES, GRT, LEQ, GEQ programming</p>	6+12	Lecture+ Practice	Assignment 1.6	RB
Module – 7 (DIFFERENT OPERATIONAL BLOCKS) (Theory- 8 hours + Practice- 12 hours)				
<p>Compute math block: CPT, ADD, SUB, MUL, DIV, SQR, NEG, TOD, FRD. Move logic block : MOV,MVM, AND, OR, XOR, NOT. CLR. File shift block : BSL, BSR, SQC, SQL,SQO, FFL,FFU,LFL,LFU. Program control block : JMP,LBL,JSR,MCR. ANALOG OPERATION Description of analog standards for field signals and SCP instruction implementation in ladder</p> <p>ADDITIONAL STUDIES Forcing of I/Os, Uploading, simulation Device Connectivity with SCADA.</p> <p>a) CPT, ADD, SUB, MUL, DIV, SQR, NEG, TOD, FRD b) MOV,MVM, AND, OR, XOR, NOT. CLR a) BSL, BSR, SQC, SQL,SQO, FFL,FFU,LFL,LFU b) JMP,LBL,JSR,MCR c) Analog communication d) Device connectivity</p>	8+12	Lecture+ Practice	Assignment 1.7	RB
Total- 60 Hours(Theory- 30 hours + Practice- 30 hours)				

Small Range Programmable Logic Controller

Course Title	Code	Type of course	T-P-PJ	Prerequisite
Small range Programmable Logic Controller	DEIA0403	Theory+Practice	2-1-0	Nil

Objective

- To teach the concept of Siemens PLC Control system.

Course Outcome

- Students will gain knowledge of Siemens PLC Programming & design.
- Students will develop skill of designing Siemens PLC based control system..

Evaluation Systems

Internal Examination	Component	% of Marks	Method of Assessment
	Internal Theory	20	Written examination
	Internal Practice	30(20+10)	Lab work + Learning Record
External Examination	External Theory	30	Written examination
	External Practice	20	Lab work
Total		<i>100</i>	

Siemens S7-300

Course Outline

Module-I: INTRODUCTION (4 Hours)

Theory

Introduction: Siemens Family controllers, S7-200, s7-300, S7-400.

Module-II: ARCHITECTURE OF SIEMENS CONTROLLERS (3 Hours)

Theory

PLC components like Power Supply, CPU, rail, IM, SM, CP etc Architecture, Rack, slot, channel, full structure description and max expansion.

Module-III: ADDRESSING (3 Hours)

Theory

Physical I/O addressing (both Digital & Analog), Memory Instructions Addressing like Timer, Counters, Binary, Integers etc.

Module-IV: HARDWARE LINKNING (4 Hours)

Theory

Hardware linking Using Simetic Manager, details about protocols , Linking with PG/PC using MPI and simulation

Practice

1. Opening of Simetic Manager software and setting the parameters.
2. Setting the communication protocol.

Module-V: PROGRAMMING BASICS

(8 Hours)

Theory

Programming concept using Ladder diagram, Basics of Ladder Programming (Network, rail, rules, New network, branch, NO, NC, R-S.), NO-NC concept, Logic Gates implementation .

Practice

3. Basic ladder logic programming .
4. NO-NC concept.
5. Digital gate's logic creation.

Module-VI: TIMERS, COUNTER, COMPARE

(18 Hours)

Theory

Timer basics, Detail programming of timers with applications.
Basics of Counter, Detail Programming of CU, CD with applications.
Basics of comparators and their Implementation

Practice

6. Timer programming
7. CU / CD programming
8. Comparator programming

Module-VII: DIFFERENT OPERATIONAL BLOCKS

(20 Hours)

Theory

Integer block: ADD, SUB, MUL, DIV.
Move logic block : MOV
Program control block : JMP,LBL,MCR
Function, Function block, Data block.

Practice

9. ADD, SUB, MUL, DIV,
10. MOV, JMP,LBL,MCR

Reference Book

1. EAL COURSE TECH,” IEMENS S7 BASIC PLC PROGRAMMING”[Print Replica] Kindle Edition,

Session Plan

Topics	No. of Sessions (in hrs.)	Activity	Assignment	Suggested Reading
Module – 1 (INTRODUCTION) (Theory- 4 hours)				
Introduction to controller Family S730 features:Details about CPUs, Memo Organisation, Program files and Data files	4	Lecture	Assignment 1.1	Reference BOOK (IND)
Module – 2 (ARCHITECTURE OF CONTROLLERS) (Theory- 3 hours)				
Architecture, Rack, slot, channel, full structure description and max expansion.	3	Lecture	Assignment 1.2	RB
Module – 3 (ADDRESSING) (Theory- 3 hours)				
Physical I/O addressing (both Digital & Analog). Memory Instructions Addressing like Timer, Counters, Binary, Integers etc.	3	Lecture	Assignment 1.3	RB
Module – 4 (HARDWARE LINKING) (Theory- 2 hours + Practice- 2 hours)				
Hardware linking Using Simetic manager. Linking with PG/PC using MPI and simulation. a) Opening of Simetic Manager software and setting the parameters. b) Setting the communication protocol.	2+2	Lecture+ Practice	Assignment 1.4	RB
Module – 5 (PROGRAMMING BASICS) (Theory- 4 hours + Practice- 4 hours)				
Programming concept using Ladder diagram. Basics of Ladder Programming (rung, rail, rules, New rung, Rung branch. NO-NC concept, Logic Gates implementation. a) Basic ladder logic programming b) NO-NC concept. c) Digital gate’s logic creation	4+4	Lecture+ Practice	Assignment 1.5	RB
Module – 6 (TIMERS, COUNTER, COMPARE) (Theory- 6 hours + Practice- 12 hours)				
Timer basics, Detail programming of timers with applications. Basics of Counter, Detail Programming of CU, CD, with applications. Basics of comparators and	6+12	Lecture+ Practice	Assignment 1.6	RB

<p>their Implementation.</p> <p>a) TON / TOF / RTO programming</p> <p>b) CU / CD programming</p> <p>c) Comparator programming</p>				
Module – 7 (DIFFERENT OPERATIONAL BLOCKS) (Theory- 8 hours + Practice- 12 hours)				
<p>Compute math block: ADD, SUB, MUL, DIV</p> <p>Move logic block : MOV, AND, OR, XOR, NOT.</p> <p>File shift block</p> <p>Program control block : JMP,LBL,MCR.</p> <p>a) ADD, SUB, MUL, DIV</p> <p>b) MOV, AND, OR, XOR, NOT</p> <p>c) JMP,LBL,JSR,MCR</p> <p>d) FC. FB, DB</p> <p>e) ANALOG OPERATION</p> <p>f) Uploading, simulation Device</p> <p>g) Connectivity with SCADA</p>	8+12	Lecture+ Practice	Assignment 1.7	RB
Total- 60 Hours(Theory- 30 hours + Practice- 30 hours)				

Medium Range Programmable Logic Controller

Course Title	Code	Type of course	T-P-PJ	Prerequisite
Medium range Programmable Logic Controller	DEIA0404	Theory+ Practice	2-1-0	Nil

Objective

- To teach the concept of FESTO & GE-FANUC PLC Control system.

Course Outcome

- Students will gain knowledge of FESTO & GE-FANUC PLC Programming & design.
- Students will develop skill of designing PLC based control system..

Evaluation Systems

Internal Examination	Component	% of Marks	Method of Assessment
	Internal Theory	20	Written examination
	Internal Practice	30(20+10)	Lab work + Learning Record
External Examination	External Theory	30	Written examination
	External Practice	20	Lab work
Total		<i>100</i>	

FESTO PLC, GE-Versamax- Microplus

Course Outline

Module-I: INTRODUCTION (4 Hours)

Theory

Introduction to FESTO & GE Family controllers.

Module-II: ARCHITECTURE OF SIEMENS CONTROLLERS (3 Hours)

Theory

PLC components like Power Supply, CPU, Architecture, full structure description and max expansion.

Module-III: ADDRESSING (3 Hours)

Theory

Physical I/O addressing (both Digital & Analog), Memory Instructions Addressing like Timer, Counters, Binary, Integers etc.

Module-IV: HARDWARE LINKING

(4 Hours)

Theory

Hardware linking Using software, details about protocols, Linking of PLC and computer .

Practice

1. Opening of software and setting the parameters.
2. Setting the communication protocol.

Module-V: PROGRAMMING BASICS

(8 Hours)

Theory

Programming concept using Ladder diagram, Basics of Ladder Programming (rung, rail, rules, New rung, Rung branch, NO, NC, R-S.), NO-NC concept, Logic Gates implementation .

Practice

3. Basic ladder logic programming .
4. NO-NC concept.
5. Digital gate's logic creation.

Module-VI: TIMERS, COUNTER, COMPARE

(18 Hours)

Theory

Timer basics, Detail programming of timers with applications.
Basics of Counter, Detail Programming of CU, CD with applications.
Basics of comparators and their Implementation

Practice

6. Timer programming
7. CU / CD programming
8. Comparator programming

Module-VII: DIFFERENT OPERATIONAL BLOCKS

(20 Hours)

Theory

Integer block: ADD, SUB, MUL, DIV.
Move logic block : MOV
Program control block : JMP,LBL,MCR

Practice

9. ADD, SUB, MUL, DIV,
10. MOV, JMP,LBL,MCR

Reference Book

1. Madhuchhanda Mitra and Samarjit Semgupta, "Programmable Logic Controllers and Industrial Automation: An Introduction 2nd Edition"

Session Plan

Topics	No. of Sessions (in hrs.)	Activity	Assignment	Suggested Reading
Module – 1 (INTRODUCTION) (Theory- 4 hours)				
Introduction to controller Family.Fes features: Details about CPUs, Memo Organisation, Program files and Data file	4	Lecture+ Practice	Assignment 1.1	Reference Book (RB)
Module – 2 (ARCHITECTURE OF CONTROLLERS) (Theory- 3 hours)				
Architecture, Rack, slot, channel, full structure description and max expansion.	3	Lecture+ Practice	Assignment 1.2	RB
Module – 3 (ADDRESSING) (Theory- 3 hours)				
Physical I/O addressing (both Digital & Analog). Memory Instructions Addressing like Timer, Counters, Binary, Integers etc	3	Lecture+ Practice	Assignment 1.3	RB
Module – 4 (HARDWARE LINKNING) (Theory- 2 hours + Practice- 2 hours)				
Hardware linking Using software. Linking with PLC to PC and simulation. a) Opening of software and setting the parameters. b) Setting the communication protocol.	2+2	Lecture+ Practice	Assignment 1.4	RB
Module – 5 (PROGRAMMING BASICS) (Theory- 4 hours + Practice- 4 hours)				
Programming concept using Ladder diagram. Basics of Ladder Programming (rung, rail, rules, New rung, Rung branch. NO-NC concept, Logic Gates implementation. a) Basic ladder logic programming . b) NO-NC concept. c) Digital gate's logic creation	4+4	Lecture+ Practice	Assignment 1.5	RB
Module – 6 (TIMERS, COUNTER, COMPARE) (Theory- 6 hours + Practice- 12 hours)				
Timer basics, Detail programming of timers with applications. Basics of Counter, Detail Programming of CU, CD, with applications. Basics of comparators and their Implementation	6+12	Lecture+ Practice	Assignment 1.6	RB

a) TON / TOF / b) CU / CD programming c) Comparator programming				
Module – 7 (DIFFERENT OPERATIONAL BLOCKS) (Theory- 8 hours + Practice- 12 hours)				
Compute math block: ADD, SUB, MUL, DIV. Move logic block : MOV, AND, OR, XOR, NOT. File shift block. Program control block : JMP,LBL,MCR. a) ADD, SUB, MUL, DIV b) MOV, AND, OR, XOR, NOT c) JMP,LBL,JSR,MCR d) ANALOG OPERATION e) Device Connectivity with SCADA	8+12	Lecture+ Practice	Assignment 1.7	RB
Total- 60 Hours (Theory- 30 hours + Practice- 30 hours)				

Human Machine Interface (HMI)

Course Title	Code	Type of course	T-P-PJ	Prerequisite
Human machine Interface (HMI)	DEIA0202	Practice	0-2-0	Nil

Objective

<ul style="list-style-type: none"> To teach the concept of Human Machine Interface system.

Course Outcome

<ul style="list-style-type: none"> Students will gain knowledge of HMI. Students will develop skill of designing HMI based control system..

Evaluation Systems

Internal Examination	Component	% of Marks	Method of Assessment
	Internal Practice	50 (40+10)	Lab Work + Learning Record
External Examination	External Practice	50	Lab Work
Total		100	

Course Outline

Module-I: INTRODUCTION

(2 Hours)

Theory

Introduction Details of Human Machine Interface, HMI Basics, Difference between SCADA & HMI, Requirements, Leading Vendors, Specification of Panel view family, Features, Communication settings in HMI & PC

Module-II: APPLICATION DEVELOPMENT

(2Hours)

Theory

New application development, HMI Screen development, Dashboard, Terminal setting, file transfer

Module-III: WORKING ON SOFTWARE

(6 Hours)

Theory

Introduction to software, tag declaration, tag type, screen type, control, screen, property.

Practice

1. Opening of software and setting the parameters.
2. Setting the communication protocol.

Module-IV: CONTROL WINDOW**(6 Hours)****Theory**

Entry, display, Drawing tools, Advance, Library.

Practice

3. Display & Drawing tools operation and application.
4. Advance Library operation and utility.

Module-V: PROPERTY WINDOW BASICS**(6 Hours)****Theory**

Property window, Appearance, Common, Navigation, Connections, Screen.

Practice :

5. Working of property window.
6. Navigation operation.
7. Connection screen configuration.

Module-VI: DESIGNING OF APPLICATION**(12 Hours)****Theory**

Designing of application, discrete type, Analog type

Practice

8. Discreet type display design
9. Analog type display design.

Module-VII: DIFFERENT DYNAMIC DISPLAYS**(11 Hours)****Theory**

Alarm, Trend, Security, Recipe, Device Connectivity,

Practice

10. Alarm, Trend, Security
11. Recipe, Device Connectivity

Reference Book

1. K S Manoj, "Industrial Automation with SCADA: Concepts, Communications and Security"

Session Plan

Topics	No. of Sessions (in hrs.)	Activity	Assignment	Suggested Reading
Module – 1 (INTRODUCTION) (Theory- 2 hours)				
Introduction Details of Human Machine Interface, HMI Basics. Difference between SCADA & HMI, Requirements, Leading Vendors, Specification of Panel view family, Features, Communication settings HMI & PC.	2	Lecture+ Practice	Assignment	Reference Book (RB)
Module – 2 (APPLICATION DEVELOPMENT) (Theory- 2 hours)				
New application development, HMI Screen development, Dashboard, Terminal setting, file transfer	2	Lecture+ Practice	Assignment	RB
Module – 3 (WORKING ON SOFTWARE) (Theory- 2 hours + Practice- 4 hours)				
Introduction to software, tag declaration, tag type. Screen type, control, screen, property. a) Opening of software and setting the parameters. b) Setting the communication protocol.	2+4	Lecture+ Practice	Assignment	RB
Module – 4 (CONTROL WINDOW) (Theory- 2 hours + Practice- 4 hours)				
Entry, display, Drawing tools. Advance Library. a) Display & Drawing tools operation and application. b) Advance Library operation and utility	2+4	Lecture+ Practice	Assignment	RB
Module – 5 (PROPERTY WINDOW BASICS) (Theory- 2 hours + Practice- 4 hours)				
Property window, Appearance, Communication. Navigation, Connections, Screen. a) Working of property window. b) Navigation operation. c) Connection screen configuration.	2+4	Lecture+ Practice	Assignment	RB
Module – 6 (DESIGNING OF APPLICATION) (Theory- 2 hours + Practice- 10 hours)				
Designing of application , Discrete type. Designing of application, analog type. a) Discrete type display design b) Analog type display design.	2+10	Lecture+ Practice	Assignment	RB

Module – 7 (DIFFERENT DYNAMIC DISPLAYS) (Theory- 3 hours + Practice- 8 hours)				
Alarm, Trend, Security. Recipe, Device Connectivity. a) Alarm, Trend, Security b) Recipe, Device Connectivity	3+8	Lecture+ Practice	Assignment	RB
Total- 45 Hours (Theory- 15 hours + Practice- 30 hours)				

Variable Frequency Drive

Course Title	Code	Type of course	T-P-PJ	Prerequisite
Variable Frequency Drive	DEIA0203	Practice	0-2-0	Nil

Objective

- ✓ To teach the concept of VFD Controller.

Course Outcome

- ✓ Students will gain knowledge of operation of VFD.
- ✓ Students will develop skill of designing VFD based control system..

Evaluation Systems

Internal Examination	Component	% of Marks	Method of Assessment
	Internal Practice	50 (40+10)	Lab Work + Learning Record
External Examination	External Practice	50	Lab Work
Total		100	

Course Outline

Module-I: INTRODUCTION TO DRIVES (2 Hours)

Theory

Introduction to drives. Working principle of drives. Types of drives.

Module-II: APPLICATION (2 Hours)

Theory

Applications of VFD, Features, inside components of VFD, Block Diagram and Architecture.

Module-III: INTRODUCTION TO AB POERFLEX (4M) (2 Hours)

Theory

Introduction to Allen Bradley Powerflex (4M). Parameters in AB Power flex 4M,

Module-IV: BASIC PROGRAMMING OF DRIVES (8 Hours)

Theory

Display group parameters, Parameter of commissioning

Practice

1. Understanding of display parameters.

- Quick commissioning technique.

Module-V: OPERATIONAL MODES OF DRIVES

(8 Hours)

Theory

Local control using Basic Operators Panel, Remote control using pushbuttons and sensors.

Practice

- Local control mode operation using BOP.
- Remote control mode operation using sensors and push buttons.

Module-VI: ADVANCE PROGRAMMING CONCEPT

(12 Hours)

Theory

Ramp time, DC Brake. Skip Frequency. Frequency control. Direction control.

Practice

- Different parameter setting of drive.

Module-VII: PLC & DRIVE COMMUNICATION & CONTROL

(11 Hours)

Theory

Remote mode control connecting with PLC VFD.

Practice

- Input & output connection technique of drive.
- Connection technique of PLC & Drive.

Session Plan

Topics	No. of Sessions (in hrs.)	Activity	Assignment	Suggested Reading
Module – 1 (INTRODUCTION TO DRIVES) (Theory- 2 hours)				
Introduction Details of Human Machine Interface, HMI Basics. Working principle drives. Types of drives.	2	Lecture	Assignment 1.1	Reference Book (RB)
Module – 2 (APPLICATION) (Theory- 2 hours)				
Applications of VFD, Features, inside components of VFD, Block Diagram and Architecture.	2	Lecture+ Practice	Assignment 1.2	RB
Module – 3 (INTRODUCTION TO AB POWERFLEX (4M) (Theory- 2 hours)				
Introduction to Allen Bradley Powerflex (4M). Parameters in AB Power flex 4M. Screen type, control, screen, property	2	Lecture+ Practice	Assignment 1.3	RB
Module – 4 (BASIC PROGRAMMING OF DRIVES) (Theory- 2 hours + Practice- 6 hours)				

Display group parameters. Parameter of commissioning. a) Understanding of display parameters. b) Quick commissioning technique.	2+6	Lecture+ Practice	Assignment 1.4	RB
Module - 5 OPERATIONAL MODES OF DRIVES) (Theory- 2 hours + Practice- 6 hours)				
Local control using Basic Operators Panel. Remote control using pushbuttons and sensors. a) Local control mode operation using BOP. b) Remote control mode operation using sensors and push buttons.	2+6	Lecture+ Practice	Assignment 1.5	RB
Module – 6 (ADVANCE PROGRAMMING CONCEPT) (Theory- 62hours + Practice- 10 hours)				
Ramp time, DC Brake. Skip Frequency. Frequency control. Direction control. a) Different parameter setting of drive.	2+10	Lecture+ Practice	Assignment 1.6	RB
Module – 7 (PLC & DRIVE COMMUNICATION) (Theory- 3 hours + Practice- 8 hours)				
Remote mode control connecting with PLC VFD. a) Input & output connection technique of drive. b) Connection technique of PLC & Drive.	3+8	Lecture+ Practice	Assignment 1.7	RB
Total- 45 Hours (Theory- 15 hours + Practice- 30 hours)				

Domain: Operation and Maintenance of Transmission and Distribution Systems

Sl. No	Course Code	Course Title	Course Nature	Credits
1	DEOM0101	Modern Transmission and Distribution System	Theory	3
2	DEOM0401	Operation and Testing of Power and Distribution Transformer	Theory + Practice	3
3	DEOM0402	System Protection and Auxiliaries	Theory + Practice	3
4	DEOM0102	Construction of HT and LT lines and Cables	Theory	3

5	DEOM0201	Safety Practice and First Aid	Practice	2
6	DEOM0202	Electrical System Layout and Drawing	Practice	2
7	DEOM0103	Power System Market, Act and Regulations	Theory	4
8	DEET0300	Project	Project	6
9	DEET0800	Internship	Practice	4
			Total	30

Course Objective:

To create technically trained manpower readily available for recruitment to the power companies in the area of Transmission & Distribution of electrical power

Course Outcome:

After completion of the course the students will acquire extensive basic and advanced knowledge of

- Operation & Maintenance of Transmission and Distribution accessories
- Necessary safety aspects required in T&D
- Details of associated equipment's
- T&D project management Process flow

Modern Transmission and Distribution System

Course Title	Code	Type of course	T-P-PJ	Prerequisite
Modern Transmission and Distribution System	DEOM0101	Theory	3-0-0	Nil

Objective

- To know the different methods of power transmission and distribution, the different equipment used in transmission and distribution system also to know the operation and maintenance of equipment used in transmission and distribution system.

Course Outcome

- The students will be able to rate and compute the parameters of the major components of the system: lines, cables, transformers, circuit breakers, capacitors and grounding systems.
- The students will understand the principles of protection for short-circuit, lightning strikes and some internal transients.

Evaluation Systems

	Component	% of Marks	Method of Assessment
Internal Examination	Internal Theory	30	Written examination
	Assignment	5	Report or Presentation + Learning Record
	Attendance	5	Based on class attended
External Examination	External Theory	60	Written examination
Total		100	

Course outline

Module-I: General Introduction To Power Generation And Transmission (8 Hours)

Theory

GENERAL INTRODUCTION: Generation, Transmission & Distribution Scenario of India

POWER GENERATION: Types of generation: Conventional and Non-conventional, Thermal Power Plant, Hydro Power Plant, Gas Power Plant, Nuclear Power Plant, Co-generation Various sources Non-conventional Energy Sources.

POWER TRANSMISSION (A) SWITCHYARD/SUBSTATION Types: Generation sub-station, Grid sub-station, Gas Insulated s/s etc, Indoor/outdoor, general comparison.

Module-II: Sub-Station Switchgears And Grounding

(8 Hours)

Theory

SUB-STATION/TRANSMISSION EQUIPMENTS AND SWITCHGEARS - Circuit breaker: Types (MOCB, ABCB, VCB, SF6), constructional details, specifications, interlocks (a) Isolator: Types earth switch, Bus bar (b) CT/CVT. Lighting Arrestors/Lighting Mask (c) Power Line Carrier Communication (PLCC):- Principle, purpose, types of coupling (d) Relays: Types, functions, constructional details, (e) Protection System: Philosophy, types, protection of transformer/reactor, motor, line/feeder generator, bus etc.

GROUNDING:- Ground and Neutral. Touch and Step Potentials. Petersen Coil. Resonant Grounding

AUXILIARY FACILITIES: DG Set Station Battery System etc.

Module-III: Sub-station Maintenance

(9 Hours)

Theory

SUB-STATION MAINTENANCE: (a) Types-Routine, preventive, planned, predictive, breakdown, emergency maintenance, online maintenance of different equipments, (b) Transformer/Reactor Maintenance-Factors affecting the life of transformer/Reactor. Inspection/preliminary testing of various components-oil sampling and testing, oil filtration, Dissolved Gas Analysis (DGA), maintenance schedule (c) Switchgear & protection Maintenance:- Maintenance of CB, Isolator, Earth switch, Support Insulators, CT/CVT, LA, LM, Protective relay maintenance testing . Erection and commissioning pre-commissioning checks/Tests of sub-station.

Module-IV: Characteristics of Loads

(4 Hours)

Theory

Characteristics of Loads: Customer Classes and Categories. Voltage Sensitivity of Loads. Constant Power. Constant Current. Constant Impedance. ZIP Coefficients. Load Curves and Duty Cycle. Coincidental and Non-coincidental Loads. Load Growth.

Module-V: Loss Optimization

(4

Hours) Theory

Optimization: Loss Minimization. System Reconfiguration. Capacitor Switching. (Energy) Conservation Voltage Reduction. Introduction to System Restoration.

Module-VI: Capacitors

(8 Hours)

Theory

Capacitors: Construction . Application of Capacitors in Transmission, Distribution and Industrial Systems. Shunt Capacitors (Voltage Control and Power Factor Correction). Series Capacitors (Line Reactance Compensation). Rating. Capacitor Switching and Operating Problems with Capacitors (Inrush Currents).

Module-VII: Modern Grids**(4 Hours)****Theory**

Modern Grids: Distribution Automation. Distributed Generation. Grid 2030. Nano Grid. Micro Grid. Mini Grid. Smart Grid. Super Grid. The Issues.

Text Books:

1. TuranGonen “Electrical Power Transmission System Engineering: Analysis and Design”, Third Edition, ,CRC Press
2. Kamaraju, “Electrical Power Distribution System”, Tata McGraw-Hill

Reference Books:

1. Soni Gupta,Bhatnagar,”Power System Engineering”, SecondEdition, DhantpatRai Publication
2. J B Gupta, S. K. Kataria& Sons, “Transmission & Distribution Of Electrical Power”, 2009
3. TuranGonen,”Electric Power Distribution Engineering”, Third Edition, CRC Press
4. A S Pabla,”Electrical Power Distribution”, Tata McGraw-Hill,Sixth Edition

Session Plan

Topics	No. of Sessions	Activity	Assignment	Suggested Reading
Module-I: General Introduction To Power Generation And Transmission(8 Hours)				
GENERAL INTRODUCTION Generation, Transmission & Distribution Scenario of India	2	Lecture	Assignment 1.1	TB 1
POWER GENERATION Types of generation: Conventional and Non-conventional, Thermal Power Plant, Hydro Power Plant, Gas Power Plant, Nuclear Power Plant, Co-generation Various sources Non-conventional Energy Sources.	3	Lecture	Assignment 1.2	TB 1
POWER TRANSMISSION SWITCHYARD/SUBSTATION . Types: Generation sub-station, Grid sub-station, Gas Insulated s/s etc. Indoor/outdoor, general comparison	3	Lecture	Assignment 1.3	TB 1

Module-II: Sub-Station Switchgears And Grounding (8 Hours)				
SUB-STATION/TRANSMISSION EQUIPMENTS Switchgears - Circuit breaker: Types (MOCB, ABCB, VCB, SF6) constructional details, specifications, interlocking	1	Lecture	Assignment 2.1	TB 1
Isolator: Types earth switch, Bus bar,	1	Lecture	Assignment 2.2	TB 1
CT/CVT Lightning Arrestors/Lighting Mask	1	Lecture	Assignment 2.3	TB 1
Relays: Types, functions, constructional details	1	Lecture	Assignment 2.4	TB 1
Protection System: Philosophy, types, protection of transformer/reactor, motor, line/feeder generator, bus etc	2	Lecture	Assignment 2.5	TB 1
Grounding:- Types of grounding, earth testing & treatment, earthmat design, step potential, Neutral grounding reactor Auxiliary facilities: DG Set Station Battery System etc. Cables-Types, Control cables, power cables, cable termination & jointing	2	Lecture	Assignment 2.6	TB 1
Module-III: Sub-station Maintenance (9 Hours)				
Sub-station operation: Grid operation, communication with RLDC/SLDC etc.	2	Lecture and field studies	Assignment 3.1	TB 1
Sub-Station Maintenance: (a) Types-Routine, preventive, planned, predictive, break-down, emergency maintenance, online maintenance of different equipments	2	Lecture	Assignment 3.2	TB 1

Transformer/ Reactor Maintenance-Factors affecting the life of transformer/Reactor. Inspection/preliminary testing of various components-oil sampling and testing, oil filtration, Dissolved Gas Analysis (DGA), maintenance schedule	2	Lecture	Assignment 3.3	TB 1
Switchgear & protection Maintenance:- Maintenance of CB, Isolator, Earthswitch, Support Insulators, CT/CVT,LA,LM, Protective relay maintenance testing	2	Lecture	Assignment 3.4	TB 1
Erection and commissioning pre-commissioning checks/Tests of sub-station;	1	Lecture	Assignment 3.5	TB 1
Module-IV: Characteristics of Loads (4 Hours)				
Characteristics of Loads. Customer Classes and Categories. Voltage Sensitivity of Loads. Constant Power. Constant Current. Constant Impedance. ZIP Coefficients. Load Curves and Duty Cycle. Coincidental and Non-coincidental Loads. Load Growth.	4	Lecture	Assignment 4.1	TB 1
Module-V: Loss Optimization (4 Hours)				
Optimization. Loss Minimization. System Reconfiguration. Capacitor Switching. (Energy) Conservation Voltage Reduction. Introduction to System Restoration.	4	Lecture	Assignment 5.1	TB 1
Module-VI: Capacitors (8 Hours)				
Capacitors. Construction . Application of Capacitors in Transmission, Distribution and Industrial Systems. Shut Capacitors (Voltage Control and	8	Lecture	Assignment 6.1	TB 1

Power Factor Correction). Series Capacitors (Line Reactance Compensation). Rating. Capacitor Switching and Operating Problems with Capacitors (Inrush Currents).				
Module-VII: Modern Grids (4 Hours)				
Modern Grids. Distribution Automation. Distributed Generation. Grid 2030. Nano Grid. Micro Grid. Mini Grid. Smart Grid. Super Grid. The Issues.	4	Lecture	Assignment 7.1	TB 1

Operation and Testing of Power and Distribution Transformer

Course Title	Code	Type of course	T-P-PJ	Prerequisite
Operation and Testing of Power and Distribution Transformer	DEOM0401	Theory + Practice	2-1-0	Nil

Objective

- To know detail about the operation and testing of both power and distribution transformers

Course Outcome

- Identify power/instrument and distribution transformer types, components and auxiliary equipment.
- Simulate appropriate tests to evaluate the condition and perform maintenance on transformers.
- Perform oil sampling, testing, drying, filling and filtering, Analyze test results to troubleshoot transformer problems.

Evaluation Systems

Internal Examination	Component	% of Marks	Method of Assessment
	Internal Theory	20	Written examination
	Internal Practice	30(20+10)	Lab work + Learning Record
External Examination	External Theory	30	Written examination
	External Practice	20	Lab work
Total		100	

Course Outline

Module-I: Transformer

(6 hours)

Theory

Transformer: Basic principles of transformer, magnetization and hysteresis, electromagnets. Flux density Ampere-turn Ratio

Practice:

- Ampere-turns Ratio test of transformer
- Magnetic balance test of transformer

Module-II: Equations related to transformers

(14 hours)

Theory

Equation for transformation: Two/ three winding & Auto Transformer

Silent features of core & shell type, transformer constructional details, Grounding transformers

Practice:

3. Grounding test of a transformer

Module-III: Transformer fixtures and oil

(8 hours)

Theory

Transformer fixtures : buchholz relay, breather, conservators, bushing of different types, thermometers, indicators, alarms. Cooling of Transformer,

Transformer Oil: Specifications & Characteristics. Sources, manufacturing and Handling. Methods of Sampling and testing.

Practice:

4. Oil testing of transformer

Module-IV: Maintenance of Transformer Oil

(8 hours)

Theory

Maintenance of Transformer Oil: Filter Machine O&M,DGA. Importance of Oil Filtration & drying out of transformer. Working principles of OLTC & its' O/M.

Practice:

5. Dissolved gas analysis of transformer

6. Maintenance of oil filter machine

Module-V: Transformer Test

(7 hours)

Theory

Transformer Test: Failures and causes, maintenance & repairs. Power Transformers Testing and commissioning - Significance & importance of tests protection of transformers

Practice:

7. Study of Protection scheme of Power Transformer

Module-VI: Test on transformer

(9 hours)

Theory

Test on transformer: Insulation resistance measurement, winding resistance measurement, magnetic current test, magnetic balance test, vector group confirmation short circuit test and differential stability test, etc.

Practice:

8. IR test of transformer

9. Winding resistance test of transformer

10. Vector grouping test of transformer

Module-VII: Conditions leading to faults

(8 hours)

Theory

Conditions leading to faults: Protective relays, differential protection, overcurrent protection , ground fault protection and monitors for protection – Factory testing of power transformers

Practice:

11. Testing of protective relay connected to transformer

Text Book

1. Indrajit Dasgupta, “Design of Transformers”, Tata McGraw-Hill, Eighth Edition

Reference Books

1. Bhel, “Transformers”, Tata McGraw-Hill, Second Edition
2. Indrajit Dasgupta, “Power Transformers Quality Assurance”, Tata McGraw-Hill

Session Plan

Topic	No. of Sessions	Activity	Assignment	Suggested Reading
Module-I: Transformer (6 hours)				
Basic principles of transformer, magnetization and hysteresis, electromagnets	4	Lecture+ Practice	Assignment 1.1	TB1
Flux density Ampere-turn Ratio	2	Lecture+ Practice	Assignment 1.2	TB1
Module-II: Equations related to transformers (14 hours)				
Two/ three winding & Auto Transformer	4	Lecture	Assignment 2.1	TB1
Silent features of core & shell type, transformer constructional details	4	Lecture	Assignment 2.2	TB1
Grounding transformers	6	Lecture+ Practice		
Module-III: Transformer fixtures and oil (8 hours)				
Buchholz relay, breather, conservators, bushing of different types, thermometers, indicators, alarms. Cooling of Transformer	4	Lecture+ Practice	Assignment 3.1	TB1
Specifications & Characteristics. Sources, manufacturing and Handling. Methods of Sampling and testing.	4	Lecture+ Practice	Assignment 3.2	TB1
Module-IV: Maintenance of Transformer Oil (8 hours)				
Filter Machine O&M,DGA. Importance of Oil Filtration & drying out of transformer.	4	Lecture+ Practice	Assignment 4.1	TB1

Working principles of OLTC & its' O/M	4	Lecture+ Practice	Assignment 4.2	TB1
Module-V: Transformer Test (7 hours)				
Failures and causes, maintenance & repairs. Power Transformers Testing and commissioning -	4	Lecture+ Practice	Assignment 5.1	TB1
Significance & importance of tests protection of transformers	3	Lecture+ Practice	Assignment 5.2	TB1
Module-VI: Test on transformer(9 hours)				
Insulation resistance measurement	3	Lecture+ Practice	Assignment 6.1	TB1
winding resistance measurement, magnetic current test, magnetic balance test	3	Lecture+ Practice	Assignment 6.2	TB1
vector group confirmation short circuit test and differential stability test, etc	3	Lecture+ Practice	Assignment 6.3	TB1
Module-VII: Conditions leading to faults (8 hours)				
Protective relays, differential protection, over current protection	4	Lecture+ Practice	Assignment 7.1	TB1
Ground fault protection and monitors for protection – Factory testing of power transformers	4	Lecture+ Practice	Assignment 7.2	TB1
Total- 60 Hours				

System Protection and Auxiliaries

Course Title	Code	Type of course	T-P-P	Prerequisite
System Protection And Auxiliaries	DEOM0402	Theory + Practice	2-1-0	Nil

Objective

- To know the different methods used for power system protection
- To Know the different equipment's and auxiliaries used in power system protection and to know the maintenance schedule of different equipment's.

Course Outcome

- Operate the protective equipment efficiently
- Can perform the maintenance of that protective equipment and also can test the protective equipment before commissioning

Evaluation Systems

Internal Examination	Component	% of Marks	Method of Assessment
	Internal Theory	20	Written examination
	Internal Practice	30(20+10)	Lab work + Learning Record
External Examination	External Theory	30	Written examination
	External Practice	20	Lab work
Total		100	

Course Outline

Module-I: CT & PTs

(6 hours)

Theory

CT & PTs: Types of CT & PTs' – their working principles, ratings and accuracy. Functions of CT & PTs' Failures of CT & PTs – their causes.

Practice

1. Testing of CT and PT

Module-II: Metering Schemes

(12 hours)

Theory

Metering Schemes: Protection of Transmission Line with Schemes. Protection of Transformer with different Schemes. Local & Back-up Protection. New Generation Relays.

Practice

2. Testing of different types of relay

Module-III: Breakers

(10 hours)

Theory

Breakers: Function of breakers. Different types of indoor and outdoor breakers e.g. Bulk oil, MOCB, Air blast, SF₆ and Vacuum Breaker - principle and their application. Operating Mechanism – springs, hydraulic, pneumatic, Current ratings, rupturing capacity, clearance time, Commissioning procedures.

Practice

3. Study the Operation of different types of breaker
4. Determining the current rating of circuit breaker

Module-IV :Breaker Maintenance

(8 hours)

Theory

Breaker Maintenance: failures and their causes. CB Control Circuit description and fault finding procedures.

Practice

5. Maintenance of circuit breaker
6. Testing of the control circuit of the CB

Module-V: Lightening Arrestors/Surge Arrestors

(7 hours)

Theory

Lightening Arrestors/Surge Arrestors: Simple description of lightening phenomena and surges. Constn. of S.As' and principles of their working. Different types of Surge Arrestor and ratings. Earthing and Location of S.A. Testing&Maint.of S.As.

Practice

7. Study of different types of Lightening Arrestors
8. Testing of Surge arrestor

Module-VI: Isolators And Insulators

(9 hours)

Theory

Isolators : Tilting and rotating isolators with & without arcing horns – earth blades – current ratings. Breaking of circuits by isolators. Interlocking with circuit Breaker. Maintenance of isolators. Insulators : Types - their electrical & mechanical characteristics.

Practice

9. Study of different types of isolators.
10. Practicing the interlocking of Isolators with Circuit breaker

Module-VII : Auxiliary facilities

(8 hours)

Theory

Auxiliary facilities: DG Set Station Battery System etc. V. Cables-Types, Control cables, power cables, cable termination & jointing. Auxiliary D.C. Supply. Battery:- Current & Ampere Hours Ratings. Battery Charging Equipment – Checking of Specific Gravity of Electrolyte – Maintenance of batteries – Trouble Shootings. Condition monitoring and hotline maintenance.

Practice

11. Preparing a maintenance schedule for the battery bank.
12. Preparing a maintenance schedule for the DG set.

Text Book

1. IEEE Guide for Power System Protection Testing, IEEE, 2009

Reference Books

1. T. S. Madhava Rao, “Power System Protection: Static Relays”, Second Edition, Tata McGraw-Hill
2. Clarence Herbert Sanderson, “Electric system handbook”, McGraw-Hill

Session Plan

Topic	No. of Sessions	Activity	Assignment	Suggested Reading
Module-I: CT & PTs (6 hours)				
CT & PTs: Types of CT & PTs’ – their working principles, ratings and accuracy.	2	Lecture	Assignment 1.1	TB1
Functions of CT & PTs’ Failures of CT & PTs – their causes.	4	Lecture+ Practice	Assignment 1.2	TB1
Module-II: Metering Schemes (12 hours)				
Metering Schemes: Protection of Transmission Line with Schemes.	3	Lecture	Assignment 2.1	TB1
Protection of Transformer with different Schemes.	4	Lecture+ Practice	Assignment 2.2	TB1
Local & Back-up Protection. New Generation Relays.	5	Lecture+ Practice	Assignment 2.3	TB1
Module-III: Breakers (10 hours)				
Breakers: Function of breakers. Different types of indoor and outdoor breakers e.g. Bulk oil, MOCB, Air blast, SF6 and Vacuum Breaker - principle and their application.	5	Lecture+ Practice	Assignment 3.1	TB1
Operating Mechanism – springs, hydraulic, pneumatic, Current ratings, rupturing capacity, clearance time, Commissioning procedures	5	Lecture+ Practice	Assignment 3.2	TB1
Module-IV :Breaker Maintenance (8 hours)				
Failures and their causes	2	Lecture	Assignment 4.1	TB1
CB Control Circuit	6	Lecture+ Practice	Assignment	TB1

description and fault finding procedures.			4.2	
Module-V: Lightening Arrestors/Surge Arrestors (7 hours)				
Simple description of lightening phenomena and surges. Construction of S.As ⁷ and principles of their working.	4	Lecture+ Practice	Assignment 5.1	TB1
Different types of Surge Arrestor and ratings. Earthing and Location of S.A. Testing&Maint.of S.As	3	Lecture+ Practice	Assignment 5.2	TB1
Module-VI: Isolators And Insulators (9 hours)				
Isolators: Tilting and rotating isolators with & without arcing horns – earth blades – current ratings. Breaking of circuits by isolators. Interlocking with circuit Breaker. Maintenance of isolators.	5	Lecture+ Practice	Assignment 6.1	TB1
Insulators : Types - their electrical & mechanical characteristics	4	Lecture+ Practice	Assignment 6.2	TB1
Module-VII : Auxiliary facilities (8 hours)				
Auxiliary facilities: DG Set Station Battery System etc. V. Cables-Types, Control cables, power cables, cable termination & jointing. Auxiliary D.C. Supply.	4	Lecture+ Practice	Assignment 7.1	TB1
Battery:- Current & Ampere Hours Ratings. Battery Charging Equipment – Checking of Specific Gravity of Electrolyte – Maintenance of batteries – Trouble Shootings. Condition monitoring and hotline maintenance.	4	Lecture+ Practice	Assignment 7.2	TB1
Total- 60 Hours				

Construction of HT and LT lines and Cables

Course Title	Code	Type of course	T-P-PJ	Prerequisite
Construction of HT and LT lines and Cables	DEOM0102	Theory	3-0-0	Nil

Objective

- To identify various types of LT / HT cables and lines and its application.

Course Outcome

- Test underground cables, trouble shooting, Locating faults, open circuit, short circuit & leakage in cables, Repairs of faulty cables.
- Current carrying capacity and selection of cables

Evaluation Systems

	Component	% of Marks	Method of Assessment
Internal Examination	Internal Theory	30	Written examination
	Assignment	5	Report or Presentation + Learning Record
	Attendance	5	Based on class attended
External Examination	External Theory	60	Written examination
Total		100	

Course Outline

Module I: Transmission Lines

(8 hours)

Theory

TRANSMISSION LINES: Transmission system in India, Tower types, Conductors, Earth wire, Insulators

Module II: IE rules and Acts

(8 hours)

Theory

IE rules and Acts: Statutory clearances, Surveying, Route Alignment Maintenance of transmission line, Thermo vision scanning

Module III: Modern trends in Underground Cabling Basic Concepts (9 hours)

Theory

Modern trends in Underground Cabling Basic Concepts: Selection, Types and Design of Underground including Standards of Cables Primary & Detailed Survey, Laying of Cable, Jointing

Module IV: Testing and Commissioning (4 hours)

Theory

Testing and Commissioning: Fault Location of Cables Maintenance & Trouble Shooting & Earthing of Underground Cables Problems encountered during conversion of overhead lines to underground cables.

Module V: Materials Used in Cables, Conductors (4 hours)

Theory

Materials Used in Cables, Conductors: Voltage Drop; Conductor Ampacity calculation; Conductor resistance; Conductor Inductance and capacitance calculation.

Module VI: Testing (8 hours)

Theory

Testing : Ampacity, Calculation of losses, AC resistance of conductor, Dielectric losses, Loss factor, Thermal resistance Test

Module VII: Buried cables (4 hours)

Theory

Drying-out of the soil does not occur, Buried cables where partial drying-out of the soil occurs Ampacity in two cases.

Text Book:

1. "Electrical Power Equipment Maintenance and Testing", Second Edition, CRC PRESS

Reference Books:

1. James E. Mack, Thomas M. Shoemaker, "The Lineman's and Cableman's Handbook", Thirteenth Edition, McGraw Hill Professional

Session Plan

Topic	No. of Sessions	Activity	Assignment	Suggested Reading
Module I: Transmission Lines (8 hours)				
TRANSMISSION LINES Transmission system in India, Tower types, Conductors, Earth wire, Insulators	8	Lecture	Assignment 1	TB1

Module II: IE rules and Acts (8 hours)				
IE rules and Acts, Statutory clearances, Surveying, Route Alignment Maintenance of transmission line, Thermo vision scanning	8	Lecture	Assignment 2	TB1
Module III: Modern trends in Underground Cabling Basic Concepts (9 hours)				
Modern trends in Underground Cabling Basic Concepts, Selection, Types and Design of Underground including Standards of Cables Primary & Detailed Survey, Laying of Cable, Jointing	9	Lecture	Assignment 3	TB1
Module IV: Testing and Commissioning (4 hours)				
Testing and Commissioning Fault Location of Cables Maintenance & Trouble Shooting & Earthing of Underground Cables Problems encountered during conversion of overhead lines to underground cables.	4	Lecture	Assignment 4	TB1
Module V: Materials Used in Cables, Conductors(4 hours)				
Materials Used in Cables, Conductors; Voltage Drop; Conductor Ampacity calculation; Conductor resistance; Conductor Inductance and capacitance calculation.	4	Lecture	Assignment 5	TB1
Module VI: Testing(8 hours)				
Testing Ampacity, Calculation of losses, AC resistance of conductor, Dielectric losses Loss factor, Thermal resistance Test	8	Lecture	Assignment 5	TB1
Module VII: Buried cables(4 hours)				

Buried cables where drying-out of the soil does not occur, Buried cables where partial drying-out of the soil occurs Ampacity in two cases.	4	Lecture	Assignment 7	TB1
Total- 45 Hours				

Safety Practice & First Aid

Course Title	Code	Type of course	T-P-PJ	Prerequisite
Safety Practice & First Aid	DEOM0201	Practice	0-2-0	Nil

Objective

- To learn the basics of safety practice to be carried out in industry

Course Outcome

- Deal with emergency situations
- Know the limits of basic first aid
- Identify signals of a heart attack.
- Identify the most important action you can take in a life-threatening emergency.

Evaluation scheme

Internal Examination	Component	% of Marks	Method of Assessment
	Internal Practice	50 (40+10)	Lab work + Learning Record
External Examination	External Practice	50	Lab work
Total		100	

Lists of Experiments

(i) Safety Requirement, Hazards, Electrical Accidents and prevention,

(ii) Safety

- Safety Philosophy.
- Safety Procedures.
- GRID Safety Norms.
- Procedures for issuing L.C.P. and cancellation.
- Maintenance of Safety records.

(iii) First Aid

- Places of Potential Hazards.
- Electric Shock Treatment.
- Artificial Respiration.
- Handling Emergency Conditions.

- Treatment of Wounds, Injuries & Burns.
- (iv) Fire Fighting
- Causes of Fire.
 - Fire Extinction.
 - Classification of Fires.
 - Fire Fighting Equipment: their operation – maintenance & refilling.
 - Fire prevention.

Session plan

Topic	No. of Sessions	Activity	Assignment	Suggested Reading
Safety Requirement, Hazards, Electrical Accidents and prevention	10	Demonstration and mock drill		Electrical safety handbook
Safety <ul style="list-style-type: none"> • Safety Philosophy. • Safety Procedures. • GRID Safety Norms. • Procedures for issuing L.C.P. and cancellation. • Maintenance of Safety records. 	15	Demonstration and mock drill		Electrical safety handbook
First Aid <ul style="list-style-type: none"> • Places of Potential Hazards. • Electric Shock Treatment. • Artificial Respiration. • Handling Emergency Conditions. • Treatment of Wounds, Injuries & Burns. 	15	Demonstration and mock drill		Electrical safety handbook
Fire Fighting <ul style="list-style-type: none"> • Causes of Fire. • Fire Extinction. 	20	Demonstration and mock drill		Electrical safety handbook

<ul style="list-style-type: none"> • Classification of Fires. • Fire Fighting Equipment: their operation – maintenance & refilling. • Fire prevention. 				
Total- 60 Hours				

Electrical System Layout & Drawing

Course Title	Code	Type of course	T-P-PJ	Prerequisite
Electrical System Layout & Drawing	DEOM0202	Practice	0-2-0	Nil

Objective

- To list out the various design aspects of earthing in indoor and outdoor substation.
- List the basic steps for drawing a electrical layout diagram.

Course Outcome

- Design the Relays, Relaying schemes and auxiliaries Wiring Diagram for the given specifications.
- Design the Substation control room wiring diagram
- Prepare the winding diagram and sketches of the designed layout of a power system network using AUTOCAD Software

Evaluation Systems

Internal Examination	Component	% of Marks	Method of Assessment
	Internal Practice	50 (40+10)	Lab work + Learning Record
External Examination	External Practice	50	Lab work
Total		100	

Lists of Experiments

1. Introduction to AutoCAD Electrical, Drawing Files, Electrical Components and Wires.
2. Symbol creation.
3. General layout of a power system network.
4. Single line diagram/equipments[Equipments-transformer, CB, fuse etc.]
5. Relays, Relaying schemes and auxiliaries Wiring Diagram
6. Relay panel wiring diagram

7. Substation control room wiring diagram
8. Layout diagram of earthing system in outdoor substation.
9. Layout of Sub-Station (33/11KV S/S, 220/33KV S/S)
10. Indoor and outdoor busbars — bus-bar mountings and their clearances.
11. Layout of different Busbar arrangement in a substation.
12. Designing Electrical Transmission Tower Types and Design
13. Layout diagram of a GIS substation.
14. Layout diagram of earthing system in outdoor substation.
15. Designing tower earthing layout and pole earthing layout.

Note: Using AUTOCAD or Smart Draw

Session Plan

Topics	No. of Sessions	Activity	Assignment	Suggested Reading
Introduction to AutoCAD Electrical, Drawing Files, Electrical Components and Wires.	4	Practice	Designing	AutoCAD Manual
Symbol creation.	4	Practice	Designing	AutoCAD Manual
General lay out of a power system network.	4	Practice	Designing	AutoCAD Manual
Single line diagram/equipments[Equipments-transformer, CB, fuse etc.]	4	Practice	Designing	AutoCAD Manual
Relays, Relaying schemes and auxiliaries Wiring Diagram	4	Practice	Designing	AutoCAD Manual
Relay panel wiring diagram	4	Practice	Designing	AutoCAD Manual
Substation control room wiring diagram.	4	Practice	Designing	AutoCAD Manual
Layout diagram of earthing system in outdoor substation.	4	Practice	Designing	AutoCAD Manual
Layout of Sub-Station(33/11KV S/S,	4	Practice	Designing	AutoCAD Manual

220/33KV S/S)				
Indoor and outdoor busbars — bus-bar mountings and their clearances.	4	Practice	Designing	AutoCAD Manual
Layout of different Busbar arrangement in a substation.	4	Practice	Designing	AutoCAD Manual
Designing Electrical Transmission Tower Types and Design	4	Practice	Designing	AutoCAD Manual
Layout diagram of a GIS substation.	4	Practice	Designing	AutoCAD Manual
Layout diagram of earthing system in outdoor substation.	4	Practice	Designing	AutoCAD Manual
Designing tower earthing layout and pole earthing layout.	4	Practice	Designing	AutoCAD Manual
Total- 60 Hours				

Power System Market, Act and Regulations

Course Title	Code	Type of course	T-P-PJ	Prerequisite
Power System Market, Act and Regulations	DEOM0103	Theory	4-0-0	Nil

Objective

- To know the Restructuring and economic evaluation of power system
- To acquire the knowledge of power system restructuring and economics of regulation

Course Outcome

- Prepare an effective contracts for different markets
- Demonstrate the factors affecting the bill structure

Evaluation Systems

	Component	% of Marks	Method of Assessment
Internal Examination	Internal Theory	30	Written examination
	Assignment	5	Report or Presentation + Learning Record
	Attendance	5	Based on class attended
External Examination	External Theory	60	Written examination
Total		100	

Course outline

Module I: Overview of Power System Market

(10 Hours)

Theory

Overview: Types of Markets: Spot market, Forward contracts and forward , Future contracts and futures markets, Options, Contracts for different markets.

Module II: Markets For Electrical Energy

(10 hours)

Theory

MARKETS FOR ELECTRICAL ENERGY: Difference Between a Megawatt-Hour and a Barrel of Oil, The Need for a Managed Spot Market, Operation of the managed spot market, Open Electrical Energy Markets, Bilateral trading, Electricity pools, Comparison of pool and bilateral trading , The Settlement Process

Module III: Participating in Markets For Electrical Energy (10 Hours)

Theory

PARTICIPATING IN MARKETS FOR ELECTRICAL ENERGY: The Consumer's Perspective, Retailers of electrical energy, The Producer's Perspective, Perfect competition, The production versus purchase decision, Imperfect competition.

Module IV: System Security And Ancillary Services (12 Hours)

Theory

SYSTEM SECURITY AND ANCILLARY SERVICES: Describing the Needs, Balancing issues, Network issues, System restoration, Obtaining Ancillary Services, Compulsory provision of ancillary services, Market for ancillary services, Demand-side provision of ancillary services, Selling Ancillary

Module V: Energy Conservation (10 Hours)

Theory

ENERGY CONSERVATION: Energy Audit Basic, Energy Accounting & Analysis, Understanding the utility bill: energy charge, Demand charge, fuel cost arrangement, power factor charge.

Module VI: Electricity Rate Structure (4 Hours)

Theory

ELECTRICITY RATE STRUCTURE: state example, Energy Economics: LCC, IRR, Energy & taxation: tax consideration & analysis. General Procedure of detail energy audit. Common Energy conservation measures.

Module VII: Energy Costing (4 Hours)

Theory

ENERGY COSTING: Block pricing rate, seasonal pricing rate, innovative rate, Real time pricing rate, Electric lighting system, energy.

Text Books:

1. Moncef Krarti, "Energy Audit of Building Systems: An Engineering Approach", Second Edition, CRC Press.

Reference Books:

1. James Momoh, Lamine Mili, "Economic Market Design and Planning for Electric Power Systems", Wiley & IEEE

Session Plan

Topic	No. of Sessions	Activity	Assignment	Suggested Reading
Module I: Overview of Power System Market (10 Hours)				
Overview, Types of Markets: Spot market, Forward contracts and forward , Future contracts and futures markets, Options, Contracts for different markets.	8	Lecture	Assignment	TB1 (Ch-1)
Module II: Markets For Electrical Energy (10 hours)				
MARKETS FOR ELECTRICAL ENERGY: Difference Between a Megawatt-Hour and a Barrel of Oil, The Need for a Managed Spot Market, Operation of the managed spot market, Open Electrical Energy Markets, Bilateral trading, Electricity pools, Comparison of pool and bilateral trading , The Settlement Process	8	Lecture	Assignment	TB1 (Ch-2)
Module III: Participating in Markets For Electrical Energy (10 Hours)				
PARTICIPATING IN MARKETS FOR ELECTRICAL ENERGY: The Consumer's Perspective, Retailers of electrical energy, The Producer's Perspective, Perfect competition, The production versus purchase decision, Imperfect competition.	9	Lecture	Assignment	TB1 (Ch-3)
Module IV: System Security And Ancillary Services (12 Hours)				
SYSTEM SECURITY AND ANCILLARY SERVICES: Describing the Needs, Balancing issues, Network issues, System restoration, Obtaining Ancillary Services, Compulsory provision of	8	Lecture	Assignment	TB1 (Ch-4)

ancillary services, Market for ancillary services, Demand-side provision of ancillary services, Selling Ancillary				
Module V: Energy Conservation (10 Hours)				
ENERGY CONSERVATION: Energy Audit Basic, Energy Accounting & Analysis, Understanding the utility bill: energy charge, Demand charge, fuel cost arrangement, power factor charge.	4	Lecture	Assignment	TB1 (Ch-5)
Module VI: Electricity Rate Structure (4 Hours)				
ELECTRICITY RATE STRUCTURE: state example, Energy Economics: LCC, IRR, Energy & taxation: tax consideration & analysis. General Procedure of detail energy audit. Common Energy conservation measures.	4	Lecture	Assignment	TB1 (Ch-6)
Module VII: Energy Costing (4 Hours)				
ENERGY COSTING: Block pricing rate, seasonal pricing rate, innovative rate, Real time pricing rate, Electric lighting system, energy	4	Lecture	Assignment	TB1 (Ch-6)
Total- 60 Hours				

**CENTURION UNIVERSITY OF TECHNOLOGY AND
MANAGEMENT, ODISHA**

SCHOOL OF PARAMEDICS & ALLIED HEALTH SCIENCES



Centurion
UNIVERSITY

**BACHELORE OF SCIENCE IN
CLINICAL MICROBIOLOGY**

2018

SYLLABUS

Preface: Clinical Microbiology helps to diagnose and prevent disease through clinical laboratory tests. It is complementary to medical science. It involves analysis of body matter such as Collection of samples like body fluid, tissue, and blood and diagnoses them. It also covers micro-organism screening, sterilization of laboratorial environment and equipments, Antibiotic sensitivity tests.

Clinical Microbiologists are an integral part of the medical profession. These professionals get involved in practical and technical work to aid correct diagnosis and effective functioning of Microbiological Laboratory.

With adequate knowledge and experience, Clinical Microbiologist having +2 Sc with biology qualification can work in supervisory or management positions in laboratories and hospitals. They can also work as Laboratory Manager/Consultant/supervisor, health care Administrator, Hospital Outreach coordination, laboratory information system Analyst/Consultant, educational consultant/coordinator etc. Additional opportunities are available in molecular diagnostics, molecular biotechnology companies and in vitro fertilization laboratories as well as in research labs.

Programme: B.Sc. in Clinical Microbiology.

Duration: Three years (Six semesters) full-time programme with 6 months internship in the last semester.

Eligibility: +2 Science with Physics, Chemistry & Biology or equivalent degree

Examination: Examination rules will be as per guideline of CUTM Examination hand book.

Internship: A candidate will have to undergo internship for a period of six calendar months in a hospital/Diagnostics Centre equipped with modern microbiology laboratory facility or in a fully equipped pathology laboratory, which fulfills the norms decided by the University.

Dissertation will be compulsory to all students. Students will carry out dissertation work individually or in the group of not more than three students. The format for dissertation/Internship report will be similar to the research thesis style; incorporating chapters on: Introduction, Materials and Methods, Results and Discussion and References / Bibliography. The dissertation will be submitted in atypewritten and bound form.

Degree: On successful completion of three year programme, the candidate will be awarded with “**Bachelor of Science in Clinical Microbiology (B.Sc.-CMB)**” from Centurion University.

Bachelor of Science in Clinical Microbiology Course Structure

SEMESTER-I

SI NO	CODE	SUBJECT	SUBJECT TYPE Lecture+ Tutorial+ Practice (L+T+P)	CREDITS
1	BSCM1101	Introductory Cell Biology	3+1+0	4
2	BSCM1102	Human Anatomy & Physiology	4+0+0	4
3	BSCM1103	Basic Haematology	3+1+0	4
4	BSCM1104	Instrumentation & Techniques	3+1+0	4
5	BSCM1105	Human Anatomy, Physiology & Haematology Practical	0+0+6	4
	Total			20

SEMESTER-II

SL NO	CODE	SUBJECT	SUBJECT TYPE (L+T+P)	CREDITS
1	FCBS0101	Environmental Science	3+1+0	4
2	FCHU1201	Foundations of English Communication	0+0+3	2
3	BSCM1201	General Microbiology	3+1+0	4
4	BSCM1202	Clinical Biochemistry	3+1+0	4
5	BSCM1203	Clinical Pathology & Diagnosis	3+1+0	4
6	BSCM1204	Clinical Pathology, Biochemistry & Microbiology Practical	0+0+6	4
	Total			22

SEMESTER-III

SL NO	CODE	SUBJECT	SUBJECT TYPE L+T+P	CREDIT
1	BSCM2301	Immunology	3+1+0	4

2	BSCM2302	Systemic Bacteriology	3+1+0	4
3	BSCM2303	Molecular Biology	3+1+0	4
4	BSCM2304	Systemic Virology & Mycology	3+1+0	4
5	FCHU0202	Communicative Practice Laboratory-2	0+0+3	2
6	BMCM2306	Bacteriology, Virology & Mycology Practical	0+0+6	4
	Total			22

SEMESTER-IV

SL NO	CODE	SUBJECT	SUBJECT TYPE L+T+P	CREDIT
1	BSCM2401	Public Health Microbiology	3+1+0	4
2	BSCM2402	Pharmaceutical Microbiology	3+1+0	4
3	BSCM2403	Industrial Microbiology	3+1+0	4
4	BSCM2404	Biochemistry	3+1+0	4
5	BSCM2405	Basic Computer & Information technique	0+0+6	4
6	BSCM2406	Industrial, Public Health Microbiology & Biochemistry Lab.	0+0+6	4
	Total			24

SEMESTER-V

SL NO	CODE	SUBJECT	SUBJECT TYPE L+T+P	CREDIT
1	BSCM3501	Epidemiology	3+1+0	4
2	BSCM3502	Diagnostic Bacteriology	3+1+0	4
3	BSCM3503	Diagnostic Virology	3+1+0	4

4	BSCM3504	Diagnostic Mycology	3+1+0	4
5	BSCM3505	Diagnostic Parasitology	3+1+0	4
6	BSCM3506	Research Methodology	3+1+0	4
7	BSCM3507	Epidemiology & Diagnosis microbiology lab	0+0+6	4
	Total			28

SEMESTER-VI				
SL NO	CODE	SUBJECT	SUBJECT TYPE L+T+P	CREDIT
1	BSCM3601	Project	NA	12
2	BSCM3602	Internship	NA	12
	Total			24

INTERNSHIP

Minimum 720 hours (calculated based on 8 hours per day, if 90 working days in a 6 months)

Syllabus
1st semester B. Sc Clinical Microbiology

BSCM1101- Introductory Cell Biology

Subject Name	Code	Type of course	L-T-P	Prerequisite
Introductory Cell Biology	BSCM1101	Lecture+ Tutorial	3-1-0	Fundamental Science

Course Objective

- Determine the parts of the cell membrane and the cell wall
- Distinguish the types and mechanism of mutation
- Compare and contrast the events of cell cycle and its regulation
- Understand the dynamic character of cellular organelles

Course Outcomes

- Describe the fundamental principals cellular biology
- Develop a deeper understanding of cell structure and how it relates to cell functions.
- Understand how cells grow, divide, and die and how these important processes are regulated.
- Understand cell signaling and how it regulates cellular functions. Also how its dis-regulation leads to cancer and other diseases.

Unit-1

Biology & Its Branches; Scientific methods in Biology; Scope of biology and career options in Medical Laboratory Sciences; Characters of living organisms (elementary idea of metabolism, transfer of energy at molecular level, open and closed systems, homoeostasis, growth and reproduction, adaptation, survival, death). Origin and Evolution of life - Theories of Evolution; Evidence of Evolution; Sources of Variations (mutation, recombination, genetic drift, migration, natural selection); Concept of species; Specification and Isolation (geographical and reproductive); Origin of species.

Unit-2

Cell organelles and their functions- nucleus, mitochondria, plastids, endoplasmic reticulum, Golgi complex, lysosomes, microtubules, centriole, vacuole, cytoskeleton, cilia and flagella, ribosomes. Molecules of cell ; inorganic and organic materials - water, salt, mineral ions, carbohydrates, lipids, amino acids, proteins, vitamins, hormones and steroids.

Unit-3

Cell as a basic unit of life - discovery of cell, cell theory, cell as a self - contained unit; prokaryotic and eukaryotic cell; unicellular and multicellular organisms; Ultrastructure of

prokaryotic and eukaryotic cell - cell wall, cell membrane - unit membrane concept (Fluid-Mosaic model); membrane transport; cellular movement (exocytosis, endocytosis)

Unit-4

Cell respiration: Metabolism, carbohydrate metabolism, cell respiration-: stage I- Glycolysis, stage II- Pyruvic acid oxidation, stage III- Krebs citric acid cycle, stage IV- oxidation phosphorylation.

Components of respiratory chain, energy relationships during cell respirations during cell respiration, types of respiration. Pathways in intermediary metabolism of carbohydrates.

Suggested Readings

1. Molecular biology of the cell by Alberts Bruce, publisher Garland Science
2. Molecular Biology by Friefelder David, Publisher Narosa
3. Introduction to Cell biology by John K Young, World Scientific publishing company
4. Introduction to biology ,3rd tropic edition by D G Maackean
5. A Term wise Text book on biology by VIDYA

BSCM1102-Human Anatomy and Physiology

Subject Name	Code	Type of course	L-T-P	Prerequisite
Human Anatomy and Physiology	BSCM1102	Lecture	4-0-0	Fundamental Science

Objective

- To identify different types of cells and describe their functions.
- To identify the organelles of a typical cell and describe their functions.
- To identify the major components of the integumentary system and describe their functions.
- To identify the major structures of the skin and describe their functions
- To identify the major components of the skeletal system and describe their functions.
- To identify the major components of the circulatory, endocrine, nervous system etc and describe their functions.

Course Outcomes

- Use anatomical terminology to identify and describe locations of major organs of each system covered.
- Explain interrelationships among molecular, cellular, tissue, and organ functions in each system.
- Describe the interdependency and interactions of the systems.
- Explain contributions of organs and systems to the maintenance of homeostasis.
- Identify causes and effects of homeostatic imbalances.
- Describe modern technology and tools used to study anatomy and physiology.

Unit-1

Scope of Anatomy and physiology. Definition of various terms used in Anatomy. Structure of cell, function of its components with special reference to mitochondria and microsomes.

Elementary tissues: Describe about the elementary tissues of the body, i.e. epithelial tissue, muscular tissue, connective tissue and nervous tissue. Cell division, meiosis and mitosis

Skeletal System: Structure and function of different human Bones, Skelton & Joints. Classification of joints and their function. Joint disorders.

Practice: Demonstration of individual bone from skeleton..

Identification of different organs and system from chart.

Unit-2

Blood, Composition, Structure, classifications, Rh factor, Grouping, Normal and Abnormal Structure of different blood cells, synthesis of blood cells, mechanism of blood clot, blood circulation in body. Cardiovascular System: Structure and functions and Position of Heart. Various parts of the heart. Blood supply in Artery and veins. Conducting system of the Heart. Cardiac output. Blood pressure and Pulses and its normal recording. Brief information about cardiovascular disorders.

Respiratory system: Various parts of respiratory system and their functions, physiology of respiration. Other respiratory organs, their structure and fuctions. Mechanism of respiration.

Practice: Demonstration the morphology of different blood cells

Measurement of Blood pressure, impulses, Heart beats, respiration rate etc.

Unit-3

Urinary System: Various parts of urinary system and their functions, structure and functions of kidney. Physiology of urine formation . Patho-physiology of renal diseases and edema.

Digestive System: names of various parts of digestive system and their functions. Structure and functions of liver, physiology of digestion and absorption.

Endocrine System: Endocrine glands and Hormones. Reproductive system. Structure and function of sense organs.

Practice: Identification of different organs and system from chart.

Suggested Readings:

1. Text book Anatomy & Physiology for nurses by Evelyn Pearce, Publisher Faber& Faber.
2. Text book Anatomy and Physiology for nurses by Sears, Publisher Edward Arnold.
3. Anatomy & Physiology- by Ross and Wilson, Publisher Elsevier.
4. Anatomy& Physiology: Understanding the human body by Clark, Publisher Jones & Bartlett.
5. Anatomy and Physiology for nurses by Pearson, Publisher Marieb & Hoehn.
6. Anatomy and Physiology by N Murgesh, Publisher satya.

BSCM1103- Basic Haematology

Subject Name	Code	Type of course	L-T-P	Prerequisite
Basic Haematology	BSCM1103	Lecture+Tutorial	3-1-0	Basic Medical science

Course Objective

- The overall aims are that the student should obtain advanced knowledge of the most common hematologic diseases & understanding the concept of Blood cells and other blood components.
- Be able to handle an investigation of hemorrhagic disorder and laboratory abnormalities such as anaemia, polycythemia, leukopenia, leukocytosis, thrombocytopenia, thrombocytosis, elevated ESR etc within hematology.
- Clinically relevant hematological analysis for deeper understanding of Evaluate normal and abnormal cell morphology with associated diseases and other blood components.

Course Outcomes

- Differentiate various laboratory test findings with their associated clinical conditions.
- Identify the various skills necessary to perform blood counts, evaluate blood elements, and report results within the stated limits of accuracy.
- Describe the various components of blood, their functions, and roles in various disease states.
- To be able to demonstrate good skills in the relevant Hematology laboratory methodology.
- Collection of blood for the investigations.
- Be able to distinguish the developmental stages of blood cells. It will also cover Bone marrow examination.
- To learn about tests carried out for hematological investigations.
- To be able to carry out blood sampling.

Unit-1

Introduction to Haematology, definition, importance, important equipment and chemicals, various test performed in Haematology laboratory. Focusing different blood cells through microscope.

Practice: Demonstration of instruments used in haematology- Microscope, Blood Cell counter, Shari's. Apparatuses.

Unit -2

Synthesis of blood in Bone marrow- Erythropoiesis, leucopoiesis, thrombopoiesis

Anticoagulants, definition, Uses, Different types, mode of action, their merits and demerits, Morphology of normal blood cells, abnormal morphology & diseases.

Practice: Demonstration of different blood cell, their synthesis from slide presentation or chart. Demonstration the normal and abnormal morphology of different blood cells.

Unit-3

Collection and preservation of blood: Different methods of collection, preservation, changes in stored blood normal and absolute values in haematology, RBC count, WBC count, Platelet count, DLC value, HB, MCH, MCV, MCHC, ESR, PCV.

Blood Film: different types, methods of preparations, staining, Different types of stains, Romanowsky stains: principle of staining, different stains, their composition and preparation, methods of staining.

Practice: Collection of blood by different methods. Preparation of DLC, TLC, TRBC etc Estimation of ESR, Hb and diagnosis procedure of different blood tests.

Unit-4

Haematological Disorders

- Classification of Anaemia: Morphological & etiological.
- Iron Deficiency Anaemia: Distribution of body Iron, Iron Absorption, causes of iron deficiency, lab findings.
- Megaloblastic Anaemia: Causes, Lab findings.
- Haemolytic Anaemia: Definition, causes, classification & lab findings.
- Bone Marrow : Cell composition of normal adult Bone marrow, Aspiration, Indication, Preparation & Staining, Special Stain for Bone Marrow -Periodic Acid Schiff, Sudan Black
- Leukaemia : Classification, Blood Picture, Differentiation of Blast Cells.

Practice: Estimation procedure of sickle cell, Identification of different abnormal morphology of blood. Different normal and abnormal morphology of RBCs, WBCs, Platelet.

Suggested Reading

- Textbook of Medical Laboratory Technology P.B Gotkar Mumbai, Bhalani Publishing House
- Text book of Medical Laboratory Technology by Paraful B. Godkar, Publisher Bhalani
- Text book of Medical Laboratory Technology (2nd edition) by V.H Talib, Publisher CBS
- Atlas of hematology (5th edition) by G.A. McDonald, Publisher Churchill Livingstone
- Medical Laboratory Technology By K.L Mukharjee, Publisher McGraw Hill education pvt limited

BSCM1104- Instrumentation & Techniques

Subject Name	Code	Type of course	L-T-P	Prerequisite
Instrumentation & Techniques	BSCM1104	Lecture+Tutorial	3-1-0	Fundamental Science

Course Objective

- To learn the principle, instrumentation & application of Microscopy
- Principle, instrumentation & application of Centrifugation
- Principle of Spectroscopy

Course Outcomes

- After completion of the course the student will be efficient in handling the microscopy equipment's.
- They will also be able to have idea about handling instruments like centrifuge, spectrophotometer, chromatography, flow cytometer, Automated and semi- automated Biochemistry analyzer.
- Each graduate will meet expected outcomes in communications, computation, and human relations, per the University General requirements.

Unit -1

Microscope: different type of microscope operation and care of binocular and monocular microscope in details Light, phase contrast, interference, fluorescence, polarization and electron microscopy (principle, parts and its application)

Photometry: Basic principal and operation.

Practice: Demonstration, operation, and Quality control of different types of microscopes.

Unit-2

UV-V is spectrometry and colorimetric instrumentation and its application.

Centrifuge: Basic principle, type analytical and preparative centrifuges, different density gradient centrifuge and its application. Blood analyzer: Principle, working and its application. Demonstration and Maintenance of Laminar Flow.

Practice: Operation, Demonstration and Quality control of Centrifuge, UV-Vis spectrometer, Colorimeter.

Unit-3

Microtome: Principle, working and its uses. Incubator, hot air oven and autoclave: Principle, working and its uses. Operation Techniques and Maintenance of different another microbiological instruments

Practice: Working procedure of microtome, Incubator, Hot air oven, autoclave and others

Suggested Reading

1. A Textbook of Medical Laboratory Technology by P Godkar, Publisher Bhalani
2. Textbook of Clinical laboratory methods and diagnosis by Ales C.Sonnenwirth & Leonard jarret.
3. A Procedure Manual for Routine Diagnostic Tests Vol. I and II by KL Mukherjee, Publisher McGraw Hill education pvt limited
4. Manual of lab and diagnostic tests by Lippincott Williams Wilkins, New York, Fischbach, 2005.

5. Medical laboratory science theory and practice by J Ochei and Kolhatkar, Publisher TBS

BSCM1105-Anatomy, Physiology & Haematology Lab

Subject Name	Code	Type of course	L-T-P	Prerequisite
Anatomy, Physiology & Haematology Lab	BSCM1105	Practice	0-0-4	Basic Medical Science

Course Objective

- To identify the cell, different organelles and describe their functions.
- To identify the major organ systems of the human body and describe their functions.
- The overall aims are that the student should obtain advanced knowledge of the most common hematologic diseases & understanding the concept of Blood cells and other blood components.
- Clinically relevant hematological analysis for deeper understanding of Evaluate normal and abnormal cell morphology with associated diseases and other blood components.

Course Outcomes

- Use anatomical terminology to identify and describe locations of major organs of each system covered.
- Explain interrelationships among molecular, cellular, tissue, and organ functions in each system.
- Describe the interdependency and interactions of the systems.
- Differentiate various laboratory test findings with their associated clinical conditions.
- Identify the various skills necessary to perform blood counts, evaluate blood elements, and report results within the stated limits of accuracy.
- Describe the various components of blood, their functions, and roles in various disease states.

Anatomy, Physiology & Haematology

Demonstrate the different body parts, their position, Structure from charts, models. Identification of different joints and bones.

Demonstration of various parts of centrifuge; its functioning and care , Demonstration of various parts of microscope its functioning and care ,Cleaning and drying of glass and plastic ware,

Preparation of various anticoagulants, Collection of venous and capillary blood, Cleaning of glass-syringes and its sterilization .Preparation of buffers, Preparation of the stains and other reagents , Preparation of peripheral blood film (PBF), To stain a peripheral blood Film by Leishman - stain, Haemoglobin estimation (oxy Hb and cyanmethaemoglobin method)

Complete Blood Counts, Determination of Haemoglobin, TRBC Count by Haemocytometers, TLC by Haemocytometer, Differential Leukocyte count, Determination of Platelet Count.

Determination of ESR by wintrobes, Determination of ESR by Westergeren's method, Determination of PCV by Wintrobes, Erythrocyte Indices- MCV, MCH, MCHC. Reticulocyte Count, Absolute Eosinophil Count, Morphology of Red Blood Cells.

Demonstration of various parts of body, tissues of body , parts of digestive system , parts of respiratory system ,parts of excretory system

Suggested Reading:-

1. A Textbook of Medical Laboratory Technology by P Godkar, publisher Bhalani
2. Hand book of Medical Lab Technology By V S talib, Publisher CBS
3. Practical Haematology(8th edition) by Sir John, Publisher Churchill Livingstone
4. Clinical Hematology by Christopher A. Ludlam
5. A Procedure Manual for Routine Diagnostic Tests Vol. I and II by KL Mukherjee
Publisher McGraw Hill education pvt limited,

2nd semester B. Sc Clinical Microbiology

FCBS0101-Environmental Science

Subject Name	Code	Type of course	L-T-P	Prerequisite
Environmental Science	FCBS0101	Lecture+Tutorial	3-1-0	Fundamental Science

Course Objectives

- To understand the concept of multi-disciplinary nature of Environmental Science where different aspects are dealt with a holistic approach.
- Students will develop a sense of community responsibility by becoming aware of environmental issues in the larger social context.
- One must be environmentally educated.

Course Outcomes

- Understand the natural environment and its relationships with human activities.
- Characterize and analyze human impacts on the environment.
- Integrate facts, concepts, and methods from multiple disciplines and apply to environmental problems.
- Design and evaluate strategies, technologies and methods for sustainable management of environmental systems and for the remediation or restoration of degraded environments.

Unit-1

Environment and its multidisciplinary nature; Need for public awareness; Renewable and non-renewable resources–forest, water, mineral, land, food and energy resources; Structure and function of ecosystems of forest, grass land, desert and aquatic types.

Unit-2

Biodiversity and its conservation: Biodiversity at global, national and local levels; Threats to biodiversity - Habitat loss; wild life poaching and man - wildlife conflicts; Endangered and endemic species; conservation measures.

Causes, effects and control measures of pollution, air, water and noise pollution; Nuclear hazards; solid-waste management–Causes, effects and control measures; Management of disasters due to natural causes of floods, earthquakes, cyclones and landslides.

Unit-3

Social issues and the environment; Sustainable environment, Water conservation measures; Rain water harvesting; Resettlement and rehabilitation of people; Climate change and global warming; Acid rain; Ozone layer depletion; water land reclamation; Consumerism and waste products; Features of Environment Protection Act, Air pollution and Control of Pollution Acts; Water Pollution and its Control Act. Effects of Pollution explosion on environment and public health; Need for value education to Protect environment and resources.

Text Book:

1. Anubhav Kaushik & C.P. Kaushik: Environmental Studies-New age International Publishers.

Reference Books:

1. Benny Joseph: Environmental Studies-Tata Mac Graw Hill
2. E. Bharucha: Text book of Environmental Studies for under graduate courses– Universities Press. (Book prepared by UGC Committee.

FCHU1201- Foundations of English Communication

Subject Name	Code	Type of course	L-T-P	Prerequisite
Foundations of English Communication	FCHU 1201	Practice	0-0-3	Fundamental Science

Course Objectives

- To develop vocabulary and grammar knowledge
- To develop reading comprehension skills

Course Outcomes

- Development of academic and sub-technical vocabulary
- Enhancement of basic language skills, i.e., listening, speaking, reading and writing
- Development of grammatical competence
- Confidence level improvement

Unit-1

READING SKILLS (7hrs.)

Read one of the following books:

- Animal Farm

- Alice in Wonderland
- Guide
- Malgudi Days
- Harry Potter
- Amar Chitra Katha

Comprehension Skills: Students will respond to comprehension lessons from the chosen book.

Unit-2

WRITING SKILLS (7hr.)

Students learn grammar and usage by writing passages, and getting formal feedback on these.

Unit-3

LISTENING SKILLS (6hrs.)

Students respond to questions based on listening to videos, audio, or speaking assignments of classmates.

Unit-4

SPEAKING SKILLS (7hrs.)

Speaking assignments based on chosen book or contemporary topics.

TEXT BOOKS:

Esteras, Santiago Remacha and Fabre, Elena Marco. (2007).

Professional English in Use ICT Student's Book. Cambridge: Cambridge University Press.

REFERENCES:

Grellet, F. (1981). Developing Reading Skills. Cambridge: Cambridge University Press

McCarthy, M. & O'Dell, F. (2008).

Academic Vocabulary in Use. Cambridge: Cambridge University Press.

Ur Penny, (1992). Five-Minute Activities: A Resource Book of Short Activities (Cambridge Handbooks for Language Teachers). Cambridge: CUP

F Klippel. (1984). Keep Talking. Cambridge: CUP

BSCM1201- General Microbiology

Subject Name	Code	Type of course	L-T-P	Prerequisite
General Microbiology	BSCM1201	Lecture+Tutorial	3-1-0	Medical Science

Course Objective

- Describe the use of microorganism in different industries to produce valuable products like drugs, beverages and different food products etc.
- To developed skills for growing microorganisms in the laboratory for the production of different products by different microorganisms.

Course Outcomes

- Students has acquired a fairly good knowledge of how microbes are used in the fermentative production of organic acids, alcohols, enzymes, antibiotics and various foods in the industry.
- Enhances analytic ability of various physical parameters which affect production of industrial products by the microorganisms and the safety aspects of the production and use of these products.
- The conceptual understanding of the subject provides opportunities for employability and scopes for higher education.
- Develops laboratory skills in producing alcohol and enzymes by fermentative process using bacteria/yeast.

Unit-1

Introduction to Microbiology ,Definition, history, relationship of micro-organisms to man, and safety guideline in a microbiology laboratory . Morphology of bacterial cell wall , Anatomy and chemical structure of a bacterial cell including spores, flagella, pili and capsules . Sporulation . Classification of bacteria according to cell wall and shape (arrangement).
Bacterial Growth and Nutrition of bacteria . Bacterial growth curve and bacterial nutrition.

Practice: Preparation of culture media, demonstrate aerobic and anaerobic culture.

Demonstration the different culture plate and bacterial growth, identification of bacteria.

Unit-2

Classification of micro-organisms with special reference to bacteria General – Biological
Sterilization ,Definition, sterilization by dry heat, moist heat (below, at and above 100o C), autoclave and hot air oven its structure and functioning, preventive measures, controls and sterilization indicators, sterilization by radiation and filtration, Antiseptics and Disinfectants
Definitions, types, properties, use of disinfectants and antiseptics, efficiency testing of disinfectants; use of laminar flow – principle and function.

Practice:- Demonstrate the different methods of sterilization with handling Hot air oven, Autoclave.

Handling Of compound microscope. Demonstration of Antiseptics, Spirit, Cetrimide & Povidone-iodine.

Demonstration the disinfectants and precaution while using disinfectants

Unit-3

Staining techniques

Methods of smear preparation, Gram stain, AFB stain, Albert's stain and special staining for spore, capsule and flagella, Culture Media, Liquid and solid media, defined and synthetic media, routine laboratory media (basal, enriched, selective, enrichment, indicator, and transport media).
Different Culture, media their preparation and uses in microbial growth.

Practice: Demonstration the different staining procedure like Gram stain, Zn stain, Albert's stain etc Demonstrate different microbial growth in different media. Identify the morphology.

Suggested Reading:-

1. Medical Laboratory Technology by Kanai Lal Mukherjee; Tata McGraw Hill, New Delhi

2. An Introduction to Medical Laboratory Technology by FJ Baker; Butterworth – Heinemann; Oxford
3. Practical Book of Medical Microbiology by Satish Gupta; JP Brothers, New Delhi
4. Medical Laboratory Manual for Tropical Countries Vol. I and II by Monica Cheesbrough; Cambridge University Press; UK
5. Textbook of Medical Laboratory Technology by Praful B Godkar; Bhalani Publishing House, Mumbai
6. Text book of Medical Microbiology by Gruckshiank

BSCM1202- Clinical Biochemistry

Subject Name	Code	Type of course	L-T-P	Prerequisite
Clinical Biochemistry	BSCM1202	Lecture+ Tutorial	3-1-0	Fundamental Science

Course Objective

- To understand the concept of metabolism of carbohydrates
- To understand the significance of amino acids, proteins
- Use of enzymes in enhancing metabolic reactions
- Role of lipids

Course Outcomes

- After completion of the course the student will be developed a very good understanding of various biomolecules which are required for development and functioning of cells.
- Would have understood the significance of carbohydrates in energy generation and as storage food molecules for cells.
- They would have understood the significance of proteins and enzymes in accelerating various metabolic activities.
- The conceptual understanding of the subject provides opportunities for skill enhancement and scopes for higher education.

Unit-1

biomedical importance & properties. Brief outline of metabolism : Glycogenesis & glycogenolysis (in brief), Glycolysis, citric acid cycle & its significance, HMP shunt & Gluconeogenesis (in brief), regulation of blood glucose level.

Unit-2

Amino acids - Definition, classification, essential & non essential amino acids. Chemistry of Proteins & their related metabolism - Introduction, definition, classification, biomedical importance. Metabolism : Transformation, Decarboxylation, Ammonia formation & transport, Urea cycle, metabolic disorders in urea cycle, catabolism of amino acids especially Phenylalanine, Tyrosine & Tryptophan, Creatine, Creatinine , Proteinuria.

Practice:-Operation procedure of Centrifuge machine, colorimeter, spectrophotometer etc

Estimation of Liver function test, Kidney function test, Thyroid , Lipid profile . Estimation of bile pigment , bile salt, bilirubin etc.

Unit-3

Chemistry of Lipids & their related metabolism - Introduction, definition, classification, biomedical importance, essential fatty acids. Brief outline of metabolism : Beta oxidation of fatty acids, fatty liver, Ketosis, Cholesterol & its clinical significance, Lipoproteins in the blood composition & their functions in brief, Atherosclerosis.

Diabetes mellitus - definition, types, features, gestation diabetes mellitus , glucose tolerance test, glycosurias, Hypoglycaemia & its causes.

Practice: - Demonstrate the estimation of Blood sugar by manual method and through Auto Analytic Technique. Demonstrate different biochemical test comes under the above unit.

Suggested Reading

1. Text book of Medical Laboratory Technology, P.B. Godkar 2nd Edn. 2003 Bhalani Publication.
2. Text book of Biochemistry, M. A. Siddique 8th Edn.1993 Vijay Bhagat Scientific Book Co., Patna.
3. Medical Biochemistry by AC Dey.
4. Handbook of Christen Medical Association, India Medical Laboratory Technology- Robert H. Carman.

BSCM1203-Clinical Pathology & Diagnosis

Subject Name	Code	Type of course	L-T-P	Prerequisite
Clinical Pathology & Diagnosis	BSCM1203	Lecture+ Tutorial	3-1-0	Fundamental Science

Course Objective

- Analyze body fluid for diagnosis of disease
- Analyze waste product for diagnosis of disease
- Understanding DOT Policy
- Understand Physiological disorder and infectious disease
- Analysis of pregnancy

Course Outcomes

- Able to collect pathological specimen
- Able to detect diabetes, ketosis, nephritis, jaundice and other physiological disorder
- Able to detect infectious disease (UTI, Hematuria, Filaria, Dysentery, Ulcer, TB, etc.)
- Preservation and processing of pathological sample.
- Identification of Parasites
- Analysis of Infertility disorder

Unit-1

Composition, collection and preservation of urine for various tests, physical chemical and microscopic examination of urine, estimation of total albumin, Specific gravity, litmus paper, tests for albumin, sugar, blood, bile salts and pigments, urobilinogen, ketones bodies etc. Urine meter, Esbachl's Albuminometer, preparation of various reagents.

Practice: Collection procedures of urine, Important precursors for collecting samples.

Physical and Chemical and Microscopic examination of urine.

Unit-2

Stool- Sample collection, physical, chemical and microscopic examination. Sputum- Sample collection, stain and study of A.F.B. Cerebrospinal Fluid: Pandy's test, Cell count, cell type differential count and malignant cells. Cells stain; cell morphology and detection of malignant cells in peritoneal fluid, pleural fluid, pericardial fluid, and synovial fluid. Differences between transudates and exudates. Semen Sample collections microscopic examination for count and morphology.

Practice: Collection procedures and important precursors for collecting samples like STOOL, CSF, SEMEN and different body fluids.

Physical and Chemical and Microscopic examination of different samples.

Unit-3

ANATOMIC PATHOLOGY: 1. Reception, Registration, preservation and processing of specimens. Haematoxyline and eosine staining procedure, mounting of stained sections, Filing of paraffin blocks, and slides. Method of decalcification, Sharpening and honing Knives techniques, using of microtome.

2. Museum: Mounting of specimens, labeling, maintenance of specimens and catalogue etc.

Post mortem/ Autopsy: Maintenance of the records of the Dead Bodies and specimens received, Autopsy techniques, Autopsy instruments, cold storage plants, legal aspects etc.

Practice : Handling clinical laboratory equipment .

Preparation of some stains, and reagents for clinical diagnosis purpose.

Suggested Reading

1. Textbook of Clinical laboratory methods and diagnosis by Gradwohls, Publisher Mosby
2. Manual Text book of lab and diagnostic tests by Lippincott Williams Wilkins, New York.
3. Medical laboratory science theory and practice by J Ochei and Kolhatkar, 2002, Tata McGraw- Hill, Publisher TBS

BSCM1204- Clinical pathology, Microbiology & Clinical Biochemistry lab

Subject Name	Code	Type of course	L-T-P	Prerequisite
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Clinical pathology, Microbiology & Clinical Biochemistry lab	BSCM1204	Practical	0-0-4	Fundamental Science
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Course Objective

- Analyze body fluid for diagnosis of disease
- Understand Physiological disorder and infectious disease
- To know various Culture media and their applications and also understand various physical and chemical means of sterilization
- To master aseptic techniques and be able to perform routine culture handling tasks safely and effectively

Course Outcomes

- Able to detect diabetes, ketosis, nephritis, jaundice and other physiological disorder
- Able to detect infectious disease (UTI, Hematuria, Filaria, Dysentery, Ulcer, TB, etc.)
- Preservation and processing of pathological sample.
- Provides knowledge on growth of microorganism.
- Provides knowledge Culturing microorganism and Liver function test, Kidney function test, Lipid profile.

Clinical Pathology and Microbiology-

Urine analysis Physical, Chemical, Microscopic, Microbiological. Stool analysis Physical, Chemical, Microscopic, Microbiological. Sputum analysis Physical, Chemical, Microscopic, Microbiological. Semen analysis Physical, Chemical, Microscopic, Microbiological. Sterilization, Media Preparation, Bacteriological examination of pus. Bacteriological examination of trout swab.

Laboratory study of parasites in stool, blood. Giardia lamblia, Entamoeba

Clinical Biochemistry-

Demonstration the centrifuge machine. Demonstration of Colorimeter.

Estimation of Liver function test, Kidney function test, Lipid profile. Estimation of Glucose in urine and blood .

Estimation of Protein in urine and blood.

Suggested Reading

1. Manual of lab and diagnostic tests by Lippincott Williams Wilkins, Fischbach, 2005 New York..
2. Clinical laboratory methods and diagnosis by Gradwohls, 2000, Publisher Mosby
3. Medical laboratory science theory and practice, J Ochei and Kolhatkar, 2002, publisher TBS

4. Medical laboratory technology Vol.1 by K. L. Mukherjee, 2007, publisher Tata McGraw Hill.

3rd semester B. Sc Clinical Microbiology

BSCM2301- Immunology

Subject Name	Code	Type of course	L-T-P	Prerequisite
Immunology	BSCM2301	Lecture+ Tutorial	3-1-0	Fundamental Science

Course Objective

- Understanding the concept of Innate & adaptive immune system; complement system; Hypersensitivity.
- Clinically relevant serological analysis for deeper understanding of antigen-antibody interaction.

Course Outcomes

- Application of Immunology in disease diagnosis.
- Students will be able to understand and explain the basis of allergy and allergic diseases along with immunological tolerance and autoimmunity.
- The conceptual understanding of the subject provides opportunities for employability and scopes for higher education.

Unit-1

Immunity: Classification, Measurement of immunity, Local immunity, Herd immunity. Antigens: Types of antigen, Antigenic Determinant or Epitome, Determinants of Antigenicity Tolerogens, Biological Classes of antigens , Superantigens. Antibodies-Immunoglobulins: Antibody structure, Immunoglobulin classes of Antigens, Antigenic Determinants on Immunoglobins.

Practice: Collection of blood sample by vein puncture, separation and preservation of serum. Raising haemolysin in Rabbit and performing its titration for Rose- Waaler test.

Unit-2

The Complement System: Principal pathways of Complement activation, Quantitation of Complement C. and its Components. Biosynthesis of complement , Complement Deficiencies.

Antigen-Antibody Reactions: Antigen-Antibody Interactions, General characteristics of Antigen-Antibody Reactions, Antigen-Antibody measurement, Parameters of serological tests, Serological Reactions.

Practice: - Preparation of Phosphate buffers, Vernol buffer, ASO buffer, Richardsons buffer Buffers of different pH and molarity , tris buffer, Standardization of cell concentration by spectrophotometer

Unit-3

Immune Response: Types of Immune response, Humoral immunity, Fate of Antigen in tissues, Production of Antibodies, Cell-mediated Immune Responses, Cytokines, Immunological tolerance, Theories of immune Response .

Hypersensitivity Reactions: Classification of hypersensitivity reactions, Type I Hypersensitivity (IgE Dependent). Type II Hypersensitivity: Cytolytic and Cytotoxic. Type III Hypersensitivity -Immune Complex-mediated, Type IV Hypersensitivity-Delayed Hypersensitivity, Shwartzman Reaction.

Practice:- Performance of Serological tests i.e. Widal, Brucella Tube Agglutination ,VDRL (including Antigen Preparation), ASO (Antistreptolysin 'O'),C-Reactive Protein (Latex agglutination), Rheumatoid factor (RF) Latex agglutination, Rose Waaletest

Suggested Readings:

1. Text book of Microbiology by Ananthanereyan & Paniker, Publisher Universities press
2. Short text book of Medical microbiology by Satish Gupt, Publisher Jaypee brothers
3. Medical laboratory Technology vol.I ,II, III by K L Mukherjee, Publisher McGraw Hill education
4. Medical Laboratory manual for tropical countries Vol II Microbiology by Monia Cheesbrough, publisher Butterworth Heinemann ltd
5. Immunology by Ivan Roitt, JonathaanBrostoff and David Male
6. Practical Medical Microbiology by Mackie & MacCartney Volume 1 and 2

BSCM2302- Systemic Bacteriology

Subject Name	Code	Type of course	L-T-P	Prerequisite
Systemic Bacteriology	BSCM2302	Lecture+Tutorial	3-1-0	Fundamental Science

Course Objective

- To learn opportunities in the basic principles of medical microbiology and infectious disease.
- To study mechanisms of infectious disease transmission, principles of aseptic practice, and the role of the human body's normal microflora.
- To understand the importance of pathogenic bacteria in human disease with respect to infections of the respiratory tract, gastrointestinal tract, urinary tract, skin and soft tissue.

Course Outcomes

- The course provides the conceptual basis for understanding pathogenic microorganisms and the mechanisms by which they cause disease in the human body.
- Recall the relationship of this infection to symptoms, relapse and the accompanying pathology.
- Explain the methods of microorganism's control, e.g. chemotherapy & vaccines. Solve problems in the context of this understanding.

Unit 1

Morphology, Metabolism, Pathogenesis, Laboratory Diagnosis, Prevention and Control of:

a. Cocci (Gram Positive):

Aerobic: Micrococcus spp., Staphylococcus spp., Streptococcus spp.

Anaerobic: Peptococcus spp., Peptostreptococcus spp., Villanelle spp., Acidaminococcus spp., Megasphaera spp., Coprococcus spp., Ruminococcus spp. and others.

b. Cocci (Gram Negative): Aerobic: Neisseria spp., Anaerobic Gram negative bacteria .

Unit 2

Morphology, Metabolism, Pathogenesis, Laboratory Diagnosis, Prevention and Control of:

a. Aerobic non-spore forming gram positive bacilli:

Bacillus spp., Corynebacterium spp., Actinomyces pyogenes, Nocardia spp., Mycobacterium spp.- pathogenic, Tubercle bacilli and MOTT bacilli (Atypical mycobacterium) and

Hansen's bacilli and others.

b. Anaerobic: Bifidobacterium spp., Eubacterium spp., Actinomyces spp., Propionebacterium, Arachnia spp., Clostridium spp and others.

Unit 3

Morphology, Metabolism, Pathogenesis, Laboratory Diagnosis, Prevention and Control of Gram Negative Bacilli

Aerobic: Enterobacteriaceae , Citrobacter spp , Edwardsiella spp ,Enterobacter spp , Escherichia coli , Ewingella , Hafnia spp., Klebsiella spp , Kluyvera ,Leclercia , Leminorella, Moellerella, Morganella spp , Pantoea ,Proteus spp. , Porvidencia spp. ,Rahnella Salmonella spp, Serratia spp ,Shigella spp ,Tatumella ,Yersinia spp and others.

BSCM2303- Molecular Biology

Subject Name	Code	Type of course	L-T-P	Prerequisite
Molecular Biology	BSCM2303	Lecture+Tutorial	3-1-0	Fundamental Science

Course Objective

- To provide depth knowledge of biological or medicinal processes through the investigation of the underlying molecular mechanisms.
- Understanding of chemical and molecular processes that occur in and between cells. Understanding will become such that can be able to describe and explain processes

and their meaning for the characteristics of living organisms.

Course Outcomes

- Conduct independent work in a laboratory.
- Read scientific articles and gain a critical understanding of their contents.
- Give a spoken and written presentation of scientific topics and research results.
- Present hypotheses and select, adapt and conduct molecular and cell-based experiments to either confirm or reject the hypotheses.

Unit 1

Introduction: a. Introduction to molecular biology, b. Molecular biology of cell,

Evolution and Molecular structure of cell and its organelles,

Types of cells. Including different kinds of Prokaryotic and eukaryotic cells,

Cell growth, Cell adhesion, cell junctions and extra cellular matrix organelles, Cell cycle, Cell membrane and its structure (fluid-mosaic model)

Factors influencing on membrane fluidity, asymmetry of membrane and membrane transport (active and passive)

Unit 2

Molecular Nature of the Genetic Material in Prokaryotic and Eukaryotic Cells:

Molecular biology of Genes , DNA: Molecular structure, types: Primary, secondary and tertiary ,The Double helix, types

RNA: Molecular structure, types. Evolution of DNA and RNA , Gene and genetic codes

Unit 3

General Concept on:

a. Regulation of the Gene Expression

b. Regulating the Metabolism:

The Lac- Operon system. , Catabolic repression, The Trp Operon system: regulating the biosynthesis of the tryptophan , Gene expression in Eukaryotic cells ,Plasmids: types, maintenance and functions

Unit 4

DNA Replication and Gene Expression: DNA Replication: Semi conservative Nature of DNA Replication ,DNA Replication in prokaryotic Cells ,DNA Replication in Eukaryotic cell Enzymes involved in DNA Replication: DNA polymerases ,Proofreading, post-replication Modification of DNA. Transferring information from DNA to RNA ,Synthesis of RNA , RNA polymerase , Initiation and Termination of Transcription , Post transcription modification of the RNA Protein Biosynthesis: Translation of the genetic code ,Translation of m RNA ,Role of RNA in protein synthesis , Forming the polypeptides- elongation ,Termination of the protein biosynthesis .

Subject Name	Code	Type of course	L-T-P	Prerequisite
Systemic Virology & Mycology	BSCM2304	Lecture+Tutorial	3-1-0	Fundamental Science

Course Objective

- To learn opportunities in the basic principles of medical microbiology and infectious disease.
- To study mechanisms of infectious disease transmission, principles of aseptic practice, and the role of the human body's normal microflora.
- To understand the importance of pathogenic Virus and fungus in human disease with respect to infections of the respiratory tract, gastrointestinal tract, urinary tract, skin and soft tissue.

Course Outcomes

- The course provides the conceptual basis for understanding pathogenic microorganisms and the mechanisms by which they cause disease in the human body.
- Know the methods used in studying viruses and fungi.
- Recall the relationship of this infection to symptoms, relapse and the accompanying pathology.
- Explain the methods of microorganism's control, e.g. chemotherapy & vaccines. Solve problems in the context of this understanding.

Unit 1

Introduction and Scope of Virology. General Properties of Viruses and Structure (Morphology) Classification of Medically Important Viruses . Genetic material , Organ system involved , Transmission

Unit 2

Replication of Viruses, Virus Host Interaction, Bacteriophage .Epidemiology, Pathogenesis, Treatment, Prevention and Control of Viral Diseases (DNA Viruses) *Adenoviridae, Poxviridae, Herpes viridae, Papoviridae, Parvoviridae, Hepadnaviridae* Epidemiology, Pathogenesis, Treatment, Prevention & Control of Viral Diseases (RNA Viruses): *Orthomyxoviridae, Paramyxoviridae, Picorna viridae, Corona viridae, Togaviridae, Rhabdoviridae, Retroviridae, Coronaviridae, Bunyaviridae, Arenaviridae, Filoviridae, Reoviridae and Calciviridae*

Unit 3

Mycology: Introduction: Scope and medical importance of fungi- Molds, Mushroom, Yeast. Definition: Mycology, Medical Mycology, Mycetes, Mycosis, Thallus, Hypha, Mycelium, Coenocyte, Rhizoids and Club. Classification, Structure and Physiology of fungi: Cryptogam (Thallophyta: Fungi Algae), Phanerogam, Pseudomycetes, Schizomycetes (Bacteria Actinomycetes, Actinomycetaliae, Nocardia, Yeasts) Myxomycetes (Slime, Molds) , Eumycetes (True fungi) ,Ascomycetes (Histoplasma, Candida, Blastomycosis) , Basidiomycetes (Cryptococcus, Rhizopus) ,Phycomycetes Mucor, Epidermophyton Fungi imperfecti: (Trichophyton).

Unit 4

Vegetative Structure (Morphology) of Fungi : Septate, aseptate, Plectenchyma, Prosenchyma, Pseudoparenchyma, Modification of Plectenchyma (Rhizomorph, Sclerotia, Stroma).

Mode of Nutrition of Fungi :Saprophytes ,Parasites (Obligate parasite, Facultative parasite, Ectoparasite, Endo-parasite) , Symbionts: Lichen Pathogenic Group of Fungi:Opportunistic pathogens ,True pathogens: *Blastomyces dermatitidis* ,*Cooccidioides immitis*, *Paracoccidioides brasiliensis* ,*Histoplasma capsulatum*.

A. Dermatophytes :*Mycrosporium* (Hair, skin) ,*Tricophyton* (Skin, hair, nail) ,*Epidermophyton* (Skin, nail) , *Aspergillus spp.*

B. Dermatomycosis (*Candida albicans*, *Cryptococcus neoformans*)

FCHU0202-Communicative Practice Laboratory-2

Subject Name	Code	Type of course	L-T-P	Prerequisite
Communicative Practice Laboratory-2	FCHU0202	Practice	0-0-2	Fundamental Science

Course Objectives

- To master Study Skills
- To acquire strategic competence to use both spoken & written language to use in a wide range of communication strategies
- To acquire Business Performance Skills

Course Outcomes

- The students will be able to Write effectively for a variety of professional and social settings. They will practice writing as a process of motivated inquiry engaging others writers' ideas as they explore and develop their own. They will demonstrate an ability to revise for content and edit for grammatical and stylistic clarity. And they will develop an awareness and confidence in their own voice as a writer.
- Become accomplished, active readers who appreciate ambiguity and complexity, and who can articulate their own interpretations with an awareness and curiosity for other perspectives.
- Demonstrate the skills needed to participate in a conversation that builds knowledge collaboratively; listening carefully and respectfully to others' view points; articulating their own ideas in relation to other voices and ideas. Students will be able to prepare, organize and deliver and engaging oral presentation. A student is required to take up five lab tests of 100 marks- at least two tests in written mode and three tests in spoken mode.

Unit-1

FRIENDLY COMMUNICATION (9 HOURS)

- Doing Things with Words: To ask for information, help, permission; To instruct, command, request, accept, refuse, prohibit, persuade

- Practice of Formulaic Expressions: Greetings, farewells, introductions, thanks, apologies, regrets, good wishes, congratulations, condolences, offers.
- Conversation Practice in familiar and unfamiliar situations (This module will be practiced through conversation activities in pairs & groups)

Unit-2

GRAMMAR AND VOCABULARY (9 HOURS)

- The focus will be on the appropriate usage of language.
- Elimination of common errors
- Editing passages
- Word power A-Z: Easy and quick techniques
- Vocabulary building exercises (Open Source Language Laboratory will be used to take quizzes and practice grammar & vocabulary)

Unit-3

PHONETICS AND SPOKEN ENGLISH (12 HOURS)

- Students will be trained to find out the correct pronunciation of words with the help of a dictionary /software, to enable them to monitor and correct their own pronunciation.
- Pronunciation Guidelines: Consonants and Vowels
- Pronunciation practice (for accent neutralization), particularly of problem sounds, in isolated words as well as sentences
- Speaking Techniques: Using correct stress patterns, developing voice quality
- Rhythm and Intonation (Reading aloud of dialogues, speeches etc. for practice in pronunciation) (In this module, the learners will use video series from BBC & Sky Pronunciation Suite to improve spoken English)

TEXT BOOKS: Dwyer, J. (2000).

The Business Communication Handbook. New Jersey: Prentice Hall.

REFERENCES:

Brown, G & Yule, G. (1983). *Teaching the Spoken Language*. Cambridge: Cambridge University Press. Brown, H. D. (1994). *Teaching by Principles: An Interactive Approach to Language Pedagogy*. New Jersey: Prentice Hall.

BSCM2306- Bacteriology, Virology & Mycology Lab

Subject Name	Code	Type of course	L-T-P	Prerequisite
Bacteriology, Virology & Mycology Lab	BSCM2306	Practice	0-0-4	Fundamental Science

Course Objective

- To understand the importance of pathogenic Virus and fungus in human disease with respect to infections of the respiratory tract, gastrointestinal tract, urinary tract, skin and soft tissue.
- To know various Culture media and their applications and also understand various physical and chemical means of sterilization and various staining techniques.

Course Outcomes

- The course provides the conceptual basis and methods used in studying viruses and fungi.
- Recall the relationship of this infection to symptoms, relapse and the accompanying pathology.
- Provides knowledge on growth of microorganism.
- Provides knowledge Culturing microorganism.

Bacteriology

Preparation and use of different stains in bacteriology laboratory Grams stain

ZN stain Albert stain Spore stain Capsule stain Flagella stain Motility test

Preparation and use of different media in bacteriology laboratory

Isolation & identification of different groups of bacteria in laboratory Antimicrobial susceptibility testing .

Virology

Demonstration of virus isolation techniques .

Demonstration of cell and tissue culture techniques used for virus isolation. Serological techniques used in diagnostic virology.

Mycology

Organization of laboratory – Mycology

Preparation of different media, chemical and stain for fungus study. Isolation and identification of different fungi of medical important .

4th semester BSc Clinical Microbiology

BSCM2401- Public Health Microbiology

Subject Name	Code	Type of course	L-T-P	Prerequisite
Public Health Microbiology	BSCM2401	Lecture+ Tutorial	3-1-0	Fundamental Science

Course Objective

- To learn the occurrence, abundance and distribution of microorganism in the community and their role in the associated with Public health and also learn different methods for their detection and characterization.
- To understand the basic principles of environment microbiology and be able to apply these principles to understanding and solving environmental problems – Water pollution and waterborne diseases, Air pollution and airborne infections.

Course Outcomes

- Explain prognosis of diseases and become aware about the role of medical microbiology in public health
- Understanding the role of microbiologist in public health
- Study of Air borne & water borne infection

Unit 1

Introduction to Public Health:

Definition, scope, concept and importance of public health microbiology, Roles of microbiologist in public health, Concept of health and disease, Indicators of health, Microbial association of water, air and soil, Basic concept on pollution (air, water, noise, radiation and waste pollution) and public health hazard in the community.

Unit 2

Air Borne Infections: 1. Introduction: Air and its composition, Microbial air pollution, Sources of air pollution & control, Indicator of air pollution – WHO guide line (microbial pollution).
2. Air borne diseases: Transmission of pathogens, Respiratory infection (Viral, bacterial, fungal), Sources of infection, characters of organisms and controls of:
Bacterial pneumonia, Diphtheria, Tuberculosis, Influenza, Measles .
3. Method of measuring microorganisms in air.

Practice-: Selection, collection, preservation and transportation of samples from the community to the laboratory.

Unit 3

Water Borne Infections: 1. Introduction : Definition of wholesome and safe water, Nature, cycle, sources, importance and quality (WHO guide line) of water. Water pollution and sanitation,
2. Microorganisms in water: Transmission of pathogens, Water borne diseases (Viral, bacterial, protozoal), Sources of infection, characters of organisms and control of:
Hepatitis, Cholera, Typhoid, Amoebiasis, Giardiasis, Poliomyelitis
Water Pollution Control. Method of Measuring Microorganisms in Water. Water Treatment, Control of Water Borne Diseases.

Practice-: Isolation and Identification of microorganisms from air.

Isolation and Identification of microorganisms from water and evaluation of water quality

Suggested Reading

1. Text Book of Microbiology, by Ghimire P. & Parajuli K. Vidhyarthi Pustak Bhandar Publication, Kathmandu.
2. Text Book of Social and Preventive Medicine by Park JE and Park K
3. Evidence Based Public Health By Brownson, RC., Baker, EA., Leet. TL., Follespie. KN
4. ,Oxford University Press
5. The Quest for Health, Educational Enterprises, Kathmandu, by Dixit H.
6. Epidemiology for Public Health Practice, by Friis, RH., and Sellers, TA, 2nd Edition, Gaithersburg, MD: Aspen Publication,
7. Modern Food Microbiology, . by Jay, J, H 3rd Edition CBS Publication and Distributors Delhi 1987.
8. Introduction to Soil Microbiology, Martin Alecender, by Academic press, 1961.

BSCM2402- Pharmaceutical Microbiology

Subject Name	Code	Type of course	L-T-P	Prerequisite
Pharmaceutical Microbiology	BSCM2402	Lecture+Tutorial	3-1-0	Fundamental Science

Course Objective

- Understanding of types & synthesis of antimicrobial agents
- Manufacture of antibiotics
- To understand the mechanism of action of antibiotics
- To study how microorganisms are known to develop resistance to antibiotics

Course Outcomes

- With the completion of the course, the students will acquire detailed knowledge of antimicrobial agents, their mechanism of action and basis of resistance of microbes to these antimicrobials, formulations.
- They will develop an understanding of different types of disinfectants/antiseptics and their uses, evaluation of their bactericidal and bacteriostatic action.
- The conceptual understanding of the subject provides opportunities for employability and scopes for higher education.

Unit 1

Introduction to Pharmaceutical Microbiology: Scope ,Importance ,Chemical disinfectants, Antiseptic ,Antibiotics, Preservatives , Static and cidal activity (fungus, bacteria) ,Germicidal activities
Types of Antibiotics and Synthetic Antimicrobial Agents :
Antibiotics , Types and Classification of antibiotics , Synthetic antibiotics , Antiviral drug

Unit 2

Manufacture of Antibiotics : Production of penicillin , Production of streptomycin
Assessment of New Antibiotics : Parameters, determination of the usefulness of antibiotics (in vitro and in vivo) ,Pharmacokinetics and Pharmacodynamics of Antimicrobial agents
Antibiotic Assay : Microbiological method , Disc diffusion technique ,Dilution technique ,Rapid method

Unit 3

Mechanisms of Action of Antibiotics :Cell wall synthesis inhibitors , Inhibitors of protein biosynthesis , Inhibitors of tetrahydrofolate , Disorganize the cytoplasm membrane.
Mode of Action of Antibiotics and Bacterial Resistance to Antibiotics :
Mode of action of antibiotics (cell wall cytoplasmic membrane, cytoplasm and compounds) ,Biochemical mechanisms of resistance , Genetic basis of antibiotic resistance , Problems in antibiotic therapy due to resistance

Evaluation of Antibiotics and Non-antibiotics Agents: Preliminary evaluation, Evaluation of Static activity (fungus, bacteria), Evaluation of Germicidal activities (fungus, bacteria)
Microbial Spoilage and Preservation of Pharmaceutical Products.

Suggested Reading

1. W B Hugo and A D Russel, Pharmaceutical Microbiology, 2nd Edition
2. Ghimire P. Hand book of Practical Microbiology, 2003, Pravesh Publication, Kathmandu

BSCM2403-Industrial Microbiology

Subject Name	Code	Type of course	L-T-P	Prerequisite
Industrial Microbiology	BSCM2403	Lecture+Tutorial	3-1-0	General Microbiology

Course Objective

- Describe the use of microorganism in different industries to produce valuable products like drugs, beverages and different food products etc.
- To developed skills for growing microorganisms in the laboratory for the production of different products by different microorganisms.

Course Outcomess

- Students has acquired a fairly good knowledge of how microbes are used in the fermentative production of organic acids, alcohols, enzymes, antibiotics and various foods in the industry.
- Enhances analytic ability of various physical parameters which affect production of industrial products by the microorganisms and the safety aspects of the production and use of these products.
- The conceptual understanding of the subject provides opportunities for employability and scopes for higher education.
- Developes laboratory skills in producing alcohol and enzymes by fermentative process using bacteria/yeast.

Unit 1

Introduction to Industrial Microbiology: Introduction, History, Definition and scope. Industrial Equipment and Uses.

Fermentation Process: Primary and secondary screening, Detection and assay of fermentation products- Physical and chemical assays, Biological assay

Stock culture, Fermentation media , Inoculums preparation , Increasing products , Phage

Practice-: Observational visit to a beer/alcohol factory.

Observational visit to pharmaceutical, food and dairy industry.

Unit 2

Typical Fermentation Process:

Antibiotic drug fermentation - Penicillin , Streptomycin , Bacterial insecticide ,Other antibiotics- Acetone , Lactic acid , Brewing

Biological Waste Treatment / Bioremediation: Anaerobic fermentation

Production of: Vitamin , Vaccines , Milk & Milk Products, Food , Bakers yeast , Food and feed yeasts, Mushrooms , Vinegar

Enzymes: Amylase , Proteolytic enzyme , Pectinases , Invertase Other enzymes

Unit 3

Industrial effluent: Introduction, Industrial pollution, Microbiology of Domestic sewage Methods for the treatment of industrial effluent and sewage.

Practice- Detection of Fermentation , Biological waste treatment.

Suggested Reading

L. E. Casida, JR., *Industrial Microbiology*, 1991, Wiley Eastern Limited, New Delhi,

BSCM2404- Biochemistry

Subject Name	Code	Type of course	L-T-P	Prerequisite
Analytical Biochemistry	BSCM2404	Lecture+Tutorial	3-1-0	Fundamental Science

Course Objective

- Understanding the concept of Biochemical analyzing instruments both automated and semi automated.
- To learn about how to Care & Maintenance of Equipment & Chemicals.
- To learn normal ranges of biochemical components in our body.
- Clinically relevant biochemical analysis for deeper understanding of all biochemical components i.e., Proteins, Electrolytes, Hormones etc.

Course Outcomes

- Understanding of instrumentation technique & principle of spectrophotometry, colorimetry, photometry and electrolyte analyzer.
- To learn about Various tests carried out for biochemical analysis & Hormone investigations.

- To learn about safety precautions and handling the equipment in biochemical laboratory.

Unit-1

Spectrophotometry and colorimetry, Introduction, Theory of spectrophotometry and colorimetry, Lambert's law and Beer's law, Applications of colorimetry and spectrophotometry.

Practice:- Practice: Cleaning of the Laboratory glass ware, Preparation of distilled Water,

Principle, working and maintenance of pH meter, To prepare 0.1 N HCl solution, 0.2N HCl solution, 0.1 molar H₂SO₄, 0.2 Molar Sodium carbonate solution, Demonstration of Osmosis and dialysis.

Demonstration of the instrument Spectrophotometry according to Lambert's and Beer's law

Unit-2

Photometry, Introduction, General principles of flame photometry, Limitations of flame Photometry, Instrumentation, Applications of flame photometry, Atomic absorption Spectroscopy – Principle & applications

Practice:- Demonstration of Photometry, general principles, limitation of Photometry.

Unit-3

Automation in clinical Biochemistry,

Method of estimation and assessment for: a. Glucose tolerance test, b. Insulin tolerance test, c. Xylose excretion test.

Clearance test for renal function. Gastric analysis, LFT, KFT, Lipid profile, Qualitative test for Urobilinogens, Barbiturates, T₃, T₄ and TSH, 17 Ketosteroids. Principles, clinical significance and procedures for estimation, of Acid phosphatase, Alkaline phosphatase, Lactate dehydrogenase, Aspartate transaminase, Alanine, transaminase and Creatine phosphokinase.

Suggested readings

- Handbook of Christen Medical Association, India (CMAI) Medical Laboratory Technology- Robert H. Carman. 2nd Edn. CMAI, New Delhi.
- Text book of Medical Laboratory Technology, P.B. Godkar 2nd Edn. Bhalani Publication.
- Handbook of Biochemistry by M. A. Siddique 8th Edn. Vijay Bhagat Scientific Book

BSCM2405- Basic Computer & Information Technique

Subject Name	Code	Type of course	L-T-P	Prerequisite
Basic Computer & Information Technique	BSCM2405	Practice	0-0-4	Fundamentals of Computer

Course Objective

- Identify the function of computer hardware components.
- Identify the factors that go into an individual or organizational decision on how to purchase computer equipment.
- Identify how to maintain computer equipment and solve common problems relating to computer hardware.
- Identify how software and hardware work together to perform computing tasks and how software is developed and upgraded
- Identify different types of software, general concepts relating to software categories, and the tasks to which each type of software is most suited or not suited.

Course Outcomes

- Understand the fundamental hardware components that make up a computer's hardware and the role of each of these components.
- Understand the difference between an operating system and an application program, and what each is used for in a computer.
- Describe some examples of computers and state the effect that the use of computer technology has had on some common products

Unit-1

Introduction to computer: introduction, characteristics of computer, block diagram of computer, generations of computer, computer languages.

Input output devices: input devices(keyboard, point and draw devices, data scanning devices, digitizer, electronic card reader, voice recognition devices, vision-input devices), output devices(monitors, pointers, plotters, screen image projector, voice response systems).

Unit-2

Processor and memory: The Central Processing Unit (CPU), main memory.

Storage Devices: sequential and direct access devices, magnetic tape, magnetic disk, optical disk, mass storage devices.

Introduction to MS-Word: introduction, components of a word window, creating, opening and inserting files, editing a document file, page setting and formatting the text, saving the document, spell checking, printing the document file, creating and editing of table, mail merge.

Unit-3

Introduction to Excel: introduction, about worksheet, entering information, saving workbooks and formatting, printing the worksheet, creating graphs.

Introduction to power-point: introduction, creating and manipulating presentation, views, formatting and enhancing text, slide with graphs. Introduction of Operating System: introduction, operating system concepts, types of operating system. Introduction to MS-DOS: History of DOS, features of MS-DOS, MS-DOS Commands (internal and external).

Unit-4

Introduction of windows: History, features, desktop, taskbar, icons on the desktop, operation with folder, creating shortcuts, operation with windows (opening, closing, moving, resizing, minimizing and maximizing, etc.). Computer networks: introduction, types of network (LAN, MAN, WAN, Internet, Intranet), network topologies (star, ring, bus, mesh, tree, hybrid), components of network.

Internet and its Applications: definition, brief history, basic services (E-Mail, File Transfer Protocol, telnet, the World Wide Web (WWW)), www browsers, use of the internet. Application of Computers in various fields: Medical, Education, Railway, Defense, Industry, Management, Sports, Commerce, Internet.

Suggested readings :

1. Objective Computer Awareness
2. Computer Networking (Global Edition)

BSCM2406- Industrial, Public Health Microbiology & Biochemistry lab.

Subject Name	Code	Type of course	L-T-P	Prerequisite
Industrial, Public Health Microbiology & Biochemistry lab.	BSCM2406	Practice	0-0-4	General Microbiology

Course Objective

- Describe the use of microorganism in different industries to produce valuable products like drugs, beverages and different food products etc.
- To learn the occurrence, abundance and distribution of microorganism in the community and their role in the associated with Public health and also learn different methods for their detection and characterization.
- To understand the significance of carbohydrates in energy generation and as storage food molecules for cells. To understand the significance of amino acids, proteins.

Course Outcomes

- Enhances analytic ability of various physical parameters which affect production of industrial products by the microorganisms and the safety aspects of the production and use of these products.
- Understanding the role of microbiologist in public health

- They would have understood the significance of proteins and enzymes in accelerating various metabolic activities.
- The conceptual understanding of the subject provides opportunities for skill enhancement and scopes for higher education and would have understood the principles of Liver function test, kidney function test, lipid profile etc.

Industrial Microbiology:

1. Observational visit to a beer/alcohol factory.
2. Observational visit to pharmaceutical, food and dairy industry.
3. Detection of Fermentation
4. Biological waste treatment.

Public Health Microbiology:

1. Isolation and identification of microorganism from different food products: meat, canned juice, milk, cheese and ice cream.
2. Isolation and identification of microorganism transmitted through vector, insect.
3. Isolation and identification of microorganism (STIs)
4. Isolation and Identification of microorganisms (hospital acquired infection)

Biochemistry:

1. Estimation of Glucose in Urine and in Blood .
2. Estimation of Protein in Urine and Blood .
3. Estimation of Urea in blood .
4. Estimation of uric acid in blood .
5. Estimation of serum bilirubin
6. Estimation of Total Cholesterol in blood .
7. Estimation of HDL Cholesterol.
8. Estimation of LDL Cholesterol .
9. Estimation of TG, Estimation of Creatinine in Blood
10. Estimation of serum calcium
11. To measure electrolytes Sodium , Potassium & Chloride.

5th semester B.Sc Medical Lab. Technology

BSCM3501 –Epidemiology

Subject Name	Code	Type of course	L-T-P	Prerequisite
Epidemiology	BSCM3501	Lecture+Tutorial	3-1-0	Fundamental Science

Course Objective

- Understand the basic epidemiological methods and study designs.
- Understand and discuss population based perspective to examine disease and health – related events.
- Discuss the ethical issues in epidemiological research.
- Explain the importance of epidemiology for informing scientific, ethical, economic and political discussion of health issues.
- Describe a public health problem in terms of person, place, and time.
- Evaluate the strengths and limitations of epidemiologic reports
- Apply concepts, methods, and tools of public health data collection, analysis and interpretation, and the evidence-based reasoning and informatics approaches that are essential to public health practice.

Course Outcomes

- Distinguish between definitions of epidemiology and clinical epidemiology and public health research.
- Apply the terminology of the Epidemiologic Triad to an infectious disease.
- Describe the important historic events in the field of epidemiology.

Unit 1

Introduction to Principles of Epidemiology:

History, Definition, and scope of epidemiology, Achievements in epidemiology ,Terms &Terminologies used in epidemiology.

Measuring Health and Disease :Definitions of health and disease, Measures of disease frequency
Use of available information ,Comparing disease occurrence

Unit 2

Concept of Epidemiological Study: Basic concepts of epidemiology Descriptive / Analytical ,Applied/Experimental ,Field Epidemiology Concept of Prevention and Control of Diseases:
Causation in epidemiology :The concept of cause , Establishing the cause of a disease
Epidemiological markers , Phenotypic and genetic markers including molecular epidemiology.
Disease surveillance : Clinical , Laboratory

Unit 3: Applied Epidemiology:

Communicable disease epidemiology ,Clinical epidemiology ,Environmental & occupational epidemiology , Nutritional epidemiology ,Reproductive epidemiology , Social epidemiology
Food epidemiology.

Epidemiology, Health services and health Policy :

Health care planning, Monitoring & evaluation ,The planning cycle ,Epidemiology, public policy and health policy ,Healthy public policy in practice

Suggested Reading

1. Basic Epidemiology. By Beaglehole R., Bonita R., Kjellstrom , World Health Organization, Geneva,
2. Field Epidemiology, By B Gregg, 2nd Edition, Oxford University Press, 2002

3. Gordis L. *Epidemiology*, 2nd Edition, WB Saunders Company Aharcourt Health Sciences Company, Philadelphia.
4. *Epidemiology in Medicine*, by Lippincott Eilliams and Wilkins, and Walters Kluwer Company
5. *Epidemiology, Principle and Method*, McMahon B, Trichopoulos D, by 2nd Edition, Boston, Little, Brown.

BSCM3502 -Diagnostic Bacteriology

Subject Name	Code	Type of course	L-T-P	Prerequisite
Diagnostic Bacteriology	BSCM3502	Lecture+ Tutorial	3-1-0	Fundamental Science

Course Objective

- | |
|---|
| <ul style="list-style-type: none"> • To confirm the suspicion of infectious bacterial disease. • To identify the etiologic agent by isolating the causative bacterial pathogen. |
|---|

Course Outcomes

- | |
|---|
| <ul style="list-style-type: none"> • Study of Lab diagnosis for Enteric infection, Respiratory tract Infection, Oral & Stomach infection, Urinary tract infections. • Study of control measures for nosocomial infection. • Student can safeguard himself & society and can work diagnostics and hospitals |
|---|

Unit 1

Aerobic Culture:

Scope and importance of aerobic culture, Factors affecting aerobic culture, Various media and techniques of aerobic culture.

Laboratory Diagnosis of Enteric Infections: (Terminology, mechanism of infection, etiology, conventional and rapid diagnostic methods) Enteric fever / Typhoid fever, Bacterial endocarditis, Bacteraemia, Septicemia, Pyrexia of unknown origin (PUO).

Unit 2

Laboratory Diagnosis of Respiratory Tract Infection (RTI):

(Terminology, mechanism of infection, etiology, conventional and rapid diagnostic methods) Lower RTI, Upper RTI .

Laboratory Diagnosis of Urinary Tract Infection: Terminology, mechanism of infection, etiology, conventional and rapid diagnostic methods)

Unit 3

Laboratory Diagnosis of Oral, Thourroat and Stomach Infection: (Terminology, mechanism of infection, etiology, conventional and rapid diagnostic methods) Gingivitis and anaerobic infection of oral cavity .

Peptic ulcer (with emphasis in mechanism of peptic ulcer caused by *Helicobacter pylori*) .

Laboratory Diagnosis of Eye Infection: (Terminology, mechanism of infection, etiology, conventional and rapid diagnostic methods) Corneal ulcer, Conjunctivitis .

Suggested Reading

1. Medical Laboratory Manual for Tropical Countries, by Cheesbrough M., Vol. I & II, Edition, ELBS.
2. *Clinical Microbiology*, by Stoker, Edward Arnold.
3. *Manual Clinical Microbiology*, by Lynnette, E. H., 8th Edition, American Society for Microbiology, Washington DC.
4. Basic Bacteriology Laboratory manual, WHO

BSCM3503- Diagnostic Virology

Subject Name	Code	Type of course	L-T-P	Prerequisite
Diagnostic virology	BSCM3503	Lecture+ Tutorial	3-1-0	Basic virology

Course Objective

- Understanding laboratory diagnosis of virus by both conventional and molecular approach.
- To produce a cadre of specialized medical virologists who would help establish clinical diagnostic services in various hospitals/centres.

Course Outcomes

- Organise sample collection, transportation, processing and storage in an appropriate manner.
- Plan, write and implement research projects in virology, analyze their results and publish these in peer-reviewed journals.
- Coordinate with concerned agencies regarding viral diseases and their outbreaks.
- Plan and execute epidemiological studies and provide advice in relation to viral diseases.

Unit 1

Laboratory Organization: Room (space), Electricity, Water supply, Sterility Sampling in Diagnostic Virology: Selection, collection, storage, transportation and processing of samples. Electron Microscope: Principle, importance and use

Unit 2

Laboratory Diagnosis of Viral Infections : Virus isolation, Inoculation in laboratory animal, Egg inoculation ,Tissue culture, Recognition of viral growth-Cytopathic effec ,Haemadsorption (Hd) ,

Immunofluorescence or immunoperoxidase staining, Interference. Identification of virus-Neutralization (N), Haemagglutination – inhibition (HI), Immunofluorescence or immunoperoxidase staining, Electronic microscope (EM). Direct demonstration of virus or virus antigens - Serology - Immunofluorescence , Electronic Microscopy , Histological demonstration of inclusion bodies, Serological tests: Detection of viral antigen ,Detection of anti viral antibodies. (Rising titer in paired sera: 4–fold or more -Detection of IgM Complement fixation (CF), Haemagglutination inhibition (HAI), Neutralization (N), Immuno- fluorescence (IFA) , Enzyme immunoassay.

Unit-3

Laboratory Diagnosis of Important

a. DNA Viruses and b. RNA Viruses, Antiviral Drugs

Practice-: Practical sessions (Laboratory Practices) will be based in the Hospital Laboratory performing diagnostic tests available / requested, in Diagnostic Virology laboratory

BSCM3504- Diagnostic Mycology

Subject Name	Code	Type of course	L-T-P	Prerequisite
Diagnostic Mycology	BSCM3504	Lecture+Tutorial	3-1-0	Fundamental Science

Course Objective

- To confirm the suspicion of fungal disease.
- To identify the etiologic agent by isolating the causative fungal pathogen.

Course Outcomes

- This course provides learning opportunities in the basic principles of medical microbiology and infectious fungal diseases.
- The course provides the conceptual basis for understanding pathogenic fungi and the mechanisms by which they cause disease in the human body.
- Student can safeguard himself & society and can work diagnostics and hospitals

Unit 1

Introduction to Diagnostic Mycology: Medically important fungi , Opportunistic Fungi Fungal Diseases: Mycoses

1. Superficial mycoses:
2. Subcutaneous mycoses:
3. Cutaneous mycoses: Trichophytosis, Microsporiosis, Epidermophytosis.
4. Systemic mycoses: Histoplasmosis, Blastomycosis, Cryptococcosis, Coccidioidosis, Paracoccidioidosis .

Unit 2

Pathogenesis and Laboratory Diagnosis of Mycotic Infections :

Aspergillus spp, Candida albicans, Fusarium spp, Cryptococcus neoformans, Histoplasma capsulatum, Sporothrix spp, Philophora spp., Trichophyton microsporium, Epidermophyton spp. Blastomyces dermatitidis, Coccidioides immitens,

Unit 3

Isolation and Identification of Fungi (Laboratory Diagnosis):

A. Selection, collection and transportation of specimens 5 hours

Skin, Hair, Nail, Mucous membranes, Ear, eye, Corneal ulcer, Pus, Blood, Biopsy, Sputum, Urine, Vaginal and Cervical swab, Stool samples, Plural and peritoneal fluid, Superficial, sub-cutaneous and cutaneous samples.

B. Smear Preparation: 2 hours

KOH Preparation, 20% KOH with 20% Glycerol, KOH – DMSO (Dimethyl Sulphoxide) 100% Lactophenol Cotton Blue , India ink preparation.

Practice:-Antifungal Sensitivity Test: Antibiotics. Stock solution of drug Dilution technique , Sensitivity test by different method , Minimal inhibitory concentration (MIC) and Minimal fungicidal concentration (MFC)

Serological Test: Identification of Antigen, Antibody and Metabolites in Body Fluid&Serum.

BSCM3505- Diagnostic Parasitology

Subject Name	Code	Type of course	L-T-P	Prerequisite
Diagnostic Parasitology	BSCM3505	Lecture+Tutorial	3-1-0	Basic Parasitology

Course Objective

- To explain the mechanisms of pathogenesis from a gross, microscopic and molecular perspective.
- Recognize the diagnostic stage of the infection under the microscope and to manage the infected patient.
- To examine parasites and parasitism, emphasizing the influence of parasites on the ecology and evolution of free-living species, and the role of parasites in global public health.

Course Outcomes

- Organise sample collection, transportation, processing and storage in an appropriate manner.
- Plan, write and implement research projects in parasitology, analyze their results and publish these in peer-reviewed journals.
- Coordinate with concerned agencies regarding protozoan and helminth diseases and their outbreaks.
- Plan and execute epidemiological studies and provide advice in relation to protozoan diseases.

Unit 1

Laboratory Organization (Parasitology Lab) Selection, Collection, Perseveration and Transportation of Samples

Unit-2

Laboratory Diagnosis, of the Intestinal and Vaginal Parasites: 28 hours (Terminology, mechanism of infection, etiology, conventional and rapid diagnostic methods) Protozoa: Entamoeba histolytica , Giardia lamblia, Trichomonas spp , Cyrptosporidium , Cyclospora cayantensis , Isospora Helminthes Ascaries lumbricoides , Hook worm: Anacylostoma and Necator, Enterobius vermicularis, Trichuris trichuira , Strongloides spp. ,Taenia spp., Echinococcus spp. , Hymonolepisnana, Tissue and Blood Parasites: Malaria sps , Kalaazar , Wacheria spp. Brugia, Loa loa, , Oncocerca, Dracuhculus , Paragonimus westermani/hertmani

Unit 3

Laboratory Diagnosis of Various Parasites: 6 hours Direct method, Indirect method, Rapid methods, Molecular Technique Parasite Culture. Different Stains used in Diagnostic Parasitology.

Practice:- Practical sessions (Laboratory Practices) will be based in the Hospital Laboratory performing diagnostic tests available / requested, in Diagnostic Parasitology laboratory

BSCM3506 -Research Methodology

Subject Name	Code	Type of course	L-T-P	Prerequisite
Research Methodology	BSCM3506	Lecture+ Tutorial	3-1-0	Fundamental Science

Course Objective

- To equip students with a basic understanding of the underlying principles of quantitative and qualitative research methods.
- Provide students with in-depth training on the conduct and management of research from inception to completion using a wide range of techniques.

Course Outcomes

- Students can understand the ethical and philosophical issues associated with research in education
- This study provides knowledge on various modes of presenting and disseminating research findings.
- Enable students to acquire expertise in the use and application of the methods of data collection and analysis.
- Provide learning opportunities to critically evaluate research methodology and findings.
- Enable students to be reflexive about their role and others' roles as researchers.

Unit 1

Introduction to Research Methodology: 4 hours Meaning and Nature of Research-
Meaning, definition and characteristics of health research Importance of health research in nursing field .

Foundation of Scientific Research -

Scientific Thinking, Research Idea and the thought Process: Reasoning, Deduction, Induction, Combining Induction and Deduction, and Reflective thinking and the Scientific Method, Scientific Research. Identification and Analysis of Research Problem

Selection of a problem, Sources Criteria, Defining a problem, Characteristics of a problem, Criteria of good research questions, Steps in analyzing the research problem.

Unit 2

Proposal Development:

Basic steps involved in the health research proposal development

process Literature Review:

Importance and Sources, Strategies for gaining access to information, Library search, Computer search. Research Title and Objectives

Criteria for selecting a research title , Formulation of research objectives , Types of research objectives , Qualities of research objective

Research Hypothesis: Definition , Qualities of research hypothesis Importance and types of research hypothesis .

Unit 3

Variables :Definition, Importance, Qualitative and Quantitative variables Dependent and Independent variables

Confounding variables, Background variables, Operational definition (defining variables), Indicator. Research Design : Purpose of research design,

Types of study designs: Interventional study design - Exploratory, Descriptive (case study / case series, cross-sectional, longitudinal), Analytical (case control, cohort) study designs; Non Interventional study design - Pre experimental (pre test post test), Quasi experimental, True

experimental (Completely Randomized, Completely Randomized Block, Factorial, Time Series) study designs.

Unit 4

Sampling Design and Procedure :

Definition, Importance, Characteristics of a good sample

Qualities of sampling frame, Population concept and parameter, Types of sampling units,

Types of Sampling – Non probability sampling (purposive, quota, convenient, snowball etc.), Probability sampling (simple random, systematic, stratified, cluster, multistage, PPS etc.)

Techniques to choose appropriate sampling procedure, Sampling errors, Sample size, Testing reliability of sample

Qualitative and Quantitative Techniques used in Health Research Process. Data Collection Methods:

Pre-testing Data Collection Tools and Making Work Plan:Preparation of working schedule Gantt chart.

Data Processing and Analysis

Coding/decoding, Editing , Preparation of master tables ,Master field books, Dummy table preparation , Data processing and analysis plan – Selection of appropriate statistical techniques.

Research Ethics and Research Proposal Format.

Suggested Reading

1. WHO, Health Research Methodology: A guide for training in research Methods, 2nd Edition, WHO-WIPRO.
2. A Student's Guide to Methodology by Clough P and Nutbrown C. Sage Publication .
3. National Ethical Guidelines for Health Research in Nepal, Available at Nepal Health Research Council.
4. Field Trials of Health Interventions in Developing Countries by Smith PG, Morrow.

BSCM3507- Epidemiology and Microbiology Practical

Subject Name	Code	Type of course	L-T-P	Prerequisite
Epidemiology and Microbiology Practical	BSCM3507	Practice	0-0-4	Fundamental Science

Course Objective

- Understand the basic epidemiological methods and study designs.
- Understand and discuss population based perspective to examine disease and health – related events.
- Discuss the ethical issues in epidemiological research.
- Explain the importance of epidemiology for informing scientific, ethical, economic and political discussion of health issues.
- To confirm the suspicion of infectious bacterial disease.
- To identify the etiologic agent by isolating the causative bacterial pathogen.

Course Outcomes

- Distinguish between definitions of epidemiology and clinical epidemiology and public health research.
- Apply the terminology of the Epidemiologic Triad to an infectious disease. Describe the important historic events in the field of epidemiology.
- Study of Lab diagnosis for pus, mycobacterium, venereal diseases, GI Tract, Meningitis and Encephalitis.
- Handling of Clinical Specimen for Microbial Study
- Student can safeguard himself & society and can work diagnostics and hospitals

Epidemiology

Filed investigation of an outbreak /disease prevalence study in a community.

Diagnosis Microbiology

Anaerobic Culture

Laboratory Diagnosis of Pus .

Laboratory Diagnosis of Mycobacterium Infection Laboratory Diagnosis of Venereal Diseases

Laboratory Diagnosis of GI Tract .

Laboratory Diagnosis of Meningitis and Encephalitis Laboratory Organization and Management

Handling of Clinical Specimen for Microbial Study Performance of different Tests Rapid

Diagnostic Tests 6 hours Molecular Tests 8 hours

Interpretation of Test Results 5 hours Test reporting

6th semester B.sc Clinical microbiology

Internship Thesis Guideline

This Guideline is designed to provide students the knowledge and practice of public health research activity, to enable them to carry out researches and solve research related problems and to help them in writing thesis and defend their work. Upon successful completion of the course, the students shall be able to:

- Search relevant scientific literature
- Develop a research proposal
- Employ appropriate data collection techniques and tools
- Manage collected data
- Analyze data with appropriate statistical techniques
- Write thesis
- Defend the findings

Proposal Development:

At the ending of third year (Sixth Semester), students individually consultation with designated faculties and extensive literature survey will develop research proposal during the initial 6 months period.

Data Collection/ Thesis Writing:

Students will carry out data collection, data management, data analysis, and thesis writing during the remaining period (Six Semester).

The Dissertation should have following format:

1. Title

2. Introduction
3. Materials and Methods
4. Results
5. Discussion
6. Conclusion
7. Recommendation
8. References
9. Appendix

BSCM3601-Project

Subject Name	Code	Type of course	L-T-P	Prerequisite
Project	BSCM3601	Project		Basic Medical science

Project work:-

Suggested Project title

1. Antibacterial activity of sweet orange(citrus sinensis) on Staphylococcus aureus and Escherchia coli isolated from wound infected.
2. The incidence of Salmonella and Escherchia coli in livestock (Poultry) feeds
3. Microbial evaluation of milk from a diary farm.
4. Gastroenteritis in primary school children (6-12yr) of specific locality.
5. Comparative analysis of microbial load of the main water production and water available to CUTM campus.

BSCM3602- Internship

Subject Name	Code	Type of course	L-T-P	Prerequisite
Internship	BSCM3602	Project		Basic Medical science

Internship

- Case record
- Lab management and ethics
- Evaluation -Guide(internal)
- Industries guide(external)
- University-project report/ Viva

**CENTURION UNIVERSITY OF TECHNOLOGY AND
MANAGEMENT, ODISHA**

SCHOOL OF PARAMEDICS & ALLIED HEALTH SCIENCES



**Centurion
UNIVERSITY**

*Shaping Lives...
Empowering Communities...*

**BACHELORE OF SCIENCE IN
MEDICAL LABORATORY TECHNOLOGY**

2018

SYLLABUS

Preface: Medical Laboratory Technology helps to diagnose and prevent disease through clinical laboratory tests. It is complementary to medical science. It involves analysis of body matter such as fluid, tissue, and blood. It also covers micro-organism screening, chemical analyses, and cell count.

Medical Technologists are an integral part of the medical profession. These professionals get involved in practical and technical work to aid correct diagnosis and effective functioning of Biochemical Laboratories.

With adequate knowledge and experience, Medical Laboratory Technologists having B.Sc MLT qualification can work in supervisory or management positions in laboratories and hospitals. They can also work as Laboratory Manager/Consultant/supervisor, health care Administrator, Hospital Outreach coordination, laboratory information system Analyst/Consultant, educational consultant/coordinator etc. Additional opportunities are available in molecular diagnostics, molecular biotechnology companies and in vitro fertilization laboratories as well as in research labs.

Programme: B.Sc. in Medical Laboratory Technology

Duration: Three years (Six semesters) full-time programme with 6 months internship in the last semester.

Eligibility: +2 Science with Physics, Chemistry & Biology or equivalent degree

Examination: Examination rules will be as per guideline of CUTM Examination hand book.

Internship: A candidate will have to undergo internship for a period of six calendar months in a hospital/Diagnostics Centre equipped with modern pathology laboratory facility or in a fully equipped pathology laboratory, which fulfills the norms decided by the University.

Dissertation will be compulsory to all students. Students will carry out dissertation work individually or in the group of not more than three students. The format for dissertation/Internship report will be similar to the research thesis style; incorporating chapters on: Introduction, Materials and Methods, Results and Discussion and References / Bibliography. The dissertation will be submitted in a typewritten and bound form.

Degree: On successful completion of three year programme, the candidate will be awarded with “**Bachelor of Science in Medical Laboratory Technology (B.Sc.-MLT)**” from Centurion University.

**BACHELOR OF SCIENCE IN
MEDICAL LABORATORY TECHNOLOGY**

**Programme
Structure**

Total Credit: 140

SEMESTER-I				
SL NO	CODE	SUBJECT	SUBJECT TYPE Lecture+ Tutorial+ Practice (L+T+P)	CREDITS
1	BSMT1101	Introductory Biology	3+1+0	4
2	BSMT1102	Basic Anatomy and Physiology	4+0+0	4
3	BSMT1103	Basic Haematology	3+1+0	4
4	BSMT1104	Basic Medical Instrumentation and Technique	3+1+0	4
5	BSMT1105	Anatomy , Physiology & Hematology Lab	0+0+6	4
Total				20

SEMESTER-II				
SL NO	CODE	SUBJECT	SUBJECT TYPE (L+T+P)	CREDITS
1.	FCBS0101	Environmental Science	3+1+0	4
2.	FCHU1201	Foundations of English Communication	0+0+3	2
3.	BSMT1201	Microbiology	3+1+0	4
4.	BSMT1202	Basic Biochemistry	3+1+ 0	4
5.	BSMT1203	Clinical Pathology	3+1+0	4
6.	BSMT1204	Clinical Pathology & Microbiology Lab	0+0+6	4
Total				22

SEMESTER-III				
SL NO	CODE	SUBJECT	SUBJECT TYPE (L+T+P)	CREDITS
1	BSMT2301	Immunology	3+1+0	4
2	BSMT2302	Applied Hematology	3+1+0	4
3	BSMT2303	Applied Biochemistry	3+1+0	4
4	BSMT2304	Basic Histology	3+1+0	4
5	FCHU0202	Communicative Practice Laboratory-2	0+0+3	2
6	BSMT2305	Immunology & Histology Lab	0+0+6	4
Total				22

SEMESTER-IV				
SL NO	CODE	SUBJECT	SUBJECT TYPE (L+T+P)	CREDITS
1.	BSMT2401	Parasitology	3+1+0	4
2.	BSMT2402	Advance Biochemistry	3+1+0	4
3.	BSMT2403	Advanced Hematology	3+1+0	4
4.	BSMT2404	Human Values & Professional Ethics	3+1+0	4
5.	BSMT2405	Basic Computers and Information Science	0+0+6	4
6.	BSMT2406	Biochemistry & Advanced Microbiology Lab	0+0+6	4
Total				24

SEMESTER-V				
SL NO	CODE	SUBJECT	SUBJECT TYPE (L+T+P)	CREDITS
1	BSMT3501	Transfusion Medicine	3+1+0	4
2	BSMT3502	Medical Laboratory Management	3+1+0	4
3	BSMT3503	Immunopathology	3+1+0	4

4	BSMT3504	Introduction To Quality and Patient Safety	3+1+0	4
5	BSMT3505	Medical Law and Ethics	3+1+0	4
6	BSMT3506	Mycology & Virology	3+1+0	4
7	BSMT3507	Mycology & Virology Lab	0+0+6	4
TOTAL				28

SEMESTER-VI				
SL NO	CODE	SUBJECT	SUBJECT TYPE (L+T+P)	CREDITS
1.	BSMT3601	Project	NA	12
2.	BSMTI3602	Internship	NA	12
		Total		24

INTERNSHIP

Minimum 720 hours (calculated based on 8 hours per day, if 90 working days in a 6 months)

Syllabus

First semester B.sc Medical Lab. Technology

BSMT1101-Introductory Biology

Subject Name	Code	Type of course	L-T-P	Prerequisite
Introductory Biology	BSMT1101	Theory+ Practice	3-1-0	Fundamental Science

Objective:

- Determine the parts of the cell membrane and the cell wall
- Distinguish the types and mechanism of mutation
- Compare and contrast the events of cell cycle and its regulation
- Understand the dynamic character of cellular organelles

Course outcome

- Describe the fundamental principals cellular biology
- Develop a deeper understanding of cell structure and how it relates to cell functions.

- Understand how cells grow, divide, and die and how these important processes are regulated.
- Understand cell signaling and how it regulates cellular functions. Also how its dis-regulation leads to cancer and other diseases.

Subject: BSMT1101- Introductory Biology

(LTP: 3+1+0)(Credit: 4)

Unit-1

Biology & Its Branches; Scientific methods in Biology; Scope of biology and career options in Medical Laboratory Sciences; Characters of living organisms (elementary idea of metabolism, transfer of energy at molecular level, open and closed systems, homeostasis, growth and reproduction, adaptation, survival, death). Origin and Evolution of life - Theories of Evolution; Evidence of Evolution; Sources of Variations (mutation, recombination, genetic drift, migration, natural selection); Concept of species; Speciation and Isolation (geographical and reproductive); Origin of species.

Unit-2

Diversity of living organisms, Systematics; Need, history and types of classification (artificial, natural, polygenetic); biosystematics; binomial nomenclature; Two kingdom system, Five kingdom System, their merits and demerits, status of bacteria and virus.

Unit-3

Cell as a basic unit of life - discovery of cell, cell theory, cell as a self - contained unit; prokaryotic and eukaryotic cell; unicellular and multicellular organisms; Ultrastructure of prokaryotic and eukaryotic cell - cell wall, cell membrane - unit membrane concept (Fluid-Mosaic model); membrane transport; cellular movement (exocytosis, endocytosis)

Unit-4

Cell organelles and their functions- nucleus, mitochondria, plastids, endoplasmic reticulum, Golgi complex, lysosomes, microtubules, centriole, vacuole, cytoskeleton, cilia and flagella, ribosomes. Molecules of cell; inorganic and organic materials - water, salt, mineral ions, carbohydrates, lipids, amino acids, proteins, vitamins, hormones and steroids.

Suggested Readings

1. Molecular biology of the cell by Alberts Bruce, publisher Garland Science
2. Molecular Biology by Friefelder David, Publisher Narosa
3. Introduction to Cell biology by John K Young, World Scientific publishing company
4. Introduction to biology ,3rd tropic edition by D G Maackean
5. A Term wise Text book on biology by VIDYA

BSMT1102-Human Anatomy & Physiology

Subject Name	Code	Type of course	L-T-P	Prerequisite
Human Anatomy and Physiology	BSMT1102	Theory	4-0-0	Fundamental Science

Objective:

- To identify different types of cells and describe their functions.

- To identify the organelles of a typical cell and describe their functions.
- To identify the major components of the integumentary system and describe their functions.
- To identify the major structures of the skin and describe their functions
- To identify the major components of the skeletal system and describe their functions.
- To identify the major components of the circulatory, endocrine, nervous system etc and describe their functions.

Course Outcome

- Use anatomical terminology to identify and describe locations of major organs of each system covered.
- Explain interrelationships among molecular, cellular, tissue, and organ functions in each system.
- Describe the interdependency and interactions of the systems.
- Explain contributions of organs and systems to the maintenance of homeostasis.
- Identify causes and effects of homeostatic imbalances.
- Describe modern technology and tools used to study anatomy and physiology.

Subject: BSMT1102- Human Anatomy And Physiology

(LTP: 4+0+0)(Credit: 4)

Unit-1

Scope of Anatomy and physiology. Definition of various terms used in Anatomy. Structure of cell , function of its components with special reference to mitochondria and microsomes.

Elementary tissues: Elementary tissues of the body, i.e. epithelial tissue, muscular tissue, connective tissue and nervous tissue.

Skeletal System: Structure and function of Skelton .Classification of joints and their function. Joint disorders.

Practice: *Demonstration of individual bone from skeleton..
Identification of different organs and system from chart .*

Unit-2

Cardiovascular System: Composition of blood, functions of blood elements. Blood group and coagulation of blood. Brief information regarding disorders of blood . Name and functions of lymph glands. Structure and functions of various parts of the heart. Blood pressure and its recording . Brief information about cardiovascular disorders .

Respiratory system: Various parts of respiratory system and their functions, physiology of respiration.

Practice: *Demonstration the morphology of different blood cells
Measurement of Blood pressure, impulses, Heart beats, respiration rate etc.*

Unit-3

Urinary System: Various parts of urinary system and their functions, structure and functions of kidney. Physiology of urine formation. Patho-physiology of renal diseases and edema .

Digestive System: names of various parts of digestive system and their functions. Structure and functions of liver, physiology of digestion and absorption .

Endocrine System: Endocrine glands and Hormones. Reproductive system . Structure and function of sense organs .

Practice: Identification of different organs and system from chart.

Suggested Readings:

1. Text book Anatomy & Physiology for nurses by Evelyn Pearce, Publisher Faber& Faber.
2. Text book Anatomy and Physiology for nurses by Sears, Publisher Edward Arnold.
3. Anatomy & Physiology- by Ross and Wilson, Publisher Elsevier.
4. Anatomy& Physiology: Understanding the human body by Clark, Publisher Jones & Bartlett.
5. Anatomy and Physiology for nurses by Pearson, Publisher Marieb & Hoehn.
6. Anatomy and Physiology by N Murgesh, Publisher satya.

BSMT1103-Basic Haematology

Subject Name	Code	Type of course	L-T-P	Prerequisite
Basic Hematology	BSMT1103	Theory+Practice	3-1-0	Basic Medical science

Objective:

- The overall aims are that the student should obtain advanced knowledge of the most common hematologic diseases & understanding the concept of Blood cells and other blood components.
- Be able to handle an investigation of hemorrhagic disorder and laboratory abnormalities such as anaemia, polycythemia, leukopenia, leukocytosis, thrombocytopenia, thrombocytosis, elevated ESR etc within hematology.
- Clinically relevant hematological analysis for deeper understanding of Evaluate normal and abnormal cell morphology with associated diseases and other blood components .

Course Outcome

- Differentiate various laboratory test findings with their associated clinical conditions.
- Identify the various skills necessary to perform blood counts, evaluate blood elements, and report results within the stated limits of accuracy.
- Describe the various components of blood ,their functions, and roles in various disease states.
- To be able to demonstrate good skills in the relevant Hematology laboratory methodology.
- Collection of blood for the investigations.
- Be able to distinguish the developmental stages of blood cells. It will also cover Bone marrow examination.
- To learn about tests carried out for hematological investigations.
- To be able to carry out blood sampling.

Subject: BSMT1103- Basic Hematology

(LTP: 3+1+0)(Credit: 4)

Unit-1

Introduction to Hematology, definition, importance, important equipment and chemicals, various test performed in Hematology laboratory.

Practice: *Demonstration of instruments used in hematology- Microscope, Blood Cell counter, Shari's Apparatuses .*

Unit -2

Composition and function of blood, Function of normal cellular components

Formation of blood, Erythropoiesis, leucopoiesis, thrombopoiesis

Anticoagulants, definition , Uses, Different types, mode of action, their merits and demerits.

Morphology of normal blood cells, abnormal morphology & diseases .

Practice: *Demonstration of different blood cell , their synthesis from slide presentation or chart.
Demonstration the normal and abnormal morphology of different blood cells .*

Unit-3

Collection and preservation of blood: different methods of collection, preservation, changes in stored blood normal and absolutely values in hematology, RBC count, WBC count, Platelet count, DLC value, HB, MCH, MCV, MCHC, ESR, PCV.

Blood Film: different types, methods of preparations , staining, Different types of stains, Romanwsky stains: principle of staining, different stains, their composition and preparation, methods of staining.

Practice: *Preparation of DLC, TLC, TRBC etc
Estimation of Esr, Hb and values of MCH , MCV, MCHC, ESR, PCV.*

Unit-4

Hematological Disorders

- Classification of Anemia: Morphological & etiological.
- Iron Deficiency Anemia: Distribution of body Iron, Iron Absorption, causes of iron deficiency, lab findings.
- Megaloblastic Anemia : Causes, Lab findings.
- Hemolytic Anemia : Definition, causes, classification & lab findings.
- Bone Marrow : Cell composition of normal adult Bone marrow, Aspiration, Indication, Preparation & Staining, Special Stain for Bone Marrow -Periodic Acid Schiff, Sudan Black
- Leukemia : Classification, Blood Picture, Differentiation of Blast Cells.

Practice: *Collection of blood by different methods
Different normal and abnormal morphology of RBCs, WBCs,Platelet.*

Suggested Reading

- Textbook of Medical Laboratory Technology P.B Gotkar Mumbai,Bhalani Publishing House
- Text book of Medical Laboratory Technology by Paraful B. Godkar, Publisher Bhalani
- Text book of Medical Laboratory Technology(IIInd edition) by V.H Talib, Publisher CBS
- Atlas of hematology(5th edition)by G.A. McDonald, Publisher Churchill Livingstone
- Medical Laboratory Technology By K.L Mukharjee,Publisher McGraw Hill education pvt limited

BSMT1104-Basic Medical Instrumentation & Techniques

Subject Name	Code	Type of course	L-T-P	Prerequisite
Basic Medical Instrumentation and	BSMT1104	Theory+Practice	3-1-0	Fundamental

Techniques				Science
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Objective:

- To learn the principle, instrumentation & application of Microscopy
- Principle, instrumentation & application of Centrifugation
- Principle of Spectroscopy

Course Outcome

- After completion of the course the student will be efficient in handling the microscopy equipment's.
- They will also be able to have idea about handling instruments like centrifuge, spectrophotometer, chromatography, flow cytometer, Automated and semi- automated Biochemistry analyzer.
- The conceptual understanding of the subject provides opportunities for skill enhancement and scopes for higher education.

Subject: BSMT1104-Basic Medical Instrumentation & Techniques (LTP: 3+1+0)(Credit: 4)

Unit -1

Microscope: different type of microscope operation and care of binocular and monocular microscope in details. Light, phase contrast, interference, fluorescence, polarization and electron microscopy (principle, parts and its application)

Photometry: Basic principal and operation.

Practice: Demonstration, operation, and Quality control of different types of microscopes.

Unit-2

UV-Vis spectrometry and colorimetric instrumentation and its application.

Centrifuge: Basic principle, type analytical and preparative centrifuges, different density gradient centrifuge and its application. Blood analyzer: Principle, working and its application.

Practice: Operation, Demonstration and Quality control of Centrifuge, UV-Vis spectrometer, Colorimeter.

Unit-3

Microtome: Principle, working and its uses. Incubator, hot air oven and autoclave: Principle, working and its uses.

Practice: Working procedure of microtome, Incubator, Hot air oven, autoclave.

Suggested Reading

1. A Textbook of Medical Laboratory Technology by P Godkar, Publisher Bhalani
2. Textbook of Clinical laboratory methods and diagnosis by Ales C.Sonnenwirth & Leonard Jarret.
3. A Procedure Manual for Routine Diagnostic Tests Vol. I and II by KL Mukherjee, Publisher McGraw Hill education pvt limited
4. Manual of lab and diagnostic tests by Lippincott Williams Wilkins, New York, Fischbach, 2005.
5. Medical laboratory science theory and practice by J Ochei and Kolhatkar, Publisher TBS

BSMT1105-Anatomy, physiology & Haematology Lab

Subject Name	Code	Type of course	L-T-P	Prerequisite
Anatomy, physiology & Haematology Lab	BSMT1105	Practice	0-0-4	Fundamental Science

Objective:

- To identify the major structures of the skin and describe their functions
- To identify the major components of the skeletal system and describe their functions.
- Clinically relevant hematological analysis for deeper understanding of Evaluate normal and abnormal cell morphology with associated diseases and other blood components.

Course Outcome

- To be able to demonstrate good skills in the relevant Hematology laboratory methodology.
- Collection of blood for the investigations.
- Be able to distinguish the developmental stages of blood cells.It will also cover Bone marrow examination.
- Explain contributions of organs and systems to the maintenance of homeostasis.
- Identify causes and effects of homeostatic imbalances.
- Describe modern technology and tools used to study anatomy and physiology.

Subject: BSMT1105- Anatomy, physiology and hematology lab

(LTP: 0+0+6)(Credit: 4)

1. Demonstration of various parts of centrifuge; its functioning and care , Demonstration of various parts of microscope its functioning and care ,Cleaning and drying of glass and plastic ware, Preparation of various anticoagulants, Collection of venous and capillary blood, Cleaning of glass-syringes and its sterilization .Preparation of buffers, Preparation of the stains and other reagents , Preparation of peripheral blood film (PBF), To stain a peripheral blood Film by Leishman - stain, Haemoglobin estimation (oxy Hb and cyanmethaemoglobin method)
2. Complete Blood Counts, Determination of Hemoglobin, TRBC Count by Hemocytometers, TLC by Hemocytometer , Differential Leukocyte count, Determination of Platelet Count.
3. Determination of ESR by wintrobes, Determination of ESR by Westergeren's method,
4. Determination of PCV by Wintrobes, Erythrocyte Indices- MCV, MCH, MCHC. Reticulocyte
5. Count, Absolute Eosinophil Count, Morphology of Red Blood Cells.
6. Demonstration of various parts of body ,tissues of body , parts of digestive system , parts of
7. respiratory system ,parts of excretory system

Suggested Reading:-

1. A Textbook of Medical Laboratory Technology by P Godkar, publisher Bhalani
2. Hand book of Medical Lab Technology By V S talib, Publisher CBS
3. Practical Haematology(8th edition) by Sir John, Publisher Churchill Livingstone
4. Clinical Hematology by Christopher A. Ludlam
5. A Procedure Manual for Routine Diagnostic Tests Vol. I and II by KL Mukherjee Publisher McGraw Hill education pvt limited

2nd semester B. Sc Medical Lab. Technology
FCBS0101-Environmental Science

Subject Name	Code	Type of course	L-T-P	Prerequisite
Environmental Science	FCBS0101	Theory+ Practice	3-1-0	Fundamental Science

Objective:

- Students will investigate and understand and model the concepts of ecology.
- Students will investigate and understand the earth's atmosphere and how it affects living organisms.
- Identify the major concerns of the atmosphere and the impact on living organisms.
- To explain the reasons for global warming, the ozone hole and acid rain and the measures being taken for prevention.
- aspects are dealt with a holistic approach.

- Students will develop a sense of community responsibility by becoming aware of environmental issues in the larger social context.

- One must be environmentally educated.

Course Outcome

- Understand the natural environment and its relationships with human activities.
- Characterize and analyze human impacts on the environment.
- Integrate facts, concepts, and methods from multiple disciplines and apply to environmental problems.
- Design and evaluate strategies, technologies and methods for sustainable management of environmental systems and for the remediation or restoration of degraded environments.

Subject: FCBS0101-Environmental Science

(LTP: 3+1+0)(Credit: 4)

Course Objectives:

1. To understand the concept of multi-disciplinary nature of Environmental Science where different aspects are dealt with a holistic approach.

2. Students will develop a sense of community responsibility by becoming aware of environmental issues in the larger social context.

3. One must be environmentally educated.

Course Outcome:

1. Understand the natural environment and its relationships with human activities.
2. Characterize and analyze human impacts on the environment.
3. Integrate facts, concepts, and methods from multiple disciplines and apply to environmental problems.
4. Design and evaluate strategies, technologies and methods for sustainable management of environmental systems and for the remediation or restoration of degraded environments.

Unit-1

Environment and its multidisciplinary nature; Need for public awareness; Renewable and non-renewable resources—forest, water, mineral, land, food and energy resources; Structure and function of ecosystems of forest, grass land, desert and aquatic types.

Unit-2

Biodiversity and its conservation: Biodiversity at global, national and local levels; Threats to biodiversity - Habitat loss; wild life poaching and man - wildlife conflicts; Endangered and endemic species; conservation measures.

Causes, effects and control measures of pollution, air, water and noise pollution; Nuclear hazards; solid-waste management—Causes, effects and control measures; Management of disasters due to natural causes of floods, earthquakes, cyclones and landslides.

Unit-3

Social issues and the environment; Sustainable environment, Water conservation measures; Rain water harvesting; Resettlement and rehabilitation of people; Climate change and global warming; Acid rain; Ozone layer depletion; water land reclamation; Consumerism and waste products; Features of Environment Protection Act, Air pollution and Control of Pollution Acts; Water Pollution and its Control Act. Effects of Pollution explosion on environment and public health; Need for value education to Protect environment and resources.

Text Book:

1. Anubhav Kaushik & C.P. Kaushik: Environmental Studies-New age International Publishers.

Reference Books:

1. Benny Joseph: Environmental Studies-Tata Mac Graw Hill
2. E. Bharucha: Text book of Environmental Studies for under graduate courses— Universities Press. (Book prepared by UGC Committee.

FCHU1201 Foundations of English Communication

Subject Name	Code	Type of course	L-T-P	Prerequisite
Foundations of English Communication	FCHU1201	Practice	0-0-3	General English

Objective:

- To develop vocabulary and grammar knowledge.
- To develop reading comprehension skills.

Course Outcome:

- Development of academic and sub-technical vocabulary.
- Enhancement of basic language skills i.e listening, speaking, reading and writing.
- Development of grammatical competence.
- Confidence level improvement.

Subject: FCHU1201 Foundations of English Communication

(LTP: 0+0+3)(Credit: 2)

Unit-1

READING SKILLS (7hrs.)

Read one of the following books:

- **Animal Farm**

- Alice in Wonderland
- Guide
- Malgudi Days
- Harry Potter
- Amar Chitra Katha

Comprehension Skills: Students will respond to comprehension lessons from the chosen book.

Unit-2

WRITING SKILLS (7hr.)

Students learn grammar and usage by writing passages, and getting formal feedback on these.

Unit-3

LISTENING SKILLS (6hrs.)

Students respond to questions based on listening to videos, audio, or speaking assignments of classmates.

Unit-4

SPEAKING SKILLS (7hrs.)

Speaking assignments based on chosen book or contemporary topics.

TEXT BOOKS:

Esteras, Santiago Remacha and Fabre, Elena Marco. (2007).

Professional English in Use ICT Student's Book. Cambridge: Cambridge University Press.

REFERENCES:

Grellet, F. (1981). Developing Reading Skills. Cambridge: Cambridge University Press

McCarthy, M. & O'Dell, F. (2008).

Academic Vocabulary in Use. Cambridge: Cambridge University Press.

Ur Penny, (1992). Five-Minute Activities: A Resource Book of Short Activities (Cambridge Handbooks for Language Teachers). Cambridge: CUP

F Klippel. (1984). Keep Talking. Cambridge: CUP

BSMT1201-Basic Microbiology

Subject Name	Code	Type of course	L-T-P	Prerequisite
Basic Microbiology	BSMT1201	Theory-Practice	3-1-0	General Biology

Objective:

- To know various Culture media and their applications and also understand various physical and chemical means of sterilization.
- To know General bacteriology and microbial techniques for isolation of pure cultures of bacteria, fungi and virus .
- To master aseptic techniques and be able to perform routine culture handling tasks safely and effectively.

Course Outcome:

- Understanding the details of microorganism morphology and metabolism.
- Broad idea regarding the different types of staining.
- Understanding the sterilization and its types.

Unit-1

Introduction to Microbiology

Definition, history, relationship of micro-organisms to man, and safety guideline in a microbiology laboratory . Morphology of bacteria , Anatomy of a bacterial cell including spores, flagella and capsules

Bacterial Growth and Nutrition of bacteria . Bacterial growth curve and bacterial nutrition .

Practice: *Preparation of culture media, demonstrate aerobic and anaerobic culture.
Demonstration the different culture plate and bacterial growth, identification of bacteria .*

Unit-2

Classification of micro-organisms with special reference to bacteria General – Biological

Sterilization ,Definition, sterilization by dry heat, moist heat (below, at and above 100o C), autoclave and hot air oven its structure and functioning, preventive measures, controls and sterilization indicators, sterilization by radiation and filtration, Antiseptics and Disinfectants

Definitions, types, properties, use of disinfectants and antiseptics, efficiency testing of disinfectants ; use of laminar flow – principle and function.

Practice--: *Demonstrate the different methods of sterilization with handling Hot air oven, Autoclave. Handling Of compound microscope . Demonstration of Antiseptics, Spirit, Cetrimide & Povidone-iodine .
Demonstration the disinfectants and precaution while using disinfectants*

Unit-3

Staining techniques

Methods of smear preparation, Gram stain, AFB stain, Albert's stain and special staining for spore, capsule and flagella, Culture Media, Liquid and solid media, defined and synthetic media, routine laboratory media (basal, enriched, selective, enrichment, indicator, and transport media)

Practice: *Demonstration the different staining procedure like Gram stain, Zn stain, Albert's stain etc*

Suggested Reading:-

1. Medical Laboratory Technology by Kanai Lal Mukherjee; Tata McGraw Hill, New Delhi
2. An Introduction to Medical Laboratory Technology by FJ Baker; Butterworth – Heinemann; Oxford
3. Practical Book of Medical Microbiology by Satish Gupta; JP Brothers, New Delhi
4. Medical Laboratory Manual for Tropical Countries Vol. I and II by Monica Cheesbrough; Cambridge University Press; UK
5. Textbook of Medical Laboratory Technology by Praful B Godkar; Bhalani Publishing House, Mumbai
6. Text book of Medical Microbiology by Gruckshiank

BSMT1202-Basic Biochemistry

Subject Name	Code	Type of course	L-T-P	Prerequisite
Basic Biochemistry	BSMT1202	Theory- Practice	3-1-0	Basic Medical Science

Objective:

- Understanding the different bio molecule structure and metabolism and metabolic pathway.
- Clinically relevant biochemical analysis for deeper understanding of all biochemical components i.e., Proteins, Electrolytes, Hormones etc.

Course Outcome:

- To learn about tests carried out for biochemical investigations.
- Understanding of principle of biochemical Clinical biochemistry tests.
- To learn normal ranges and abnormal ranges of biochemical components and hormones.
- To study about diseases related to biochemical and hormone imbalance in human body.

Subject: BSMT1202- Basic Biochemistry

(LTP: 3+1+0)(Credit: 4)

Unit-1

Enzymes - Introduction, definition, classification, coenzymes, isoenzymes, properties, factors affecting enzyme action, enzyme inhibition, diagnostic value of serum enzymes - Creatinine kinase, Alkaline phosphatase, Acid phosphatase, LDH, SGOT, SGPT, Amylase, Lipase, Carbonic anhydrase etc.

Unit-2

Chemistry of carbohydrates & their related metabolism - Introduction, definition, classification, biomedical importance & properties. Brief outline of metabolism : Glycogenesis & glycogenolysis (in brief), Glycolysis, citric acid cycle & its significance, HMP shunt & Gluconeogenesis (in brief), regulation of blood glucose level.

Unit-3

Amino acids - Definition, classification, essential & non essential amino acids . Chemistry of Proteins & their related metabolism – Introduction, definition, classification, biomedical importance. Metabolism : Transformation, Decarboxylation, Ammonia formation & transport, Urea cycle, metabolic disorders in urea cycle, catabolism of amino acids especially Phenylalanine, Tyrosine & Tryptophan, Creatine, Creatinine, Proteinuria.

Unit-4

Chemistry of Lipids & their related metabolism – Introduction, definition, classification, biomedical importance, essential fatty acids. Brief outline of metabolism : Beta oxidation of fatty acids, fatty liver, Ketosis, Cholesterol & its clinical significance, Lipoproteins in the blood composition & their functions in brief, Atherosclerosis.

Diabetes mellitus - definition, types, features, gestation diabetes mellitus, glucose tolerance test, glycosurias, Hypoglycemia & its causes.

Suggested Reading

1. Text book of Medical Laboratory Technology, P.B. Godkar 2nd Edn. 2003 Bhalani

Publication.

2. Text book of Biochemistry, M. A. Siddique 8th Edn.1993 Vijay Bhagat Scientific Book Co., Patna.
3. Medical Biochemistry by AC Dey.
4. Handbook of Christen Medical Association, India Medical Laboratory Technology- Robert H. Carman.

BSMT1203-Clinical Pathology

Subject Name	Code	Type of course	L-T-P	Prerequisite
Clinical Pathology	BSMT1203	Theory-Practice	3-1-0	Basic biology

Objective:

- Analyze body fluid for diagnosis of disease
- Analyze waste product for diagnosis of disease
- Understanding DOT Policy
- Understand Physiological disorder and infectious disease

Course Outcome

- Able to collect pathological specimen
- Able to detect diabetes, ketosis, nephritis, jaundice and other physiological disorder
- Able to detect infectious disease (UTI, Hematuria, Filariasis, Dysentery, Ulcer, TB, etc.)
- Preservation and processing of pathological sample.
- Identification of Parasites

Subject: BSMT1203-Clinical pathology

(LTP: 3+1+0)(Credit: 4)

Unit-1

URINE: Urine meter, Esbachl's Albuminometer, preparation of various reagents. Composition, collection and preservation of urine for various tests, physical chemical and microscopic examination of urine, estimation of total albumin, Specific gravity, litmus paper, tests for albumin, sugar, blood, bile salts and pigments, urobilinogen, ketones bodies etc.

Practice: Collection procedures of urine, Important precursors for collecting samples. Physical and Chemical and Microscopic examination of urine .

Unit-2

STOOL: Sample collection, physical, chemical and microscopic examination.

SPUTAM : Sample collection, stain and study of A.F.B.

CEREBROSPINAL FLUID: Pandy's test, Cell count, cell type differential count and malignant cells.

BODIES FLUID: Cells stain; cell morphology and detection of malignant cells in peritoneal fluid, pleural fluid, pericardial fluid, and synovial fluid. Differences between transudates and exudates.

SEMEN: Sample collections microscopic examination for count and malignant and morphology.

Practice: Collection procedures and important precursors for collecting samples like STOOL, CSF, SEMEN and different bodies fluid.

Physical and Chemical and Microscopic examination of different samples .

Unit-3

ANATOMIC PATHOLOGY: 1. Reception, Registration, preservation and processing of specimens. Haematoxyline and eosine staining procedure, mounting of stained sections, Filing of paraffin blocks, and slides. Method of decalcification, Sharpening and holing Knives techniques , using of microtome. 2. Museum: Mounting of specimens, labeling, maintenance of specimens and catalogue etc. Post mortem/ Autopsy: Maintenance of the records of the Dead Bodies and specimens received, Autopsy techniques, Autopsy instruments, clod storage plants, legal aspects etc.

Practice : Handling clinical laboratorial equipment
Preparation of some stains , and reagents for clinical diagnosis purpose.

Suggested Reading

1. Textbook of Clinical laboratory methods and diagnosis by Gradwohls, Publisher Mosby
2. Manual Text book of lab and diagnostic tests by Lippincott Williams Wilkins, New York.
3. Medical laboratory science theory and practice by J Ochei and Kolhatkar, 2002, Tata McGraw- Hill, Publisher TBS
4. Medical laboratory technology Vol.1 by K. L. Mukherjee, 2007, Publisher Tata McGraw Hill.

BSMT1204-Clinical Pathology & microbiology lab

Subject Name	Code	Type of course	L-T-P	Prerequisite
Clinical Pathology & Microbiology lab	BSMT1204	Practice	0-0-4	Basic Pathology and microbiology

Objective:

- Analyze body fluid for diagnosis of disease
- Analyze waste product for diagnosis of disease
- To know General bacteriology and microbial techniques for isolation of pure cultures of bacteria, fungi and virus .
- To master aseptic techniques and be able to perform routine culture handling tasks safely and effectively.

Course Outcome

- Understanding the details of microorganism morphology and metabolism.
- Broad idea regarding the different types of staining.
- Understanding the sterilization and its types.
- Able to collect pathological specimen
- Able to detect diabetes, ketosis, nephritis, jaundice and other physiological disorder

Subject: BSMT1204-Clinical pathology and microbiology lab

(LTP: 0+0+6)(Credit: 4)

(1) Urine analysis Physical, Chemical, Microscopic, Microbiological.

- (2) Stool analysis Physical, Chemical, Microscopic, Microbiological.
- (3) Sputum analysis Physical, Chemical, Microscopic, Microbiological.
- (4) Semen analysis Physical, Chemical, Microscopic, Microbiological.
- (5) Sterilization, Media Preparation, Bacteriological examination of pus.
- (6) Bacteriological examination of trout swab.
- (7) Laboratory study of parasites in stool, blood. Giardia lamblia, Entamoeba

Suggested Reading

1. Manual of lab and diagnostic tests by Lippincott Williams Wilkins, Fischbach, 2005 New York..
2. Clinical laboratory methods and diagnosis by Gradwohls, 2000, Publisher Mosby
3. Medical laboratory science theory and practice, J Ochei and Kolhatkar, 2002, publisher TBS
4. Medical laboratory technology Vol.1 by K. L. Mukherjee, 2007, publisher Tata McGraw Hill.

3rd semester B.sc Medical Lab. Technology

BSMT2301-Immunology

Subject Name	Code	Type of course	L-T-P	Prerequisite
Immunology	BSMT2301	Theory-Practice	3-1-0	Fundamental Science

Objective:

- Understanding the concept of Innate & adaptive immune system; complement system; Hypersensitivity.
- Clinically relevant serological analysis for deeper understanding of antigen-antibody interaction.
- To understand the concept of cells of immune system and organs of immune system.

Course Outcome

- The student will learn the application of Immunology in disease diagnosis.
- Complement system followed by the body on encountering an Antigen.
- Immune Response produced on encounter with foreign body.
- The students will learn the role of immunity in fighting disease, along with consequence of undesirable expression of immune system such as, hypersensitivity and auto immune disease.

Subject: BSMT2301-Immunology

LTP: (3+1+0)(Credit:4)

Unit-1

Immunity: Classification, Measurement of immunity, Local immunity, Herd immunity.

**Antigens: Types of antigen, Antigenic Determinant or Epitome, Determinants of Antigenicity
Tolerogens, Biological Classes of antigens, Superantigens.**

Antibodies-Immunoglobulins: Antibody structure, Immunoglobulin classes of Antigens, Antigenic Determinants on Immunoglobulins.

Practice: Collection of blood sample by vein puncture, separation and preservation of

serum

Raising haemolysin in Rabbit and performing its titration for Rose-Waaler test.

Unit-2

The Complement System: Principal pathways of Complement activation, Quantitation of Complement

(C) and its Components. Biosynthesis of complement, Complement Deficiencies.

Antigen-Antibody Reactions: Antigen-Antibody Interactions, General characteristics of Antigen-Antibody Reactions, Antigen-Antibody measurement, Parameters of serological tests, Serological Reactions.

Practice: - Preparation of Phosphate buffers, Vernol buffer, ASO buffer, Richardsons buffer Buffers of different pH and molarity, tris buffer, Standardization of cell concentration by spectrophotometer

Unit-3

Immune Response: Types of Immune response, Humoral immunity, Fate of Antigen in tissues, Production of Antibodies, Cell-mediated Immune Responses, Cytokines, Immunological tolerance, Theories of immune Response.

Hypersensitivity Reactions: Classification of hypersensitivity reactions, Type I Hypersensitivity (IgE Dependent). Type II Hypersensitivity: Cytolytic and Cytotoxic. Type III Hypersensitivity -Immune Complex-mediated, Type IV Hypersensitivity-Delayed Hypersensitivity, Shwartzman Reaction.

Practice:- Performance of Serological tests i.e. Widal, Brucella Tube Agglutination, VDRL (including Antigen Preparation), ASO (Antistreptolysin 'O'), C-Reactive Protein (Latex agglutination), Rheumatoid factor (RF) Latex agglutination, Rose Waaletest

Suggested Readings:

1. Text book of Microbiology by Ananthanereyan & Paniker, Publisher Universities press
2. Short text book of Medical microbiology by Satish Gupt, Publisher Jaypee brotthers
3. Medical laboratory Technology vol.I ,II, III by K L Mukherjee, Publisher McGraw Hill education
4. Medical Laboratory manual for tropical countries Vol II Microbiology by Monia Cheesbrough, publisher Butterworth Heinemann ltd
5. Immunology by Ivan Roitt, JonathaanBrostoff and David Male
6. Practical Medical Microbiology by Mackie & MacCartney Volume 1 and 2

BSMT2302-Applied Haematology

Subject Name	Code	Type of course	L-T-P	Prerequisite
Applied Hematology	BSMT2302	Theory-Practice	3-1-0	Basic Medical science

Objective:

- The overall aims are that the student should obtain advanced knowledge of the most common hematologic diseases & understanding the concept of Blood cells and other blood components.
- Be able to handle an investigation of hemorrhagic disorder and laboratory abnormalities such as anaemia, polycythemia, leukopenia, leukocytosis, thrombocytopenia, thrombocytosis, elevated ESR etc within hematology.

- Clinically relevant hematological analysis for deeper understanding of Evaluate normal and abnormal cell morphology with associated diseases and other blood components.

Course Outcome

- Differentiate various laboratory test findings with their associated clinical conditions.
- Identify the various skills necessary to perform blood counts, evaluate blood elements, and report results within the stated limits of accuracy.
- Describe the various components of blood, their functions, and roles in various disease states.
- To be able to demonstrate good skills in the relevant Hematology laboratory methodology.

Subject: BSMT2302- Applied Hematology

LTP:(3+1+0)(Credit:4)

Unit-1

Definition and classification of anemia .

Definition, classification and laboratory diagnosis of leukaemias

Definition and laboratory diagnosis of Leukamoid reactions

Cytochemical staining , procedure and their significance in various haemopoietic disorders.

Laboratory diagnosis of iron deficiency anaemia, Laboratory diagnosis of megaloblastic anaemia

Laboratory diagnosis of haemolytic anemia .

Practice: *Collection of blood from different body parts. Data and record Maintain , Handling hematological equipments.*

Unit-2

Chromosomal studies in various haematological disorders and their significance.

Mechanism of normal fibrinolysis and Laboratory diagnosis of hyperfibrinolysis .

Mechanism and laboratory diagnosis of disseminated intravascular coagulation (DIC).

Laboratory diagnosis of Haemophilia and von-willebrand disease . Laboratory diagnosis of Idiopathic thrombocytopenic purpura (ITP), Platelet function tests and their interpretation .

Various radioactive isotopes used in hematology

Practice: - *To estimate serum iron and total iron binding capacity. To detect whether the given specimen is G6PD deficient or normal. To estimate Hb-F in a given blood sample .To estimate plasma and urine Haemoglobin in the given specimens. To demonstrate the presence of Hb-S by Sickling and solubility tests.*

Unit-3

L.E.cell phenomenon-

a. Definition of L.E.cell , **b.** Demonstration of L.E.cell by various methods **c.** Clinicals

Physiological variations in Hb, PCV, TLC and Platelets .

Investigations of a case suffering from bleeding disorders.

Quantitative assay of coagulation factors - **a.** Principle **b.** Procedure

Biomedical waste management in hematology laboratory (Other than Radioactive material)

Practice-: *Demonstration of functional aspect of blood cell counter*

Study the RBCs abnormal morphological form -a.Variation in size , shape and staining Character , b. Red cell inclusion

Identify morphologically the-Immature Erythroid series of cells

Immature Myeloid ad other WBCs series of cells

Suggested readings

1. Text book of Medical Laboratory Technology by Paraful B. Godkar, Bhalani Publisher
2. Text book of Practical Hematology by JB Dacie
3. Hand book of Medical Laboratory Technology(2nd edition) by V.H. Talib, publisher CBS
4. Hematology (International edition) Emmanuel C.Besa Harwal Publisher
5. Practical Hematology(8th edition) by Sir John, Publisher Churchill livingstone
6. Clinical Hematology by Christopher A. Ludlam, Publisher Churchill livingstone
7. Clinical Diagnosis & Management by Laboratory methods(20th edition) by John bernard Henary

BSMT2303-Applied Biochemistry

Subject Name	Code	Type of course	L-T-P	Prerequisite
Applied Biochemistry	BSMT2303	Theory-Practice	3-1-0	Basic science Medical

Objective:

- Understanding the concept of Biochemical analyzing instruments both automated and semi automated.
- Understanding about different biochemical test.

Course Outcome

- Understanding of instrumentation technique & principle of spectrophotometry, colometry, photometry and electrolyte analyzer.
- To learn about safety precautions and handling the equipment in a biochemical laboratory.
- Students will explain/describe the synthesis of proteins, lipids, nucleic acids, and carbohydrates and their role in metabolic pathways

Subject: BSMT2303-Applied Biochemistry

LTP :(3+1+0)(Credit:4)

Unit- 1

Automation in clinical Biochemistry,

Method of estimation and assessment for: a. Glucose tolerance test ,b. Insulin tolerance test, c. Xylose excretion test.

Practice:- Demonstration the centrifuge machine ,Demonstration of Colorimeter.

Unit-2

Clearance test for renal function . Gastric analysis, LFT , KFT, Lipid profile, Qualitative test for Urobilinogens ,Barbiturates, T3, T4 and TSH, 17 Ketosteroids. Principles, clinical significance and procedures for estimation, of Acid phosphatase, Alkaline phosphatase, Lactate dehydrogenase, Aspartate transaminase, Alanine, transaminase and Creatine phosphokinase.

Practice:- Estimation of Liver function test, Kidney function test, Lipid profile.

Unit-3

Qualitative analysis of renal calculi . Chemical examination of cerebrospinal fluid , Brief knowledge about rapid techniques in clinical biochemistry.

Practice:- Estimation of Glucose in urine and blood .

Estimation of Protein in urine and blood .

Suggested readings

1. Text book of Medical Laboratory Technology by P. B. Godker, Publisher Bhalani.
2. Text book of Medical Biochemistry by Chaterjee & Shinde, Publisher JPB
3. Medical Laboratory Technology by Mukherjee, Publisher
4. Principal of Biochemistry by Lehninger, Publisher Kalyani
5. Practical Clinical Biochemistry by Harold Varley, Publisher CBS.

BSMT2304- Basic Histology

Subject Name	Code	Type of course	L-T-P	Prerequisite
Basic Histology	BSMT2304	Theory-Practice	3-1-0	Basic Medical science

Objective:

- Understanding the concept of histotechnology; Basic concepts about routine methods of examination of tissues Collection.
- perform routine laboratory procedures encompassing all major areas of the histology laboratory.
- Clinically relevant onchological analysis for deeper understanding of abnormal cell growth at anywhere in human body.

Course Outcome

- The students will learn about various staining procedures for demonstration of different substances & various cytological investigations.
- The students will learn about special staining procedures & handling & testing of various cytological specimens.
- Reception and labeling of histological specimens.
- Use of antiseptics, disinfectants and insecticides in a tissue processing laboratory.

Subject: BSMT2304 –Basic Histology

LTP:(3+1+0)(Credit:4)

Unit-1

Introduction to histotechnology, Care , maintenance and Safety measures of laboratory equipment used in histotechnology. Basic concepts about routine methods of examination of tissues Collection and transportation of specimens for histological examination, fixation Various types of fixatives used in a routine histopathology laboratory- Simple fixatives ,Compound fixatives ,Special fixatives for demonstration of various tissue elements.

Practice: *Demonstration of instruments used for dissection.*

Use of antiseptics, disinfectants and insecticides in tissue processing laboratory .

Unit-2

Decalcification Criteria of a good decalcification agent, Technique of decalcification Followed with selection of tissue, fixation, decalcification, neutralization of acid an thorough washing. Various types of decalcifying fluids, Processing of various tissues for histological examination ,Embedding, Schedule for manual or automatic Tissue processing, Components & principles of various types of a tissue processors .

Practice: - *Method of Decalcification, fixation, Embedding , manual or automatic tissue processing.*

Unit-3

Section Cutting , Sharpening of Microtome Knives, Honing, Stropping, various types of microtome and their applications ,Freezing Microtome and various types of Cryostats. Staining, Impregnation and Mountains, Commonly used mountains in histotechnology lab. General Staining Procedures for Paraffin Infiltrated and Embedded tissue . Nuclear Stains and Cytoplasmic stain, Equipment and Procedure for manual Staining and Automatic Staining Technique . Mounting of Cover Slips, Labeling and Cataloguing the Slides .

Practice: - *Procedure for manual Staining and Automatic Staining Technique.*

Suggested readings

1. Color text book of histology by Gartner &Hiatt ,publisher Elsevier
2. Netter’s essential histology by William Ovalle, publisher Elsevier
3. Histology E-book by Barry Mitchell, publisher Elsevier
4. Textbook of Histology (color atlas) by Krishna Garg , Indira Bahl, Mohini kaul, publisher CBS
5. Textbook of Histology and a Practical Guide by JP Gunasegaran , Publisher Elsevier

FCHU0202-Communicative Practice Laboratory-1

Subject Name	Code	Type of course	L-T-P-	Prerequisite
<i>Communicative Practice Laboratory-1</i>	FCHU0202	practice	0-0-2	General english

Objective:

- To expose the students to a variety of self- instructional, learner- friendly modes of language learning. To enable them to learn better pronunciation through stress on word accent, intonation, and rhythm. To maintain good linguistic - through accuracy in grammar, pronunciation and vocabulary.

Course Outcome

- Ability to communicate fluently in different business situation
- Effective oral and written communication
- Appropriate word usage with correct pronunciation

- Clarity of word stress and intonation

Subject: FCHU0202 -Communicative Practice Laboratory-1

(LTP: 0+0+3)(Credit: 2)

The language laboratory acts as a platform for learning, practicing and producing language skills through interactive lessons and communicative mode of teaching.

Unit-1

FRIENDLY COMMUNICATION (9 HOURS)

- Doing Things with Words: To ask for information, help, permission; To instruct, command, request, accept, refuse, prohibit, persuade
- Practice of Formulaic Expressions: Greetings, farewells, introductions, thanks, apologies, regrets, good wishes, congratulations, condolences, offers.
- Conversation Practice in familiar and unfamiliar situations (This module will be practiced through conversation activities in pairs & groups)

Unit-2

GRAMMAR AND VOCABULARY (9 HOURS)

- The focus will be on the appropriate usage of language.
- Elimination of common errors
- Editing passages
- Word power A-Z: Easy and quick techniques
- Vocabulary building exercises (Open Source Language Laboratory will be used to take quizzes and practice grammar & vocabulary)

Unit-3

PHONETICS AND SPOKEN ENGLISH (12 HOURS)

- Students will be trained to find out the correct pronunciation of words with the help of a dictionary /software, to enable them to monitor and correct their own pronunciation.
- Pronunciation Guidelines: Consonants and Vowels
- Pronunciation practice (for accent neutralization), particularly of problem sounds, in isolated words as well as sentences
- Speaking Techniques: Using correct stress patterns, developing voice quality
- Rhythm and Intonation (Reading aloud of dialogues, speeches etc. for practice in pronunciation) (In this module, the learners will use video series from BBC & Sky Pronunciation Suite to improve spoken English)

TEXT BOOKS: Dwyer, J. (2000).

The Business Communication Handbook . New Jersey: Prentice Hall.

REFERENCES:

Brown, G & Yule, G. (1983).Teaching the Spoken Language. Cambridge: Cambridge University

Press. Brown, H. D. (1994). Teaching by Principles: An Interactive Approach to Language

Pedagogy. New Jersey: Prentice Hall.

BSMT2305-Immunology and Histology lab (LTP: 0+0+4)(Credit:4)

Subject Name	Code	Type of course	L-T-P	Prerequisite
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<i>Immunology and Histology lab</i>	BSMT2305	Practice	0-0-4	Basic immunology & Histology
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Objective:

- perform routine laboratory procedures encompassing all major areas of the histology laboratory.
- Clinically relevant onchological analysis for deeper understanding of abnormal cell growth at anywhere in human body.
- Clinically relevant serological analysis for deeper understanding of antigen-antibody interaction.

Course Outcome

- The students will learn about various staining procedures for demonstration of different substances & various cytological investigations.
- The students will learn about special staining procedures & handling & testing of various cytological specimens.
- The student will learn the application of Immunology in disease diagnosis.

Subject: BSMT2305-Immunology and Histology lab

(LTP: 0+0+6)(Credit:4)

Immunology

Collection of blood sample by vein puncture, separation and preservation of serum

Raising haemolysin in Rabbit and performing its titration for Rose-Waaler test

Preparation of Phosphate buffers, Vernol buffer, ASO buffer, Richardsons buffer,

Buffers of different pH and molarity, tris buffer, Standardization of cell concentration by spectrophotometer

Performance of Serological tests i.e.

- Widal,
- Brucella Tube Agglutination,
- VDRL (including Antigen Preparation),
- ASO (Antistreptolysin 'O')
- C-Reactive Protein (Latex agglutination)
- Rheumatoid factor (RF) Latex agglutination
- Rose Waaler test,

Demonstration of antigen / antibody determination by Immunoflourescence,

Immunodiffusion, precipitation in agarosegel(ouchterlony),CCIEP, ELISA, SDSPAGE and western blotting.

Histotechnology

Demonstration of instruments used for dissection

Use of antiseptics, disinfectants and insecticides in a tissue processing laboratory

Reception and labeling of histological specimens

Preparation of various fixatives -Helly's fluid, Zenker's fluid, Bouin's fluid , Corney's fluid,

10% Neutral formalin, Formal saline , Formal acetic acid, Pereyn's fluid

To perform embedding and casting of block .

To process a bone for decalcification

To prepare 70% alcohol from absolute alcohol.
 Processing of tissue by manual and automated processor method
 To demonstrate various part and types of microtome .
 To learn sharpening of microtome knife (Honing and stropping technique)
 To perform section cutting , learn mounting of stained smears.
 To practice attachment of tissue sections to glass slides
 To learn using tissue floatation bath drying of sections in incubator (-560 C)
 To perform & practice the Haematoxylin and Eosin staining technique
 To perform & practice the Mallory's Phosphotungstic Acid Haematoxylin (PTAH)

4th semester B.Sc Medical Lab. Technology

BSMT2401-Parasitology

Subject Name	Code	Type of course	L-T-P-	Prerequisite
Parasitology	BSMT2401	Theory-Practice	3-1-0	Basic biology

Objective:

- Describe basic morphology, life cycle, pathogenesis, lab diagnosis and treatment of parasites (Protozoa, metazoa and Helminth)
- Perform appropriate laboratory techniques used in the processing of specimens and identification of parasites.

Course Outcome

- Identification of pathogenic parasite in disease diagnosis and treatment.
- The conceptual understanding of the subject provides opportunities for employability and scopes for higher education.
- To serve as a resource for the clinical laboratories professionals in the different region.

Subject: BSMT2401- Parasitology

(LTP:3+1+0)(Credit:4)

Unit-1

Introduction to Medical Parasitology , General characteristics of protozoa and helminthes
 Collection, Transport, processing and preservation of samples for routine parasitological investigations .

Practice:- Method of sample Collection, Transport, processing and preservation of samples for routine parasitological investigations.

Unit-2

Morphology, life cycle and lab-diagnosis of Giardia and Entamoeba
 Morphology, life cycle and lab-diagnosis of Roundworms and Hookworms
 Morphology, life cycle and lab-diagnosis of T. solium and T. saginata
 Morphology, life cycle and lab-diagnosis of Malarial parasite with special refrence to P.vivax and P.falciparum .

Practice:- Laboratory diagnosis of hydrated cyst and cysticercosis

Concentration techniques for demonstration of Ova (Principles and applications)

Routine Stool examination for detection of intestinal parasites.

Identification of adult worms from model's or slide's.

Identification of different parasites their morphology from slide's

Suggested Reading

1. Text book of Parasitology by N C Dey, publisher New central book agency
2. Text book of Parasitology by Chaterjee, publisher CBS
3. Text book of microbiology by Ananthanereyan, Publisher universities press
4. Medical Parasitology by RL Ichhpujani and Rajesh Bhatia, jaypee publisher
5. Short text book of medical microbiology by Satish gupt, Publisher Jaypee

BSMT2402-Advance Biochemistry

Subject Name	Code	Type of course	L-T-P	Prerequisite
Advance Biochemistry	BSMT2402	Theory-Practice	3-1-0	Basic medical sciences

Objective:

- To learn the principle, instrumentation & application of Microscopy.
- Principle, instrumentation & application of Centrifugation.
- Principle of Spectroscopy.

Course Outcome

- After completion of the course the student will be efficient in handling the microscopy equipment's.
- They will also be able to have idea about handling instruments like centrifuge, spectrophotometer, chromatography, flow cytometer, Automated and semi- automated Biochemistry analyzer.
- Students will explain/describe the synthesis of proteins, lipids, nucleic acids, and carbohydrates and their role in metabolic pathways

Subject: BSMT2402-Advance Biochemistry

(LTP:3+1+0)(Credit:4)

Unit-1

Spectrophotometry and colorimetry, Introduction, Theory of spectrophotometry and

colorimetry , Lambert`s law and Beer`s law ,Applications of colorimetry and spectrophotometry.

Practice:- Practice: Cleaning of the Laboratory glass ware, Preparation of distilled Water, Principle, working and maintenance of pH meter, To prepare 0.1 N HCl solution, 0.2N HCl

solution.,0.1 molar H₂SO₄, 0.2 Molar Sodium carbonate solution, Demonstration of Osmosis and dialysis.

Demonstration of the instrument Spectrophotometry according to Lambert`s and Beer`s law

Unit-2

Photometry, Introduction, General principles of flame photometry, Limitations of flame Photometry, Instrumentation, Applications of flame photometry , Atomic absorption Spectroscopy – Principle & applications

Practice:- Demonstration of Photometry, general principles, limitation of Photometry.

Unit-3

Chromatography Introduction, definition, types of chromatograph, Paper Chromatography:

Introduction, principle, types , details for qualitative and Quantitative analysis, application

Thin layer chromatography: Introduction, experimental techniques, application of TLC, Limitations,

High performance thin layer chromatography

Column chromatography: Introduction, principle column efficiency, application of

Column chromatography Gas chromatography: Introduction principle, instrumentation,

Application Ion exchange chromatography: Introduction, Definition and principle, cation and

Anion exchangers , application.

Practice:- Demonstration of Chromatography, Demonstration of Gel Chromatography

Unit-4

Electrophoresis: Introduction, principle, Instrumentation, types of electrophoresis - paper and gel electrophoresis ,application.

Suggested readings

1. Handbook of Christen Medical Association, India (CMAI) Medical Laboratory Technology- Robert H.Carman. 2nd Edn. CMAI, New Delhi.
2. Text book of Medical Laboratory Technology, P.B. Godkar 2nd Edn. Bhalani Publication.
3. Handbook of Biochemistry by M. A. Siddique 8th Edn. Vijay Bhagat Scientific Book

BSMT2403-Advance Hematology

Subject Name	Code	Type of course	L-T-P	Prerequisite
Advance Haematology	BSMT2403	Theory- Practice	3-1-0	Basic haematology

Objective:

- The overall aims are that the student should obtain advanced knowledge of the most common hematologic diseases & understanding the concept of Blood cells and other blood components.
- Demonstrate an understanding of the components of human blood and characteristics, functions, and abnormalities and disease states of each.
- Demonstrate proficiency in the skills necessary to perform blood cell counts, and evaluation of blood elements within stated limits of accuracy.

Course Outcome

- Differentiate various hematological procedures and the use of basic equipment essential to working in a Hematology Laboratory.
- Discuss differences between Quality control, Quality Assurance, and Continuing Quality Improvement principles as used in the Hematology Laboratory.
- Categorize various hematology analyses , operational principles of various hematology instruments, and troubleshooting of various instruments.
- Explain the principles and theories utilized in a variety of problem-solving situations.

Subject: BSMT2403-Advance Hematology

(LTP:3+1+0)(Credit:4)

Unit-1

Definition and classification of anemia's , Laboratory diagnosis of iron deficiency anemia.

Laboratory diagnosis of megaloblastic anemia , Laboratory diagnosis of hemolytic anemia.

Definition, classification and laboratory diagnosis of leukemia's

Definition and laboratory diagnosis of Leukamoid reactions Cytochemical staining, procedure and their significance in various haemopoietic disorders. Chromosomal studies in various hematological disorders and their significance. Mechanism of normal fibrinolysis and Laboratory diagnosis of hyperfibrinolysis .

Mechanism and laboratory diagnosis of disseminated intravascular coagulation (DIC).

Practice:- Demonstrate the different abnormal morphology of RBCs in Anemia cases.

Laboratory diagnosis of hemolytic anemia, leukemia's, Leukamoid reactions

Unit-2

Laboratory diagnosis of Hemophilia and von-will brand disease. Laboratory diagnosis of Idiopathic thrombocytopenic purpura (ITP) ,Platelet function tests and their interpretation.

Unit-3

Measurement of:

a. Blood volume, b. Determination of Red cell volume and Plasma volume, c. Red cell life span,

d. Platelet life span .Estimate serum iron, total iron, Hb-F, Plasma and urine hemoglobin.

Demonstrate the presence of Hb-S by Sickling and solubility ,Perform various Platelet function test.

Practice:- Demonstration the sickle cells

Suggested readings

1. Text book of Medical Laboratory Technology by Paraful B. Godkar Practical Hematology Publisher JB Dacie, Bhalani publisher
2. Text book of Medical Laboratory Technology(2nd edition) by V.H. Talib, publisher CBS
3. Hematology (International edition) EmmanuelC.BesaHarwal Publisher
4. Practical Hematology (8th edition) by Sir John , publisher Churchill livingstone

BSMT2404-Human value & professional ethics

Subject Name	Code	Type of course	L-T-P	Prerequisite
Human value & professional ethics	BSMT2404	Theory Practical	3-1-0	NA

Objective:

- The course provides an introduction to ethics generally and more specifically to medical ethics, examining in particular the principle of autonomy, which informs much of medical law. The course then considers the general part of medical law governing the legal relationship between medical practitioners and their patients.
- It considers the legal implications of the provision of medical advice, diagnosis and treatment. Selected medico-legal issues over a human life are also examined. These may include reproductive technologies, foetal rights, research on human subjects, organ donation, the rights of the dying and the legal definition of death.

Course Outcome

- The ethical underpinnings of the law as it relates to medicine,
- The law of negligence in the context of the provision of healthcare,
- Legal and ethical issues surrounding end and beginning of life decisions,
- The maintenance of professional standards in the healthcare profession, and

Subject: BSMT2404-Human value & professional ethics

(LTP: 3+1+0)(Credit:4)

Unit-1.

Course Introduction - Need, Basic Guidelines, Content and Process for Value Education
 Understanding the need, basic guidelines, content and process for Value Education.
 Self Exploration–what is it?- its content and process; ‘Natural Acceptance’ and Experiential Validation- as the mechanism for self exploration.
 Continuous Happiness and Prosperity- A look at basic Human Aspirations
 Right understanding, Relationship and Physical Facilities- the basic requirements for fulfillment of Aspirations of every human being with their correct priority
 Understanding Happiness and Prosperity correctly- A critical appraisal of the current scenario
 Method to fulfill the above human aspirations: understanding and living in harmony at various Levels

Unit- 2.

Understanding Harmony in the Human Being - Harmony in Myself!
 Understanding human being as a co-existence of the sentient ‘I’ and the material ‘Body’
 Understanding the needs of Self (‘I’) and ‘Body’ - Sukh and Suvidha
 Understanding the Body as an instrument of ‘I’ (I being the doer, seer and enjoyer)
 Understanding the characteristics and activities of ‘I’ and harmony in ‘I’
 Understanding the harmony of I with the Body: Sanyam and Swasthya; correct appraisal of Physical needs, meaning of Prosperity in detail
 Programs to ensure Sanyam and Swasthya

Unit- 3

Understanding Harmony in the Family and Society- Harmony in Human-Human Relationship

Understanding harmony in the Family- the basic unit of human interaction

Understanding values in human-human relationship; meaning of Nyaya and program for its

Fulfillment to ensure Ubhay-tripti; Trust (Vishwas) and Respect (Samman) as the foundational values of relationship

Understanding the meaning of Vishwas; Difference between intention and competence

Understanding the meaning of Samman, Difference between respect and differentiation; the other salient values in relationship

Understanding the harmony in the society (society being an extension of family): Samadhan,

Samridhi, Abhay, Sah-astitva as comprehensive Human Goals

Visualizing a universal harmonious order in society- Undivided Society (AkhandSamaj), Universal Order (SarvabhaumVyawastha)- from family to world family!

BSMT2405-Basic Computers & Information science

Subject Name	Code	Type of course	L-T-P	Prerequisite
Basic Computers & Information science	BSMT2405	Practice	0-0-4	Fundamentals of Computer

Objective:

- Identify the function of computer hardware components.
- Identify the factors that go into an individual or organizational decision on how to purchase computer equipment.
- Identify how to maintain computer equipment and solve common problems relating to computer hardware.
- Identify how software and hardware work together to perform computing tasks and how software is developed and upgraded
- Identify different types of software, general concepts relating to software categories, and the tasks to which each type of software is most suited or not suited

Course Outcome

- Understand the fundamental hardware components that make up a computer's hardware and the role of each of these components.
- Understand the difference between an operating system and an application program, and what each is used for in a computer.
- Describe some examples of computers and state the effect that the use of computer technology has had on some common products

Subject:BSMT2405-BasicComputers&Information science

(LTP:0+0+6)(Credit:4)

Unit-1

Introduction to computer: introduction, characteristics of computer, block diagram of computer, generations of computer, computer languages.

Input output devices: input devices(keyboard, point and draw devices, data scanning devices, digitizer, electronic card reader, voice recognition devices, vision-input devices), output devices(monitors, pointers, plotters, screen image projector, voice response systems).

Unit-2

Processor and memory: The Central Processing Unit (CPU), main memory.

Storage Devices: sequential and direct access devices, magnetic tape, magnetic disk, optical disk, mass storage devices.

Introduction to MS-Word: introduction, components of a word window, creating, opening and inserting files, editing a document file, page setting and formatting the text, saving the document, spell checking, printing the document file, creating and editing of table, mail merge.

Unit-3

Introduction to Excel: introduction, about worksheet, entering information, saving workbooks and formatting, printing the worksheet, creating graphs.

Introduction to power-point: introduction, creating and manipulating presentation, views, formatting and enhancing text, slide with graphs. Introduction of Operating System: introduction, operating system concepts, types of operating system. Introduction to MS-DOS: History of DOS, features of MS-DOS, MS-DOS Commands (internal and external).

Unit-4

Introduction of windows: History, features, desktop, taskbar, icons on the desktop, operation with folder, creating shortcuts, operation with windows (opening, closing, moving, resizing, minimizing and maximizing, etc.). Computer networks: introduction, types of network (LAN, MAN, WAN, Internet, Intranet), network topologies (star, ring, bus, mesh, tree, hybrid), components of network.

Internet and its Applications: definition, brief history, basic services (E-Mail, File Transfer Protocol, telnet, the World Wide Web (WWW)), www browsers, use of the internet. Application of Computers in various fields: Medical, Education, Railway, Defense, Industry, Management, Sports, Commerce, Internet.

Suggested readings :

1. Objective Computer Awareness
2. Computer Networking (Global Edition)

BSMT2406-Biochemistry &Advanced Microbiology Lab

Subject Name	Code	Type of course	L-T-P	Prerequisite
Biochemistry&Advanced Microbiology Lab	BSMT2406	Practice	0-0-4	Basic microbiology

Objective:

- To know various Culture media and their applications and also understand various physical and chemical means of sterilization
- To know General bacteriology and microbial techniques for isolation of pure cultures of bacteria, fungi and virus
- To master aseptic techniques and be able to perform routine culture handling tasks.

Course Outcome

- This study demonstrates the theory and practical skills in microscopy and their handling techniques and staining procedures.
- Understanding the details of microbial cell organelles.
- Provides knowledge on the growth of microorganism.

Subject:BSMT2406-Biochemistry&AdvancedMicrobiologyLab

(LTP:0+0+6)(Credit:4)

Practical-1

- Estimation of Glucose in Urine and in Blood .
- Estimation of Protein in Urine and Blood .
- Estimation of Urea in blood .
- Estimation of uric acid in blood .
- Estimation of serum bilirubin
- Estimation of Total Cholesterol in blood .
- Estimation of HDL Cholesterol.
- Estimation of LDL Cholesterol .
- Estimation of TG, Estimation of Creatinine in Blood
- Estimation of serum calcium
- To measure electrolytes Sodium , Potassium & Chloride.

Practical-2

- To demonstrate the instruments used to seed culture media
- To learn techniques for Inoculation of bacteria on culture media
- To isolate specific bacteria from a mixture of organisms .
- To demonstrate simple staining (Methylene blue)
- To prepare India ink preparation to demonstrate negative staining .
- Bacterial identification: To demonstrate reagent preparation and procedure for Gram stain, Albert stain, Neisser’s staining, Z-N staining, Capsule staining , Demonstration of flagella by staining methods,Spore staining ,To demonstrate spirochetes by Fontana staining procedure
- To prepare the reagent and demonstrate following biochemical tests with positive and negative control bacteria:
- Catalase , Coagulase , Indole, Methyl Red (MR) ,VogesProskauer (VP),Urease , Citrate ,Oxidase , TSIA, Nitrate reduction ,Carbohydrate fermentation , Huger and leifson, Bile solubility , H₂S production Demonstration and motility , Decarboxylases, CAMP , Hippurate hydrolysis, Naglar’s reaction

5th semester B.sc Medical Lab. Technology

BSMT3501-Transfusion Medicine

Subject Name	Code	Type of course	L-T-P	Prerequisite
Transfusion Medicine	BSMT3501	Theory-Tutorial	3-1-0	Basic biology

Objective:

- To provide an outstanding education in all aspects of blood banking and

transfusion medicine and prepare fellows for a career in a blood center or in a hospital transfusion service, either in an academic center or in a community hospital.

Course Outcome

- Describe the principles of patient identification.
- Perform pre-transfusion testing, including ABO and/or Rh testing, red blood cell (RBC) antibody screen and antibody identification.
- Learn adverse reactions of transfusion techniques.

Subject: BSMT3501-Transfusion Medicine

(LTP:3+1+0)(Credit:4)

Unit-1

Introduction of transfusion medicine.

Blood products and transfusion procedures, summary information about blood products and hemostatic agents.

Basics of red cell immunology and compatibility testing, Pre transfusion and transfusion procedure.

Practice: Demonstrate the different method for blood collection.

Identify the different organs for transfusion medicine.

Demonstrate Pre transfusion and transfusion procedure.

Unit-2

Clinical transfusion: Surgery and critical illness, planned surgery.

Clinical transfusion in the medical setting , Immunoglobulin for the prevention of infection.

Practice: Demonstrate routine test on blood donation, ABO blood grouping.

Identify anemic disorders, renal disorders, congenital hemostatic disorders, Immunological Disorders etc.

Unit-3

Transfusion in antenatal obstetric and neonatal care.

Adverse effects of transfusion

Suggested Reading

1. Text book of Blood banking and transfusion medicine by Sally V. Rudmann Publisher Elsevier Health Sciences
2. Handbook of Transfusion Medicine, Editor D B L McClelland, United Kingdom Blood Services 4th Edition
3. Medical Laboratory Technology By K.L Mukherjee ,Publisher McGraw Hill education pvt limited

BSMT3502 –Medical Laboratory Management

Subject Name	Code	Type of course	L-T-P	Prerequisite

Medical Laboratory Management	BSMT3502	Theory-practice	3-1-0	Fundamental Science
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Objective:

- Explain and apply principle of effective test utilization
- Interpret, implement and complying law, regulation, accrediting standards and guidelines of Govt. and NG organizations.
- Design, implement and evaluate resources in lab
- Communicate effectively with laboratory personnel and health care professional.
- Explain and apply the major principle and tactics of laboratory administration.

Course Outcome

- Become professional competent in medical laboratory
 - Exhibit a sense of commitment to the ethical and human aspect of patient care
 - Recognize the role of clinical laboratory scientist in the assurance of quality health care
- Application of safety and governmental regulation and standards as applied to medical laboratory practice.

Subject:BSMT3502 –Medical Laboratory Management

(LTP:3+1+0)(Credit:4)

Unit-1

Ethical Principles and standards for a clinical laboratory professional-

Duty to the patient, Duty to colleagues and other professionals, Duty to the society

Good Laboratory Practice (GLP) Regulations and Accreditation-

Introduction to Basics of GLP and Accreditation, Aims of GLP and Accreditation

.Advantages of Accreditation

Brief knowledge about Nation and International Agencies for clinical laboratory accreditation

Awareness / Safety in a clinical laboratory-General safety precautions, HIV : pre- and Post-exposure guidelines, Hepatitis B & C : pre- and Post-exposure guidelines, Drug Resistant Tuberculosis

Unit-2

Patient management for clinical samples collection, collection of sample, transportation and preservation, Sample accountability-Purpose of accountability, Methods of accountability

Sample analysis-Introduction, Factors affecting sample analysis

Reporting results-Basic format of a test report, Reported reference range, Clinical Alerts, Abnormal results, Turnaround time, Results from referral laboratories, Release of examination results

Alteration in reports

Unit-3

Quality Management system-Introduction,

Ethical Principles and standards for a clinical laboratory professional-

Duty to the patient-Duty to colleagues and other professionals, Duty to the society

Good Laboratory Practice (GLP) Regulations and Accreditation-

Introduction to Basics of GLP and Accreditation, Aims of GLP and Accreditation,

Advantages of Accreditation, Brief knowledge about Nation and International Agencies for clinical laboratory accreditation

Awareness / Safety in a clinical laboratory

General safety precautions-HIV : pre- and Post-exposure guidelines, Hepatitis B & C : pre- and Post-exposure guidelines, Drug Resistant Tuberculosis.

Unit-4

Patient management for clinical samples collection, collection of sample, transportation and preservation, Sample accountability-Purpose of accountability, Methods of accountability
Sample analysis-Introduction, Factors affecting sample analysis
Reporting results, Basic format of a test report, Reported reference range, Clinical Alerts,
Abnormal results, Turnaround time, Results from referral laboratories, Release of examination results

BSMT3503-Immunopathology

Subject Name	Code	Type of course	L-T-P	Prerequisite
Immunopathology	BSMT3503	Theory- Practice	3- 1- 0	Fundamental Science

Objective:

- To understand how the immune system is working, about the components of the immune system, their functioning, the defense mechanisms against different pathogens (viruses, bacteria, and parasites), the pathogenesis of immune diseases (hypersensitivity, autoimmunity, immunodeficiencies), and on the mechanisms underlying the rejection of the transplants and the antitumor immune response.
- It also provides knowledge of the main immunological techniques used in research and diagnostics.

Course Outcome

- To know and describe the organization and functioning of the immune system, its cells and its molecules.
- To know the principles of diagnostic tests described on immunological techniques.
- To know the fundamental stages of the immune system and its changes over the course of life (intrauterine life, newborn, adult, elderly)
- *The conceptual understanding of the subject provides opportunities for employability and scopes for higher education.*

Subject:BSMT3503-Immunopathology

(LTP:3+1+0)(Credit:4)

Unit-1

Basic Components of the Immune System

Immunological Techniques, Immune Regulation, Immunological Aspects of Infection

Immunological Aspects of Immunodeficiency Diseases

Unit-2

Autoimmunity, Chronic Lymphocytic Leukemia

Immunology of HIV Infections

Immunological Aspects of Allergy and Anaphylaxis

Immunological Aspects of Skin Diseases

Unit-3

Experimental Approaches to the Study of Autoimmune Rheumatic Diseases

Immunological Aspects of Cardiac Disease

Immunological Aspects of Chest Diseases: The Case of Tuberculosis

Immunological Aspects of Gastrointestinal and Liver

Immunological Aspects of Endocrine Disease

Immunological Aspects of Renal Disease Immunological Aspects of Transplantation .

- Knowing patient safety
- Report Distribution system
- Laboratory infection control Policy
- Bio-Medical waste management
- Understanding Patient rights
- ISO Policy for medical laboratory

Suggested Readings:

1. Text book of Microbiology by Ananthanereyan & Paniker, Publisher Universities press
2. Short text book of Medical microbiology by Satish Gupt, Publisher Jaypee brotthers
3. Medical laboratory Technology vol.I ,II, III by K L Mukherjee, Publisher McGraw Hill education
4. Medical Laboratory manual for tropical countries Vol II Microbiology by Monia Cheesbrough, publisher Butterworth Heinemann ltd
5. Immunology by Ivan Roitt, JonathaanBrostoff and David Male.

BSMT3504-Introduction to Quality And Patient Safety

Subject Name	Code	Type of course	L-T-P	Prerequisite
Introduction To Quality And Patient Safety	BSMT3504	Theory-practice	3-1-0	Fundamental Science

Objective:

Course Outcome

- Know about rights and duties of patient
- Know about right and duties of lab technician
- Understand various policy to manage lab
- Understand infection control procedure

Subject: BSMT3504-IntroductionToQualityAndPatientSafety

(LTP:3+1+0)(Credit:4)

Unit-1

Introduction – the science of safety Medical Error & Metacognition

Investigating an Error/ Root cause analysis Responding to Adverse events

Error reporting systems Disclosure

Unit-2

Teamwork and Communication Culture of Safety/ Leadership
Thinking about Quality 1 Thinking about Quality
Components of Measurement Measure development and evaluation
Regulation and accountability Case Mix Adjustment
Spring Break , Patient Satisfaction Using large datasets for quality evaluation
Quality Measure Presentations .

Unit-3

Introduction to Quality Improvement Innovation and Adoption
Knowledge Translation Evaluation of Implementation
Lean Methodology and Problem Solving Audit and Feedback; Process mapping; Trigger tool
Information Technology in Quality Improvement
Quality Improvement Project Presentations

BSMT3505-Medical law and Ethics

Subject Name	Code	Type of course	L-T-P	Prerequisite
Medical law and Ethics	BSMT3505	Theory-practice	3-1-0	Fundamental Science

Objective:

- The course provides an introduction to ethics generally and more specifically to medical ethics, examining in particular the principle of autonomy, which informs much of medical law. The course then considers the general part of medical law governing the legal relationship between medical practitioners and their patients.
- It considers the legal implications of the provision of medical advice, diagnosis and treatment. Selected medico-legal issues over a human life are also examined. These may include reproductive technologies, foetal rights, research on human subjects, organ donation, the rights of the dying and the legal definition of death.

Course Outcome

- The ethical underpinnings of the law as it relates to medicine,
- The law of negligence in the context of the provision of healthcare,
- Legal and ethical issues surrounding end and beginning of life decisions,
- The maintenance of professional standards in the healthcare profession, and
- The role of policy in the formation of law as it relates to medicine.

Subject: BSMT3505-Medical law and Ethics

(LTP:3+1+0)(Credit:4)

Unit-1

Course Introduction - Need, Basic Guidelines, Content and Process for Value Education
Understanding the need, basic guidelines , content and process for Value Education.
Self Exploration–what is it?- its content and process; ‘Natural Acceptance’ and

Experiential Validation- as the mechanism for self exploration . Continuous Happiness and Prosperity- A look at basic Human Aspirations.

Unit-2

Understanding Harmony in the Nature and Existence - Whole existence as Co-existence-

Understanding the harmony in the Nature

Interconnectedness and mutual fulfillment among the four orders of nature recyclability and self-regulation in nature .

Understanding Existence as Co-existence (*Sah-astitva*) of mutually interacting units in all-pervasive space. Holistic perception of harmony at all levels of existence .

Unit-3

Understanding Harmony in the Human Being - Harmony in Myself!

Understanding Harmony in the Family and Society- Harmony in Human-Human Relationship . Implications of the above Holistic Understanding of Harmony on Professional Ethics .

Practice:-To visit the following places, meet people visiting/living/working in that environment, understand their life style, understand value of human life in each environment and share with them the aspects of their joys and sorrows: Charitable and Government Hospitals, Orphanages, Old age homes, Training Institute for handicapped , Drug De-Addiction centers ,Schools in rural areas, Industries Slums

BSMT3506-Mycology & Virology

Subject Name	Code	Type of course	L-T-P	Prerequisite
Mycology & Virology	BSMT3506	Theory-Practice	3-1-0	Fundamental Science

Objective:

- To describe the characteristics and diseases caused by pathogenic viruses and fungi.
- To perform basic laboratory techniques in mycology, to isolate fungus from clinical samples.
- Understanding different methods of virus cultivation.
- Understanding collection, transportation and preservation methods of clinical specimen.

Course Outcome

- Broad idea about structure and basic characteristics of virus and fungus.
- Plan, write and implement research projects in virology and mycology analyze their results and publish these in peer-reviewed journals.
- Coordinate with concerned agencies regarding viral and fungal diseases and their outbreaks.
- Plan and execute epidemiological studies and provide advice in relation to viral diseases.

Sub:BSMT3506-Mycology & Virology

(LTP:3+1+0)(Credit:4)

Unit-1

Introduction to medical mycology, Basic concepts about superficial and deep Mycoses .
Taxonomy and classification and general characteristics of various medically important fungi .
Normal fungal flora .
Morphological, cultural characteristics of common fungal laboratory contaminants
Culture media used in mycology.

Practice-: To prepare culture media used routinely in mycology. To perform all the staining techniques for identification of fungi as mentioned in theory syllabus.

Unit-2

Direct microscopy in Medical mycology laboratory .
Processing of clinical samples for diagnosis of fungal infections i.e. Skin, nail, hair, pus, sputum, CSF and other body fluids.
Techniques used for isolation and identification of medically important fungi
Methods for identification of yeasts and moulds .

Practice-: To identify given yeast culture (By performing various identification techniques studied in theory. To identify given mould culture (By performing various identification techniques studied in theory. To demonstrate dimorphism in fungi

Unit-3

Introduction to medical virology, Classification of viruses . Introduction to medically important viruses . Collection, transportation and storage of sample for viral diagnosis
Staining techniques used in Virology. Processing of samples for viral diagnosis (Egg inoculation and tissue culture) .

Practice--: Demonstration of fertilized hen egg. Demonstration of various inoculation routes in fertilized hen egg. Inoculation of fertilized hen egg through various routes.

BSMT3507-Mycology & Virology lab.

Subject Name	Code	Type of course	L-T-P	Prerequisite
Mycology & Virology Lab	BSMT3507	Practice	0-0-4	Basic microbiology

Objective:

- To describe the characteristics and diseases caused by pathogenic viruses and fungi.
- To perform basic laboratory techniques in mycology, to isolate fungus from clinical samples.
- Understanding different methods of virus cultivation.
- Understanding collection, transportation and preservation methods of clinical specimen.

Course Outcome

- To describe the characteristics and diseases caused by pathogenic viruses and fungi.
- To perform basic laboratory techniques in mycology, to isolate fungus from clinical samples.
- Understanding different methods of virus cultivation.
- Understanding collection, transportation and preservation methods of clinical specimen.

Sub: BSMT3507-Mycology & Virology lab.

(LTP:3+1+0)(Credit:4)

1. To prepare culture media used routinely in mycology.
2. To perform all the staining techniques for identification of fungi as mentioned in theory syllabus.
3. To identify given yeast culture (By performing various identification techniques studied in theory).
4. To identify given mould culture (By performing various identification techniques studied in theory).
5. To demonstrate dimorphism in fungi
6. To process clinical samples for laboratory diagnosis of fungal infections i.e.
 - a) Skin
 - b) Nail
 - c) Hair
 - d) Body fluids and secretions
7. To use mice for lab diagnosis of any fungal infection
8. Demonstration of fertilized hen egg.
9. Demonstration of various inoculation routes in fertilized hen egg
10. Inoculation of fertilized hen egg through various routes.

Internship Thesis Guideline

This Guideline is designed to provide students the knowledge and practice of public health research activity, to enable them to carry out researches and solve research related problems and to help them in writing thesis and defend their work. Upon successful completion of the course, the students shall be able to:

- Search relevant scientific literature
- Develop a research proposal
- Employ appropriate data collection techniques and tools
- Manage collected data
- Analyze data with appropriate statistical techniques
- Write thesis
- Defend the findings

Proposal Development:

At the ending of third year (Sixth Semester), students individually consultation with designated faculties and extensive literature survey will develop research proposal during the initial 6 months period.

Data Collection/ Thesis Writing:

Students will carry out data collection, data management, data analysis, and thesis writing during the remaining period (Six Semester).

The Dissertation should have following format:

1. Title
2. Introduction
3. Materials and Methods
4. Results
5. Discussion
6. Conclusion
7. Recommendation
8. References
9. Appendix

Subject: BSMT3601-Project

(Project) (Credit: 12)

BSMT3601-Project

Subject Name	Code	Type of course	L-T-P	Prerequisite
Project	BSMT3601	Project	0-0-12	Basic medical science

Project work:-

Suggested Project title

1. Serum electrolytes/urea/creatinine in pregnant women with Malaria Parasitamia.
2. Urinary tract infection in adult students in CUTM Campus.
3. Blood groups, Prothrombin time(PT), Activated partial thromboplastin time(APTT) among Undergraduate student.

4. Gastroenteritis in primary school children (6-12yr) of specific locality.

BSMT3602- Internship

Subject Name	Code	Type of course	L-T-P	Prerequisite
Internship	BSMT3602	Internship	0-0-12	Basic medical science

Subject: **BSMT3602- Internship** (Practice) (Credit: 12)

Internship

- Case record
- Lab management and ethics
- Evaluation -Guide(internal)
 - Industries guide(external)
 - University-project report/ Viva

**CENTURIONUNIVERSITYOFTECHNOLOGYANDM
ANAGEMENT,ODISHA**

SCHOOL OF PARAMEDICS & ALLIED HEALTH SCIENCES



**Centurion
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*Shaping Lives...
Empowering Communities...*

**MASTER OF SCIENCE
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SYLLABUS**

M.Sc in Applied and Clinical Microbiology

Preface: Medical microbiology is the branch of medical science concerned with the prevention, diagnosis and treatment of infectious diseases. In addition, this field of science studies various clinical applications of microbes for the improvement of health. There are four kinds of microorganisms that cause infectious disease: bacteria, fungi, parasites and viruses and one type of infectious protein called Prion.

A medical microbiologist studies the characteristics of pathogens, their modes of transmission, mechanism of infection and growth. Using this information, a treatment can be revised.

Medical microbiologist often serves as a consultant of physician, providing identification of pathogen and suggesting treatment option.

Scope: M.Sc in Applied and Clinical Microbiology gives opportunity for specialized study in the field of medical & clinical microbiology. Candidates who successfully complete M. Sc in Applied and Clinical Microbiology course may obtain jobs as

- Specialized technologist in Microbiology or supervisor of clinical laboratories in hospitals.
- Laboratory scientists in Biomedical and research institutes.
- Teachers in training institutes of Medical Laboratory Technology/graduate & postgraduate programme of microbiology & related areas.
- Utilize or apply the concepts, theories and principles of laboratory science.
- Demonstrate the ability to plan an effect the change in laboratory practice and health care delivery system.
- Establish collaborative relationship with members of other disciplines.
- Demonstrate interest in continued learning and research for personal and professional advancement.
- Be able to interpret or guide the development of medical diagnostics in need locally and cheaply
- Be able to manage and guide appropriately equipped and staffed clinical microbiology laboratories
- Be a highly skilled human resource for the emerging pharmaceutical/medical industry
- Be able to participate in supervised or team-research in universities, industry or government
- Demonstrate advanced knowledge in the fields of Clinical Microbiology and Immunology, with excellent skills to teach and communicate this knowledge
- Demonstrate independent critical and analytical thinking, both within their field of study, and beyond, for the use of their knowledge for service to others.
- Be able to guide patient care and the public on the pathology, pathogenesis and clinical manifestation, mode of transmission, prevention and current control methods for infections of public health importance
- Be a highly skilled human resource in the management of an increasing number of patients with tissue/Organ transplants, Cancers and immune deficiencies

- Be able to critique and evaluate the impact of the existing national disease control programmes on the epidemiology of infectious diseases and advise on improving them
- Have acquired critical and analytical skills required for further studies in specialized areas of microbiology or related studies
- Identify and suggest possible solutions to ethical dilemmas that occur in their work and field of study, and understand the importance of professional ethics in all aspects of scientific communication and laboratory work
- Demonstrate competence in the laboratory, including application of the scientific method and appropriate use of basic and state-of-the-art laboratory tools and techniques
- Demonstrate written and oral skills necessary for communication of research, knowledge, and ideas to scientists and non-scientists alike

Programme: M.Sc. in Applied and Clinical Microbiology

Duration: Two years (Four semesters) full-time programme with 6 months internship in the last semester.

Eligibility: Bachelor's degree in any branch of Life Science / Agriculture / Pharmacy / Veterinary / Medicine (MBBS/BDS).

Examination: Examination rules will be as per guideline of CUTM Examination handbook.

Internship : A candidate will have to undergo internship for a period of six calendar months in a hospital/Diagnostics Centre /Research Institution equipped with modern laboratory facility , which fulfill the norms decided by the University. Dissertation will be compulsory to all students. Students will carry out dissertation work individually or in the group of not more than three students. The format for dissertation/Internship report will be similar to the research thesis style; incorporating chapters on: Introduction, Materials and Methods, Results and Discussion and References/Bibliography. The dissertation will be submitted in a typewritten and bound form.

Degree: The degree of M.Sc in Applied and Clinical Microbiology course of the University shall be conferred on the candidates who have pursued the prescribed course of study for not less than two academic years and have passed examinations as prescribed under the relevant scheme and completed 6 months of compulsory internship in the last semester.

On successful completion of three year programme, the candidate will be awarded with **“Master of Science in Applied and clinical microbiology (M.Sc.-CMB)”** from Centurion University.

MASTER OF SCIENCE IN APPLIED & CLINICAL MICROBIOLOGY

Programme Structure

SEMESTER-I				
SLNO	CODE	SUBJECT	SUBJECTTYPE Lecture+ Tutorial+ Practice(L+T+P)	CREDITS
1	MSCM1101	GeneralMicrobiology	3+1+0	4
2	MSCM1102	HumanAnatomy&Physiology	4+0+0	4
3	MSCM1103	Biomolecules	3+1+0	4
4	MSCM1104	AnalyticalTechniques	3+1+0	4
5	MSCM1105	BasicMicrobiologyLab	0+0+6	4
Total				20

SEMESTER-II				
SLNO	CODE	SUBJECT	SUBJECT TYPE(L+ T+P)	CREDITS
1.	FCBS0101	EnvironmentalScience	3+1+0	4
2.	FCHU0203	BusinessCommunication	0+0+3	2
3.	MSCM1201	SystematicBacteriology	3+1+0	4
4.	MSCM1202	Molecular Biology andClinicalBiochemistry	3+1+0	4
5.	MSCM1203	MedicalParasitologyandMycology	3+1+0	4
6.	MSCM1204	Appliedmicrobiology	3+1+0	4
7.	MSCM1205	Bacteriology,Parasitology& MycologyLab	0+0+6	4
Total				26

SEMESTER-III				
SL NO	CODE	SUBJECT	SUBJECT TYPE(L+T+P)	CREDITS
1	MSCM2301	Immunology&Virology	3+1+0	4
2	MSCM2302	DiagnosticBacteriology	3+1+0	4
3	MSCM2303	Biochemistry	3+1+0	4
4	MSCM2304	Histology	3+1+0	4
5	MSCM2305	ResearchMethodology	3+1+0	4
6	FCHU0204	CommunicativePracticeLaboratory–II	0+0+3	2
7	MSCM2306	Immunology,Histopathology&BiochemistryLab	0+0+6	4
Total				26

SEMESTER-IV				
SLNO	CODE	SUBJECT	SUBJECTTYPE(L+T+P)	CREDITS
1.	MSCM2401	Project	NA	12
2.	MSCM2402	Internship	NA	12
Total				24

INTERNSHIP

Minimum 720 hours (calculated based on 8 hours per day, if 90 working days in 6 months)

Syllabus

1st semester M.Sc. in Applied and Clinical Microbiology

MSCM1101- General Microbiology

Subject Name	Code	Type of course	L-T-P	Prerequisite
General Microbiology	MSCM1101	Lecture+Tutorial	3-1-0	Fundamental Science

Objective

- To know various Culture media and their applications and also understand various physical and chemical means of sterilization
- To know General bacteriology and microbial techniques for isolation of pure culture bacteria, fungi and virus
- To master aseptic techniques and be able to perform routine culture handling tasks safely effectively

Course Outcome

- This study demonstrates the theory and practical skills in microscopy and their handling techniques and staining procedures.
- Understanding the details of microbial cell organelles.
- Provides knowledge on growth of microorganism.
- Provides knowledge culturing microorganism.

Unit-1

History and scope of Microbiology, Recent trends and developments in modern microbiology. Identification, characterization and classification of microorganisms. Distinguishing characteristics between prokaryotic and eukaryotic cells. Structure and function of Cell wall of bacteria, cell membranes, flagella, pili, capsule, gas vesicles, carboxysomes, magnetosomes and phycobolosomes.

Unit-2

Methods of sterilization: Physical methods – Dry heat, moist heat, radiation methods, filtration methods, chemical methods and their application. Concept of containment facility, sterilization at industrial level. Different staining techniques used in bacteriology.

Practice: - Demonstration the different type of Sterilization technique and operation of the Instruments used in microbiological lab. Demonstration of various parts of microscope. Demonstrate the different staining techniques.

Unit-3

Bacterial nutrition – Nutritional requirement of bacteria. Cultivation of aerobes and anaerobes, Reproduction in bacteria and spore formation. Bacterial growth curve and bacterial nutrition Media. Culture Media, Liquid and solid media, defined and synthetic media, routine laboratory media (basal, enriched, selective, enrichment, indicator, and transport media).

Practice: - Preparation and demonstration of different culture media, biochemical tests, growth Bacteria.

Suggested Readings

1. Textbook of Medical Laboratory Technology by Praful B Godkar, Publisher Bhalani
2. Text book of Medical Microbiology by Gruckshiank
3. Medical Laboratory Technology by Kanai Lal Mukherjee, Publisher Tata McGrawHill
4. An Introduction to Medical Laboratory Technology by FJ Baker, Publisher Butterworth
5. Practical Book of Medical Microbiology by SatishGupt, Publisher JaypeeBrothers
6. Medical Laboratory Manual for Tropical Countries Vol. I and II by Monica Cheesbrough

MSCM1102- Anatomy and Physiology

Subject Name	Code	Type of course	L-T-P	Prerequisite
Human Anatomy and Physiology	MSCM1102	Lecture	4-0-0	Fundamental Science

Objective

- To identify different types of cells and describe their functions.
- To identify the organelles of a typical cell and describe their functions.
- To identify the major components of the integumentary system and describe their functions.
- To identify the major structures of the skin and describe their functions
- To identify the major components of the skeletal system and describe their functions.
- To identify the major components of the circulatory, endocrine, nervous system etc and describe functions.

Course Outcome

- Use anatomical terminology to identify and describe locations of major organs of each system covered.
- Explain interrelationships among molecular, cellular, tissue, and organ functions in the system.
- Describe the interdependency and interactions of the systems.
- Explain contributions of organs and systems to the maintenance of homeostasis.
- Identify causes and effects of homeostatic imbalances.
- Describe modern technology and tools used to study anatomy and physiology.

Unit-1

Scope of Anatomy and physiology. Definition of various terms used in Anatomy. Structure of cell, function of its components with special reference to mitochondria and microsomes.

Elementary tissues: Elementary tissues of the body, i.e. epithelial tissue, muscular tissue, connective tissue and nervous tissue.

Skeletal System: Structure and function of Skelton. Classification of joints and their function. Joint disorders.

Practice: Demonstration of individual bone from skeleton Identification of different organs and system from chart.

Unit-2

Cardiovascular System: Composition of blood, functions of blood elements. Blood group and coagulation of blood. Brief information regarding disorders of blood. Name and functions of lymph glands. Structure and functions of various parts of the heart. Blood pressure and its recording. Brief information about cardiovascular disorders.

Respiratory system: Various parts of respiratory system and their functions, physiology of respiration.

Practice: Demonstration the morphology of different blood cells

Measurement of Blood pressure, impulses, Heart beats, respiration rate etc.

Unit-3

Urinary System: Various parts of urinary system and their functions, structure and functions of kidney. Physiology of urine formation. Patho-physiology of renal diseases and edema.

Digestive System: names of various parts of digestive system and their functions. Structure and functions of liver, physiology of digestion and absorption.

Endocrine System: Endocrine glands and Hormones. Reproductive system Structure and function of senseorgans.

Practice: Demonstration of various parts of body, tissues of body, parts of digestive system, parts of respiratory system, parts of excretorysystem. Identification of different organs and system from chart

Suggested Readings:

1. Text book Anatomy & Physiology for nurses by Evelyn Pearce, Publisher Faber&Faber.
2. Text book Anatomy and Physiology for nurses by Sears, Publisher EdwardArnold.
3. Anatomy & Physiology- by Ross and Wilson, PublisherElsevier.
4. Anatomy& Physiology: Understanding the human body by Clark, Publisher Jones &Bartlett.
5. Anatomy and Physiology for nurses by Pearson, Publisher Marieb&Hoehn.
6. Anatomy and Physiology by N Murgesh, Publishersatya.

MSCM1103-Biomolecules

Subject Name	Code	Type of course	L-T	Prerequisite
Biomolecules	MSCM1103	Lecture+Tutorial	3-1-0	Fundamental Science

Objective

To study the structure and function of biomolecules and the vital processes that occurs in l organisms.

Course Outcomes

- Provide students with learning experiences that help in still deep interests in learning biochemistry
- Develop broad and balanced knowledge and understanding of biomolecules, key biochemical concepts, principles and theories related to biochemistry
- Equip students with appropriate tools of analysis and with theoretical, technical and analytical skills to tackle issues and problems in the field of biochemistry.

Unit-1

Major Biomolecules: Carbohydrates – Classification, chemistry, properties, and function – mono, di, oligo and polysaccharides. bacterial cell wall polysaccharides. Conjugated polysaccharides– glycoproteins, muriensandlipopolysaccharides.

Lipids – classification, chemistry, properties and function – free fatty acids, triglycerides, phospholipids, glycolipids & waxes. Conjugated lipids – lipoproteins. Major steroids of biological importance – prostaglandins.

Unit -2

Amino acids and proteins – classification, structure and function. Essential amino acids & amphoteric nature of amino acids and reactions and functions of carboxyl and amino groups and side chains. Peptide structure. Ramachandran's plot. Methods for isolation and characterization of proteins. Structural levels of proteins – primary, secondary, tertiary and quaternary, denaturation of proteins. Hydrolysis of proteins. Protein sequencing using various methods.

Unit -3

Nucleic acids – structure, function and their properties. Structural polymorphism of DNA, RNA. Structural characteristics of RNA.

Sources, Chemistry and biochemical functions of water-soluble vitamins. Chemistry of Porphyrins – Heme, Cytochromes, Chlorophylls, xanthophylls, Bacteriochlorophylls& algal pigments, Carotenoids

Unit-4

Biological oxidation, Biological redox carriers, biological membranes, electron transport, oxidative phosphorylation and mechanism. Bacterial photosynthesis, photosynthetic electron transport
 Mineral metabolism – phosphorus, potassium, calcium and Trace elements – molybdenum, zinc, manganese, cobalt and copper. Influence of minerals on the production of toxins. Role of trace elements on microbial enzymes.

Suggested readings

1. Text book of Medical Laboratory Technology by P. B. Godker, Publisher Bhalani.
2. Text book of Medical Biochemistry by Chaterjee & Shinde, Publisher JPB
3. Medical Laboratory Technology by Mukherjee, Publisher
4. Principal of Biochemistry by Lehninger, Publisher Kalyani
5. Practical Clinical Biochemistry by Harold Varley, Publisher CBS.

MSCM1104-Analytical Techniques

Subject Name	Code	Type of course	L-T	Prerequisite
Analytical Techniques	MSCM1104	Lecture+Tutorial	3-1	Fundamental Science

Objective

- To learn the principle, instrumentation & application of Microscopy
- Principle, instrumentation & application of Centrifugation
- Chromatographic techniques
- Electrophoretic techniques
- Principle of Spectroscopy

Course Outcome

- After completion of the course the student will be efficient in handling the microscopes.
- They will also be able to have idea about handling instruments like centrifuge, spectrophotometer, chromatography, flow cytometer, Automated and semi- automatic Biochemistry analyzer.
- They will gain knowledge on the principle behind and the application of NMR, X-ray diffraction, ESR.
- The conceptual understanding of the subject provides opportunities for skill enhancement scopes for higher education.

Unit-1

Microscopy– Microscopic techniques: Basic principles and applications of light, phase – contrast microscopy (phase annulus, phase plate, specimen preparations), fluorescent microscopy (filters, dark field condenser, complex optical system, sample preparations) and electron microscopy (Magnetic lenses, electron beams, condensers, types of electron microscopy – scanning and transmission, sample preparations - fixing of specimens, preparation of blocks, Microtomy – sectioning, microtomy and staining, negative staining techniques of biological samples), cytometry and flow cytometry

Practice: Demonstration of different Microscopes with their operation and maintain technique.

Preparing specimens for observing under above microscopes.

Unit-2

Principles of Centrifugation – Centrifugation techniques-preparative and analytical methods, density gradient centrifugation.

General principles and applications of chromatography – Paper, Thin layer, Column, Ion exchange, Affinity chromatography, Gelfiltration, Gas, HPLC, FPLC.

Electrophoresis – moving boundary, zone (Paper Gel) electrophoresis, Immunoelectrophoresis. Immunoblotting Isoelectric focusing, 2-Delectrophoresis.

Practice: Demonstration the Centrifuge, Different Electrophoresis, Auto /Semi auto Analyzer, Microtome. Maintenance and Quality control of Medical Lab Equipment 's.

Unit-3

Principles, Laws of absorption and radiation. Visible, ultraviolet, infrared and mass spectrophotometry. Absorption spectra, fluorescence flame photometry, Principles of colorimetry, Turbidometry, Viscometry. Determination of size, shape and molecular weight of macromolecules– osmotic pressure, flow birefringence, optical rotatory dispersion. light scattering, diffusion, sedimentation and X-ray diffraction, NMR, ESR.

Suggested Reading

1. Instrumental Methods of Chemical Analysis by CHATWAL &ANANAD.
2. Practical Biochemistry: Principles and techniques by WILSON &WALKER.
3. Physical Biochemistry: Application to Biochemistry and Molecular biology (2nd edition) by FREIFELDER.
4. Biochemical methods (2nd edition) by SADASIVAM &MANICKAM.
5. Biophysical Chemistry: Principles and techniques by UPADHYAY, UPADHYAY &NATH.
6. HAWK'S Physiological Chemistry by OSER.

MSCM1105- Basic microbiology lab

Subject Name	Code	Type of course	L-T	Prerequisite
General Microbiology	CUTM1711	Practice	0-0-	Fundamental Science

Objective

- To know various Culture media and their applications and also understand various phy and chemical means of sterilization
- To know General bacteriology and microbial techniques for isolation of pure culture bacteria, fungi and virus
- To master aseptic techniques and be able to perform routine culture handling tasks safely effectively

Course Outcome

- This study demonstrates the theory and practical skills in microscopy and their hand techniques and staining procedures.
- Understanding the details of microbial cell organelles.
- Provides knowledge on growth of microorganism.
- Provides knowledge culturing microorganism.

1. Demonstration of various parts of centrifuge; its functioning and care, Demonstration of various parts of microscope its functioning and care, Cleaning and drying of glass and plastic ware , Preparation of various anticoagulants , Collection of venous and capillary blood ,Cleaning of glass ,syringes and its sterilization. Preparation of buffers , Preparation of the stains and other reagents , Preparation of peripheral blood film (PBF) ,To stain a peripheral blood Film by Leishman , stain ,Hemoglobin estimation (oxy Hb and cyanmethaemoglobin method)
2. Preparation of bacterial smear and staining – Gram's ,Acid-fast, Staining of bacterial spores flagella, capsule, spirochaetes
3. Preparation of media, cultivation of bacteria, Biochemical tests for identification of bacteria, Preservation of stock cultures of bacteria.
4. Demonstration of various parts of body ,tissues of body, parts of digestive system, parts of respiratory system ,parts of excretory system

Suggested Reading

1. A Procedure Manual for Routine Diagnostic Tests Vol. I and II by KL Mukherjee; Tata McGraw Hill Publishers, New Delhi
2. A Textbook of Medical Laboratory Technology by P Godkar, Bhalani Publishing House, Mumbai

2nd semester M.Sc. in Applied and Clinical Microbiology

FCBS0101-Environmental Science

Subject Name	Code	Type of course	L-T	Prerequisite
Environmental Science	FCBS010	Lecture+Tutorial	3-1-	Fundamental Science

Objectives

- To understand the concept of multi-disciplinary nature of Environmental Science where different aspects are dealt with a holistic approach.
- Students will develop a sense of community responsibility by becoming aware of environmental issues in the larger social context.
- One must be environmentally educated.

Course Outcome

- Understand the natural environment and its relationships with human activities.
- Characterize and analyze human impacts on the environment.
- Integrate facts, concepts, and methods from multiple disciplines and apply to environmental problems.
- Design and evaluate strategies, technologies and methods for sustainable management of environmental systems and for the remediation or restoration of degraded environments.

UNIT-I

Environment and its multidisciplinary nature; Need for public awareness; Renewable and non-renewable resources—forest, water, mineral, land, food and energy resources; Structure and function of ecosystems of forest, grass land, desert and aquatic types.

UNIT -II

Biodiversity and its conservation: Biodiversity at global, national and local levels; Threats to biodiversity - Habitat loss; wild life poaching and man - wildlife conflicts; Endangered and endemic species; conservation measures.

Causes, effects and control measures of pollution, air, water and noise pollution; Nuclear hazards; solid-waste management—Causes, effects and control measures; Management of disasters due to natural causes of floods, earthquakes, cyclones and landslides.

UNIT-III

Social issues and the environment; Sustainable environment, Water conservation measures; Rain water harvesting; Resettlement and rehabilitation of people; Climate change and global warming; Acid rain; Ozone layer depletion; water land reclamation; Consumerism and waste products; Features of Environment Protection Act, Air pollution and Control of Pollution Acts; Water Pollution and its Control Act. Effects of Pollution explosion on environment and public health; Need for value education to Protect environment and resources.

Text Book:

1. AnubhavKaushik& C.P. Kaushik: Environmental Studies-New age International Publishers.

Reference Books:

1. Benny Joseph: Environmental Studies-Tata Mac GrawHill
2. E. Bharucha: Text book of Environmental Studies for under graduate courses– Universities Press.
(Book prepared by UGCCCommittee.

FCHU0203-Business Communication

Subject Name	Code	Type of course	L-T	Prerequisite
Business Communication	FCHU0203	Practice	0-0-	Fundamental Science

Objectives

- The course on Business Communication focuses on the basic skills required to be an effective communicator. It aims at imparting the communication skills that are needed in the academic and professional pursuits.
- This is directed towards helping the students gain skills in comprehension, group discussions, presentations, interviews, active listening, technical writing and the ability to manage cross-cultural interactions. The focus is on the difficulty experienced by individual students, and the effort to explore a useful strategy for self-improvement. This is achieved through an amalgamation of lecture-oriented approach of teaching with the task-based skill-oriented methodology of learning.

Course Outcomes

- Understand the differences between general communication and business communication
- Development of basic language skills, i.e., listening, speaking, reading and writing
- Effective participation in group discussion and job interviews.

Unit-1

UNDERSTANDING COMMUNICATION IN BUSINESS (8 hrs.)

- The module is a guide to organization communication. It is directed towards enabling students to develop the skills necessary to manage the human resources of their organization.
- General Communication and Business Communication
- Communication in Organizational Settings: Patterns of Communication in the Business World – Upward, Downward, Horizontal Grapevine etc, Channels of Communication- Internal and External, Formal and Informal
- Introduction to Cross Cultural Communication
- Strategies to Overcome Communication Barriers

Unit-2

READING AND WRITING (10 hrs.)

- This unit works on the competency in reading and writing skills through such tasks/activities as reading books, articles, magazines, novels, developing outlines, key expressions, situations, slogan writing and theme building exercises, dialogue writing, interpreting pictures, technical writing.
- Importance of Developing Reading Skills

- Sub-Skills of Reading: Predicting Content, Skimming & Scanning, Topic sentence and supporting details, Inferential Reading, Guessing the Meaning of Unfamiliar Words, Note Making
- Importance of Writing Skills and Principles of Effective Writing ♣ Writing Process: Pre- writing, Drafting and Re-Writing
- Paragraph Writing
- Summaries and Abstracts Page |10
- Business Correspondence: Writing Business Letters, E-mail Messages, Memo, Notice, Circulars, Reports, Proposals
- Career Communication: Writing Resume/ CV and Job Application Letter

Unit-3

LISTENING AND SPEAKING (9 HOURS)

- Listening is the mother of all speaking. This unit aims to achieve competence in speaking i.e., the ability to communicate orally in clear, coherent, and persuasive language appropriate to purpose, occasion, and audience. The module focuses on developing this competency which includes acquiring poise and developing control of the language through experience in making presentations to small groups, to large groups, and through the media.
- Listening Skills: Listening Process, Hearing and Listening, Types and Barriers, Effective Listening Strategies
- Common forms of Oral Communication in the Business World:
- Meetings: Organize Meetings, Preparing an Agenda, Chairing a Meeting, Drafting Resolutions, Writing Minutes
- Persuasive Speaking: Improving Fluency and Self-Expressions, Articulation, Good Pronunciation, Voice Quality
- Making an Oral Presentation: Planning, Preparing and Delivery
- Facing an Interview: Preparation, Types of Interview, Do's and Don'ts
- Group Discussions: Debate and GD, Types of GD, GD Etiquette (Treatment: Developing listening and speaking skills through various activities, such as role play activities, practicing short dialogues, JAM, group discussions, debates, speeches, listening to news bulletins, viewing and reviewing documentaries and short films etc.)

TEXT BOOKS:

An Introduction to Professional English and soft skills by B.K Das et al., Cambridge University Press

REFERENCES:

Effective Technical Communication, M. Ashraf Rizvi, TMH Publications. Business Communication, Krizan. Merrier. Logan. Williams, Thomson Business Communication Today, Courtland L Bovee, John V Thill & Mukesh Chaturvedi, Pearson Education. Business communication by Meenakshi Raman and Prakash Singh (Oxford) Business Communication, Urmila Rai & S.M Rai, Himalaya Publishing House

MSCM1201-Systematic Bacteriology

Subject Name	Code	Type of course	L-T-P	Prerequisite
Systemic Bacteriology	MSCM1201	Lecture+Tutorial	3-1-0	Fundamental Scien

Objective

- To learn opportunities in the basic principles of medical microbiology and infectious diseases.
- To study mechanisms of infectious disease transmission, principles of aseptic practice, and the role of the human body's normal microflora.
- To understand the importance of pathogenic bacteria in human disease with respect to infections of the respiratory tract, gastrointestinal tract, urinary tract, skin and soft tissue.

Course Outcome

- The course provides the conceptual basis for understanding pathogenic microorganisms and the mechanisms by which they cause disease in the human body.
- Recall the relationship of this infection to symptoms, relapse and the accompanying pathology.
- Explain the methods of microorganism's control, e.g. chemotherapy & vaccines. Solve problems in the context of this understanding.

Unit-1

Morphology, culture, identification, pathogenesis, clinical findings, laboratory diagnosis, epidemiology and pathogenesis of following bacterial infections

Staphylococcus, Streptococcus, Enterococcus, Micrococcus, Gram positive anaerobic cocci, Neisseria, Moraxella, Branhamella

Unit-2

Bacillus, Corynebacteria, Listeria, Erysipelothrix, Lactobacillus, Clostridium, Brucella, Propionibacterium, Prevotella, Eubacterium, Leptotrichia, Fusobacterium, Gardnerella, Actinobacils. Bordetella, Legionella, Calymato bacterium, Campylobacter, Helicobacter, Bacteriodes, Spirillum minus, Tropheryma.

Unit-3

Mycobacterium, Actinomyces, Nocardia, Mycoplasma, Ureaplasma, Rickettsiae, Chlamydia, Spirochaetes, Enterobacteriaceae- Escherichia coli, Shigella, Salmonella, Klebsiella, Proteus, Morganella, Providencia, Citrobacter, Enterobacter, Serratia, Yersinia, Pasteurella, Francisella. Vibrio, Aeromonas, Plesiomonas, Pseudomonas, Acinetobacter, Alcaligenes, Achromobacter. Normal bacterial flora of human beings.

Suggested Reading

1. Medical Laboratory Technology by Kanai Lal Mukherjee; Tata McGraw Hill, New Delhi
2. An Introduction to Medical Laboratory Technology by FJ Baker; Butterworth – Heinemann; Oxford
3. Practical Book of Medical Microbiology by Satish Gupta; JP Brothers, New Delhi
4. Medical Laboratory Manual for Tropical Countries Vol. I and II by Monica Cheesbrough; Cambridge University Press; UK

5. Textbook of Medical Laboratory Technology by Praful B Godkar; Bhalani Publishing House, Mumbai
6. Text book of Medical Microbiology by Gruckshiank

MSCM1202-Molecular Biology and Clinical Biochemistry

Subject Name	Code	Type of course	L-T-P	Prerequisite
Molecular Biology and Clinical Biochemistry	MSCM1202	Lecture+Tutorial	3-1-0	Fundamental Science

Objective

- Understanding the central dogma of life
- To understand the concept of gene regulation and its impact
- The use of several molecular diagnostic techniques for disease interpretation
- Understanding the concept of Biochemical analyzing instruments, chemicals and normal ranges of biochemical components in our body.
- Clinically relevant biochemical analysis for deeper understanding of all biochemical components i.e., Proteins, Electrolytes, Hormones etc

Course Outcome

- After completion of the course the student will be gain knowledge of the significance of genes and proteins.
- They will understand the mechanism of gene expression and protein synthesis,
- The significance of gene expression regulation will become clear.
- The students will understand the use of several molecular techniques in disease diagnosis.
- To learn about tests carried out for biochemical investigations.
- Understanding of principle of biochemical Clinical biochemistry tests.

Unit-1

Chemistry of Nucleic acids: DNA Structure and function, RNA Types: Structure and function. Replication, Transcription, genetic code, Translation, Regulation of transcription and translation, Ageing, malignant transformation of cells and role of oncogenes. Apoptosis, cell regeneration.

Unit-2

Molecular diagnostics: Recombinant DNA Technology, Polymerase chain reaction, application of PCR in diagnosis of pathogens, Site directed mutagenesis, DNA finger printing, DNA Foot Printing, antisense RNA technology, chromosomal walking, inherited genetic disorders in man and gene therapy

Unit-3

Metabolic disorders and Diagnostic enzymology: Disorders of metabolism: carbohydrate, Lipids, Amino acids and Nucleic acids. Diagnostic enzymes: Role of Enzymes in Clinical Practice: Marker enzymes in myocardium, liver and pancreas. Tumour markers, Radio isotope techniques

Unit-4

Organ function tests: Liver function tests, Bile pigment metabolism, tests for liver function. Jaundice and its type, Functions of Kidney, Urine formation and renal function tests disease of kidney, Renal Calculi: Theory of formation and analysis, Gastric Analysis, Composition of gastric juice, concepts of free and bound acid, Fractional Test Meal.

*Practice: Operation procedure of Centrifuge machine, colorimeter, spectrophotometer etc Estimation of Liver function test, Kidney function test, Thyroid, Lipid profile.
Estimation of bile pigment, bile salt, bilirubin etc.*

Suggested Reading

1. Text book of Medical Laboratory Technology, P.B. Godkar 2nd Edn. 2003 Bhalani Publication.
2. Text book of Biochemistry, M. A. Siddique 8th Edn. 1993 Vijay Bhagat Scientific Book Co., Patna.
3. Medical Biochemistry by AC Dey.
4. Handbook of Christen Medical Association, India Medical Laboratory Technology- Robert H. Carman.

MSCM1203-Medical Parasitology & Mycology

Subject Name	Code	Type of course	T-P-P	Prerequisite
Medical Parasitology and Mycology	MSCM1203	Lecture+Tutorial	3-1-0	Fundamental Science

Objective

- Describe basic morphology, life cycle, pathogenesis, lab diagnosis and treatment of parasites and fungi.
- Perform appropriate laboratory techniques used in the processing of specimens for identification of parasites and fungi.
- Describe basic principle and procedures of isolation of fungus and parasites from clinical samples like stool, vaginal swab etc.
- Perform appropriate laboratory techniques used in the processing of specimens for identification of parasites and fungi.

Course Outcome

- Identification of pathogenic parasite and fungus in disease diagnosis and treatment.
- The conceptual understanding of the subject provides opportunities for employability scopes for higher education.

- To serve as a resource for the clinical laboratories professionals in the different region.

Unit-1

General Parasitology, Classification of medically important parasites, epidemiology of parasitic infections, immunology of human parasitic infections. Diagnostic parasitology- Systematic study of following parasites (Geographical distribution, habitat, morphology and life cycle, risk of infection, pathogenesis, laboratory diagnosis prophylaxis and serological diagnosis)

Unit-2

Protozoa – Intestinal amoeba, free living pathologic amoeba, giardia, trichomonas, balantidium, isospora, cryptosporidium, microspora, cyclospora Plasmodia, leishmania, trypanosoma, toxoplasma, babesia. Helminthes– Cestodes – Taenia, Echinococcus, Diphylobothrium, Hymenolepsis, Multiceps Trematodes- Schistosoma, Fasciola, Fasciolepis, Paragonimus, Clonorchis, Opisthorchis. Nematodes- Ascaris, Hookworm, Trichuris, Enterobius, Strongyloides, Filaria, Trichinella, Toxocara, Dracunculus Biological vectors.

Practice: Collection & transport of specimens. Examination of stool for parasites. Examination of blood & bone marrow for parasites. Demonstrate different staining technique

Unit-3

General Mycology – Fungus – Classification Fungal Structure & Morphology, Reproduction in fungi, Immunity to Fungal Infections. Culture Media in Mycology, Stains in Mycology. Normal fungal flora of human beings. Diagnostic Mycology - Epidemiology, Pathogenesis, Laboratory Diagnosis of Fungal Infections. Specimen collection, preservation, Transportation & Identification of Mycological Agent. Biochemical tests for fungal identification Anti-fungal agents, invitro tests. Serological tests for mycotic infections. Use of laboratory animals in Mycology. Typing of fungi Preparation of fungal antigens & their standardization.

Unit-4

Method of different sample collection and preservation for mycological examination.

Media & Stains preparation for Mycology, Diagnostic Methods in Mycotic Infections, Identification test in Mycology, Serological tests in Mycology Skin tests. Animal inoculation techniques.

Practice: Collection & transport of specimens Examination of stool for parasites. Examination of blood & bone marrow for parasites. Examination of other body fluids & biopsy specimens for parasites. Culture techniques for parasites. Serological diagnostic methods, skin tests.

Suggested Reading

1. Text book of Parasitology by N C Dey, publisher New central bookagency
2. Text book of Parasitology by Chaterjee, publisher CBS
3. Text book of microbiology by Ananthaneryan, Publisher universitiespress
4. Medical Parasitology by RL Ichhpujani and Rajesh Bhatia, Jaypeepublisher

5. Short text book of medical microbiology by Satish Gupta, Publisher Jaypee

MSCM1204- Applied Microbiology

Subject Name	Code	Type of course	L-T	Prerequisite
Applied Microbiology	MSCM1204	Lecture+Tutorial	3-1	Fundamental Science

Objective

- To impart knowledge of the basic principles of bacteriology, virology, including nature of pathogenic microorganisms, pathogenesis, laboratory diagnosis, transmission, prevention and control of diseases common in the country

Course Outcome

- To know the applications of microbiology in diagnostics, hospitals and community
- Learn principles underlying diagnostic tests and handle kits for diagnosis of diseases
- Explain prognosis of diseases and become aware about the role of medical microbiology in public health

Unit-1

The normal flora, collection and transport of clinical specimens
Collection and preliminary processing of specimens.

Unit-2

Diagnostic microbiology- an approach to laboratory diagnosis
Rapid and automation methods in diagnostic microbiology
Molecular techniques in microbiology
Serological and skin tests

Unit-3

Microbiology in the service of human being
Community microbiology
Emerging and re-emerging Microbial disease
Nosocomial infections

Unit-4

Hospital and laboratory waste
Diagnostic virology, Emergency microbiology
Bacteriology of Milk, Air and Water

Suggested Reading

- Medical Parasitology by RL Ichhpujani and Rajesh Bhatia, jaypeepublisher
- Short text book of medical microbiology by Satishgupt, Publisher Jaypee

MSCM1205- Bacteriology, Parasitology & Mycology Lab

Subject Name	Code	Type of cour	T-P-Pj	Prerequisite
Bacteriology, Parasitology & Mycology I	MSCM1205	Theory	0-3-0	Fundamental Science

Objective

- Describe basic morphology, life cycle, pathogenesis, lab diagnosis and treatment of paras bacteria and fungi.
- Perform appropriate laboratory techniques used in the processing of specimens and identification of parasites, bacteria and fungi.
- Describe basic principle and procedures of isolation of fungus and parasites from clinical samples like stool, vaginal swab etc.
- Perform appropriate laboratory techniques used in the processing of specimens and identification of parasites, bacteria and fungi.

Course Outcome

- Identification of pathogenic parasite and fungus in disease diagnosis and treatment.
- The conceptual understanding of the subject provides opportunities for employability scopes for higher education.
- To serve as a resource for the clinical laboratories professionals in the different region.

1. Collection & transport of specimens Examination of stool for parasites. Examination of blood & bone marrow for parasites. Examination of other body fluids & biopsy specimens for parasites. Laboratory diagnosis of hydrated cyst and cysticercosis, Concentration techniques for demonstration of Ova (Principles and applications), Routine Stool examination for detection of intestinal parasites.
2. Identification of adult worms from model's or slide's. Identification of different parasites their morphology from slide's. Culture techniques for parasites. Serological diagnostic methods, skin tests.
3. Media & Stains preparation for Mycology, Diagnostic Methods in Mycotic Infections, Identification test in Mycology, Serological tests in Mycology Skin tests. Animal inoculation techniques.
4. To prepare culture media used routinely in mycology
5. To perform all the staining techniques for identification of fungi as mentioned in theory syllabus. To identify given yeast culture (By performing various identification techniques studied in theory.

3rd semester M. Sc. Applied and Clinical Microbiology
MSCM2301- Immunology & Virology

Subject Name	Code	Type of course	L-T-P	Prerequisite
Immunology & Virology	MSCM23	Lecture+Tutorial	3-1-0	Fundamental Science

Objective

- Understanding the concept of Innate & adaptive immune system; complement system and Hypersensitivity.
- Clinically relevant serological analysis for deeper understanding of antigen-antibody interaction.
- To understand the concept of cells of immune system and organs of immune system.
- To understand the properties of virus, diagnosis of important viruses and vaccination.

Course Outcome

- The student will learn the application of Immunology in disease diagnosis.
- Complement system followed by the body on encountering an Antigen.
- Immune Response produced on encounter with foreign body.
- The students will learn the role of immunity in fighting disease, along with consequences of undesirable expression of immune system such as, hypersensitivity and auto immune disease.
- They will gather knowledge regarding the properties, diagnosis of virus and vaccination against them.
- The conceptual understanding of the subject provides opportunities for employability scopes for higher education.

Unit - I

Introduction to Immunology: Immunity, Type (Innate & adaptive immune response). Organs of Immune System: Primary and Secondary lymphoid organ. Ontogeny and phylogeny of Lymphocytes: T and B Lymphocytes, Null Antigen, Antibody. Cell of Immune System: Mononuclear cell and granulocytes, Antigen presenting cell. Antigen, Haptens: Factors effecting immunogenicity, epitopes (Properties of it) Antibodies: Structure, Types and function.

Unit - 2

Complement System: Role of complement system in immune response, complements and Components and Activation pathways. Monoclonal antibodies: Production characterization and applications in diagnosis, therapy and basic research. Antigen-Antibody interaction, avidity & affinity measurement. Hypersensitivity: Definition, factor causing hypersensitivity. Common hypersensitivity reaction, types, classification based on the time taken for reaction. Auto Immune disease. Serological Reactions.

Unit-3

Medical Virology General Properties of viruses, Detection of viruses and antigens in clinical specimens, Serological diagnosis of virus infections. Cultivation of viruses. Arthropod borne and rodent borne virus diseases, Picorna viruses and diseases. Hepatitis viruses: Rabies and other neuro viruses: Orthomyxo and paramyxo viruses. Pox, Adeno, Herpes, Reo, Rota and HIV Viruses, Oncogenic viruses, Viral vaccines, their Preparation and their immunization schedules. Viruses of importance to bacteria, Bacteriophages, their structure, types, Typing and application in bacterial genetics.

Suggested Readings:

1. Practical Medical Microbiology by Mackie & MacCartney Volume 1 and 2
2. Text book of Microbiology by Ananthanereyan
3. Medical Microbiology by Paniker & Satish Gupte
4. Medical laboratory Technology vol. I, II, III by Mukherjee
5. Medical Laboratory manual for tropical countries Vol II Microbiology by Monia Cheesbrough
6. Immunology by Ivan Roitt, Jonathan Brostoff and David Male
7. Immunology by Kuby

MSCM2302-Diagnostic Bacteriology

Subject Name	Code	Type of course	L-T-P	Prerequisite
Diagnostic Bacteriology	MSCM2302	Lecture+Tutorial	3-1-0	Fundamental Science

Objective

- To confirm the suspicion of infectious bacterial disease.
- To identify the etiologic agent by isolating the causative bacterial pathogen

Course Outcome

- Study of Lab diagnosis for Enteric infection, Respiratory tract Infection, Oral & Stomach infection, Urinary tract infections.
- Study of control measures for nosocomial infection.
- Student can safeguard himself & society and can work diagnostics and hospitals

Unit-1

Laboratory strategy in the diagnosis of various Infective syndromes: Samples of choice, Collection, transportation and processing of samples for laboratory diagnosis of the following complications:

- a) Septicemia and bacteraemia, b) Upper Respiratory tract infections, c) Lower Respiratory tract infections
- d) Wound, skin, and deep sepsis, e) Urinary tract infections, f) Genital Tract infections, g) Meningitis, h) Gastro intestinal infections, i) Enteric fever, j) Tuberculosis (Pulmonary and Extra-pulmonary), k) Pyrexia of unknown origin

Practice: collection of different specimens from different organs. Record maintaining process. Preparation and use of different media in bacteriology laboratory. Isolation and identification of different groups of bacteria in laboratory.

Unit-2

Antibiotic susceptibility testing in bacteriology- a. Definition of antibiotics, b. Culture medium used for Antibiotic susceptibility testing, c. Preparation and standardization of inoculum, d. Control bacterial strains, e. Choice of antibiotics, f. MIC and MBC, g. Various methods of Antibiotic susceptibility testing with special reference to Stokes method and Kirby-Bauer method, h. Tests for production of β -lactamase

Practice: Antimicrobial susceptibility testing

Unit-3

Bacteriological examination of water, milk, food and air –

- a) Examination of water - Collection and transportation of water sample, Presumptive coliform count, Eijkman test, Introduction and importance of other bacteria considered as indicators of faecal contamination
- b) Examination of Milk and milk products - Basic Concepts regarding gradation of milk, Various tests for Bacteriological examination
- c) Examination of food articles -Basic Concepts regarding classification of food like frozen food, canned food, raw food, cooked food etc. Various tests for Bacteriological examination with special reference to food poisoning bacteria
- d) Examination of Air -Significance of air bacteriology in healthcare facilities, Collection processing and reporting of an air sample.

*Practice: Sterility testing of I/v fluids -a. Collection, transportation and processing of I/v fluids for bacterial contamination, b. Recording the result and interpretation
Nosocomial Infection, Epidemiological markers.*

Suggested Readings:

1. Practical Medical Microbiology by Mackie & MacCartney Volume 1 and 2
2. Text book of Microbiology by Ananthanereyan
3. Medical Microbiology by Paniker & Satish Gupte
4. Medical laboratory Technology vol. I, II, III by Mukherjee
5. Medical Laboratory manual for tropical countries Vol II Microbiology by Monia Cheesbrough

Subject Name	Code	Type of course	L-T-P	Prerequisite
Biochemistry	MSCM2303	Lecture+ Tutorial	3-1-0	Basic Medical science

Objective

- Understanding the concept of Biochemical analyzing instruments, chemicals and normal ranges of biochemical components in our body.
- Clinically relevant biochemical analysis for deeper understanding of all biochemical components i.e., Proteins, Electrolytes, Hormones etc

Course Outcome

- To learn about tests carried out for biochemical investigations.
- Understanding of principle of biochemical Clinical biochemistry tests.
- To learn normal ranges and abnormal ranges of biochemical components and hormones
- To study about diseases related to biochemical and hormone imbalance in human body.

Unit -1

Carbohydrate: Introduction, Carbohydrate Metabolism: Glycolysis, Gluconeogenesis, HMP, and its regulations, Disorders of carbohydrates metabolism related to each cycle (inborn error of metabolism) Proteins: Different metabolic pathway of amino acid. Amino acids oxidation. Transamination, deamination and pathways leading to acetylco-A. Decarboxylation of Amino acids, formation of nitrogenous excretion products. Urea cycle and ammonia excretion. Lipid: Biosynthesis and oxidation of fatty acids, Ketone bodies formation and their oxidation. Regulation and inborn error of lipid metabolism

Unit -2

Biochemical aspects of Hormone: Hormone receptors and intracellular messengers, Adenylatecyclase, protein kinase and phosphodiesterase. Role of Insulin, glucagon's, epinephrine and their mechanism. Various endocrine and regulatory systems mediated by cyclic AMP. Vitamin: Fat and Water soluble and their deficiency. Mineral metabolism: Minor and Major (Cu, Fe, Ca, Mg & P). Inborn error of Nucleic acids metabolism

Unit- 3

LFT, KFT, Lipid profile, Estimation of Glucose / GOD – POD method. Draw a standard graph of GTT curve, Introduction of electrophoresis.

Practice- Demonstration the centrifuge machine, Demonstration of Colorimeter, Estimation of Glucose in urine and blood, Estimation of Protein in urine and blood, Estimation of Liver function test, Kidney function test, Lipid profile.

Suggested readings

1. Text book of Medical Laboratory Technology by P. B. Godker, Publisher Bhalani.

2. Text book of Medical Biochemistry by Chaterjee&Shinde, PublisherJPB
3. Medical Laboratory Technology by Mukherjee, Publisher
4. Principal of Biochemistry by Lehninger, PublisherKalyani
5. Practical Clinical Biochemistry by Harold Varley, PublisherCBS.

MSCM2304- Histology

Subject Name	Code	Type of course	L-T-P	Prerequisite
Histology	MSCM2304	Lecture+ Tutorial	3-1-0	Basic Medical Science

Objective

- Understanding the concept of histotechnology; Basic concepts about routine method examination of tissues Collection.
- Perform routine laboratory procedures encompassing all major areas of the histo laboratory.
- accurately and proficiently embed tissue and understand the principles of microtomy.
- Clinically relevant onchological analysis for deeper understanding of abnormal cell grow anywhere in human body.
- The conceptual understanding of the subject provides opportunities for employability scopes for higher education.

Course Outcome

- In this section students will be made aware of terminology used in histotechnology, various instruments and their maintenance and also learn the processing of various samples for histopathological investigations.
- Reception and labeling of histological specimens.
- Use of antiseptics, disinfectants and insecticides in a tissue processing laboratory.
- The students will learn about various staining procedures for demonstration of different substances & various cytological investigations.
- The students will learn about special staining procedures & handling & testing of various cytological specimens.

Unit-1

Introduction to histotechnology, Care, maintenance and Safety measures of laboratory equipment used in histotechnology. Basic concepts about routine methods of examination of tissues Collection and transportation of specimens for histological examination, fixation Various types of fixatives used in a routine histopathology laboratory- Simple fixatives, Compound fixatives, Special fixatives for demonstration of various tissue elements.

Practice: Practice: Demonstration of instruments used for dissection.

Use of antiseptics, disinfectants and insecticides in tissue processing laboratory.

Unit-2

Decalcification Criteria of a good decalcification agent

Technique of decalcification followed with selection of tissue, fixation, decalcification, neutralization of acid and thorough washing. Various types of decalcifying fluids

Processing of various tissues for histological examination, Embedding

Schedule for manual or automatic tissue processing, Components & principles of various types of a tissue processors.

Practice: -Method of Decalcification, fixation, Embedding, manual or automatic tissue processing.

Unit-3

Section Cutting, Sharpening of Microtome Knives, Honing, Stropping, various types of microtome and their applications, Freezing Microtome and various types of Cryostats.

Staining, Impregnation and Mountants, Commonly used mountants in histotechnology lab. General Staining Procedures for Paraffin Infiltrated and Embedded tissue.

Nuclear Stains and Cytoplasmic stain, Equipment and Procedure for manual Staining and Automatic Staining Technique. Mounting of Cover Slips, Labeling and Cataloguing the Slides.

Practice: Demonstration of instruments used for dissection .Use of antiseptics, disinfectants and insecticides in tissue processing laboratory. Preparation of various fixatives- Hell's fluid, Zenker's fluid, Formal saline, Formal acetic acidetc.

Demonstration various parts and types of microtome.

Suggested Readings

1. Color text book of histology by Gartner & Hiatt, publisher Elsevier
2. Netter's essential histology by William Ovalle, publisher Elsevier
3. Histology E-book by Barry Mitchell, publisher Elsevier
4. Textbook of Histology (color atlas) by Krishna Garg, Indira Bahl, Mohini Kaul, publisher CBS
5. Textbook of Histology and a Practical Guide by JP Gunasegaran, Publisher Elsevier.

MSCM2305- Research Methodology

Subject Name	Code	Type of course	L-T	Prerequisite
Research Methodology	MSCM2305	Theory	3-1	Fundamental Science

Objective

- To equip students with a basic understanding of the underlying principles of quantitative and qualitative research methods.
- Provide students with in-depth training on the conduct and management of research from inception to completion using a wide range of techniques.

Course Outcome

- Students can understand the ethical and philosophical issues associated with research education
- This study provides knowledge on various modes of presenting and disseminating research findings.
- Enable students to acquire expertise in the use and application of the methods of collection and analysis.
- Provide learning opportunities to critically evaluate research methodology and findings.
- Enable students to be reflexive about their role and others' roles as researchers.

Unit-1

Introduction to Research: Definition, Scope, Limitations, and Types. Objectives of Research. Research Process. Research Designs.
Practice: Related to above unit.

Unit-2

Data Collection: Secondary Data, Primary Data, and Methods of Collection. Scaling Techniques: Concept, Types, Rating scales & Ranking Scales
Scale Construction Techniques, Multi-Dimensional Scaling. Sampling Designs: Concepts, Types and Techniques Sample Size Decision.
Practice: Demonstrate the data collection technique, scaling and sampling.

Unit-3

Theory of Estimation and Testing of Hypothesis
Small & Large Sample Tests, Tests of Significance based on t, F, Z test and Chi-Square Test. Designing Questionnaire.
Interviewing.
Tabulation, Coding, Editing. Interpretation and Report Writing.

Suggested Readings

1. Research Methodology kindle edition by R. Panneerselvam publisher PHI Learning; 2 edition
2. Research Methodology: Methods and Techniques Paperback – Abridged, Audiobook, Box set by C R Kothari, publisher newage

FCHU0204- Communicative Practice Laboratory-II

Subject Name	Code	Type of course	T-P-Pj	Prerequisite
Communicative Practice Laboratory-II	FCHU0204	Practice	0-0-3	Fundamental Science

Objectives

- To master Study Skills
- To acquire strategic competence to use both spoken & written language to use in a wide range of communication strategies

- To acquire Business Performance Skills

Course Outcomes

- The students will be able to Write effectively for a variety of professional and social settings. They will practice writing as a process of motivated inquiry engaging others writers' ideas; they explore and develop their own. They will demonstrate an ability to revise for content and edit for grammatical and stylistic clarity. And they will develop an awareness and confidence in their own voice as a writer.
- Become accomplished, active readers who appreciate ambiguity and complexity, and who articulate their own interpretations with an awareness and curiosity for other perspectives.
- Demonstrate the skills needed to participate in a conversation that builds knowledge collaboratively; listening carefully and respectfully to others' view points; articulating own ideas in relation to other voices and ideas. Students will be able to prepare, organize, deliver and engaging oral presentation. A student is required to take up five lab tests of marks- at least two tests in written mode and three tests in spoken mode.

Unit-1

LISTENING (6 HOURS) Exercises on Active Listening:

- The whole group listens to any speech/news broadcast in English and notes down the important points. They listen again to check their points and evaluate themselves. The group then compares points to see how well they have understood the broadcast.

Unit-2

SPEAKING (8 HOURS)

- Situational Dialogues / Role Play: Organization Communication
- Oral Presentations- Prepared and Extempore
- 'Just a minute' Sessions (JAM)
- Debates
- Mock Meetings
- Cracking Job Interviews: Mock Sessions
- Group Discussions on current topics (This module will be practiced through speaking activities like role plays, presentations, and discussions)

Unit-3

READING (8 HOURS)

- Students will be given practice in reading and comprehension 6-8 passages of 100-300 words each, on topics of General as well as professional interest. The texts will be supported by suitable exercises designed to foster comprehension skills and vocabulary enrichment. Students are encouraged to read newspapers, articles, books and novels.
- Reading Comprehension Exercises Through Tests, Writing Summary and Presenting, Note Making
- Review Presentation (Movie/ Article/Book)
- Vocabulary Building Exercises (This module encourages extensive use of reading materials)

Unit-4

WRITING (8 HOURS)

- The Writing Lab content is designed to acquaint the students not only with the techniques of effective writing but also give them an insight into planning and writing documents that produce results.
- Short Paragraphs on current general and technical topics
- Creative Writing: Idea Generation
- Business Letters, Email Messages, Project Writing
- Writing Resumes and Cover Letters (* Students will be required to produce and submit by the end of second semester a 350- 500 words project report on a topic of their choice. The project should involve data collection, analysis and reporting. Ten marks (out of 100 marks allocated for Lab Test) will be set apart for the project.)

TEXT BOOK:

An Introduction to Professional English and soft skills by B.K Das et al., Cambridge University Press

REFERENCES:

Effective Business Communication, Asha Kaul, Prentice Hall Professional Communication, Aruna Koneru, TMH

MSCM2306- Immunology, Histopathology & Biochemistry Lab

Subject Name	Code	Type of course	L-T-P	Prerequisite
Immunology Lab	MSCM2306	Practice	0-0-4	Fundamental Science

Objective

- Understanding the concept of Innate & adaptive immune system; complement system Hypersensitivity.
- Clinically relevant serological analysis for deeper understanding of antigen-antibody interaction.
- To understand the concept of cells of immune system and organs of immune system.
- To understand the properties of virus, diagnosis of important viruses and vaccination.
- Distinguish normal tissues and organs by microscopic appearance when shown a microscopic image (light or electron microscopic photomicrograph) or glass slide.
- Analyze body fluid for diagnosis of disease
- Understand Physiological disorder and infectious disease.

Course Outcome

- The student will learn the application of Immunology in disease diagnosis.
- Complement system followed by the body on encountering an Antigen.
- Immune Response produced on encounter with foreign body.
- The students will learn the role of immunity in fighting disease, along with consequences.

undesirable expression of immune system such as, hypersensitivity and auto immune disease

- They will gather knowledge regarding the properties, diagnosis of virus and vaccines against them.
- The conceptual understanding of the subject provides opportunities for employability scopes for higher education.
- After completion of the Practical student will be able to understand the use of instruments used in dissection, embedding and casting of block and use of microtome.
- Able to detect Glucose, Proteins, Urea, Uric acid, Creatinine, Bilirubin, Lipids.

Unit-1

Collection of blood sample by vein puncture, separation and preservation of serum

Performance of Serological tests i.e.- Widal, Brucella Tube Agglutination, VDRL (including Antigen Preparation), ASO (Antistreptolysin 'O'), (Latex agglutination), Rheumatoid factor (RF) Latex agglutination, Rose Waaler test,

Demonstration of antigen / antibody determination by Immunofluorescence, Immunodiffusion, precipitation in agarose gel (Ouchterlony), CIEP, ELISA, SDS-PAGE and western blotting.

Unit-2

Hazards & safety measures in clinical Biochemistry laboratory .

Quality control and quality assurance in a clinical biochemistry laboratory .

Laboratory organization, management and maintenance of records

Principles of assay procedures, Normal range in blood, Serum, Plasma and Urine and reference values for : a. Glucose b. Proteins c. Urea d. Uric acid e. Creatinine f. Bilirubin g. Lipids Principles, procedures for estimation & assessment of the following including Errors involved and their corrections :

a. Sodium, Potassium and Chloride, Iodine. b. Calcium, Phosphorous and Phosphates

Unit-3

Demonstration of instruments used for dissection

Use of antiseptics, disinfectants and insecticides in a tissue processing laboratory

Reception and labeling of histological specimens.

To perform embedding and casting of block

To process a bone for decalcification

To prepare 70% alcohol from absolute alcohol

Processing of tissue by manual and automated processor method

To demonstrate various parts and types of microtome

To learn sharpening of microtome knife (Honing and stropping technique) .

To perform section cutting.

To practice attachment of tissue sections to glass slides.

4th semester M. Sc. in Applied and Clinical Microbiology

Internship Thesis Guideline

This Guideline is designed to provide students the knowledge and practice of public health research activity, to enable them to carry out researches and solve research related problems and to help them in writing thesis and defend their work. Upon successful completion of the course, the students shall be able to:

- Search relevant scientific literature
- Develop a research proposal
- Employ appropriate data collection techniques and tools
- Manage collected data
- Analyze data with appropriate statistical techniques
- Write thesis
- Defend the findings

Proposal Development:

At the ending of second year (fourth Semester), students individually consultation with designated faculties and extensive literature survey will develop research proposal during the initial 6 months period.

Data Collection/ Thesis Writing:

Students will carry out data collection, data management, data analysis, and thesis writing during the remaining period (fourth Semester).

The Dissertation should have following format:

1. Title
2. Introduction
3. Materials and Methods
4. Results
5. Discussion
6. Conclusion
7. Recommendation
8. References
9. Appendix

MSCM2401-PROJECT

Subject Name	Code	Type of course	Credit	Prerequisite
Project	MSCM2401	NA	12	Basic Medical science

Project work:

- **Microbiology:**

Suggested Project title

1. Hepatitis C viruses among pregnant women/people living withHIV/AIDS.
2. Antibacterial activity of honey on staphylococcus Aureusescherichia coli and streptococcus Pyogen isolated fromwound.
3. Susceptibilities of salmonella Typhi and other bacterial pathogens to antibiotics and hot aqueous extract of hibicussabdariffa.
4. Isolation and identification of bacteria from food vendors and some vegetableavailable.
5. Urinary tract infections in adult students of centurion university, BBSRcampus
6. Air borne microbiological disorders (DOTScentre)

MSCM2402 - INTERNSHIP

Subject Name	Code	Type of course	Credits	Prerequisite
Internship	MSCM2402	NA	12	Basic Medical science

Internship

- Caserecord
- Lab management andethics
- Evaluation-Guide(internal)
 - Industries guide(external)
 - University-project report/ Viva

The following colour represents the syllabus revision, skill, employability and entrepreneurship.

Green : Skill

Pink : Employability

Sky : Entrepreneurship

CHOICE BASED CREDIT SYSTEM

COURSE STRUCTURE & SYLLABUS

BASKET - I



School of Engineering & Technology

2018

BASKET - I
(Basic Sciences)

<i>Course Code</i>	<i>Course Title</i>	<i>Course Type</i>	<i>Credits</i>	<i>Prerequisite</i>	<i>Department Offering</i>
<i>FCBS0101</i>	<i>Environmental Science</i>	<i>Theory</i>	<i>3</i>	<i>Nil</i>	<i>Chemistry</i>
<i>FCBS 0102</i>	<i>Differential Equations</i>	<i>Theory</i>	<i>3</i>	<i>Nil</i>	<i>Mathematics</i>
<i>FCBS 0103</i>	<i>Linear Algebra & Vector Calculus</i>	<i>Theory</i>	<i>3</i>	<i>Nil</i>	<i>Mathematics</i>
<i>FCBS 0104</i>	<i>Integral Transform</i>	<i>Theory</i>	<i>3</i>	<i>Nil</i>	<i>Mathematics</i>
<i>FCBS 0105</i>	<i>Complex Analysis</i>	<i>Theory</i>	<i>3</i>	<i>Nil</i>	<i>Mathematics</i>
<i>FCBS0106</i>	<i>Discrete Mathematics</i>	<i>Theory</i>	<i>3</i>	<i>Nil</i>	<i>Mathematics</i>
<i>FCBS0107</i>	<i>Calculus</i>	<i>Theory</i>	<i>3</i>	<i>Nil</i>	<i>Mathematics</i>
<i>FCBS0108</i>	<i>Probability & Statistics</i>	<i>Theory</i>	<i>3</i>	<i>Nil</i>	<i>Mathematics</i>
<i>FCBS0109</i>	<i>Numerical Methods</i>	<i>Theory</i>	<i>3</i>	<i>FCBS0102 Differential Equations</i>	<i>Mathematics</i>
<i>FCBS0401</i>	<i>Applied Analytical Chemistry</i>	<i>Theory + Practice</i>	<i>3</i>	<i>Nil</i>	<i>Chemistry</i>
<i>FCBS0402</i>	<i>Industrial Chemistry</i>	<i>Theory + Practice</i>	<i>3</i>	<i>Nil</i>	<i>Chemistry</i>
<i>FCBS0403</i>	<i>Applied Engineering Materials</i>	<i>Theory + Practice</i>	<i>3</i>	<i>Nil</i>	<i>Chemistry</i>
<i>FCBS0404</i>	<i>Electricity and Magnetism</i>	<i>Theory + Practice</i>	<i>4</i>	<i>Nil</i>	<i>Physics</i>
<i>FCBS0405</i>	<i>Basic Mechanics and Properties of Matter</i>	<i>Theory + Practice</i>	<i>4</i>	<i>Nil</i>	<i>Physics</i>
<i>FCBS0406</i>	<i>Optics and Optical Fibres</i>	<i>Theory + Practice</i>	<i>4</i>	<i>Nil</i>	<i>Physics</i>

Environmental Science

Subject Name	Code	Type of course	T-P-Pr (Credit)	Prerequisite
Environmental Science	FCBS0101	Theory	3	Nil

Course Objective:

- To understand the concept of multi-disciplinary nature of Environmental Science where different aspects are dealt with a holistic approach.
- Students will develop a sense of community responsibility by becoming aware of environmental issues in the larger social context.
- One must be environmentally educated.

Course Outcome:

- Understand the natural environment and its relationships with human activities.
- Characterize and analyze human impacts on the environment.
- Integrate facts, concepts, and methods from multiple disciplines and apply to environmental problems.
- Design and evaluate strategies, technologies and methods for sustainable management of environmental systems and for the remediation or restoration of degraded environments.

Evaluation System

	Component	% of Marks	Method of Assessment
Internal Examination	Midterm Test	30	Written examination
	Assignment	05	Report and Presentation
	Attendance	05	Attendance percentage
	Total	40	
External Examination		60	Written examination
Total		100	

MODULE-I

Environment and its multidisciplinary nature; Need for public awareness; Renewable and non renewable resources—forest, water, mineral, land, food and energy resources; Structure and function of ecosystems of forest, grass land, desert and aquatic types.

MODULE -II

Biodiversity and its conservation: Biodiversity at global, national and local levels; Threats to biodiversity - Habitat loss; wild life poaching and man - wildlife conflicts; Endangered and endemic species; conservation measures.

Causes, effects and control measures of pollution, air, water and noise pollution; Nuclear hazards; solid-waste management—Causes, effects and control measures; Management of disasters due to natural causes of floods, earthquakes, cyclones and landslides.

MODULE-III

Social issues and the environment; Sustainable environment, Water conservation measures; Rain water harvesting; Resettlement and rehabilitation of people; Climate change and global warming; Acid rain; Ozone layer depletion; water land reclamation; Consumerism and waste products; Features of Environment Protection Act, Air pollution and Control of Pollution Acts; Water Pollution and its Control Act. Effects of Pollution explosion on environment and public health; Need for value education to Protect environment and resources.

Text Book: Anubhav Kaushik & C.P. Kaushik : Environmental Studies-New age International Publishers.

Reference Books:

1. Benny Joseph : Environmental Studies-Tata Mac Graw Hill
2. E. Bharucha : Text book of Environmental Studies for Under graduate courses– Universities Press. (Book prepared by UGC Committee.

Differential Equations

Subject Name	Code	Type of course	T-P-Pr (Credit)	Prerequisite
Differential Equations	FCBS 0102	Theory	3	Nil

Course Objectives:

- To understand most of the physical phenomena from Science and Engineering which are modeled by differential equations.
- To find and interpret the solutions of the ODE & PDE appearing in signal systems, dynamical systems, stability theory and a number of applications to scientific and engineering problems.
- To develop the ability to apply differential equations to significant applied and/or theoretical problems.

Course Outcomes: Upon successful completion of this course, the student will be able to:

- Learn fundamental concepts of ODE & PDE theories and where and how such equations arise in applications to scientific and engineering problems.
- Be competent in solving linear/non-linear 1st & higher order ODEs & PDEs using analytical solution methods to obtain their exact solutions.
- Recognize the major classification of ODEs & PDEs and the qualitative differences between the classes of equations.

Evaluation System

	Component	% of Marks	Method of Assessment
Internal Examination	Midterm Test	30	Written examination
	Assignment	05	Report and Presentation
	Attendance	05	Attendance percentage
	Total	40	
External Examination		60	Written examination
Total		100	

MODULE-I (12 Hours)

First Order Differential Equations: Separable Equations, Homogeneous & Non-homogeneous Equations, Exact Differential Equations, Integrating Factor, Linear Differential Equations, Bernoulli Equation.

MODULE-II (15 Hours)

Second & Higher Order Linear Differential Equations: Linear Dependence and Independence of Solutions, Wronskian, Constant Coefficient Homogeneous Equations, Cauchy-Euler Equation, Nonhomogeneous Equations, Method of Variation of Parameter, Method of Inverse Operator, Legendre Equation.

MODULE-III (15Hrs)

Partial Differential Equation of First Order, Linear and Non-linear Partial Differential Equations, Charpit's Method, Homogeneous and Non-homogeneous Linear Partial Differential Equations with Constant Coefficients, Cauchy Type Differential Equation.

Text Book:

1) Higher Engineering Mathematics by B.V. Raman Publisher: TMH
Chapters: 8 (8.1 to 8.10); 9 (9.1 to 9.7), 18 (18.1 to 18.8) **Reference**

Book: 1) Advanced Engineering Mathematics by P.V.O'Neil Publisher: Thomson

Linear Algebra & Vector Calculus

Subject Name	Code	Type of course	T-P-Pr (Credit)	Prerequisite
Linear Algebra & Vector Calculus	FCBS 0103	Theory	3	Nil

Course Objectives:

- To apply concepts of Linear Algebra & Vector Calculus to the problems related to models in work, circulation and flux Problems, hydrodynamics and fluid dynamics, electrical circuits, networking, linear programming, graph theory, computer graphics, cryptography, thermodynamics, construction of curves and surfaces through specified points etc.
- To solve the system of linear equations appearing in the problems of electrical engineering, mechanical engineering, applied mechanics etc.
- To apply vectors in higher dimensional space in experimental data, storage and warehousing, electrical circuits, graphical images, mechanical systems and in physics.

Course Outcomes:

Upon successful completion of this course, the student will be able to:

- Use matrix operations to solve systems of linear equations and be able to determine the nature of the solutions.
- Compute with the characteristic polynomial, eigenvalues, eigenvectors and eigenspaces of a matrix as well as the geometric and the algebraic multiplicities of an eigenvalue and then to diagonalise that matrix.
- Determine the important quantities associated with scalar and vector fields.

Evaluation System

	Component	% of Marks	Method of Assessment
Internal Examination	Midterm Test	30	Written examination
	Assignment	05	Report and Presentation
	Attendance	05	Attendance percentage
	Total	40	
External Examination		60	Written examination
Total		100	

MODULE-I (14 Hours)

Linear Algebra, Basic Concepts, Linear System of Equations, Solution by Gauss Elimination, Conditions of Existence and Uniqueness of Solutions, Rank of a Matrix, Determinants and Cramer's Rule, Linear Dependence and Independence.

MODULE-II (14 Hours)

Eigen Values and Eigen Vectors, Basis, Symmetric, Skew-Symmetric and Orthogonal Matrices, Complex Matrices, Similarity of Matrices, Diagonalization.

MODULE-III (14 Hours)

Vector Differential Calculus: Vector Algebra, Inner Product, Vector Product, Vector & Scalar Functions and Fields, Derivatives, Gradient of a Scalar Field, Directional Derivative, Divergence of a Vector Field, Curl of a Vector Field.

Text Book:

1) *Advanced Engineering Mathematics* by E. Kreyszig Publisher: Johnwiley & Sons Inc-8th Edition Chapters: 6 (6.1 to 6.6); 7 (7.1, 7.3 to 7.5), 8 (8.1 to 8.4, 8.9 to 8.11) **Reference Books:**

1) *Advanced Engineering Mathematics* by P.V.O' Neil Publisher: Thomson

Mathematical Methods by Potter & Goldberg ; Publisher : PHI

Integral Transform

Subject Name	Code	Type of course	T-P-Pr (Credit)	Prerequisite
Integral Transform	FCBS 0104	Theory	3	Nil

Course Objectives: To describe the ideas of Fourier and Laplace Transforms and indicate their applications in the fields such as Signal & System, Digital Signal Processing, Image Processing, Theory of Control Systems, Differential Equations and many others.

- To use Fourier series for solving boundary value problems appearing in scientific & engineering problems.
- To get acquainted with the fact that the Laplace transform is related to the Fourier transform, but the Fourier transform expresses a function or signal as a series of modes of vibration (frequencies), whereas the Laplace transform resolves a function into its moments.

Course Outcomes: Upon successful completion of this course, the student will be able to:

- Obtain Laplace transform of simple functions, functions expressed in graphical form, integrals and derivatives.
- Solve differential & integral equations with initial conditions using Laplace transform.
- Compute the Fourier series representation of a periodic function, in both exponential and sine-cosine forms.
- Evaluate the Fourier transform of a continuous function and be familiar with its basic properties.

Evaluation System

	Component	% of Marks	Method of Assessment
Internal Examination	Midterm Test	30	Written examination
	Assignment	05	Report and Presentation
	Attendance	05	Attendance percentage
	Total	40	
External Examination		60	Written examination
Total		100	

MODULE-I (16 Hours)

Laplace Transforms, Transforms of Derivatives and Integrals, Derivatives and Integrals of Transforms, Shifting Properties, Unit Step Function, Dirac's Delta Function, Convolution, Inverse Transforms, Solution to Differential Equation, Integral Equation.

MODULE-II (12 Hours)

Periodic Functions, Trigonometric Series, Fourier Series, Fourier Expansion of Functions of any Period, Even and Odd Functions, Half Range Expansions,

MODULE-III (14Hrs)

Fourier Integrals: Fourier Sine Integral, Fourier cosine Integral. Fourier Transforms: Fourier Sine Transform, Fourier Cosine Transform.

Text Book:

Advanced Engineering Mathematics by E.Kreyszig
 Publisher: Johnwiley & Sons Inc-8th Edition Chapters:
 5 (5.1 to 5.6); 10 (10.1 to 10.4, 10.8, 10.9) **Reference**

Books:

- 1) *Advanced Engineering Mathematics* by P.V.O'Neil .Publisher: Thomson
- 2) *Higher Engineering Mathematics* by B.V.Raman .Publisher: TMH

Complex Analysis

Subject Name	Code	Type of course	T-P-Pr (Credit)	Prerequisite
Complex Analysis	FCBS 0105	Theory	3	Nil

Course Objectives:

- To understand the application of Complex Analysis to Two-Dimensional problems in Physics including Hydrodynamics and Thermodynamics and also in Engineering fields such as; Nuclear, Aerospace, Mechanical and Civil engineering, signal processing & communications.
- To acquire the skill of contour integration to evaluate complicated real integrals appearing in Engineering problems via residue calculus.

Course Outcomes: Upon successful completion of this course, the student will be able to:

- To get equipped with the understanding of the fundamental concepts of functions of a complex variable along with the concepts of analyticity, Cauchy-Riemann relations and harmonic functions.
- Evaluate complex contour integrals applying the Cauchy integral theorem, Cauchy integral formula and Residue theorem.
- Illustrate the applications of the calculus of residues in the evaluation of real integrals.

Evaluation System

	Component	% of Marks	Method of Assessment
Internal Examination	Midterm Test	30	Written examination
	Assignment	05	Report and Presentation
	Attendance	05	Attendance percentage
	Total	40	
External Examination		60	Written examination
Total		100	

MODULE-I (14 Hours)

Complex Analysis: Analytic Function, Cauchy-Riemann Equations, Laplace Equation, Harmonic Function, Linear Fractional Transformation.

MODULE-II (14 Hours)

Parametric representation, Line Integral in the Complex plane, Cauchy's Integral Theorem, Cauchy's Integral Formula, Derivatives of Analytic Function.

MODULE-III (14Hrs)

Power Series, Taylor's Series, Maclaurin Series, Laurent's Series, Singularities and Zeroes, Residue Theorem, Residue Integration Method, Evaluation of Real Integrals.

Text Book:

1) *Advanced Engineering Mathematics* by E. Kreyszig Publisher: John Wiley & Sons Inc-8th Edition Chapters: 12 (12.1 to 12.4, 12.9); 13, 14 (14.2, 14.4) & 15.

Reference Books:

1) *Advanced Engineering Mathematics* by P.V. O'Neil Publisher: Thomson

2) *Fundamentals of Complex Analysis (with Applications to Engineering and Science)* by E.B. Saff & A.D. Snider Publisher: Pearson

Discrete Mathematics

Subject Name	Code	Type of course	T-P-Pr (Credit)	Prerequisite
Discrete Mathematics	FCBS 0106	Theory	3	Nil

Course Objectives:

<p><i>To learn a particular set of mathematical facts and to apply their applications in many subjects of Computer Science and Engineering such as Cryptography, Theory of Computation & Data Networking.</i></p> <p><i>To understand mathematical reasoning in order to read, comprehend and construct mathematical arguments as well as to solve problems, occurred in the development of programming languages.</i></p> <p><i>To work with discrete structures such as graphs to study the structure of the world wide web, to model a computer network and to find the shortest path between two places in a transportation network.</i></p>
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Course Outcomes: Upon successful completion of this course, the student will be able to:

<ul style="list-style-type: none"> • Evaluate elementary mathematical arguments and identify fallacious reasoning. • Apply the logical structure of proofs and work symbolically with connectives and quantifiers to produce logically valid, correct and clear arguments. • Reformulate statements from common language to formal logic. Apply truth tables and the rules of propositional and predicate calculus. • Model and solve real-world problems using graphs, both quantitatively and qualitatively.
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Evaluation System

	Component	% of Marks	Method of Assessment
Internal Examination	Midterm Test	30	Written examination
	Assignment	05	Report and Presentation
	Attendance	05	Attendance percentage
	Total	40	
External Examination		60	Written examination
Total		100	

MODULE-I (12 Hours)

Propositional Logic, Propositional Equivalence, Predicates and Quantifiers, Nested Quantifiers, Rules of Inference, Recurrence Relations, Solving Linear Recurrence Relations.

MODULE-II (16 Hours)

Relations and its properties, Representation of Relations, Closure of Relations, Equivalence Relations and Partitions, Partial Ordering, POSet, Hasse Diagram, Maximal & Minimal elements of a Poset, Supremum & Infimum of a Poset, Lattice, Basic properties of Lattices.

MODULE-III (14Hrs)

Introduction to Graph Theory, Graph terminology, Representation of graphs, Graph Isomorphism, Connectivity, Euler and Hamiltonian Paths, Planar graph, Graph Coloring, **Text Books:**

- 1 *Discrete Mathematics and its Applications* by K.H.Rosen Publisher: TMH, Sixth Edition
Chapters: 1(1.1 to 1.5) ; 6 (6.1, 6.2) ; 7; 8(8.1 to 8.5, 8.7, 8.8)
- 2 *Elements of Discrete Mathematics* by C.L.liu & D.P. Mohapatra Publisher: TMH, Third Edition Chapter: 11 (11.1 to 11.4) **Reference Books:**
Discrete and Combinatorial Mathematics by R.P.Grimaldi Publisher: Pearson
Discrete Mathematics and Applications by Thomas Koshy Publisher: Elsevier
Discrete Mathematical Structures by B. Kolman, R.C. Busby & S. Ross Publisher: PHI

Calculus

Subject Name	Code	Type of course	T-P-Pr (Credit)	Prerequisite
Calculus	FCBS0107	Theory	3	Nil

Objective

<ul style="list-style-type: none"> · To study how things change. It provides a framework for modeling systems in which there is change, and a way to deduce the predictions of such models. · To construct a relatively simple quantitative models of change, and to deduce their consequences. · The fundamental idea of calculus is to study change by studying “instantaneous” change, by which we mean change over tiny interval of time.
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Course Outcome

<p>Upon successful completion of this course, students will be able to:</p> <ul style="list-style-type: none"> · Understand the importance of linear functions in mathematics. · Understand the major problems of differential and integral calculus. · Understand and recognize other important classes of functions (such as trigonometric and rational functions), and be able to use calculus with these functions.
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Evaluation Systems

	Component	% of Marks	Method of Assessment
Internal Examination	Midterm Test	30	Written examination
	Assignment	05	Report and Presentation
	Attendance	05	Attendance percentage
	Total	40	
External Examination		60	Written examination
Total		100	

MODULE-I (6 Hours)

Asymptotes

MODULE-II (6 Hours)

Curve Tracing

MODULE-III (6 Hours)

Curvature

MODULE-IV (6 Hours)

Reduction Formulae

MODULE-V (6 Hours)

Vector Integral Calculus: Line Integrals.

MODULE-VI (6 Hours)

Surface Integrals, Green's Theorem

MODULE-VII (6 Hours)

Volume Integrals, Gauss's Theorem, Stokes' Theorem (without proof).

Text Books:

- 1) A Text book of Calculus Part-III : Shantinakaran
Chapters: 1 (Art 1 & 3), 3(Art 7, 8, 9)
- 2) A Text book of Calculus Part – II : Shantinakaran
Chapter: 8 (Art. 24, 25, 26),
- 3) A Text book of Calculus Part – II : Shantinakaran
Chapter: 10 (Art.33, 34, 35, 36, 37)
- 4) A Textbook of Vector Calculus by Shanti Narayan & P. K. Mittal, S. Chand & Co. , 2003
Chapters: 7 (7.1 to 7.6, 7.8 & 7.11)

Probability & Statistics

Subject Name	Code	Type of course	T-P-Pr (Credit)	Prerequisite
Probability & Statistics	FCBS0108	Theory	3	Nil

Objective

- To translate real-world problems into probability models.
- To motivate in students an intrinsic interest in statistical thinking.
- To recognize the role of and application of probability theory, descriptive and inferential statistics in many different fields of engineering.

Course Outcome

Upon successful completion of this course, students will be able to:

- Define and illustrate the concepts of sample space, events and compute the probability and conditional probability of events.
- Define, illustrate and apply the concepts of discrete and continuous random variables, the discrete and continuous probability distributions.
- Define, illustrate and apply the concept of the expectation to the mean, variance and covariance of random variables.
- Compute probabilities based on practical situations using the Binomial, Poisson and Normal distributions.

Evaluation Systems

	Component	% of Marks	Method of Assessment
Internal Examination	Midterm Test	30	Written examination
	Assignment	05	Report and Presentation
	Attendance	05	Attendance percentage
	Total	40	
External Examination		60	Written examination
Total		100	

MODULE-I

(6 Hours)

Probability: Sample space and Events, Principles of Counting, Classical definition of probability.

MODULE-II

(6 Hours)

Axioms of probability, Elementary theorems, Addition and Multiplication rules, Conditional probability.

MODULE-III

(6 Hours)

Probability Distributions: Discrete and Continuous Random Variables.

MODULE-IV

(6 Hours)

Probability Density and Distribution functions, Mean and Variance of Distributions. Binomial Distribution.

MODULE-V

(6 Hours)

Poisson Distribution, Normal Distributions, Poisson and Normal Distributions as Limiting forms of Binomial Distribution.

MODULE-VI

(6 Hours)

Statistics: Random Sampling, Population and Sample, Sample Mean and Variances.

MODULE-VII**(6 Hours)**

Point and Interval Estimations, Confidence Intervals, Fitting Straight Lines, Correlation and Regression.

Text Book:

- 1) Advanced Engineering Mathematics by E. Kreyszig
 Publisher: John Willey & Sons Inc-8th Edition
 Chapters: 22(22.1 to 22.8), 23(23.1 to 23.3, 23.9, 23.10)

Reference Books:

- 1) Statistical Methods By S.P. Gupta (31st Edition); Publisher: Sultan Chand & Sons.
- 2) Mathematical Statistics By S.C. Gupta & V.K. Kapur (10th Edition); Publisher: Sultan Chand & Sons.

Numerical Methods

Subject Name	Code	Type of course	T-P-Pr (Credit)	Prerequisite
Numerical Methods	FCBS0109	Theory	3	FCBS0102 Differential Equations

Objective

<ul style="list-style-type: none"> · To understand the limitations of analytical methods and the need for numerical methods and the ability to apply these numerical methods to obtain the approximate solutions to engineering and mathematical problems. · Ability to decide and to derive appropriate numerical methods for approximating the solutions of various types of problems in engineering and science and analyze the error incumbent in any such numerical approximation. · Ability to report analysis, solution and results in a standard engineering format.

Learning Outcome

<p>Upon successful completion of this course, students will be able to:</p> <ul style="list-style-type: none"> · Perform error analysis to select an appropriate numerical model and to estimate errors in numerical solution of a given problem. · Derive a variety of numerical algorithms/methods & compare the viability of different approaches to the numerical solutions of various mathematical problems arising in roots of linear and non-linear equations, interpolation and approximation, numerical differentiation and integration, system of linear algebraic equations and differential equations. · Analyze and evaluate the accuracy of common numerical methods.
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Evaluation Systems

	Component	% of Marks	Method of Assessment
Internal Examination	Midterm Test	30	Written examination
	Assignment	05	Report and Presentation
	Attendance	05	Attendance percentage
	Total	40	
External Examination		60	Written examination
Total		100	

MODULE-I (6 Hours)
Approximation and round of errors, Truncation error and Taylor's series, Roots of equation using Bisection Method.

MODULE-II (6 Hours)
Roots of equation using the false-position method, fixed point iteration, Newton-Raphson method, Secant method.

MODULE-III (6 Hours)
Solution of System of Linear algebraic equations: Gauss-Seidel method, Lagrange Interpolation.

MODULE-IV (6 Hours)
Newton divided difference interpolation, Inverse Interpolation, Lagrange Interpolation, Newton's forward and backward interpolation.

MODULE-V (6 Hours)
Numerical Differentiation, Numerical integration by the trapezoidal rule.

MODULE-VI (6 Hours)
Numerical integration by the Simpson's rules, Gauss quadrature rule.

MODULE-VII (6 Hours)
Solution of Ordinary Differential Equations: Euler's method, Improvement of Euler's method, Runge-Kutta methods.

Text Book:

- 1) Advanced Engineering Mathematics by E. Kreyszig
Publisher: John Willey & Sons Inc-8th Edition
Chapters: 17 (17.1 to 17.3, 17.5), 18 (18.3), 19 (19.1)

Reference Books:

- 1) Numerical Methods for Scientific and Engineering Computation by M. K. Jain, S. R. K. Iyengar & R.K. Jain; New Age International Publishers.
- 2) Introductory Methods of Numerical Analysis by S.S. Sastry; Third Edition, Prentice Hall India.

Applied Analytical Chemistry

Subject Name	Code	Type of course	T-P-Pr (Credit)	Prerequisite
Applied Analytical Chemistry	FCBS0401	Theory + Practice	3	Nil

Course Objective

- The aim of this course is to give students that are going to carry out an experimental work the necessary comprehension in analytical chemistry.
- The course will also provide the student with knowledge to be able to understand and critically evaluate experimental data produced by others.

Course outcome

- Explain fundamental principles for environmental analytical methods (titration, electrochemistry, instrumentation and basic parameters of water, soil, fuel etc)
- Point out suitable analytical techniques for analyzing a specific compounds in an environmental matrix
- Point out suitable techniques for sampling and handling of environmental samples
- Apply quality control on chemical analysis and laboratory work and explain its importance
- Plan and carry out laboratory experiments, including data analysis and conclusions
- Describe simple approaches for troubleshooting

Evaluation System

	<i>Component</i>	<i>% of Marks</i>	<i>Method of Assessment</i>
<i>Internal Examination</i>	Internal	20	Written examination
	Assignment	30	Report and Presentation
<i>External Examination</i>	<i>End Sem</i>	30	Written examination
	<i>Practice</i>	20	Experiment followed by Viva
<i>Total</i>		100	

Module-1

Water Analysis: Importance of water, different types of water, sources and uses of water, types of water pollutants and domestic and industrial significance of analysis of water. Removal of hardness by Lime-Soda, Zeolite and Ion exchange methods. Removal of DO and dissolved CO₂ from water by De-aeration method. Desalination of brackish water by Reverse osmosis and electro dialysis process. Water disinfection by bleaching powder, liquid Cl₂, and chloramine.

Practice:

1. Determination of total hardness by EDTA method, total dissolved solids, total alkalinity
2. Determination of Turbidity by nepheloturbidity meter, pH, Conductivity.
3. Determinations of BOD, COD, DO.

NB: The above parameters can also be determined by using water kits and the results are to be compared with those obtained manually.

Module-2

Soil Analysis: Composition of rocks and minerals, soil profile and properties.

Practice:

1. Determination of texture of soil.
2. Determination of moisture content in a soil sample, pH, electrical conductivity,
3. Determination of water holding capacity of soil.
4. Measurement of Calcium and Magnesium Using EDTA methods.

Module-3

Chemistry of fuels: Classification of fuels, composition and properties of Petroleum, LPG, Water gas, producer gas, CNG. Knocking – Mechanism of knocking, harmful effects, Anti knocking agents – TEL, Catalytic converters – Principle & working, Unleaded petrol, Power alcohol & Biodiesel. Photovoltaic cells - construction & working of a PV cell **Practice:**

1. Proximate analysis of fuel (Coal, biomass etc.) Moisture, Volatile content, Ash, fixed carbon
2. Testing of fuel properties of the plastic oil and bio diesel: Specific gravity by picnometer, flash point and fire point by pesky-Marten flash point apparatus, viscosity by Redwood viscometer, calorific value by bomb calorimeter

Industrial Chemistry

Subject Name	Code	Type of course	T-P-Pr (Credit)	Prerequisite
Industrial Chemistry	FCBS0402	Theory + Practice	3	Nil

Course Objective

Students may also explore in depth specialized areas of chemistry of materials, including ores, metals, cemenas well as dyes, oils, soaps

- Introduce the students to industrial processing principles as applicable to chemical and allied industries.
- Provide the students with the knowledge of how raw materials are sourced for various chemical industries and how these materials are processed.
- Provide students with advanced technical skills in Chemical Engineering that will enable them to (a) translate fundamental discoveries in materials and other high technology areas to commercial exploitation, and (b) adapt readily to the challenges presented in a diverse range of industrial sectors that can benefit from process engineering approaches.

Course outcome

- Appreciate better their future roles as chemists in Industrial establishments
- Be able to explain the origin of raw materials used in the chemical and allied industries
- Have a good understanding of how chemical raw materials are processed into finished products.
- Graduates find employment in, quality control, oil and petroleum industry, textile industry, dyes and paints industry, cement industry, just to name a few.

Evaluation System

<i>Internal Examination</i>	<i>Component</i>	<i>% of Marks</i>	<i>Method of Assessment</i>
	Internal	20	Written examination
Assignment	30	Report and Presentation	
<i>External Examination</i>	<i>End Sem</i>	30	Written examination
	<i>Practice</i>	20	Experiment followed by Viva
<i>Total</i>		100	

Module 1: Preparation of soap, dyes and oil analysis :

Introduction: Types of soap (soft and hard soap), methods of preparation of soap, mechanism, difference between fats and oils, physical properties of fats and oil, general introduction to chemistry of dye, various example of dyes, types of dyes.

Practice:

- Preparation of soap by saponification
- Determination of the properties different type of soap
 1. pH test
 2. Foam test
- Hard water test
- Determination of iodine number of oil
- Preparation of dyes (azo dyes): 2- naphthol + 4 - nitro aniline: salicylic acid + 4- nitro aniline
- Preparation of Phenyle.

Applications: Effect of water hardness in cleansing action of soap. Application of dyes to cloth

Module 2: Metals estimation from ores

Introduction: General introduction on ores, types of ore, important ore minerals, application of ores.

Practice:

- Estimation of Cu in copper ore
- Determination of Fe as ferrous iron in an ore sample
- Determination of Zn in Zinc ore by EDTA complex metric method

Module 3: Analysis of cement

Introduction: what is cement? types of cement, composition of cement, preparation of cement, applications.

Practice:

- Estimation of calcium in Portland cement
- Cement hydration and pH evaluation during curing
- To check the quality of cement (colour, texture, smell test, float test, shape test and strength test)

Applied Engineering Materials

Subject Name	Code	Type of course	T-P-Pr (Credit)	Prerequisite
Applied Engineering Materials	FCBS0403	Theory + Practice	3	Nil

Course Objective

- To understand the importance of the chemical approach to nanomaterials
- To study the preparation, analysis and applications of metal nanoparticles
- To develop an understanding of conjugated polymers and their applications
- To understand how polymer composition and architecture imparts unique properties and behavior
- To study organic-inorganic hybrid materials (COMPOSITES) and how the incorporation of metals in the polymer architecture leads to new properties and applications

Course outcome

- Know what it takes to have a career in nanotechnology
- Understand the need to increase Nanotechnology awareness
- Understand the definition of Nanotechnology
- Know the processing of Nanoparticles and Nanomaterials □ Know the application of Nanotechnology and nanomaterials

Evaluation System

Internal Examination	Component	% of Marks	Method of Assessment
	Internal	20	Written examination
	Assignment	30	Report and Presentation
External Examination	End Sem	30	Written examination
	Practice	20	Experiment followed by Viva
Total		100	

Module 1: Nano Materials:

Introduction, nano scale, applications in various fields.

Practice:

- Synthesis of Ag, Au nano particles by wet chemical methods. □ Synthesis of ZnO Nanoparticles by Precipitation Method □ Synthesis of Cu nano particles Sonochemical method.
- Synthesis of Fe nano particles Co-precipitation method.
- Thickness measurement by sol-gel process of coating.

Module 2: Polymers

Introduction, types of polymers, Polymerisation mechanisms.

Practice:

- Synthesis of Thiokol Rubber
- Synthesis of a Rubber Ball from Rubber Latex
- Synthesis of Polystyrene (PS)
- Synthesis of Polymethyl Methacrylate (PMMA) □ Synthesis of Nylon-6:6.
- Determination of molecular weight of polymers by visometry method.

Module 3: Composites

Introduction :Biopolymers or synthetic polymers reinforced with natural or biofibers(termed as bio composites) as a viable alternative to glass fibre composites.Biocomposites“ refers to those composites that can be employed in bioengineering.Biocomposites are composite materials, that is, materials formed by a matrix (resin) and a reinforcement of natural fibers (usually derived from plants or cellulose). Bio composites are the combination of natural fibers (biofibers) such as wood fibers (hardwood and softwood) or non - wood fibers (e.g., wheat, kenaf, hemp, jute, sisal, and flax) with polymer matrices from both renewable and non-renewable resources.

Practice:

- Synthesis of bio composite materials by using jute fibres and wood fibres

Electricity and Magnetism

Subject Name	Code	Type of course	T-P-Pr (Credit)	Prerequisite
Electricity and Magnetism	FCBS0404	Theory + Practice	4	Nil

Course Objective

- To understand electric circuit components and their use.
- To learn and verify the fundamental laws of electricity, learn how to use certain electrical devices. Understanding magnetic properties of matter and performing experiments to realize magnetism.

Course outcome

- Realizing the importance and use of electrical components in a circuit.
- Learning how to do different connections and their purpose.
- Understanding magnetism of matter and its applications

Evaluation Criteria

Internal Examination	Component	% of Marks	Method of Assessment
	Internal	20	Written examination
	Assignment	30	Report and Presentation
External Examination	End Sem	30	Written examination
	Practice	20	Experiment followed by Viva
Total		100	

Practice I Theory:

Electric field, Potential, EMF, capacitance, resistance, series connection, parallel connection, Kirchhoff's laws, RC circuits, LC circuits.

Lab:

1. Use a Multi-meter for measuring (a) Resistance, (b) AC and DC Voltages, (c) DC Current, (d) Capacitance and (e) Checking electrical fuses.
2. To determine an unknown Low Resistance using Potentiometer. 3. To determine an unknown Low Resistance using Carey Foster's Bridge.

Practice II

Theory: Electrical Circuits: AC Circuits: Kirchhoff's laws for AC circuits. Complex Reactance and Impedance. Series LCR Circuit: (1) Resonance, (2) Power Dissipation and (3) Quality Factor, and (4) Band Width. Parallel LCR Circuit.

Lab:

1. To verify the Superposition, and Maximum power transfer theorems.
2. To determine self-inductance of a coil by Anderson's bridge.
3. To study response curve of a Series LCR circuit and determine its (a) Resonant Frequency, (b) Impedance at resonance, (c) Quality factor Q, and (d) Band width.
4. To study the response curve of a parallel LCR circuit and determine its (a) Anti- resonant frequency and (b) Quality factor Q.

PRACTICE III

Theory: Magnetic Properties of Matter: Magnetization vector (**M**). Magnetic Intensity (**H**). Magnetic Susceptibility and permeability. Relation between **B**, **H**, **M**. Ferromagnetism. B-H curve and hysteresis. Electromagnetic Induction: Faraday's Law. Lenz's Law. Self Inductance and Mutual Inductance. Reciprocity Theorem. Energy stored in a Magnetic Field.

Lab:

2. To study the induced e.m.f. as a function of the velocity of the magnet.
3. Measurement of field strength B and its variation in a solenoid.
4. Determination of μ_r ratio.

Text Book:

1. *Electricity and Magnetism* By K. K. Tiwari, S. Chand Publishing References:
2. *Electricity and Magnetism*, By M. C. Saxena, Satya Prakash, V. P. Arora, Publisher: Pragati Prakashan
3. *Introduction to Electrodynamics*, by David J. Griffiths Prentice-Hall; 3 edition (2011) 4. *Electricity and Magnetism* by - D. C. Tayal, Himalaya Publishing, 2009.

Basic Mechanics and Properties of Matter

Subject Name	Code	Type of course	T-P-Pr (Credit)	Prerequisite
Basic Mechanics and Properties of Matter	FCBS0405	Theory + Practice	4	Nil

Course Objective

- To give the students overall idea about material properties and also hands on experience to measure them.
- To make them realize the applications of material properties.
- To expose them to phenomena like hydrostatics, elasticity, viscosity, surface tension and their applications in various places.
- Encouraging them to build simple models to explain the mechanical properties. **Theory:**

Course outcome

- To understand material properties and perform experiments on them.
- To understand the applications of material properties in real life.
- To be able to make small models for explain few mechanical properties.

Evaluation System

	<i>Component</i>	<i>% of Marks</i>	<i>Method of Assessment</i>
<i>Internal Examination</i>	Internal	20	Written examination
	Assignment	30	Report and Presentation
<i>External Examination</i>			
	<i>End Sem</i>	30	Written examination
	<i>Practice</i>	20	Experiment followed by Viva
<i>Total</i>		100	

Elasticity: Elastic constants, Relation among elastic constants, torsion of right circular cylinder, bending of beams, Vibration of loaded cantilever.

Lab:

1. Young's modulus by single/double cantilever
2. Young's modulus by Searle's method
3. Rigidity modulus using Barton's apparatus
4. Poisson's ratio

Practice II Theory:

Hydrostatics: hydrostatic force on a body, buoyancy, metacentric height, hydrostatic pressure, pressure measurement: manometer

Viscosity: Viscosity of fluids, Stoke's law, terminal velocity, Poiseuille's equation, Searle's viscometer.

Surface tension & surface energy: Pressure difference across curved liquid surface. **Lab:**

1. Viscosity by Stokes method
2. Viscosity by Poiseuille's method
3. Metacentric height of floating body
4. Measurement of Pressure by manometer
5. Surface tension by capillary rise method
6. Determination of surface tension by Quincke's method

Practice III:

Basic Mechanics

Theory: Kinematics and Kinetics, Effort amplification using levers and pulleys, Friction, Laws of friction.

Rotational Motion: Moment of Inertia, Theorem of Parallel and Perpendicular axes. Moment of inertia of circular disc.

Lab:

1. Effort-output ratio using combination of pulleys
2. Verification of laws of static and dynamic friction
3. Moment of inertia of fly wheel

Text Book:

1. *Elements of Properties of Matter, Dec 2010* by D.S. Mathur, S.Chand (G/L) & Company Ltd Reference Books:

1. *A Text Book of Fluid Mechanics* by R.K. Bansal, Laxmi Publishers, 2005
2. *Engineering Mechanics Statics and Dynamics* by A. K. Tayal, Umesh Publications.

Optics and Optics Fibre

Subject Name	Code	Type of course	T-P-Pr (Credit)	Prerequisite
Optics and Optics Fibre	FCBS0406	Theory + Practice	4	Nil

Course Objective

To understand optical phenomena.

- *To understand different light sources and their use*
- *Understand designing of microscope and artificial light sources*
- *Understanding optical fiber and its applications*

Course outcome

- *Students should understand optical phenomena.*
- *Students should learn about different light sources and their use*
- *Students should be able to understand optical fiber principle, operations and its applications.*

Evaluation System

	Component	% of Marks	Method of Assessment
Internal Examination	Internal	20	Written examination
	Assignment	30	Report and Presentation
External Examination	End Sem	30	Written examination
	Practice	20	Experiment followed by Viva
Total		100	

Practice I

Theory: Reflection and refraction of light. Mirror formula, lens maker's formula. Refraction through a prism. Dispersion, light sources: Principle and operations of sodium lamp, mercury lamp and LASER.

Lab:

1. To determine refractive index of the Material of a prism using sodium source.
2. To determine the dispersive power and Cauchy constants of the material of a prism using mercury source.
3. To determine the refractive index of glass slab using travelling microscope.
4. Designing of a compound microscope.

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Theory: Interference. Young's experiment, conditions for interference, Intensity distribution of fringes, Interference in thin films, Newton's rings.

Diffraction: types of diffraction, Fraunhofer diffraction at a single slit, diffraction at N-parallel slits and plane diffraction grating.

Polarization: Polariser and analyser, optical rotation and Polarimeter

Lab:

1. Determination of wavelength of light by Newton's ring method.
2. Determination of wavelength of LASER source by diffraction grating method
3. Thickness of thin paper by wedge-shaped films
4. Dispersive power and resolving power of a plane diffraction grating.
5. Polarimetry

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Theory: Optical properties—scattering, refraction, reflection, transmission & absorption. Introduction, principle of Laser, stimulated and spontaneous emission, Coherence (temporal and spatial) Ruby Laser, Application of Lasers.

Optical Fibres: Introduction, numerical aperture, step index and graded index fibres, attenuation

& dispersion mechanism in optical fibers (Qualitative only), application of optical fibres, optical communication (block diagram only)

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1. Measurement of attenuation and bending losses of an optical fibre.
2. Measurement of numerical aperture of a optical fibre
3. Study of spatial and temporal coherence of LASER

4. Making
of a light
guide

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1. *A Text Book of Optics by M.N. Avadhanulu, Brij Lal, N. Subrahmanyam, S Chand; 23rd Rev. Edn. References:*

2. *Optics by Ajoy Ghatak, McGraw Hill Education; 5 edition*

3. *Physics-I for engineering degree students by B.B. Swain and P.K.Jena.*

4. *Concepts in Engineering Physics by I Md. N. Khan.*

Centurion University of Technology and Management Odisha

COURSE STRUCTURE & SYLLABUS

BASKET - II



Centurion
UNIVERSITY

Shaping Lives...
Empowering Communities...

**CENTURION UNIVERSITY OF TECHNOLOGY AND
MANAGEMENT**

School of Engineering & Technology

2018

CURRICULUM
COURSES OFFERED BY DEPARTMENT OF HUMANITIES AND
MANAGEMENT
BASKET - II

<i>Course Code</i>	<i>Course Title</i>	<i>Course type</i>	<i>Credits</i>	<i>Prerequisite</i>	<i>Department Offering</i>
FCHU1201	Foundations of English Communication	Workshop	2	Nil	Humanities
FCHU1202	Communicative Practice Laboratory -I	Workshop	2	Nil	Humanities
FCHU1203	Business Communication	Workshop	2	Nil	Humanities
FCHU1204	Communicative Practice Laboratory-II	Workshop	2	Nil	Humanities
FCHU1205	Corporate Readiness Laboratory	Workshop	2	Nil	Humanities
FCHU1206	IT Enabled Communication	Workshop	2	Nil	Humanities
FCHU1207	Career Communication	Workshop	2	Nil	Humanities
FCHU1208	Personality Development	Workshop	2	Nil	Humanities
FCHU1209	Seminar and Technical Writing	Workshop	2	Nil	Humanities
FCHU1210	Professional Etiquette	Workshop	2	Nil	Humanities
FCHU1211	Creative Writing	Workshop	2	Nil	Humanities
FCHU1212	English for Competition (GRE/GMAT/TOEFL/IELTS)	Workshop	2	Nil	Humanities
FCHU1213	Be a Contributor	Workshop	2	Nil	Humanities
FCHU0210	Life Skills Development (LSD) – I	Practice	2	Nil	Humanities
FCHU0211	Life Skills Development (LSD) – II	Practice	2	Nil	Humanities
FCHU0212	Life Skills Development (LSD) - III	Practice	2	Nil	Humanities
FCMG0114	Economics	Theory	2	Nil	Management
FCMG0102	Accounting & Finance	Theory	2	Nil	Management
FCMG0103	Management Processes and OB	Theory	2	Nil	Management
FCMG0104	Production and Operation Management	Theory	2	Nil	Management
FCMG0105	Marketing Management	Theory	2	Nil	Management
FCMG0108	Introduction to Research	Theory	2	Nil	Management

<i>FCMG0113</i>	<i>Indian Society and Culture</i>	<i>Theory</i>	<i>2</i>	<i>Nil</i>	<i>Management</i>
<i>FCMG0115</i>	<i>Human Rights</i>	<i>Theory</i>	<i>1</i>	<i>Nil</i>	<i>Management</i>
<i>FCMG0116</i>	<i>Introduction to Ethics</i>	<i>Theory</i>	<i>1</i>	<i>Nil</i>	<i>Management</i>
<i>FCMG1201</i>	<i>Disaster Management</i>	<i>Workshop</i>	<i>2</i>	<i>Nil</i>	<i>Management</i>
<i>FCMG1202</i>	<i>Ms Excel</i>	<i>Workshop</i>	<i>2</i>	<i>Nil</i>	
<i>FCMG0401</i>	<i>Gender Issues in Development</i>	<i>Theory+ Project</i>	<i>1</i>	<i>Nil</i>	<i>Management</i>

Note: The evaluation for Workshop type subject will be 100% internal by the concerned faculty.

SYLLABUS
FCHU1201 FOUNDATIONS OF ENGLISH COMMUNICATION

<i>Pre - requisites</i>	<i>Course Type</i>	<i>Credits</i>
<i>Nil</i>	<i>Workshop</i>	<i>2</i>

COURSE OBJECTIVES

To develop vocabulary and grammar knowledge

To develop reading comprehension skills

COURSE OUTCOMES

Development of academic and sub-technical vocabulary

Enhancement of basic language skills, i.e., listening, speaking, reading and writing

Development of grammatical competence

Confidence level improvement

This course aims to build the vocabulary, comprehension, and writing skills for effective communication in English language. It will focus on reading, listening to, and writing passages, as a means of learning communications skills.

The essential elements of this course will include:

MODULE-I: READING SKILLS (7hrs.)

Read **one** of the following books:

Animal Farm

Alice in Wonderland

Guide

Malgudi Days

Harry Potter

Amar Chitra Katha

Comprehension Skills: Students will respond to comprehension lessons from the chosen book.

MODULE-II: WRITING SKILLS (7hr.)

Students learn grammar and usage by writing passages, and getting formal feedback on these.

MODULE-III: LISTENING SKILLS (6hrs.)

Students respond to questions based on listening to videos, audio, or speaking assignments of classmates.

MODULE-IV: SPEAKING SKILLS (7hrs.)

Speaking assignments based on chosen book or contemporary topics.

TEXT BOOKS:

Esteras, Santiago Remacha and Fabre, Elena Marco. (2007). *Professional English in Use ICT Student's Book*. Cambridge: Cambridge University Press.

REFERENCES:

Grellet, F. (1981). *Developing Reading Skills*. Cambridge: Cambridge University Press

McCarthy, M. & O'Dell, F. (2008). *Academic Vocabulary in Use*. Cambridge: Cambridge University Press.

Ur Penny, (1992). *Five-Minute Activities: A Resource Book of Short Activities* (Cambridge Handbooks for Language Teachers). Cambridge: CUP

F Klippel. (1984). *Keep Talking*. Cambridge: CUP

EVALUATION SYSTEM (CONTINUOUS INTERNAL ASSESSMENT)

<i>Methods</i>	<i>Conversations-</i> <i>ation</i>	<i>Listening</i> <i>Comprehension</i>	<i>Book Review</i> <i>Presentation</i>	<i>Vocab.</i>	<i>Mid-I</i> <i>(Presentati</i> <i>on)</i>	<i>Mid-II</i> <i>(Online)</i> <i>Common</i> <i>Errors</i>	<i>Mid-III</i> <i>(Written</i> <i>)</i>	<i>% of</i> <i>Marks</i> <i>100(B</i> <i>est 5)</i>
Total	20	20	20	20	20	20	20	100

S. No.	Topic	Pedagogy	Details	Instructional Hrs			
				Th	Pract	video	Proj
1	Getting to Know Each Other	Activity Based Learning	Catch the Ball Introductions Ice-breaker Share an interesting fact, stories, questions, memories, embarrassing moments or sometimes relevant to the context. Useful link: http://www.icebreakers.ws/small-group/catch-ball-introductions-icebreaker.html	0	1	0	0
2	Conversation Practice	Pair work using Realia	Formulaic Expressions Doing Things with Words/ Objects <u>Description:</u> Student practice real life situations like using maps, asking for directions, small talk on weather, holidays, parties and eating out.	0	1	1	0
3	Formal and Informal Communication	Degrees of Formality	Worksheet: Ask the students to work in small groups of 2/3. They must read through the phrases in the table, deciding whether each phrase is formal or informal in conversation a conversation situation. When they have finished, review the exercise as a class (answers provided in the worksheet)	0	1	1	0

S. No.	Topic	Pedagogy	Details	Instructional Hrs			
				Th	Pract	video	Proj
4	Shadowing	Pronunciation – intonation, stress, pause	Find an Audio to Listen & Repeat – BBC News, Seminar Talk, Ted Talk etc. https://www.youtube.com/watch?v=GVWFGIyNswI	0	1	1	0
5	Speech Acts	Plain English	Students can 'become' anyone they like for a short time! They will be encouraged to come forward and perform small speech acts and role-plays.	0	1	0	0
6	Ask Me Questions Challenge	Questions & Responses	Individual to respond- the whole class to ask questions. In this session, a student will learn communication management.	0	1	0	0
7	TED Talk Listening	Listening Comprehension	Ice-breaker: Talkathon Assignment: In groups of 4, you are going to create/write 10 questions about the TED Talk Afterwards, the groups of 4 will split up in new groups of 4 to discuss and compare their questions. Comprehension Test	0	1	1	0
8	Ted Talks	Communication & Confidence Body Language	Listen to a Ted Talk & make a presentation on a popular/contemporary topic	0	1	1	0
9	Reading Comprehension	Pre-reading	Students are encouraged to read any two books in the first semester. [Animal Farm/Old Man and The Sea/ Guide/Malgudi	0	1	1	0

	<i>Strategies - 1</i>		<i>Days/Amar Chitra Katha]</i>				
10	<i>Reading Comprehension Strategies - 2</i>	<i>Mid - reading</i>	<i>Students respond to comprehension lessons from the chosen books. [Comprehension Passages, Gap filling and Sentence Completion]</i>	0	1	1	0
11	<i>Reading Comprehension Strategies - 3</i>	<i>Post Reading</i>	<i>Students respond to comprehension lessons from the chosen books. [Summarizing/ Narrating/ Enacting/Vocabulary Quiz/]</i>	0	1	0	0
12	<i>Book Review</i>	<i>Writing Short Passages/ Paragraphs</i>	<i>Write a review of your favorite book in at least 250 words. Mention 3 specific learnings and 3 distinct ways in which you plan to incorporate them in your life. To choose from the recommended books.</i>	0	1	0	0
13	<i>News Reading</i>	<i>7 Cs of Communication</i>	<i>Group Activity: Campus/ National News Reading Students read notice boards and visit departments Prepare campus news headlines Present in the class</i>	0	1	0	0

S. No.	Topic	Pedagog	Details	Instructional Hrs			
				Th	Pract	video	Proj
14	<i>Writing to the Point</i>	<i>Word Usage and Sentence Structure Main Idea, Coherence & Cohesion</i>	<i>Each group is seated in a circle. In this activity, the leader of each group cannot see (either blind or blind fold using a handkerchief), but can hear the peer voice. Ask the leader to flip through the pages, and put the finger randomly on fifteen words from the chosen book in five minutes. The other participates copy the words that are closest to the finger. This time bound activity increases the curiosity of the students and engages them in exciting communication and completion of the task. Then, I ask the students to shape the randomly chosen disconnected words into a short poem/story/essay by adding a title to it. Read Out Loud in the Class</i>	0	1	0	0
15	<i>Word Power</i>	<i>Synonyms & Antonyms</i>	<i>App: SPEAK ENGLISH</i>	0	1	1	0
16	<i>Homonyms</i>	<i>Some confusable words Minimizing errors through discussions</i>	<i>Activity: Select the correct option, Use the confusables in sentences to bring out their meaning</i>	0	1	0	0
17	<i>Reading and Writing about visuals</i>	<i>Useful Expressions</i>	<i>Presentation about visuals Task: Selecting information from a visual</i>	0	1	0	0

18	Word Formation	Word structure Word hunt Vocabulary explorations	Group Activity: Students make word clouds	0	1	0	0
19	Vocabulary Building	Descriptive words	Activity : Describe yourself/ your favorite person using 5 descriptive words	0	1	0	0
20	Listen to Popular Songs	Verb tense and aspect of grammar Vocabulary Idioms and expressions	Listen to the song with lyrics Ask questions about the title Gap Filling Exercises	0	1	0	0
21	Vocabulary Development	Word Power	Quiz/ Puzzle	0	1	0	0
22	Grammar	Common Errors	Surprise Quiz & debriefing	0	1	0	0
23	Grammar	Correct Usage	Easy Grammar App-Practice Sets	0	1	0	0
24	English Language Enhancement-I	Tenses	Usage, Question and explanation Fill in the blanks	0	1	0	0
25	English Language Enhancement -II	Active and Passive	I am passive..../I am active activity	0	1	0	0
26	English Language Enhancement-III	Reported Speech	Assignment & debriefing	0	1	0	0
27	English Language Enhancement -IV	Subject-verb agreement	Online Quiz & debriefing	0	1	0	0
28	Learn Grammar with Fun	Conditionals	Activity: The whole class is divided into The Zero Conditional, The First conditional, The Second conditional, and The Conditional to perform the task	0	1	0	0

FCHU1202 COMMUNICATIVE PRACTICE LABORATORY –I

<i>Pre - requisites</i>	<i>Course Type</i>	<i>Credits</i>
<i>Nil</i>	<i>Workshop</i>	<i>2</i>

The language laboratory acts as a platform for learning, practicing and producing language skills through interactive lessons and communicative mode of teaching.

COURSE OBJECTIVES

To expose the students to a variety of self- instructional, learner- friendly modes of language learning.

To enable them to learn better pronunciation through stress on word accent, intonation, and rhythm.

To maintain good linguistic - through accuracy in grammar, pronunciation and vocabulary.

COURSE OUTCOMES

Ability to communicate fluently in different business situation

Effective oral and written communication

Appropriate word usage with correct pronunciation

Clarity of word stress and intonation

A student is required to take up five lab tests of 100 marks- three tests in spoken mode and two tests in written mode.

MODULE-I: FRIENDLY COMMUNICATION (9 HOURS)

Doing Things with Words: To ask for information, help, permission; To instruct, command, request, accept, refuse, prohibit, persuade

Practice of Formulaic Expressions: Greetings, farewells, introductions, thanks, apologies, regrets, good wishes, congratulations, condolences, offers.

Conversation Practice in familiar and unfamiliar situations

(This module will be practiced through conversation activities in pairs & groups)

MODULE-II: GRAMMAR AND VOCABULARY (9 HOURS)

The focus will be on the appropriate usage of language.

Elimination of common errors

Editing passages

Word power A-Z: Easy and quick techniques

Vocabulary building exercises

(Open Source Language Laboratory will be used to take quizzes and practice grammar & vocabulary)

MODULE-III: PHONETICS AND SPOKEN ENGLISH (12 HOURS)

Students will be trained to find out the correct pronunciation of words with the help of a dictionary /software, to enable them to monitor and correct their own pronunciation.

Pronunciation Guidelines: Consonants and Vowels

Pronunciation practice (for accent neutralization), particularly of problem sounds, in isolated words as well as sentences

Speaking Techniques: Using correct stress patterns, developing voice quality

Rhythm and Intonation

(Reading aloud of dialogues, speeches etc. for practice in pronunciation)

(In this module, the learners will use video series from BBC & Sky Pronunciation Suite to improve spoken English)

TEXT BOOKS:

Dwyer, J. (2000). *The Business Communication Handbook*. New Jersey: Prentice Hall.

REFERENCES:

Brown, G & Yule, G. (1983). *Teaching the Spoken Language*. Cambridge: Cambridge University Press.

Brown, H. D. (1994). *Teaching by Principles: An Interactive Approach to Language Pedagogy*. New Jersey: Prentice Hall.

EVALUATION SYSTEM (CONTINUOUS INTERNAL ASSESSMENT)

Methods	Role play	Speech Acts	Grammar Quiz	Story Telling	JAM	Vocabulary-Exercise	Vocabulary-Quiz	% of Marks 100(Best 5)
Total	20	20	20	20	20	20	20	100

SESSION PLAN: COMMUNICATIVE PRACTICE LABORATORY -1

MODULE I: FRIENDLY COMMUNICATION (9 HOURS)

S. No.	Topic	Pedagogy	Details	Instructional Hrs.			
				Th	Prac	Vide o	Pro j
Lab-1	Ice-Breaking/ Introductory Session	Name Game and Other Ice-breaking Activities	Knowing Each Other http://www.buzzle.com/articles/classroom-icebreaker-activities-for-students.html http://cutmlanguagelab.org/course/view.php?id=3	0	2	0	0
Lab -2	Conversation Practice-I	Role Plays OSLL (Moodle)	Speech Acts/ Formulaic Expression http://cutmlanguagelab.org/course/view.php?id=3	0	2	0	0
Lab -3	Conversation Practice-Ii	Small Skits	Small Skits Using Formulaic Expressions http://www.lazybeescripts.co.uk/Scripts/Results.aspx?iSh=5&iSk=1&iMR=11&iXR=15&iPo=2&iI7=1&iAS=2&iPS=2 http://cutmlanguagelab.org/course/view.php?id=3	0	2	0	0

MODULE II: GRAMMAR AND VOCABULARY (12 HOURS)

S. No.	Topic	Pedagogy	Details	Instructional Hrs.			
				Th	Prac	Vide o	Pro j
Lab-4	Elimination of Common Grammatical Errors	Quiz OSLL (Moodle)	Emphasis on Tense, Verbs, Modals, Conditionals, Active and Passive Voice, Statements, Questions and Responses, Articles, Preposition & Concord http://cutmlanguagelab.org/course/view.php?id=3 http://www.learnenglishfeelgood.com	0	2	0	0

Lab - 5	Document Makeover	Assignment OSL (Moodle)	Editing passages: Grammatical and Construction errors http://cutmlanguagelab.org/course/view.php?id=3	0	2	0	0
Lab - 6	Vocabulary Building- Word Power	Assignment and Online practice	http://a4esl.org/ http://cutmlanguagelab.org/course/view.php?id3	0	2	0	0
Lab - 7 & 8	Vocabulary Building	Assignment and Online practice	Synonyms, Antonyms, Homophones, One-Word Substitution, Phrasal Verbs http://www.majortests.com/word-focus/vocabulary-tests.php http://www.grammarbank.com/synonyms-antonyms-worksheet.html http://cutmlanguagelab.org/course/view.php?id3	0	2	0	0

MODULE-III: PHONETICS AND SPOKEN ENGLISH (12 HOURS)

S. No.	Topic	Pedagogy	Details	Instructional Hrs.			
				Th	Prac	Vide o	Pro j
Lab -9	Phonetics-I	Online Practice OSL (Moodle)	Phonemic Transcription Using IPA Symbols, Stress Pattern in Words and Phrases http://usefulenglish.ru/phonetics/practice-consonants http://www.agendaweb.org/phonetic.html http://cutmlanguagelab.org/course/view.php?id=3 https://www.youtube.com/watch?v=htmkIboG9Q	0	1	1	0
Lab -10	Phonetics-Ii	Online Practice OSL (Moodle) Sky Pronunciation Suite	Rhythm and Intonation http://www.learning-english-online.net/areas/pronunciation/stress-and-intonation/ http://www.tolearnenglish.com/english_lessons/intonation-exercises http://cutmlanguagelab.org/course/view.php?id=3	0	2	0	0
Lab -11	Event Narration, Story Telling	Assignment	http://gdpi.hitbullseye.com/other-selection-tools-extempore.php http://cutmlanguagelab.org/course/view.php?id=3 http://grammar.about.com/od/developingessays/a/topnarrative07.htm	0	2	0	0

Lab -12	Speaking - Jam, Extempore	Activity Based OSLL (Moodle)	http://orelt.col.org/module/unit/3-practice-public-speaking http://cutmlanguagelab.org/course/view.php?id=3 https://www.youtube.com/watch?v=wV66cH5uQ https://www.youtube.com/watch?v=Mm-AT7aOS4	2	0	0
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FCHU1203 BUSINESS COMMUNICATION

<i>Pre - requisites</i>	<i>Course Type</i>	<i>Credits</i>
<i>Nil</i>	<i>Workshop</i>	<i>2</i>

COURSE OBJECTIVES

The course on Business Communication focuses on the basic skills required to be an effective communicator. It aims at imparting the communication skills that are needed in the academic and professional pursuits.

This is directed towards helping the students gain skills in comprehension, group discussions, presentations, interviews, active listening, technical writing and the ability to manage cross-cultural interactions. The focus is on the difficulty experienced by individual students, and the effort to explore a useful strategy for self-improvement. This is achieved through an amalgamation of lecture oriented approach of teaching with the task based skill oriented methodology of learning.

COURSE OUTCOMES

Understand the differences between general communication and business communication

Development of basic language skills, i.e., listening, speaking, reading and writing

Effective participation in group discussion and job interviews

MODULE-I: UNDERSTANDING COMMUNICATION IN BUSINESS (8 hrs.)

The module is a guide to organization communication. It is directed towards enabling students to develop the skills necessary to manage the human resources of their organization.

General Communication and Business Communication

Communication in Organizational Settings: Patterns of Communication in the Business World

– Upward, Downward, Horizontal Grapevine etc, Channels of Communication- Internal and External, Formal and Informal

Introduction to Cross Cultural Communication

Strategies to Overcome Communication Barriers

MODULE-II: READING AND WRITING (10 hrs.)

This unit works on the competency in reading and writing skills through such tasks/activities as reading books, articles, magazines, novels, developing outlines, key expressions, situations, slogan writing and theme building exercises, dialogue writing, interpreting pictures, technical writing.

Importance of Developing Reading Skills

Sub-Skills of Reading: Predicting Content, Skimming & Scanning, Topic sentence and supporting details, Inferential Reading, Guessing the Meaning of Unfamiliar Words, Note Making

Importance of Writing Skills and Principles of Effective Writing

Writing Process: Pre-writing, Drafting and Re-Writing

Paragraph Writing

Summaries and Abstracts

Business Correspondence: Writing Business Letters, E-mail Messages, Memo, Notice, Circulars, Reports, Proposals

Career Communication: Writing Resume/ CV and Job Application Letter

MODULE-III: LISTENING AND SPEAKING (9 HOURS)

Listening is the mother of all speaking. This unit aims to achieve competence in speaking i.e., the ability to communicate orally in clear, coherent, and persuasive language appropriate to purpose, occasion, and audience. The module focuses on developing this competency which includes acquiring poise and developing control of the language through experience in making presentations to small groups, to large groups, and through the media.

Listening Skills: Listening Process, Hearing and Listening, Types and Barriers, Effective Listening Strategies

Common forms of Oral Communication in the Business World:

Meetings: Organize Meetings, Preparing an Agenda, Chairing a Meeting, Drafting Resolutions, Writing Minutes

Persuasive Speaking: Improving Fluency and Self-Expressions, Articulation, Good Pronunciation, Voice Quality

Making an Oral Presentation: Planning, Preparing and Delivery

Facing an Interview: Preparation, Types of Interview, Do's and Don'ts

Group Discussions: Debate and GD, Types of GD, GD Etiquette

(Treatment: Developing listening and speaking skills through various activities, such as role play activities, practicing short dialogues, JAM, group discussions, debates, speeches, listening to news bulletins, viewing and reviewing documentaries and short films etc.)

TEXT BOOKS:

An Introduction to Professional English and soft skills by B.K Das et al., Cambridge University Press

REFERENCES:

Effective Technical Communication, M. Ashraf Rizvi, TMH Publications.

Business Communication, Krizan. Merrier. Logan. Williams, Thomson

Business Communication Today, Courtland L Bovee, John V Thill & Mukesh Chaturvedi, Pearson Education.

Business communication by Meenakshi Raman and Prakash Singh (Oxford)

Business Communication, Urmila Rai & S.M Rai, Himalaya Publishing House

EVALUATION SYSTEM (CONTINUOUS INTERNAL ASSESSMENT)

Methods	Role Plays (Org. Comm.)	Reading Comprehension & Note –Making	Listening & Individual Presentation	GD	Mid-I (Online Test on Vocabulary)	Mid-II (Written exam on module 2)	Mid-III (Oral Presentation)	% of Marks 100 (Best 5)
Total	20	20	20	20	20	20	20	100

SESSION PLAN: BUSINESS COMMUNICATION

S. No.	Topic	Pedagogy	Details	Instructional Hrs			
				Th	Pract	video	Proj
1	Introduction To Business Communication	Business games Written Assignment	What is Business Communication? General Communication vs. Professional Comm. Das, AIPE & SS,	0	1	0	0
2	General Communication & Business Communication	Audio-visual clips Communication game- Change your style	Difference in Style Degrees of Formality pp. 6-7 http://christopherhouse.blogspot.in/2012/08/difference-between-business.html	0	1	0	0

3	Communication In Organisational Settings	Small group work Role Plays Quiz	Internal Communication: Formal Communication Network Informal Communication Network External Communication Raman, BC, pp- 13-21 http://keydifferences.com/difference-between-formal-and-informal-communication.html	0	1	0	0
4	Understanding The Importance Of Cross-Cultural Communications	Flip class- Match your points Role Plays	The Global Marketplace The Multicultural Workforce Krizen, BC, Chapter 2 & Bovee, BCT, pp. 63- 65 http://study.com/academy/lesson/cross-cultural-communication-definition-strategies-examples.html	0	1	0	0

S. No.	Topic	Pedagogy	Details	Instructional Hrs			
				Th	Pract	video	Proj
5	Improving Intercultural Sensitivity	Communication Games and activities	Recognise Cultural Differences Overcome Ethnocentrism Study other Cultures Overcome Language Barriers Develop Effective intercultural Skills Bovee, BCT, pp. 66-82	0	1	0	0
6	Over Coming Miscommunication	Workshop (Emphasis on listening skill)	The Information Gap principle Organizational Structure Difference in Status Incorrect Choice of Medium Message Complexity Cultural Differences Psychological Barriers Noise, and barriers http://www.businesscoachphil.com/overcoming-miscommunication-at-work Raman, BC, pp.22-27	0	1	0	0
7	Strategies For Improving Organisational Communication	Good Listener Case Studies Role plays & presentations	Open Feedback, Simple Language, Avoid Overload, Walk the Talk http://debo10199businesscommunication.blogspot.in/2012/02/strategies-for-improving-organizational.html Raman, BC, pp.34-40	0	1	0	0

MODULE II: READING AND WRITING

S. No.	Topic	Pedagogy	Details	Instructional Hrs			
				Th	Pract	video	Proj
8	Importance Of Developing Reading Skills & Reading Strategies	Reading News clips	The Importance of Developing Reading Skills Vocabulary Skills Word Meaning Recognition Guessing the Meaning from Word Structure and Context Guidelines for Improving Reading Skill Types of Reading	0	1	0	0

			<i>Tips for Improving Reading Speed</i> Rizvi, ETC, pp. 219- 224 http://www.nclrc.org/essentials/reading/stratread.htm				
9	<i>The Sub-Skills of Reading</i>	<i>Guessing Game</i>	<i>Understanding the Main Idea and Supporting Details</i> <i>Reading between the Lines: Inferential Reading</i> <i>Understanding the Writer's Point Of View</i> <i>Making Predictions</i> · <i>Guessing the Meanings of Unfamiliar Words</i> · <i>Skimming and Scanning</i> Rizvi, ETC, pp. 228-250 http://literallycommunication.blogspot.in/2013/06/reading-skills-and-its-sub-skills.html	0	1	0	0
10	<i>Note-Making</i>	<i>Topicalizing</i> <i>Schematising</i> <i>Use of</i> <i>Reduction</i> <i>Devices</i> <i>Methods of</i> <i>Sequencing</i> <i>Practice in Note</i>	<i>Mechanics of Note Making</i> <i>Note Writing Techniques</i> Rizvi, ETC, pp.273-289 · http://www2.le.ac.uk/offices/ld/resources/study/notes	0	1	0	0

S. No.	Topic	Pedagogy	Details	Instructional Hrs			
				Th	Pract	video	Proj
11	<i>Importance of Writing Skills</i>	<i>Tasks on small paragraphs</i> <i>Creative writing</i>	<i>Writing Process: Pre-writing, Drafting and Re-writing Idea</i> <i>Mapping Writing and Editing</i> Rai, BC, pp. 182-192 http://smallbusiness.chron.com/importance-writing-skills-business-845.html	0	1	0	0
12	<i>Paragraph Writing</i>	<i>Written Assignment</i> <i>Developing story outline</i>	<i>Unity in writing</i> <i>Topic sentence</i> <i>Chronological order of development</i> <i>Using Connectives</i> <i>Organizing a Paragraph</i> <i>Adequate Development of supporting details</i> <i>Cohesion & Coherence in a Paragraph</i> Rizvi, ETC, pp.337-350 http://www.wikihow.com/Write-a-Paragraph	0	1	0	0
13	<i>Summaries & Abstracts</i>	<i>Written Assignment based on guidelines</i>	<i>Differences between Abstract and Summary</i> <i>Procedure for Writing Abstracts</i> <i>Procedure for writing summary</i> Rizvi, ETC, pp.290-307 http://www.uts.edu.au/current-students/support/helps/self-help-resources/academic-writing/abstract-and-executive-summary	0	1	0	0
14	<i>Writing Business Letter &</i>	<i>Written Assignment based on</i>	<i>Purpose & goal</i> <i>Principles of effective letter writing: Courtesy and consideration, Directness and</i>	0	1	0	0

	<i>Proposal</i>	<i>guidelines</i>	<i>conciseness, Avoid verbosity, Participial endings, Positive and direct statements, Clarity and precision Structure and layout Rizvi, ETC, pp.351-365 & Raman, BC, PP.256-260 http://www.writing-business-letters.com/business-proposal-letter.html</i>				
15	<i>Memo, Notice, Circulars & Email</i>	<i>Written Assignment based on guidelines</i>	<i>What is a Memo? Email writing format Characteristics of Effective Memo Difference between notice and circular Essentials of notice and notice format Rizvi, ETC, pp.423-436 http://www.umuc.edu/writingcenter/writingresources/effective_memos.cfm http://www.englishtransform.com/2014/04/difference-between-circular-memo-notice.html</i>	0	1	0	0
16	<i>Reports</i>	<i>Written Assignment based on guidelines</i>	<i>Definition and Types Deciding on Format and Length Structure / Parts of Formal Report Topics Covered in a Report Introduction, Body and Closing Krizen, BC, pp 259-303 & Rizvi, ETC, pp. 452-467 http://cgu.edu/pages/852.asp</i>	0	1	0	0

TREATMENT: Tasks/activities as reading books, articles, magazines, novels, developing outlines, key expressions, situations, slogan writing and theme building exercises, dialogue writing, interpreting pictures, technical writing.

MODULE III: LISTENING AND SPEAKING

S. No.	Topic	Pedagogy	Details	Instructional Hrs			
				Th	Pract	video	Proj
17	<i>Listening Skills</i>	<i>Effective Listening Strategies TED Talks: Listening and individual presentation</i>	<i>Listening Process Hearing and Listening Types and Barriers Rizvi, ETC, pp. 59-75 Video : https://www.youtube.com/watch?v=C8zNx_IarUw</i>	0	1	0	0
18	<i>Listening Attentively</i>	<i>News video clips and quizzing</i>	<i>Overall comprehension Extracting Detail information Listening between the lines Note taking Video https://www.youtube.com/watch?v=t2z9mdX1j4A</i>	0	1	0	0
19	<i>Persuasive Speaking</i>	<i>Inspirational audio-video clips for language</i>	<i>Communication module for persuasive meeting Feed back Taking care of non-verbal elements Decoding message Handling noise</i>	0	1	0	0

		improvement	Raman, BC, pp. 123- 169 & Rizvi, ETC, pp.195 -218 Video: https://www.youtube.com/watch?v=NBObNfR2n_4 Reference: http://www.speaking.pitt.edu/student/public-speaking/persuasive.html				
20	Oral Presentation	Individual presentation on Events	Improving Fluency and Self-Expressions Articulation Good Pronunciation, Voice Quality Planning & Preparing your Oral Presentation Types of Delivery Guidelines for Delivery: Verbal elements, non-verbal elements, visual elements Practice delivery elements Controlling Nervousness and Stage fright Handling questions responsively narration/JAM Raman, BC, pp. 123- 169 & Rizvi, ETC, pp.195 -218 http://www4.caes.hku.hk/epc/presentation/VIDEO https://www.youtube.com/watch?v=WJIOZfLQ5w4	0	2	0	0
21	Group Discussions	GD Sessions on current/ social issues	Nature of Group Discussion Characteristics of Group Discussion Skills Selection Group Discussions Subject knowledge Oral communication skills Team management Group Discussion Strategies Role Functions in Group Discussions Rizvi, ETC, pp 165-187 https://www.youtube.com/watch?v=ymcMo7JWSu8 http://placement.freshersworld.com/what-is-group-discussion/33122049	0	2	0	0
22	Group Discussions	GD Sessions on current/ social issues	Debate and GD Types of GD GD Etiquette		1		
23	Revision	TUTORIAL	Module - I		1		
24	Revision	TUTORIAL	Module - I		1		
25	Revision	TUTORIAL	Module - I		1		

FCHU1204 COMMUNICATIVE PRACTICE LABORATORY –II

<i>Pre - requisites</i>	<i>Course Type</i>	<i>Credits</i>
<i>Nil</i>	<i>Workshop</i>	<i>2</i>

The suggestive assignments in the laboratory are intended as learning activities to facilitate the students in accomplishing the language skills which are needed to succeed in the business world.

COURSE OBJECTIVES

To master Study Skills

To acquire strategic competence to use both spoken & written language to use in a wide range of communication strategies

To acquire Business Performance Skills

COURSE OUTCOMES

The students will be able to

Write effectively for a variety of professional and social settings. They will practice writing as a process of motivated inquiry engaging others writers' ideas as they explore and develop their own. They will demonstrate an ability to revise for content and edit for grammatical and stylistic clarity. And they will develop an awareness and confidence in their own voice as a writer. Become accomplished, active readers who appreciate ambiguity and complexity, and who can articulate their own interpretations with an awareness and curiosity for other perspectives.

Demonstrate the skills needed to participate in a conversation that builds knowledge collaboratively; listening carefully and respectfully to others' view points; articulating their own ideas in relation to other voices and ideas. Students will be able to prepare, organize and deliver an engaging oral presentation.

A student is required to take up five lab tests of 100 marks- at least two tests in written mode and three tests in spoken mode.

MODULE-I: LISTENING (6 HOURS)

Exercises on Active Listening: The whole group listens to any speech/news broadcast in English and notes down the important points. They listen again to check their points and evaluate themselves. The group then compares points to see how well they have understood the broadcast.

MODULE- II: SPEAKING (8 HOURS)

Situational Dialogues / Role Play: Organization Communication

Oral Presentations- Prepared and Extempore

'Just a minute' Sessions (JAM)

Debates

Mock Meetings

Cracking Job Interviews: Mock Sessions

Group Discussions on current topics

(This module will be practiced through speaking activities like role plays, presentations, and discussions)

MODULE-III: READING (8 HOURS)

Students will be given practice in reading and comprehension 6-8 passages of 100-300 words each, on topics of General as well as professional interest. The texts will be supported by suitable exercises designed to foster comprehension skills and vocabulary enrichment. Students are encouraged to read newspapers, articles, books and novels.

Reading Comprehension Exercises Through Tests, Writing Summary and Presenting, Note Making

Review Presentation (Movie/ Article/ Book)

Vocabulary Building Exercises

(This module encourages extensive use of reading materials)

MODULE-IV: WRITING (8 HOURS)

The Writing Lab content is designed to acquaint the students not only with the techniques of effective writing but also give them an insight into planning and writing documents that produce results.

Short Paragraphs on current general and technical topics

Creative Writing: Idea Generation

Business Letters, Email Messages, Project Writing

Writing Resumes and Cover Letters

(* Students will be required to produce and submit by the end of second semester a 350-500 word project report on a topic of their choice. The project should involve data collection, analysis and reporting. Ten marks (out of 100 marks allocated for Lab Test) will be set apart for the project.)

TEXT BOOK:

An Introduction to Professional English and soft skills by B.K Das et al., Cambridge University Press

REFERENCES:

Effective Business Communication, AshaKaul, Prentice Hall

Professional Communication, ArunaKoneru, TMH

EVALUATION SYSTEM (CONTINUOUS INTERNAL ASSESSMENT)

Methods	Listening Skills	Movie Review	Role Plays	Group Discussion	Mock Interview	JAM	Vocabulary/ Comprehension	% of Marks
Total	20	20	20	20	20	20	20	100(Best 5)

SESSION PLAN: COMMUNICATIVE PRACTICE LABORATORY –II

MODULE I: LISTENING (6 HOURS)

S No.	Topic	Pedagogy	Details	Instructional Hrs			
				Th	Pract	Video	Proj
Lab-1	Introduction and Ice Breakers	Activity - Based	Knowing Each Other, People's Bingo http://cutmlanguagelab.org/course/view.php?id=4	0	2	0	0
Lab - 2	Exercises On Active Listening	Activity Based	Feedback, Note Taking, Summarizing, Paraphrasing and Non-verbal Cues http://cutmlanguagelab.org/course/view.php?id=4 https://www.youtube.com/watch?v=cSohjLYOI2A	0	1	1	0
Lab - 3	Movie Review Presentation	Activity Based	The October Sky/ In Pursuit of Happiness/A Beautiful Mind/ Any Other http://cutmlanguagelab.org/course/view.php?id=4	0	1	1	0

MODULE II: SPEAKING (8 HOURS)

S. No.	Topic	Pedagogy	Details	Instructional Hrs			
				Th	Pract	Video	Pro
Lab-4	Organization Communication	Role play	Business Situations and Mock Meeting http://cutmlanguagelab.org/course/view.php?id=4 http://eduscapes.com/distance/course_activities/simulations.htm https://www.youtube.com/watch?v=3X51J-ZDMmE	0	2	0	0
Lab - 5	Oral Presentations	Activity OSLL (Moodle)	Prepared and Extempore/ Debate / 'Just a Minute' Talk (JAM) http://cutmlanguagelab.org/course/view.php?id=4	0	2	0	0
Lab - 6	Interview /Group Discussion	Mock Interview /Group Discussion OSLL (Moodle)	Frequently Asked Questions (FAQs) Discussion on Current Topics - General, Social, Political, Management, Creative, Education and Sports http://cutmlanguagelab.org/course/view.php?id=4 https://www.youtube.com/watch?v=ymcMo7JWSu8 https://www.youtube.com/watch?v=7gcsZ9H2I6s	0	2	0	0

MODULE-III: READING (8 HOURS)

S. No.	Topic	Pedagogy	Details	Instructional Hrs			
				Th	Pract	Video	Pro
Lab -7	Reading Assignment - I	Assignment , online practice and discussion	Reading abridged texts, relevant topics, and news articles http://cutmlanguagelab.org/course/view.php?id=4	0	2	0	0
Lab -8	Reading Assignment - Ii		Reading for comprehension and vocabulary http://cutmlanguagelab.org/course/view.php?id=4 http://www.majortests.com/sat/reading-comprehension.php	0	2	0	0

MODULE-IV: WRITING (8 HOURS)

S. No.	Topic	Pedagogy	Details	Instructional Hrs			
				Th	Pract	Video	Pro
Lab -9	Writing Short Paragraphs - General,	Assignment, online practice	Write, Rewrite, Expand, Correct, Complete, and Improve Paragraphs http://cutmlanguagelab.org/course/	0	2	0	0

	<i>Current and Technical Topics</i>	<i>and discussion</i>	view.php?id4				
Lab -10	<i>Idea Generation and Creative Writing</i>	<i>Assignment and discussion</i>	<i>Problem solving/decision making, Strategy development, Outline a proposal, Create a timeline Collaboration technique, Expression of creativity, Condensing various thoughts, Put visuals and text together</i> http://cutmlanguagelab.org/course/view.php?id=4	0	2	0	0
Lab -11	<i>Memo Writing & Emails</i>	<i>Assignment and discussion</i>	<i>Adopt the steps of writing process for preparing of memo and emails</i> http://cutmlanguagelab.org/course/view.php?id=4 https://www.youtube.com/watch?v=6zHLHc9CcvQ	0	2	0	0
Lab -12	<i>Preparation Of Business Reports/ Proposals And Presentation</i>	<i>Project Work and discussion</i>	<i>Adopt the steps of writing process for preparing business reports and proposals</i> http://cutmlanguagelab.org/course/view.php?id=4 mails https://www.youtube.com/watch?v=eLKVRDBAMyQ	0	2	0	0

FCHU1205CORPORATE READINESS LABORATORY

<i>Pre - requisites</i>	<i>Course Type</i>	<i>Credits</i>
<i>Nil</i>	<i>Workshop</i>	<i>2</i>

A real-time project approach in the laboratory is intended to provide a developmentally appropriate ambience, make the students proactive, encourage and motivate as well as develop skills to become a good listener, good communicator and responsible. A student will experience the challenging application process and at the same time prepare for the challenging world. The experience gained from working on projects can help one understand the appropriate and effective use of language skills. It also creates context in which learners engage in purposeful communication.

All communication activities are supported with the help of live projects on general techno-management or local themes which provide exposure to the students and help them to find a suitable job in the industry.

A student is required to take up five laboratory tests of 100 marks.

COURSE OBJECTIVES

Understand the process of communication

View communication from the perspective of each stakeholder

Plan and manage communication difficulties

Learn exactly how, when and what of communication

COURSE OUTCOMES

Understanding the convention of project report

Understanding the process of data collection and documentation

Preparation and presentation of project report

Preparation for various academic and professional needs

INSTRUCTION AND DELIVERY

Instruction- led facilitation highlights interactions between students and their facilitators, and emphasizes guidance from the facilitator who will track, assess and mentor them.

Students will make a team of four members who will take up real problems and run through the semester trying to solve the problems. The lab program will augment this learning with the right theory.

Participants will use PPTS, flash presentations or high impact presentations, flip charts, blogs, boards with graphical or pictorial representations, with captions and outlines, video display or any other best mode of presentation, post-it notes and group activities to document all processes and methodology.

OUTLINE

LAB1: Introduction to the Lab Program (Session will be driven by the Facilitators)

(Structure, Objective, Methodology, Objective of Choosing Project as a Vehicle to Learn the Course, Process of Carrying out the Project, Announcing the List of Projects)

LAB2: Discussion on Project Approach and Communication (Session will be driven by the Facilitators)

LAB3: Win Your Project: A Presentation by Groups (Session will be driven by the Students)

LAB4: Project Plan Presentation by Groups (Session will be driven by the Students)

LAB5: Review of Weekly Status Reports by the Guide, and Discussions (Session will be driven by the Students)

LAB6: Progress Presentation by Groups, and Feedback by Guide and Co-Guide (Session will be driven by the Students)

LAB7: Review of Documentation File/Dossier, and Feedback by Guide

LAB8: Progress Presentation and Submission of Dossier Containing Documentary Notes

(E.g., compilation of weekly status reports, minutes, photocopies of emails, feedbacks, testimonials, photographs)

LAB 9: Presentation on the Project, Feedback by the Guide and Co-guide

LAB 10: Final Presentation by Groups in front of a Panel and Submission of Project Work

TEXT BOOK:

The Essential Guide to Doing your Research Project by O'LEARY (2011)

REFERENCES:

Logical Framework Analysis, Capacity Building Workshop for Dryland Management, May 3-5, 2000

Professional Presentations by Goodale (2007)

EVALUATION SYSTEM (CONTINUOUS INTERNAL ASSESSMENT)

Methods	Win Your Project	Project Plan Presentation	Weekly Reports	Progress Presentation	Project Presentation	Documentation	Project Report	% of Marks 100 (Best 5)
Total	20	20	20	20	20	20	20	100

S. No.	Topic	Pedagogy	Details	Instructional Hrs			
				Th	Pract	video	Proj
1	Introduction to the Lab Program	Project-based Learning Discussion Beyond the class Learning	Structure, Objective, Methodology, Objective of Choosing Project as a Vehicle to Learn the Course, Process of Carrying out the Project (Session will be driven by the Facilitators)	0	2	0	0
2	Announcing the List of Projects		Topics available in OSL (Moodle) http://cutmlanguagelab.org/	0	1	0	1
3	Project Approach & Communication		(Session will be driven by the Facilitators) https://www.youtube.com/watch?v=IybtFwYb7Oc	0	1	0	1
4	Win Your Project		Rationale for choosing the project topic What makes you say that you deserve the project?/ Why should we give you the project (Session will be driven by the Students)	0	1	0	1
5	Project Plan		Stakeholder Analysis, Objective Analysis, Situation Analysis, Problem Analysis, Strategy Analysis (Session will be driven by the Students)	0	1	0	1
6	6Review of Weekly Status		Dossier Verification/Reports by the Guide	0	1	0	1
7	Review of Progress	Project-based Learning Group	Progress Presentation by Groups, and Feedback by Guide and Co-Guide (Session will be driven by the Students)	0	1	0	1
8	Documentation Review	Presentation with Facilitator Beyond the class Learning	Review of Documentation File/Dossier, and Feedback by Guide	0	1	0	1
9	Progression Presentation	Project-based Learning	Progress Presentation and Submission of Dossier Containing Documentary Notes	0	1	0	1

	<i>and Report Submission</i>	<i>Presentation and Report Writing Beyond the class Learning</i>	<i>(E.g., compilation of weekly status reports, minutes, photocopies of emails, feedbacks, testimonials, photographs)</i>				
<i>10</i>	<i>Presentation on the Project</i>	<i>Project-based Learning Presentation Beyond the class Learning</i>	<i>Presentation on the Project, Feedback by the Guide and Co-guide</i>	<i>0</i>	<i>1</i>	<i>0</i>	<i>1</i>
<i>11</i>	<i>Project Work</i>	<i>Discussion</i>	<i>Performance Analysis</i>	<i>0</i>	<i>0</i>	<i>0</i>	<i>2</i>
<i>12</i>	<i>Communication</i>	<i>Discussion</i>	<i>Performance Analysis</i>	<i>0</i>	<i>2</i>	<i>0</i>	<i>0</i>

FCHU1206IT ENABLED COMMUNICATION

<i>Pre - requisites</i>	<i>Course Type</i>	<i>Credits</i>
<i>Nil</i>	<i>Workshop</i>	<i>2</i>

COURSE OBJECTIVE AND OUTCOME

Upon completing the syllabus, students should be able to:

- Speak confidently and fluently, in both formal and informal contexts.
- Write clearly, correctly and cogently
- Design and have a Home Page/Blog Space, Facebook Page and post comments/reports for collaboration & online presence
- Evolve from the role of an 'information provider', through 'motivator' and 'catalyst of change', to 'Change Agent'.

COURSE OUTLINE

MODULE I: CONCEPTUAL FOUNDATIONS

Pre-Course Assessment

Tell me a bit about yourself: Your background, your major, your professional aspirations ... your likes ... and maybe your favorite movie, and what you like to do in your spare time...

Do you know?

Introduction to IT Enabled Communication

Communication in the New Age Context and Demand for Communication Interventions

(This module includes pre-course assessments and presentations)

MODULE II: BLOG DESIGNING & POSTING

Step-by- Step to Writing a Blog: Researching, Brainstorming and Structuring, Writing, Posting, Editing and Accessorizing

Photoshop for Image, Editing and graphic design

(This module will be driven through methods like self-learning, learning by doing, and workshop)

MODULE III: TECHNOLOGY AND COMMUNICATION

Tools for Business Correspondence and web-based exercises

Creating and delivering high impact presentations with Slides and other Visuals

Video Documentaries

Video Conferencing Sites, Skype, Team Viewer

(This module will be facilitated through presentations, use of tools and technology)

TEXT BOOKS

Shirley Taylor, Model Business Letters (MBL) and Other Business Documents, 5th Edition.

Krizen. Merrier. Logan. Williams, Business Communication, and Thomson (BC: Krizen).

M.M. Monippally, Business Communication Strategies (BCS: MMM), TMH, New Delhi, 2001.

Arthur H. Bell & Dayle M. Smith, Management Communication (MC: AHB & DMS), Wiley Student Edition, 2005

LINKS

http://ctb.ku.edu/en/tablecontents/section_1017.htm

Useful websites for some topics will be linked to the course for improving language proficiency skills of the students.

www.a4esl.org

www.learnenglishfeelgood.com

EVALUATION SYSTEM (CONTINUOUS INTERNAL ASSESSMENT)

<i>Methods</i>	<i>Presenta- tion</i>	<i>Blog Design & Post</i>	<i>Video Documentary</i>	<i>E-mail Writing</i>	<i>Business Letters</i>	<i>Poster/ Template Design</i>	<i>Mid-Sem written Exam</i>	<i>% of Marks 100(Best 5)</i>
Total	20	20	20	20	20	20	20	100

MODULE I: CONCEPTUAL FOUNDATIONS (3HRS)

S. No.	Topic	Pedagogy	Details	Instructional Hrs			
				Th	Pract	video	Proj
1	Pre-Course Assessment [IT Enabled Communication]	Record pre-course assessments on communication management & technology by 'Probing & Doing'	Do you Know?	0	1	0	0
2	Tell me a bit about yourself	Know each other, and create a classroom philosophy through a game	Your background, your major, your professional aspirations ... your likes ... and maybe your favorite movie, and what you like to do in your spare time...	0	1	0	0
3	Communication in the New Age	Presentation	Context and Demand for Communication Interventions Explore top five social networking sites relevant to technology sector and present in the class, create and maintain online presence on Facebook, Google + or any other	0	1	0	0

MODULE II: BLOG DESIGNING & POSTING

S. No.	Topic	Pedagogy	Details	Instructional Hrs			
				Th	Pract	video	Proj
4	Step-by- Step to Writing a Blog - 1	Learning to Learn (Self-learning)	Researching	0	1	0	0
5	Step-by- Step to Writing a Blog - 2	Learning to Learn (Self-learning)	Brainstorming & Structuring	0	1	0	0
6	Step-by- Step to Writing a Blog - 3	Learning to Learn (Self-learning)	Writing & Posting	0	1	0	0
7	Step-by- Step to Writing a Blog - 4	Learning to Learn (Self-learning)	Editing & Accessorizing	0	1	0	0
8	Blog	Workshop (Self-learning)	One Day Workshop On Blog Design (CUTM e-content)	0	1	1	0
9	Blog Design	Posting assignments/ weekly reports/share what he/she has learnt (Doing)	Assignment: "Me in a Minute" blog post, email your blog's web address to the facilitators and peer group	0	1	0	0
10	Photoshop - 2	Self- Learning & Peer Learning	Editing and Graphic Design	0	1	1	0
11	Photoshop -3	Photoshop (FOSS) Training	Video tool www.spoken-tutorial.org	0	1	0	0
12	Photoshop	Workshop	One Day Workshop On Blog Design (CUTM e-content)	0	1	1	0

MODULE III: TECHNOLOGY AND COMMUNICATION

S. No.	Topic	Pedagogy	Details	Instructional Hrs			
				Th	Pract	video	Proj
13	Business Correspondence	Document Makeover, Web-based Exercises	Letters & Emails [Write to the point with correctness, conciseness, coherence and completeness]	0	1	0	0
14	Impress Presentation	Training and Practice	Language Laboratory Impress (FOSS)- Presentations (www.spoken-tutorial.org)	0	1	0	0
15	Enhancing presentation through slides and other visuals	Use of media for presenting the visual contents to reinforce the message, and create online presence	Equip the learners with techniques where they feel more confident in front of an audience Assignment [Improve the slides] Slide Share/ Upload on YouTube or Google +	0	1	0	0
16	Delivering High Impact Presentations	Video Recording & Peer Evaluation	Mastering the Art of Delivery, Preparing to Speak, Overcoming Anxiety, Handling Questions Watch-YouTube: Steve Jobs and iPod	0	1	0	0
17	Video Documentaries	Video documentary (Self- Learning)	Each student/group will make a short documentary movie (CSR, Facilities Labs, Student Projects etc.)	0	1	0	0
18	Making of Video Documentary	Workshop	One Day Workshop on Making Video Documentaries	0	1	1	0
19	Documentary Movie	10 min. video presentation by individuals/ groups	Feedback and Analysis	0	1	0	0
20	Video Conferencing	Free conference calls, webcam chat, video conferencing, group calls	Create Account & Practice [Skype, TeamViewer, Mobile]	0	1	0	0
21	Organize and Manage a Video Conference	Use video conference for business meetings Video conference etiquette & tips	Organise, Share & Collaborate	0	1	0	0

FCHU1207 CAREER COMMUNICATION

<i>Pre - requisites</i>	<i>Course Type</i>	<i>Credits</i>
<i>Nil</i>	<i>Workshop</i>	<i>2</i>

OBJECTIVES

- Prepare the graduates to acquire their dream jobs.*
- Build their mindset with right attitude, self-awareness, pro-activeness.*
- Build confidence, and enhance their communication skills to handle all situations.*

OUTCOMES

- Build the confidence of students*
- Trigger the thinking and analyzing ability of the learners to solve problems.*
- Readiness to work on their dream jobs.*

List of Experiments

LAB 1: Introduction to Career Communication

LAB 2: Presentation on Corporate House

Create an awareness and exposure on corporate life and culture.

Learners get exposure to corporate life and culture.

LAB 3: Corporate Quiz

LAB 4: Telephonic Conversation

Learners are equipped with basic knowledge and skill practice for improved telephonic communication.

LAB 5: Email Writing

Learn the characteristics of successful e- mail messages.

Create an effective e-mail message.

LAB 6: Mini Test on Email Writing

LAB 7: Learning Etiquette

Understand what etiquette is & why it's important.

Provide practical techniques and generally-accepted professional and ethical conduct or behaviour that will help create a favourable impression in social and professional life.

Practice proper manners like greeting, saying 'please', 'thank you'.

Appear professional and well groomed.

LAB 8 :Identifying Traits for Professional and Interpersonal Success

Understand the importance of effective interpersonal communication and traits for professional success.

Explore the significance of Active Listening, Problem Solving, Respect, Decision Making,

Empathy, Co-operation and Non-verbal communication for professional success.

LAB 9: Job-Application -Cover Letter

Develop the career writing skills of the learners with special emphasis on their interest in specific job positions, their strengths and what values they will bring to the organisation.

LAB 10: Job-Applications – CV

Produce a polished and impressive CV that can be tailored to each specific job application.

Develop the career writing skills of the learners with special emphasis on Statement of Purpose.

Provide with tools to showcase Unique Selling Points for the specified job description.

LAB 11: Participating in Group Discussion (GD)

Mock Interview on basic questions

LAB 12: Facing an Interview

EVALUATION SYSTEM (CONTINUOUS INTERNAL ASSESSMENT)

<i>Methods</i>	<i>Presentation</i>	<i>Corporate Quiz</i>	<i>Telephonic Conversation</i>	<i>Email Writing</i>	<i>CV</i>	<i>GD</i>	<i>Interview</i>	<i>% of Marks 100(Best 5)</i>
Total	20	20	20	20	20	20	20	100

SESSION PLAN: CAREER COMMUNICATION

S. No.	Topic	Pedagogy	Details	Instructional Hrs.			
				Th	Pract	video	Pro j
LA B-1	Introduction to Career Communication	Discussion	The Course introduces students to the resources and skills necessary for a successful job or internship search http://cutmlanguagelab.org/course/view.php?id=2	0	2	0	0
	Presentation on Corporate House	Team Presentation	Create an awareness and exposure on corporate life and culture. Learners get exposure to corporate life and culture. http://cutmlanguagelab.org/course/view.php?id=2 https://www.youtube.com/watch?v=g-_xABU21Yc	0	1	1	0
AB -3	Corporate Quiz	OSLL (Moodle) Quiz	This Corporate Quiz is an initiative to bring forth all the updates and insights from various industries. Through this quiz , students will be updated with the current happening in the present Corporate world http://cutmlanguagelab.org/course/view.php?id=2	0	2	0	0
LA B-4	Telephonic Conversation	Role play (Pair Work)	Learners are equipped with basic knowledge and skill practice for improved telephonic communication https://www.youtube.com/watch?v=mmXAqMQe0AI https://www.youtube.com/watch?v=6tfFRD0enV0	0	1	1	0
LA B-5	Email Writing	Doing	Learn the characteristics of successful e-mail messages. Create an effective e-mail message. http://cutmlanguagelab.org/course/view.php?id=2 https://www.youtube.com/watch?v=mmXAqMQe0AI	0	1	1	0
AB -6	Email Writing	Mini Test OSLL (Moodle)	(Questions from TCS) http://cutmlanguagelab.org/course/view.php?id=2 https://www.youtube.com/watch?v=LTKb5Fexcuk	0	2	0	0

S. No.	Topic	Pedagog	Details	Instructional Hrs.			
				Th	Pract	video	Pro j
LAB-7	Learning Etiquette	Demonstration Video	Understand what etiquette is & why it's important.	0	1	1	0

		<i>Analysis</i>	<i>Provide practical techniques and generally-</i>				
--	--	-----------------	--	--	--	--	--

			behaviour that will help create a favourable impression in social and professional life. http://cutmlanguagelab.org/course/view.php?id=2 https://www.youtube.com/watch?v=ieYuoQ9sMvA				
LAB -8	Identifying Traits for Professional and Interpersonal Success	Group Activity Video Analysis	Understand the importance of effective interpersonal communication and traits for professional success. Explore the significance of Active Listening, Problem Solving, Respect, Decision Making, Empathy, Co-operation and Non-verbal communication for professional success. http://cutmlanguagelab.org/course/view.php?id=2	0	1	1	0
LAB -9	Job-Application - Cover Letter	Document Makeover	Develop the career writing skills of the learners with special emphasis on their interest in specific job positions, their strengths and what values they will bring to the organisation. http://cutmlanguagelab.org/course/view.php?id=2 https://www.youtube.com/watch?v=37TbhadX0C8	0	2	0	0

FCHU1208PERSONALITY DEVELOPMENT

<i>Pre - requisites</i>	<i>Course Type</i>	<i>Credits</i>
<i>Nil</i>	<i>Workshop</i>	<i>2</i>

The laboratory aims at the promotion of the strategies for the personality development of the participants. The rationale behind this endeavor is the recognition of the multifaceted influence of the personality of the participants.

A student is required to take up five laboratory tests of 100 marks.

COURSE OBJECTIVE

Project the force of inner self, assert individuality, influence others and power to success.

COURSE OUTCOME

Learners develop a positive attitude and graceful personality.

LIST OF EXPERIMENTS

Lab 1: Self-Discovery/Self-Analysis

Identifying strengths and weaknesses through games and activities

Lab 2: Impression Management

Formation of impression, first and lasting impression, change: warm-up discussion

Lab 3: Body Language and Communication Style Profile Test

Lab 4 : Working on Attitude: Assertive, Aggressive, Passive

Measure your attitude, case study and role plays

Lab 5: Build Your Skills

Interpersonal Communication and Self

Lab 6: Team Building and Teamwork

Ice-breaker, test your team skills, exercise on stages of formation and effective teams

Lab 6: Explore Your Personality

Lab 7 : Motivation and Success

Ted talks, invited talks and success stories

Lab 8: Time Management

Identifying important time wasters, time management exercises

Lab 10 : Stress Management

Case-based discussions to identify causes of stress, and manage stress

Lab 11: Etiquette and Manners

Test your etiquette and manners, practice good manners

Lab 12 : Personality and Career Choice

Matching your career & personality

TEXT BOOKS:

Basic Managerial Skills for All, 9th Edition, E.H. McGrath, S.J.

Personality Development by [Harold R. Wallace & L. Ann Masters](#), 2006.

REFERENCES:

Personality Development by [John Aurther](#) .Reprint, 2009.

[Personality Development - Transform Yourself](#) by [Rajiv K. Mishra](#), 2004.

[Power of One - Personality and Self-Development](#) by [Dr. Abhishek Mishra](#), 2007.

EVALUATION SYSTEM (CONTINUOUS INTERNAL ASSESSMENT)

<i>Meth ods</i>	<i>Self- introductio n in sales pitch</i>	<i>Debate/ Extempor e</i>	<i>Presentatio n (USP)</i>	<i>Group Activity (Communicatio n)</i>	<i>Public Speaking on Current Topic</i>	<i>Case- based Discussion s</i>	<i>Motiva -tion Speech</i>	<i>% of Marks 100 (Best 5)</i>
Total	20	20	20	20	20	20	20	100

SESSION PLAN: PERSONALITY DEVELOPMENT

S. No.	Topic	Pedagogy	Details	Instructional Hrs			
				Th	Pract	video	Proj
1	Self-Discovery/Self-Analysis	Activity Based Learning	Game	0	2	0	0
2	Impression Management	Videos and interactions	<u>19 tips to impress others</u> https://www.buzzfeed.com/carolynkylstra/impress-literally-everyone-you-meet?utm_term=.nbz2MKVOJO#.qywdZLkQXO	0	1	1	0
3	Body Language and Communication Style Profile Test	Understanding of different postures and gestures through online test	http://www.queendom.com/queendom_tests/transfer	0	1	1	0
4	Working on Assertive, Aggressive, Passive	Role Plays and are Encouraged to watch videos	https://www.youtube.com/watch?v=O6eyUUKpoU8 Role plays	0	1	1	0
5	Build Your Skills	Videos	https://www.youtube.com/watch?v=w97dR3OJB1k http://www.investopedia.com/video/play/interpersonal-skills/	0	1	1	0
6	Team Building and Teamwork	Activity Based Learning	Coin Logo Time Required: 5-10 minutes Begin by asking all participants to empty their pockets, purses, and wallets of any coins they may have and place them on the table in front of them. If someone doesn't have any coins or only has very few, others in the room can share their coins with them. Instruct each person to create their own personal logo using the coins in front of them in just one minute. Other materials they may have on them, such as pens, notebooks, wallets, etc. can also be used in creation of the logo. If there is a particularly large group, people can be broken up into teams of 3-6 people and instructed to create a logo that represents them as a team or the whole room can gather to use the coins to create a logo for the organization/group/department/etc. Each solitary participant can explain their logo to the group or if the room was split into groups, the leader can have each group discuss what led to the team logo and what it says about them. Not only does this activity promote self and mutual awareness, but it also enables participants to get to know each other on a more personal level. http://www.livestrong.com/article/219775-team-building-exercises-for-small-groups/	0	1	1	0
7	Explore Your Personality	videos	https://www.16personalities.com/free-personality-test	0	1	1	0
8	Motivation		https://www.youtube.com/watch?v=ILEg5EZ	0	1	1	0

	<i>and Success</i>	<i>videos</i>	w3iQ https://www.youtube.com/watch?v=g-PNJHhf-ag				
9	<i>Stress Management</i>	<i>Classroom Exercise</i>	Time Wasters Exercise.pdf	0	1	0	0
10	<i>Etiquette and Manners</i>	<i>videos</i>	https://www.youtube.com/watch?v=55cXVve0Ipw for table manners https://www.youtube.com/watch?v=VLqKVfSG-bk for interview etiquette. https://www.youtube.com/watch?v=4-8AlriF908 for manners.	0	1	1	0

S. No.	Topic	Pedagogy	Details	Instructional Hrs			
				Th	Pract	video	Proj
11	<i>Personality and Career Choice</i>	<i>Classroom exercise</i>	rs_self-assessment.pdf	0	1	0	0
12	<i>Time Management</i>	<i>Group Activity</i>	<p>How long is a minute?</p> <p>At the beginning of session ask people to close their eyes for 30 seconds and after that to open it. Nobody can watch the clock and don't measure the time. Ask of participants to open their eyes after what they believe has been 30 seconds.</p> <p>Of course, they all open them at different times. Afterwards, we talk about our understanding of time. Even though everyone has an equal (24 hours a day or 30 seconds for exercise), in fact, we experience it and use it in different ways. Some of us experienced it as a short period, other as a long. This always works as a good opener.</p> <p>2) Cover all the clocks in the room, then ask participants to remove their wrist watches and stand up. Instruct them to sit down when they think 1 minute has elapsed after you shout "Start" to begin the countdown. You will be surprised with the results. Just enjoy the fun that follows this activity</p>	0	1	0	0

FCHU1209 SEMINAR AND TECHNICAL WRITING

<i>Pre - requisites</i>	<i>Course Type</i>	<i>Credits</i>
<i>Nil</i>	<i>Workshop</i>	<i>2</i>

Seminar allows students the opportunity to put all of information together. The students are required to prepare technical reports including oral presentations supported by written technical papers. Seminar is designed to assist students in preparing for their career.

COURSE OBJECTIVES

- Understand the requirements and ethics of technical writing in the 21st Century workplace.*
- Work professionally, individually and in a team to produce effective technical documents incorporating verbal, visual, and multimedia materials as necessary.*
- Communicate effectively by analyzing audience, organizing documents, writing clearly and precisely with no grammar errors and presenting the document with skillful design.*
- Locate, evaluate, and incorporate pertinent information.*
- Write clear, intelligent technical reports*
- Make seminar presentations*

COURSE OUTCOMES

- Understand how technical communication is used in the workplace.*
- Understand and use the principles of design in business and technical communication.*
- Apply useful descriptive language to your technical documents.*
- Students will gain experience in preparing a technical report including an oral presentation supported by a written technical paper.*

MODULE-I: TECHNICAL COMMUNICATION ESSENTIALS

COURSE OUTCOMES

- Describe the writing process most useful in today's technical writing environment.*
- Analyze an audience and consider appropriate writing situations to meet the audience's needs.*
- Understand the ethics of the workplace and apply those ethics to their technical and business writing.*

OUTLINE: Communicating in the Workplace, Technical Writing Process Today, Readers and Contexts of Use, Ethics in the Technical Workplace

MODULE- II: DOCUMENT DESIGN

COURSE OUTCOMES

- Create and use graphics that complement your business and technical communication.*

OUTLINE: Designing Documents and Interfaces, Creating and Using Graphics

MODULE-III: TECHNICAL COMMUNICATION STRATEGIES AND RESEARCHED REPORT WRITING

COURSE OUTCOMES

- Define terms clearly in technical documents.*
- Explain instructions and processes clearly.*
- Write clear proposals for business and technical situations.*
- Research and manage information.*
- Write an analytical report.*

OUTLINE: Researching and Managing Information, Organizing and Drafting, Technical Definitions, Technical Descriptions, Instructions and Documentation, Proposals, Analytical Reports

MODULE-IV: SEMINAR PRESENTATION

COURSE OUTCOME

- Students will not only learn from the experience gained in preparing and presenting their seminar, but will have the opportunity to observe and participate in the seminar given by their classmates.*

OUTLINE: Technical Report, Seminar Presentation

(Planning, Preparing, Organizing and Seminar Presentation are the 4 stages of this module)

TEXT BOOK:

Gerson, Sharon J. and Gerson, Steven M. (2007). *Technical Writing Process and Product*. Delhi: Pearson Education.

REFERENCES:

Effective Technical Communication, M. Ashraf Rizvi, TMH Publications.

Business Communication Today, Courtland L Bovee, John V Thill & Mukesh Chaturvedi, Pearson Education.

EVALUATION SYSTEM (CONTINUOUS INTERNAL ASSESSMENT)

Methods	Proposal Writing	Report Writing	Organizing Seminar	Document Formatting	Preparing a Technical Paper	Seminar Presentation-I	Seminar Presentation-II	% of Marks 100 (Best 5)
Total	20	20	20	20	20	20	20	100

SESSION PLAN: SEMINAR AND TECHNICAL WRITING

S. No.	Topic	Pedagogy	Details	Instructional Hrs			
				Th	Pract	video	Proj
1	Introduction to Technical Writing	Activity Based Learning	Writing Genres: Technical versus non-technical writings https://www.youtube.com/watch?v=LTDsgd0ytbE	0	1	0	0
2	Preparing to Write	Doing	Audience Analysis Brainstorming Organizing information Link: https://www.youtube.com/watch?v=wxKJT13EhuM	0	1	0	0
3	Gathering information	Google Search	How do we gather information? Ways, techniques and tools	0	2	0	0
4	Focusing on Writing Skills	Workshop	Brainstorming, Drafting, Editing	0	2	0	0
5	Technical Writing Conventions	Analysis and Discussion	Analysis of different case studies	0	1	0	0
6	Reporting	Learning to Learn Analysis and Discussion	FORMAT: Preliminary pages, Summary, Main section, Conclusion, Recommendations References	0	2	0	0

S. No.	Topic	Pedagogy	Details	Instructional Hrs			
				Th	Pract	video	Proj
7	Using and interpreting Graphics	Group work and Discussion	Matching Games : Texts and graphic types	0	2	0	0
8	Document Formatting	Workshop	Layouts Use of MS Word for Documenting	0	2	0	0

			Document templates APA Format (6th) - Microsoft Word 2010 https://www.youtube.com/watch?v=aWT9zgMPyiY				
9	Documentation	Workshop	Documenting Sources: https://www.youtube.com/watch?v=-H2fRG_Rtns	0	2	0	0
10	Introduction to Seminar	Discussion	Seminar : Needs and ways of preparation Video : https://www.youtube.com/watch?v=Rz2II40tQuI	0	1	0	0
11	Questioning Skills	Workshop	Asking and Responding to questions in Seminars TED TALK: https://www.youtube.com/watch?v=PkcHstP6Hi0	0	2	0	0
12	Analysis of various Seminars	Videos and Discussion	Analysis of Seminars: Pros and Cons How to make a seminar effective? https://www.youtube.com/watch?v=x7qPAY9JqE4	0	1	1	0
13	Preparing for a Seminar	Group Work	Grouping Selection of topics	0	1	0	0
14	Collection of Information	Workshop	Primary and secondary sources Preparing sample PPTs	0	2	0	0
15	Seminar Presentation-I	Group Work	Demonstration and Discussion	0	2	0	0
16	Seminar Presentation-II		Demonstration and Discussion	0	2	0	0

FCHU1210PROFESSIONAL ETIQUETTE

<i>Pre - requisites</i>	<i>Course Type</i>	<i>Credits</i>
<i>Nil</i>	<i>Workshop</i>	<i>2</i>

Etiquette begins with meeting and greeting. Good professional etiquettes indicate that you are a mature responsible, adult who can aptly represent any organization. Etiquettes center upon respect.

COURSE OBJECTIVES

- To recognize the importance of proper etiquette at workplace*
- To understand the elements and characteristics of proper etiquette*
- To behave professionally and gain respect*
- To develop an action plan to improve professionalism*

COURSE OUTCOMES

At the end of this course students would be able to learn:

- Professional behavior, standards for appearance, action and attitude in a business environment*
- Handle a variety of social and business situation*
- Different styles of communication based on different situations.*

MODULE- I: MEETING AND GREETING ETIQUETTE, OFFICE ETIQUETTE (7hrs)

- Personal Branding and First Impressions
- Introducing yourself and introducing a guest
- Professionalism at office
- Language styles, tone and attitude

MODULE-II: COMMUNICATION EXCELLENCE (7hrs)

- Techno Etiquette
- Phone Etiquette
- Email Etiquette
- Social Media Etiquette

MODULE-III: NETWORKING ETIQUETTE (6hrs)

- Business Card Etiquette
- Names
- Titles
- Net Etiquette
- Proper Introductions

MODULE-IV: BUSINESS ETIQUETTE (7)

- Presentation Etiquette
- Meeting Etiquette
- Dining Etiquette
- Global Etiquette

TEXT BOOK:

The New Etiquette, Real Manners for Real People in Real situations- An A-to-Z Guide by Marjabella Young Stewart, St. Martin Griffin.

Soft Skills, Know Yourself and the World, K.Alex.

REFERENCES:

Do's and Taboos of Hosting International Visitors, Roger E. Axtell, John Wiley & Sons, Inc.

Breaking through Culture Shock: What You Need to Succeed in International Business by Elisabeth Marx.

Dos and Taboos of International Trade by Roger E. Axtell, John Wiley & Sons, Inc. The Art of Writing Effective E-mails, Jayprakash, Sajitha, Himalayan Publications. International Communication Management-Individual & Organizational Outcomes by Antonio Ragus, Bookboon, 2010.

Business Communication for Success by Scott Mac Lean, Flat World Knowledge, 2010.

Effective Technical Communication, M. Ashraf Rizvi, TMH Publications.
EVALUATION SYSTEM (CONTINUOUS INTERNAL ASSESSMENT)

Methods	Introducing others, Small Talk	Role Play in formal & informal situations	Presentation	Telephonic interview	Email	Mock Meeting	Quiz on Professional Etiquette	% of Marks 100(Best 5)
Total	20	20	20	20	20	20	20	100

LESSON PLAN: PROFESSIONAL ETIQUETTE

S. No.	Topic	Pedagogy	Details	Instructional Hrs			
				Th	Pract	video	Proj
MODULE 1: MEETING & GREETING ETIQUETTE, OFFICE ETIQUETTE							
1	Personal Introduction	Role play on formal situation with proper introduction	http://smallbusiness.chron.com/first-impressions-business-etiquette-2908.html	0	1	0	0
2	Introducing Others	Knowing each other Fish bowl game	http://www.fasset.org.za/downloads/Office_Etiquette_Material/Handbook_Essential_Office_Etiquette.pdf				
3	Basics of Etiquette	Video clips Small skits	http://www.fasset.org.za/downloads/Office_Etiquette_Material/Handbook_Essential_Office_Etiquette.pdf	0	1	0	0
4	Interpersonal Etiquette	Video clips Activity on using speech acts with appropriate body language Guessing game	http://www.fasset.org.za/downloads/Office_Etiquette_Material/Handbook_Essential_Office_Etiquette.pdf	0	1	0	0
5	Professionalism And Front Office Etiquette	Video Clips Role play on front office management on their dream company Quiz	http://careerplanning.about.com/od/workplacesurvival/a/professionism.htm http://www.octech.edu/sites/www/Uploads/files/TRIO/Professionalism%20in%20the%20Workplace.pdf	0	1	0	0
6	Professional Conduct	Conversational practice and SWOT Analysis in pair/group task	http://www.fasset.org.za/downloads/Office_Etiquette_Material/Handbook_Essential_Office_Etiquette.pdf	0	1	0	0
7	Professionalism And Front Office Etiquette	Video Clips Role play on front office management on their dream company Quiz	http://careerplanning.about.com/od/workplacesurvival/a/professionism.htm http://www.octech.edu/sites/www/Uploads/files/TRIO/Professionalism%20in%20the%20Workplace.pdf	0	1	0	0
8	Formal & Informal Attire	Communication Game Quiz	http://www.fasset.org.za/downloads/Office_Etiquette_Material/Handbook_Essential_Office_Etiquette.pdf	0	1	0	0
9	Language Etiquette And Attitude	Enactment in different formal situations with appropriate communication styles	http://www.english.wisc.edu/rfyoung/336/attitudes.pdf https://blog.udemy.com/communication-styles/ http://www.english.wisc.edu/rfyoung/336/attitudes.pdf	0	1	0	0
10	Techno	Conversational	http://theedgeexecutivecoaching.com/arti	0	1	0	0

	<i>Etiquette</i>	<i>practice and Small skits</i>	cles/etiquette/techno-etiquette/# Question & Answers :http://www.workforce.com/articles/q-a-about-techno-etiquette				
11	<i>Smart Phone Etiquette</i>	<i>Dialogue Exchange Telephonic Quiz</i>	http://www.talkenglish.com/LessonPractice.aspx?ALID=483	0	1	0	0
12	<i>Email Etiquette Social Media Etiquette</i>	<i>Video Clips Written task practice Group work Debate</i>	http://www.businessemailletiquette.com/business-e-mail-etiquette-basics/ http://www.realsimple.com/work-life/work-life-etiquette/manners/social-media-etiquette http://www.moneycrashers.com/social-media-etiquette-tips-personal-business/ Video : https://www.youtube.com/watch?v=RFZwtkoNGrk https://www.youtube.com/watch?v=ootxiibcOWc	0	0	1	0

MODULE II: COMMUNICATION EXCELLENCE (7 HOURS)

S. No.	Topic	Pedagogy	Details	Instructional Hrs			
				Th	Pract	video	Proj
10	<i>Techno Etiquette</i>	<i>Conversational practice and Small skits</i>	http://theedgeexecutivecoaching.com/articles/etiquette/techno-etiquette/# Question & Answers :http://www.workforce.com/articles/q-a-about-techno-etiquette	0	1	0	0
11	<i>Smart Phone Etiquette</i>	<i>Dialogue Exchange Telephonic Quiz</i>	http://www.talkenglish.com/LessonPractice.aspx?ALID=483	0	1	0	0
12	<i>Email Etiquette Social Media Etiquette</i>	<i>Video Clips Written task practice Group work Debate</i>	http://www.businessemailletiquette.com/business-e-mail-etiquette-basics/ http://www.realsimple.com/work-life/work-life-etiquette/manners/social-media-etiquette http://www.moneycrashers.com/social-media-etiquette-tips-personal-business/ Video : https://www.youtube.com/watch?v=RFZwtkoNGrk https://www.youtube.com/watch?v=ootxiibcOWc	0	0	1	0

MODULE-III NETWORKING ETIQUETTE (6HRS)

S. No.	Topic	Pedagogy	Details	Instructional Hrs			
				Th	Pract	video	Proj
13	<i>Netiquette</i>	<i>Written Assignment Drafting Email</i>	http://jillbremer.com/articles/etiquette/techno-etiquette/ http://www.slideshare.net/MarcellineChitolie/techno-etiquette-final-copy	0	1	1	0
14	<i>Business Card</i>	<i>Presentations and</i>	http://www.careerealism.com/3-rules-	0	1	1	0

	<i>Etiquette</i>	<i>small group work</i>	to-smart-business-card-etiquette/				
15	<i>Forms of Addressing</i>	<i>Written assignment Scrabble and puzzles</i>	http://www.talkenglish.com/LessonPractice.aspx?ALID=483	0	1	1	0

MODULE IV: BUSINESS ETIQUETTE (7 hours)

S. No.	Topic	Pedagogy	Details	Instructional Hrs			
				Th	Pract	video	Proj
16	<i>Present ation Etiquette</i>	<i>Demonstration</i>	http://dianegottsman.com/2013/11/business-etiquette-9-powerful-presentation-tips/ http://dianegottsman.com/2012/07/stand-and-deliver-ten-tips-to-delivering-a-powerful-presentation/	0	1	1	0
17	<i>Meeting Etiquette</i>	<i>Mock Meeting</i>	http://businessculture.org/northern-europe/uk-business-culture/meeting-etiquette/ http://www.fasset.org.za/downloads/Office_Etiquette_Material/Handbook_Essential_Of_fice_Etiquette.pdf	0	1	1	0
18	<i>Dinning Etiquette</i>	<i>Activity on- Playing the role of the Host/Hostess, Playing the role of the Guest</i>	Rizvi, ETC, pp.139-164 Soft Skill, Dr.K.Alex-pp-203-219	0	1	1	0

S. No.	Topic	Pedagogy	Details	Instructional Hrs			
				Th	Pract	video	Proj
19	<i>Golden Rules of Global Etiquette</i>	<i>Discussion and Activity</i>	<i>Developing intercultural skill</i> http://www.kwintessential.co.uk/cultural-services/articles/international-business-etiquette.html http://www.kwintessential.co.uk/resources/country-profiles.html http://www.forbes.com/sites/susanadams/2012/06/15/business-etiquette-tips-for-international-travel/ http://www.marcaria.com/international-business-etiquette-customs-and-culture.asp	0	1	1	0
20	<i>Doubt Clearing</i>	<i>One-to-One Interaction</i>	<i>Practice</i>	0	1	0	0
21	<i>Recap</i>	<i>Discussion</i>	<i>Performance Analysis</i>	0	1	0	0

FCHU1211 CREATIVE WRITING

<i>Pre - requisites</i>	<i>Course Type</i>	<i>Credits</i>
<i>Nil</i>	<i>Workshop</i>	<i>2</i>

The aim of the course is to prepare students for careers in a workplace that is information-rich and that increasingly values communication skills and the ability to think creatively and critically. The class time will be devoted to writing workshop, innovation exercises, and the critical appreciation of write-ups. The Creative Writing course will focus on

Reading

Writing Creatively

Presentations

Thus the main objective is to breed a culture of learning where students learn a variety of approaches to creative writing in a cooperative learning environment.

COURSE OBJECTIVES

Develop thinking skills

Acquire basic skills and techniques to develop a suitable practice of creative writing in context

Use a constructive approach to critique his/her own work, as well as work by his/her peers

Organize, prepare and present spoken presentations clearly and expressively

COURSE OUTCOMES

Upon the Completion of the course, a student will

Create Blog/ Online Presence

Submit works for publication

Compose a variety of written responses for different purposes and audiences

Collaborate by sharing ideas, examples and insights, productively and respectfully in informal conversations and discussions.

Students will put into practice the learning into the personal, professional and technical sphere.

MODULE -I: WRITING CREATIVELY (12hrs)

Foundational activities

Introduction to Class Standards

(Workshops, peer conferencing, blogging, reading outside the classroom)

Collaborative Creation of Classroom Philosophy

Basics of Creative Writing

Different forms of expression

Memoirs/Writing the Personal Narratives

Situational Writing/ Writing for the Target Audience

Dialogues, Essay, Poetry Slam

Script Writing

Writing for Blogs

Cooking Up Interview Stories

Writing from visuals

Pictures, Graphs, Images, Diagrams and Designs, Cartoons

Brochures and Newsletters

(This module will be facilitated through creative writing and speaking activities)

MODULE-II: READING AND CRITICAL APPRECIATION (8hrs)

Book

(Independent Study: Two Master Piece)

Article

Movie

(Student Work: Free Choice, Discussion and Oral/ Written Critiquing, Editing/ Revision

Publication/ Sharing, Short Report on Two Authors

(This module will be facilitated through reading activities and critical appreciation)

MODULE-III: POWER OF LATERAL THINKING TO CREATE NEW IDEAS (7hrs)

General Concepts: Creativity and Lateral Thinking
 Using the Technique of Lateral Thinking in Writing
 Idea Generation Games and Activities
 Six Thinking Hats

(This module will be facilitated through idea generation activities and presentation)

TEXT BOOKS

Creative Writing: A Workbook with Readings- Linda Anderson

Creative Writing- By DevAnjanaNeira

REFERENCES

The Cambridge Companion to Creative Writing by David Morley, Philip Neilsen

Creative Writing- By Adele Ramet

The Creative Writing Mfa Handbook: A Guide for Prospective Graduate Students By Tom Kealey

EVALUATION SYSTEM (CONTINUOUS INTERNAL ASSESSMENT)

Methods	Memoirs	Essay/ Dialogue Writing	Slam Poetry	Script Writing	Writing for Blog	Presentation from Visuals	Cooking up Interview Stories	% of Marks 100(Best 5)
Total	20	20	20	20	20	20	20	100

**SESSION PLAN: CREATIVE WRITING
 MODULE-1 : WRITING CREATIVELY (12 hours)**

S. No.	Topics	Pedagogy	Details	Instructional Hrs			
				Th	Prac t	Vide o	Proj
1	Foundational activities Introduction to Class Standards (Workshops, peer conferencing, blogging, reading outside the classroom)	Conversatio nal practice, Role Plays	https://www.teachingchannel.org/videos/peer-conferencing https://blogging.org/	0	2	0	0
2	Collaborative Creation of Classroom Philosophy	Group tasks	http://writing-speech.dartmouth.edu/teaching/first-year-writing-pedagogies-methods-design/collaborative-learninglearning-peers	0	2	0	0
3	Basics of Creative Writing	Video links /Practice	https://www.earlham.edu/media/894432/creative_writing_rules.pdf http://www.idiotsguides.com/education/creative-writing/creative-writing-basics/ https://www.youtube.com/watch?v=syuuXYpV4zA	0	2	0	0
4	Different forms of expression Memoirs/Writing the Personal Narratives Situational Writing/ Writing for the Target Audience	Group work, writing, video links ,	http://classroom.synonym.com/between-memoir-personal-narratives/ https://www.youtube.com/watch?v=PLHkuSpJxPs	0	2	0	0

			toKkWas https://www.youtube.com/watch?v=zJGX2raiafU				
5	Dialogues, Essay, Poetry Slam	Role Plays, Written tasks	https://en.wikipedia.org/wiki/Poetry_slam Examples of poetry slams : http://www.poetrysoup.com/poems/best/slam https://www.writersstore.com/how-to-write-a-screenplay-a-guide-to-scriptwriting/	0	2	0	0
6	Script Writing Writing for Blogs	Writing tasks individual/pairs Video links Blog writing practice	https://www.youtube.com/watch?v=XZszextv6yE BLOGS https://www.youtube.com/watch?v=t21sKonfylk https://www.themuse.com/advice/6-types-of-stories-you-should-have-on-hand-for-job-interviews	0	2	0	0
7	Cooking Up Interview Stories		http://lifehaecker.com/prepare-these-15-stories-for-your-next-job-interview-1610270959 https://www.themuse.com/advice/the-interview-technique-you-should-be-using https://twp.duke.edu/uploads/assets/Using%20Visual%20Rhetoric%20in%20Academic%20Writing.pdf	0	1	0	0
8	Writing from visuals Pictures, Graphs, Images, Diagrams and Designs, Cartoons Brochures and Newsletters		https://www.youtube.com/watch?v=r6ZVGBQYNXE	0	1	0	0

MODULE-II: READING AND CRITICAL APPRECIATION (8 HOURS)

S. No.	Topics	Pedagogy	Details	Instructional Hrs			
				Th	Pract	Vide o	Proj
9	Book (Independent Study: Two Master Piece)		http://www.howtolearn.com/2012/08/different-reading-techniques-and-when-to-use-them/	0	2	0	0
10	Article writing			0	2	0	0
11	Movie Review (Student Work: Free Choice, Discussion and Oral/ Written Critiquing, Editing/ Revision)			0	1	1	0
12	Publication/ Sharing, Short Report on Two Authors		https://www.elsevier.com/authors/book-authors/science-and-technology-book-publishing/overview-of-the-publishing-process	0	2	0	0

MODULE-III: POWER OF LATERAL THINKING TO CREATE NEW IDEAS (7hrs)

S. No.	Topics	Pedagogy	Details	Instructional Hrs			
				Th	Prac	Vide	Proj
13	General Concepts: Creativity and Lateral Thinking	Role Plays/ Oral Presentations Practice	www.brainstorming.co.uk/tutorials/definitions.html http://www.trainingcoursematerial.com/free-training-articles/creativity-problem-solving-decision-making-and-lateral-thinking/defining-lateral-thinking-parallel-thinking-creativity-and-innovation Video https://www.youtube.com/watch?v=H7PyFNzPSVY	0	1	1	0
14	Idea Generation Games and Activities	Pair/group activities	http://study.com/academy/lesson/what-is-idea-generation-definition-process-techniques.html	0	1	1	0
15	Six Thinking Hats	Group task	http://www.debonogroup.com/six_thinking_hats.php	0	1	1	0

16 DOUBT CLEARING

0 1 0 0

FCHU1212ENGLISH FOR COMPETITION (GRE/GMAT/TOEFL/IELTS)

<i>Pre - requisites</i>	<i>Course Type</i>	<i>Credits</i>
<i>Nil</i>	<i>Workshop</i>	<i>2</i>

COURSE OBJECTIVE

Familiarize the learners with the pattern of the TOEFL/GMAT/IELTS/GRE examination and improve overall English skills to face the competitive exams confidently.

COURSE OUTCOME

Learners understand the pattern of the TOEFL, IELTS and GRE examination and apply test-taking strategies in exams.

A student is required to take up five laboratory tests of 100 marks.

LIST OF EXPERIMENTS

1: TOEFL Listening

Developing Listening Comprehension by taking notes after the short recorded conversations.

2: TOEFL Speaking

Developing test taking strategies to face speaking test of TOEFL exam through role play and Mock Interview.

3: TOEFL Reading

Practicing and improving student's confidence in completing the various sections of reading test in TOEFL examination.

4: TOEFL Writing

Learning and enhancing writing skills required for TOEFL writing test.

5: IELTS Listening

Practicing the listening comprehension of the students and handling questions while listening to the recorded conversations.

6: IELTS Speaking

Developing test taking strategies to face speaking test of IELTS examination through role plays and mock interviews.

7: IELTS Writing

Summarizing or explaining information presented in a graph, chart, table or diagram.

8: IELTS Reading

Understanding and interpreting the text in its particular use of language, ideas and style.

9: GRE Reading Comprehension

Taking GRE Reading Comprehension examination with confidence utilizing the methods and strategies.

10: GRE SENTENCE COMPLETION

Developing sentence completion strategies through logical thinking.

11: GRE SENTENCE EQUIVALENCE

Learning and developing strategies to deal with sentence equivalence questions.

12: GRE VOCABULARY

Understanding and using appropriate choice of vocabulary in GRE vocabulary section.

13. GRE Vocabulary & Verbal-Sentence Corrections

14. GMAT Verbal-Critical Reasoning

15. GMAT Verbal- Reading Comprehension

(The entire lab will be facilitated through online quizzes, and practice sets available in language lab))

TEXT BOOKS:

NorthStar Building Skills for the TOEFL iBT, High Intermediate Level (Pearson Education).

NorthStar Building Skills for the TOEFL iBT, Intermediate Level (Pearson Education).

McGraw-Hill's New GRE: 2011-2012 Edition

Princeton Review: Cracking the New GRE 2012

REFERENCES:

- Longman Preparation Course for the TOEFL Test – iBT Speaking (Pearson Education).
 Longman Preparation Course for the TOEFL Test – iBT Listening (Pearson Education).
 Longman Preparation Course for the TOEFL Test – iBT Writing (Pearson Education).
 Longman Preparation Course for the TOEFL Test – iBT Reading (Pearson Education).
 NorthStar Building Skills for the TOEFL iBT, Advanced Level (Pearson Education).
 Achieve IELTS Workbook: Intermediate to Upper Intermediate: English for International Education (Achieve IELTS Intermediate/Upper) (Paperback).
 Kaplan New GRE Premier 2011-2012
 Barron's New GRE 19th Edition Grade
 Manhattan GRE
 Gruber's Complete GRE Guide 2012
 Nova's GRE Prep Course Grade
 ETS's Official Guide to the GRE Revised General Test
 Barron's GRE Verbal Workbook
 Barron's IELTS with Audio CD: International English Language Testing System (Paperback)
 Achieve IELTS Teacher's Book: Intermediate to Upper Intermediate: English for International Education (Achieve IELTS Intermediate/Upper) (Paperback)
 Step Up to IELTS Self-study Student's Book [STUDENT EDITION] (Paperback)
 IELTS Collected Papers: Research in speaking and writing assessment (Studies in Language Testing) (Paperback)

EVALUATION SYSTEM (CONTINUOUS INTERNAL ASSESSMENT)

<i>M</i> <i>et</i> <i>h</i> <i>o</i> <i>ds</i>	<i>Listenin</i> <i>g & fill-</i> <i>up</i> <i>blanks,</i> <i>short</i> <i>answers</i> <i>, Multipl</i> <i>e-</i> <i>choice</i>	<i>JAM/</i> <i>Questions</i> <i>&</i> <i>Responses</i>	<i>Vocabulary</i> <i>Quiz,</i> <i>Sentence</i> <i>Completion</i> <i>& Re-order</i> <i>paragraphs</i>	<i>Reading</i> <i>Comprehension</i>	<i>Summarize</i> <i>/Data</i> <i>Comment</i>	<i>Essay</i> <i>Writing</i>	<i>Analytical</i> <i>Writing</i>	<i>% of Marks</i> <i>100</i> <i>(Best 5)</i>
<i>T</i> <i>ot</i> <i>al</i>	20	20	20	20	20	20	20	100

SESSION PLAN: ENGLISH FOR COMPETITION

<i>S.</i> <i>No</i> <i>.</i>	<i>Topic</i>	<i>Pedagogy</i>	<i>Details</i>	<i>Instructional Hrs</i>			
				<i>Th</i>	<i>Pract</i>	<i>video</i>	<i>Pro</i> <i>t</i>
1	TOEFL Listening	Listening Activity Based Learning	http://www.examenglish.com/TOEFL/toefl_listening.htm	0	1	1	0
2	TOEFL Speaking	Listening and speaking activity	http://www.examenglish.com/TOEFL/TOEFL_Speaking_part5.htm	0	1	1	0
3	TOEFL Reading & Writing	Reading and Writing Practice	http://www.examenglish.com/TOEFL/TOEFL_reading1.htm (Reading) https://www.englishclub.com/esl-exams/ets-toefl-practice-writing.htm .	0	2	0	0

			http://www.time4writing.com/toefl/ (Writing)				
4	IELTS Listening	Listening Practice	http://takeielts.britishcouncil.org/prepare-your-test/free-ielts-practice-tests/listening-practice-test-1	0	1	1	0
5	IELTS Speaking	Speaking Practice	http://takeielts.britishcouncil.org/prepare-your-test/free-practice-tests/speaking-practice-test-1	0	2	0	0
6	IELTS Writing & Reading	Writing & Reading Practice	http://takeielts.britishcouncil.org/prepare-your-test/free-practice-tests/writing-practice-test-1-ielts-academic http://takeielts.britishcouncil.org/sites/default/files/Writing_practice_test_1_1_IELTS_Academic_questions.pdf (writing) http://takeielts.britishcouncil.org/prepare-test/practice-tests/reading-practice-test-1-academic (Reading)	0	2	0	0
7	GRE Reading Comprehension	Reading Practice	http://gre.graduateshotline.com/reading_comprehension_practice.html#.V2kJDRITXCM https://www.ets.org/gre/revised_general/prepare/verbal_reasoning/reading_comprehension/sample_questions	0	2	0	0
8	GRE Sentence Completion & Sentence Equivalence	Online practice	http://gre.graduateshotline.com/gre_sentence_completion.pl https://www.ets.org/gre/revised_general/prepare/verbal_reasoning/text_completion/sample_questions http://www.examfocus.com/gre/pt/verbal/sentence-equivalence-1.html	0	2	0	0
9	GRE Vocabulary	Online practice	http://gre.graduateshotline.com/	0	2	0	0
10	GMA Verbal-Sentence Corrections	Online practice	http://freegmattest.net/Questions http://www.majortests.com/gmat/sentence_correction.php	0	2	0	0
11	GMAT Verbal-Critical Reasoning	Online practice	http://www.majortests.com/gmat/critical_reasoning_test01	0	2	0	0
12	GMAT Verbal-Reading Comprehension	Online practice	http://www.majortests.com/gmat/reading_comprehension_test01	0	2	0	0

FCHU1213BE A CONTRIBUTOR

<i>Pre - requisites</i>	<i>Course Type</i>	<i>Credits</i>
<i>Nil</i>	<i>Workshop</i>	<i>2</i>

PROGRAM OBJECTIVES:

1. Build consciousness of ‘contributor thinking’ in students systematically by exposing them to the essential building blocks of contributor thinking. [The 4 sets of the program represent the 4 fundamental building block of the program]
2. Through projects expose students to the ‘realness’ of contributor way of thinking in the world around them.

SESSION PLAN:

Semester 1 of program delivery	SET 1: CONTRIBUTOR BASICS	
	UNIT 1: Who is a Contributor?	~5hrs
	UNIT 2: Scope of Contribution (<i>Self, Organization, Society</i>)	~5hrs
	UNIT 3: Depth of Contribution (<i>From ‘opportunities to contribute’ to a ‘life of Purpose’</i>)	~5hrs
	SET 2: BASIC AXIOMS OF LIFE	
	UNIT 4: The Contributor’s Response (<i>From ‘victim’ to ‘creator of my destiny’</i>)	~5hrs
	UNIT 5: The Contributor’s Identity (<i>From ‘static identities’ to ‘dynamic identities’</i>)	~5hrs
Semester 2 of program delivery	UNIT 6: The Contributor’s Vision of Success & Career (<i>From an ‘acquisitive vision’ to a ‘contributive vision’</i>)	
	SET 3: CONTRIBUTOR EFFECTIVENESS	
	UNIT 7: Engage Deeply	~5hrs
	UNIT 8: Design Solutions	~5hrs
	UNIT 9: Create Value	~5hrs
	SET 4: CONTRIBUTOR CONDUCT	
	UNIT 10: Thinking Win-win (Enlightened Self-Interest)	~5hrs
UNIT 11: Thinking Human-impact (Imaginative Sympathy)	~5hrs	
UNIT 12: Building Trust-surplus (Trust Behaviors)	~5hrs	
Full program duration		~60hrs

1.0 | Faculty can utilise the 5 hours of classroom as follows –

<p>i. The Class Engagement Books (for each unit)</p>	
<p>ii. The Program App (Channel Illumine App)</p>	<p>~ 4hrs for Book and App engagement.</p>
<p>iii. Projects (for each unit)</p> <p>Students can do 1-2 projects in each semester. The project is done out of class. In-class time is only for student presentation.</p>	<p>~1hr for project presentations</p>

Source: This document is an abridged version of 'Overview of Become a Contributor Program' given in your Facilitator Guide. It is strongly recommended that faculty refer the detailed Facilitator Guide for more details.

EVALUATION PARAMETERS (Total-100 Marks)

A] ENGAGEMENT IN CLASS		40 marks
1	Regular attendance across classes	10 marks
2	Quality of class participation (<i>involvement in discussions, asking thoughtful questions, sharing examples, etc.</i>)	15 marks
3	In-class assignments · <i>Students can be asked to submit their filled books for specific in-class assignments (Illumine can provide a list of which class engagements in each book, can be checked for this)</i> · <i>Any 4 books (one from each set), can be considered for marking.</i>	15 marks
B] PROJECT WORK · <i>Project assignments are provided by Illumine for the course.</i> · <i>Mark students on their best 3, from these project assignments.</i>		30 marks
1	Completion & submission of assigned projects, with basic quality	10 marks
2	Design and execution of the project (Methodology of project work) (<i>students present how they went about the project – their approach, method, documentation of research work</i>)	10 marks
3	Project presentation & project output uploads (<i>assessed against the project goal</i>)	10 marks
C] PRE & POST TEST		20 marks
1	Completion of pre-test	5 marks
2	Completion of post-test	5 marks
3	Improvement (sent by Illumine, based on test results)	10 marks
D] APP USAGE (sent by Illumine, based on app usage pattern)		10 marks

FCHU0210 LIFE SKILLS DEVELOPMENT-I [English]

<i>Pre - requisites</i>	<i>Course Type</i>	<i>Credits</i>
<i>Nil</i>	<i>Practice</i>	<i>2</i>

OBJECTIVES

To provide ample opportunities for practice

To approach reading comprehension questions and improve your vocabulary

OUTCOME

To qualify competitive exams

MODULE I: (24 HOURS)

s No.	Topic	Pedagogy	Details	Instructional Hrs			
				Th	Pract	video	Pro j
1	Reading Comprehension-1 & 2	Workbook Practice	Passage Reading	0	2	0	0
2	Reading Comprehension-3 & 4	Workbook Practice	Passage Reading	0	2	0	0
3	Reading Comprehension-1, 2 & 3	Workbook Practice	Passage Reading	0	2	0	0
4	Reading Comprehension-4,5 & 6	Workbook Practice	Passage Reading	0	2	0	0
5	Vocabulary(10 New Words)	Workbook Practice	Learning 10 new words	0	2	0	0
6	Vocabulary(15 New Words)	Workbook Practice	Learning 15 new words	0	2	0	0
7	Vocabulary(15 New Words)	Workbook Practice	Learning 15 new words	0	2	0	0
8	Vocabulary(20 New Words)	Workbook Practice & Quiz	Learning 20 new words	0	2	0	0
9	Reading Comprehension-1 & 2	Workbook Practice	Passage Reading	0	2	0	0
10	Reading Comprehension-3 & 4	Workbook Practice	Passage Reading	0	2	0	0
11	Reading Comprehension-5 & 6	Workbook Practice	Passage Reading	0	2	0	0
12	Speaking Skills	ACTIVITY	JAM	0	2	0	0
MODULE II: (24 HOURS)							
1	Vocabulary	Workbook Practice	Learning new words	0	2	0	0
2	Vocabulary	Workbook Practice	Learning new words	0	2	0	0
3	Reading Practice	News Reading	Reading Comprehension	0	2	0	0
4	Reading Comprehension-1 & 2	Workbook Practice	Passage Reading	0	2	0	0
5	Reading Comprehension-3 & 4	Workbook Practice	Passage Reading	0	2	0	0

7	Vocabulary	Workbook Practice	Learning new words	0	2	0	0
8	Vocabulary	Quiz	Learning new words	0	2	0	0
9	Vocabulary	Workbook Practice	Learning new words	0	2	0	0
10	Speaking Skills	GD & Analysis	General Topics	0	2	0	0
11	Reading Comprehension-1 & 2	Workbook Practice	Passage Reading	0	2	0	0
12	Vocabulary-1	Quiz	Learning new words	0	2	0	0
MODULE-3 (24 HOURS)							
1	Reading Comprehension-1 & 2	Workbook Practice	Passage Reading	0	2	0	0
2	Vocabulary-1	Workbook Practice	Learning new words	0	2	0	0
3	Vocabulary-2	Surprise Quiz	Learning new words	0	2	0	0
4	Vocabulary-2	Workbook Practice	Learning new words	0	2	0	0
5	Vocabulary-3	Workbook Practice	Learning new words	0	2	0	0
6	Vocabulary-3	Asking Each Other	Learning new words	0	2	0	0
7	Vocabulary-4	Quiz	Learning new words	0	2	0	0
8	Reading Comprehension-1 & 2	Workbook Practice	Passage Reading	0	2	0	0
9	Reading Comprehension-3 & 4	Workbook Practice	Passage Reading	0	2	0	0
10	Speaking Practice	Activity Based Learning	Extempore/ Communication Game	0	2	0	0
11	Vocabulary-5	Workbook Practice	Learning new words	0	2	0	0
12	Vocabulary-5	Recap & Analysis	Vocabulary Exercises	0	2	0	0

EVALUATION SYSTEM: INTERNAL ASSESSMENT (50) + EXTERNAL ASSESSMENT (50)

Methods	Online Test-I	Online Test-I	Online Test-I	Attendance	Assignment	% of Marks 50
Total	10	10	10	10	10	100

FCHU0211LIFE SKILLS DEVELOPMENT-II [APTITUDE]

<i>Pre - requisites</i>	<i>Course Type</i>	<i>Credits</i>
<i>Nil</i>	<i>Practice</i>	<i>2</i>

OBJECTIVE

Aptitude and Reasoning Tests are designed to give an objective assessment of a Candidate's ability in numerical as well as analytical

OUTCOMES

Ability skills will be increased

Improved skills to qualify all competitive exams like Banking Exams, Company-based Exams, Railway Exams, GATE Exams

SESSION PLAN: APTITUDE MODULE I: (24 HOURS)

S. No.	Topic	Pedagogy	Details	Instructional Hrs			
				Th	Pract	video	Proj
1	Number System-01	Workbook Practice	Operation on Numbers, Classification of Numbers, Tests of Divisibility	0	2	0	0
2	Number System-01	Workbook Practice		0	2	0	0
3	Number System-02	Workbook Practice	Unit Digit Calculation, Remainder Calculation,	0	2	0	0
4	Number System-02	Workbook Practice		0	2	0	0
5	Practice Test - 01	Practice Test	Practice Test on Number System http://gradestack.com/blogs/short-quiz-on-number-system-for-ctet-2015/	0	2	0	0
6	Lcm & HCF	Workbook Practice	Basics of LCM & HCF	0	2	0	0
7	Lcm & HCF	Workbook Practice	Basics of LCM & HCF	0	2	0	0
8	Practice Test - 02	Practice Test	Practice Test on LCM & HCF	0	2	0	0
9	Average	Workbook Practice	Basics of Average	0	2	0	0
10	Average	Workbook Practice	Basics of Average	0	2	0	0
11	Practice Test - 03	Practice Test	Practice Test on Average	0	2	0	0
12	Practice Test - 04	Practice Test	Practice Test on Number System, LCM & HCF & Average	0	2	0	0

MODULE II: (24 HOURS)

S. No.	Topic	Pedagogy	Details	Instructional Hrs			
				Th	Pract	video	Proj
1	Percentage	Workbook Practice	Basics of Percentage	0	2	0	0
2	Percentage	Workbook Practice	Basics of Percentage	0	2	0	0
3	Practice Test – 05	Practice Test	Practice Test on Percentage	0	2	0	0
4	Ratio & Proportion	Workbook Practice	Basics of Ratio & Proportion	0	2	0	0
5	Practice Test-06	Practice Test	Practice Test on Ratio & Proportion	0	2	0	0
6	Time & Work	Workbook Practice	Basics of Time & Work, Chain Rule	0	2	0	0
7	Time & Work	Workbook Practice	Basics of Time & Work, Chain Rule	0	2	0	0
8	Practice Test – 07	Practice Test	Practice Test on Time & Work	0	2	0	0
9	Pipes & Cistern	Workbook Practice	Basics of Pipes & Cistern	0	2	0	0
10	Time & Distance, Trains	Workbook Practice	Basics of Time & Distance, Trains	0	2	0	0
11		Workbook Practice	Basics of Time & Distance, Trains	0	2	0	0
12	Practice Test – 08	Practice Test	Practice Test on Time & Distance, Trains	0	2	0	0

MODULE-3 (24 HOURS)

S. No.	Topic	Pedagogy	Details	Instructional Hrs			
				Th	Pract	video	Proj
1	Boats & Streams	Class Task	Basics of Boats & Streams	0	2	0	0
2	Profit & Loss	Class Task	Basics of Profit & Loss	0	2	0	0
3	Profit & Loss	Home Task	Basics of Profit & Loss	0	2	0	0
4	Practice Test - 09	Practice Test	Practice Test on Profit & Loss http://gradestack.com/ssc/quants-quiz-on-profit-and-loss-for-ssc-cgl-2015-exam/	0	2	0	0
5	Practice Test - 10	Practice Test	Practice Test on Boats & Streams	0	2	0	0
6	Practice Test -11	Practice Test	Practice Test on Average,Percentage,NumberSystem,LCM& HCF, Boats &Streams, Average,Profit&Loss,Trains,Time & Distance www.livetest.in	0	2	0	0
7	Practice Test - 12	Practice Test	Practice Test on Average,Percentage,NumberSystem,LCM& HCF, Boats & Streams, Average,Profit&Loss,Trains,Time & Distance https://www.wiziq.com/tests/aptitude-test	0	2	0	0
8	Practice Test - 13	Practice Test	Practice Test on Average,Percentage,NumberSystem,LCM& HCF, Boats & Streams, Average,Profit&Loss,Trains,Time & Distance	0	2	0	0
9	Practice Test -14	Practice Test	Practice Test on Average,Percentage,NumberSystem,LCM& HCF, Boats & Streams, Average,Profit&Loss,Trains,Time & Distance	0	2	0	0
10	Practice Test - 15	Practice Test	Practice Test on Average,Percentage,NumberSystem,LCM& HCF, Boats & Streams, Average,Profit&Loss,Trains,Time & Distance	0	2	0	0
11	Practice Test - 16	Practice Test	Practice Test on Average,Percentage,NumberSystem,LCM& HCF, Boats & Streams, Average,Profit&Loss,Trains,Time & Distance http://www.freeonlinetest.in	0	2	0	0
12	Practice Test -17	Practice Test	Practice Test on Average,Percentage,NumberSystem,LCM& HCF, Boats & Streams, Average,Profit&Loss,Trains,Time & Distance	0	2	0	0

			<i>References for online tests:</i> http://www.careerride.com/Online-practice-test.aspx http://www.freeonlinetest.in http://gradestack.com www.livetest.in https://www.wiziq.com/tests/aptitude-test				
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EVALUATION SYSTEM: INTERNAL ASSESSMENT (50) + EXTERNAL ASSESSMENT (50)

<i>Methods</i>	<i>Online Test-I</i>	<i>Online Test-I</i>	<i>Online Test-I</i>	<i>Attendance</i>	<i>Assignment</i>	<i>% of Marks</i>
Total	10	10	10	10	10	100

FCHU0212LIFE SKILLS DEVELOPMENT – III [REASONING]

<i>Pre - requisites</i>	<i>Course Type</i>	<i>Credits</i>
<i>Nil</i>	<i>Workshop</i>	<i>2</i>

SESSION PLAN: REASONING MODULE I: (24 HOURS)

S. No.	Topic	Pedagogy	Details	Instructional Hrs			
				Th	Pract	video	Proj
1	Number Series	Workbook Practice	BASICS	0	2	0	0
2	Number Series	Workbook Practice	BASICS	0	2	0	0
3	Practice Test - 01	Practice Test	Practice Test on Number Series http://gradestack.com/ssc/reasoning-quiz-on-number-series-for-ssc-exams-3/	0	2	0	0
4	Letter Series	Class Task	BASICS	0	2	0	0
5	Letter Series	Workbook Practice	BASICS	0	2	0	0
6	Practice Test - 02	Practice Test	Practice Test on Letter Series	0	2	0	0
7	Alpha Numeric Series	Workbook Practice	Basics	0	2	0	0
8	Alpha Numeric Series	Workbook Practice	Basics	0	2	0	0
9	Practice Test - 03	Practice Test	Practice Test on Alpha Numeric Series	0	2	0	0
10	Continuous Pattern Series	Workbook Practice	Basics	0	2	0	0
11	Continuous Pattern Series	Workbook Practice	Basics	0	2	0	0
12	Practice Test - 04	Practice Test	Practice Test on Number Series, Letter Series, Alpha Numeric Series & Continuous Pattern Series	0	2	0	0

MODULE II: (24 HOURS)

S. No.	Topic	Pedagogy	Details	Instructional Hrs			
				Th	Pract	video	Proj
1	Percentage	Workbook Practice	Basics of Percentage	0	2	0	0
2	Percentage	Workbook Practice	Basics of Percentage	0	2	0	0
3	Practice Test - 05	Practice Test	Practice Test on Percentage	0	2	0	0
4	Ratio & Proportion	Workbook Practice	Basics of Ratio & Proportion	0	2	0	0
5	Practice Test-06	Practice Test	Practice Test on Ratio &	0	2	0	0

			<i>Proportion</i>				
6	<i>Time & Work</i>	<i>Workbook Practice</i>	<i>Basics of Time & Work, Chain Rule</i>	0	2	0	0
7	<i>Time & Work</i>	<i>Workbook Practice</i>	<i>Basics of Time & Work, Chain Rule</i>	0	2	0	0
8	<i>Practice Test - 07</i>	<i>Practice Test</i>	<i>Practice Test on Time & Work</i>	0	2	0	0
9	<i>Pipes & Cistern</i>	<i>Workbook Practice</i>	<i>Basics of Pipes & Cistern</i>	0	2	0	0
10	<i>Time & Distance, Trains</i>	<i>Workbook Practice</i>	<i>Basics of Time & Distance, Trains</i>	0	2	0	0
11	<i>Time & Distance, Trains</i>	<i>Workbook Practice</i>	<i>Basics of Time & Distance, Trains</i>	0	2	0	0
12	<i>Practice Test - 08</i>	<i>Practice Test</i>	<i>Practice Test on Time & Distance, Trains</i>	0	2	0	0

MODULE-3 (24 HOURS)

<i>S. No.</i>	<i>Topic</i>	<i>Pedagogy</i>	<i>Details</i>	<i>Instructional Hrs</i>			
				<i>Th</i>	<i>Pract</i>	<i>video</i>	<i>Proj</i>
1	<i>Miscellaneous</i>	<i>Workbook Practice</i>	<i>Basics</i>	0	2	0	0
2	<i>Miscellaneous</i>	<i>Workbook Practice</i>	<i>Basics</i>	0	2	0	0
3	<i>Practice Test - 11</i>	<i>Practice Test</i>	<i>Practice Test on Syllogism, Puzzle, Letter & Number Series, Miscellaneous</i>	0	2	0	0
4	<i>Practice Test - 12</i>	<i>Practice Test</i>	<i>Practice Test on Syllogism, Puzzle, Letter & Number Series, Miscellaneous</i>	0	2	0	0
5	<i>Practice Test - 13</i>	<i>Practice Test</i>	<i>Practice Test on Syllogism, Puzzle, Letter & Number Series, Miscellaneous</i>	0	2	0	0
6	<i>Practice Test - 14</i>	<i>Practice Test</i>	<i>Practice Test on Syllogism, Puzzle, Letter & Number Series, Miscellaneous</i>	0	2	0	0
7	<i>Practice Test - 15</i>	<i>Practice Test</i>	<i>Practice Test on Syllogism, Puzzle, Letter & Number Series, Miscellaneous</i>	0	2	0	0
8	<i>Practice Test - 16</i>	<i>Practice Test</i>	<i>Practice Test on Syllogism, Puzzle, Letter & Number Series, Miscellaneous</i>	0	2	0	0
9	<i>Practice Test - 17</i>	<i>Practice Test</i>	<i>Practice Test on Syllogism, Puzzle, Letter & Number Series, Miscellaneous</i>	0	2	0	0
10	<i>Practice Test - 18</i>	<i>Practice Test</i>	<i>Practice Test on Syllogism, Puzzle, Letter & Number Series, Miscellaneous</i>	0	2	0	0
11	<i>Practice Test - 19</i>	<i>Practice Test</i>	<i>Practice Test on Syllogism, Puzzle, Letter & Number Series, Miscellaneous</i>	0	2	0	0
12	<i>Practice Test - 20</i>	<i>Practice Test</i>	<i>Practice Test on Syllogism, Puzzle, Letter & Number</i>	0	2	0	0

			<i>Series, Miscellaneous</i> http://gradestack.com http://www.freeonlinetest.in www.livetest.in				
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EVALUATION SYSTEM: INTERNAL ASSESSMENT (50) + EXTERNAL ASSESSMENT (50)

<i>Methods</i>	<i>Online Test-I</i>	<i>Online Test-I</i>	<i>Online Test-I</i>	<i>Attendance</i>	<i>Assignment</i>	<i>% of Marks</i>
Total	10	10	10	10	10	100

FCMG0114 ECONOMICS

<i>Pre - requisites</i>	<i>Course Type</i>	<i>Credits</i>
<i>Nil</i>	<i>Theory</i>	<i>2</i>

Course Objective:

In today's dynamic economic environment, effective managerial decision making requires timely and efficient use of information. The basic purpose of this course is to provide students with a basic understanding of the economic principles, methodologies and analytical tools that can be used in business decision making problems. It provides an understanding of the economic environment and its impact on strategy formulation. The course also focuses on the impact of economic policies on managerial decision-making by providing an understanding of fiscal policy, and national and global economic issues affecting business.

The language of science (and all analytical thinking) is mathematics. Since economics is a social science, use of some mathematical tools, basically the constrained and un-constrained optimization techniques will help in measuring and solving the basic economic problems and thus improves decision-making. It becomes difficult and totally un-practicable to solve business (economic) problems logically and systematically without use of mathematics. The basic objective is to solve problems mathematically and interpret the results economically.

Module-1: Micro Economics

Introduction to economics: Scarcity, Choice and Efficiency, Fundamental issues of what, how and for whom to produce to make the best use of economics. Demand for a commodity: Law of demand, Demand schedule and demand curve, Individual and market demand, Change in demand, Consumer behavior: Analysing law of demand through Marshallian utility analysis, Indifference curve technique and Consumer Surplus.

Elasticity of demand: Price Elasticity of demand: Estimation, Types, Elasticity and revenue, Factors affecting price elasticity of demand. Income elasticity, Cross elasticity, Uses of different concepts of elasticity in business decisions.

Analysis of Supply: Law of Supply, Supply schedule and supply curve, Change in supply, Price elasticity of supply, Equilibrium of demand and supply: Equilibrium with demand and supply curves, Effect of a shift of demand and supply curves.

Production Function: Production function with one variable input, Production function with two variable inputs, optimal combination of inputs, Returns to scale

Cost Theory: Types of costs, Production and cost, Short-run cost functions, Long-run cost functions, Economies of scale and scope, Cost-Volume-profit Analysis

Market: Meaning, types and characteristics of different market structure (Perfect competition, Monopoly, Monopolistic competition and Oligopoly)

Module: 2: Macro Economics

National Income Accounting: Circular flow of Income, National Income Concept, Eight variants of national product aggregates, Measurement (Income, Value Added and Expenditure), Real and Nominal GNP, Difficulties in measuring the national income, Uses of National income statistics,

Money and Inflation: Demand for and supply of money. Causes and consequences of Inflation.

Commercial and central banking: Role and functions of commercial banks and R.B.I., Monetary

Policy and Fiscal policy: Objectives and Instruments, Balance of Payment (BoP): Meaning, BoP

Account, Disequilibrium in BoP, Measures to correct disequilibrium in BoP, Foreign Exchange: Floating Exchange Rate and Fixed Exchange Rates

Books & Reference:

1. *Managerial Economics in a Global Economy*, by D. Salvatore, Sixth Edition, OUP, 2008
2. *Managerial Economics*, Truett & Truett, Wiley Publication.
3. *Managerial Economics*, by Petersen Craig H. Cris Lewis and S.K. Jain, Pearson, 2007
4. *Modern Micro Economics*, Koutsoyiannis, (1975), A, Macmillan Press
5. *Managerial Economics*, Mehta, P. L (1999), Sultan Chand & Sons

6. *Principles of Microeconomics, Mankiw, N. G (2006), Cengage Learning*
7. *Macroeconomics, Mankiw, N. G, (2009), Worth Publishers*
8. *Macroeconomics, Theory and Policy, Dwivedy, D.N (2007), Tata McGraw Hill*
9. *Macroeconomics, D'Souza, E (2008), Pearson Education*
10. *Macroeconomic Analysis, Shapiro, E (2003), Galgotia Publications*
11. *Environmental Economics in Theory and Practice – Hankey N, Shogren J F, and White B – 1999
– Macmillan Indian Limited*
12. *Indian Economy, Mishra &Puri (2011), Himalaya Publishing House*

FCMG0102 ACCOUNTING AND FINANCE

<i>Pre - requisites</i>	<i>Course Type</i>	<i>Credits</i>
<i>Nil</i>	<i>Theory</i>	<i>2</i>

Course Objective:

- To familiarise the students with basic terms of accounting, accounting principles, concepts and convention.*
- To equip the students with various concepts, tools and techniques of Cost accounting as well as Management accounting essential for managerial decision making process.*
- To aware students overview of Time Value of Money, Working Capital and Stock Market*

Course outcomes:

On the successful completion of this paper the students should be able composed the information about:

- Develop a basic understanding of accounting and financial ratio analysis.*
- Students will be able to create, balance and deliver a budget and use budget information for planning and decision purposes.*
- Undertake various costing techniques and information for planning and decision-making*
- Demonstrate time management by understand various financial funding options for project planning and working capital management of an organizations.*
- Know how financial markets as well as the global economy are impacting their organization today and how they will impact their organization into the future.*

Module 1:

Basic Accounting Concepts and Conventions, Basic Accounting Equation, Accounting Mechanism: Journals, Ledgers, Trial Balance, Basic Financial Statements: Analysis of Items found in Balance Sheet and Income Statement, Ratio Analysis

Module 2:

Cost Concepts and Cost Terms: Financial Accounting vrs. Cost Accounting, Direct and Indirect Costs, Fixed, Variable and Semi-variable Costs, Standard, Budgeted and Actual Costs, Controllable and Non-controllable costs, Preparation of Cost Sheet, Cost-Volume-Profit Analysis: Concept of Marginal Cost and Contribution, Concept of Break Even Analysis, Applications of Marginal Costing

Module 3:

Time Value of Money: Concept, Simple and Compound Interest, Present Value of a Single Amount, Present Value of an Uneven Series, Future Value of an Annuity, Present Value of an Annuity
Working Capital Management: Meaning and Components of Working Capital, Determinants of Working Capital, Profitability-Risk Trade-off, Types of Working Capital, Importance of Working Capital, Operating Cycle: Concept and Estimation
Stock Market: Types of Capital Issues: Initial Public Offer, Follow-on Public Offer, Rights Issues, Preferential Issues, Red-herring Prospectus, Free Pricing of Issues, Greenshoe Option, Lock-in Period, Safety Net, Listing of Securities on Stock Exchanges

Books Recommended:

- Accounting for Management—Ashok Sehegal, Taxxman*
- Financial Accounting -- A managerial Perspective, R. Narayanswamy, PHI*
- Khan & Jain – Management Accounting, TMH.*
- Horngren ,Datar, Foster- Cost Accounting, Pearson.*
- Financial Accounting, Jain/Narang/Agrawal, Kalyani.*
- Basic Financial Accounting for Management, Shah, Oxford.*
- Financial Management by I. M. Pandey*
- Financial Management – Theory and Practice by Chandra*
- Financial Management – Text and Problems by Khan & Jain*

FCMG0103 MANAGEMENT PROCESSES AND ORGANIZATIONAL BEHAVIOR

<i>Pre - requisites</i>	<i>Course Type</i>	<i>Credits</i>
<i>Nil</i>	<i>Theory</i>	<i>2</i>

Course Objectives:

Management as a subject of study has brought a new paradigm in managing organizations. The young professionals has to learn and reflect the basic principles of management. Along with it the knowledge of Individual and group behaviour and its impact at the workplace is vital.

Organizational Behavior (OB) is a field of study that investigates the impact that individuals, groups, and structure have on behavior within an organization. Then it applies that knowledge to make organizations work more effectively. This course will expose students to gain knowledge on the basic principles of management and organization behavior.

Course Introduction

Management as a subject of study has brought a new paradigm in managing organizations. The young professionals has to learn and reflect the basic principles of management. Along with it the knowledge of Individual and group behaviour and its impact at the workplace is vital. Organizational Behavior (OB) is a field of study that investigates the impact that individuals, groups, and structure have on behavior within an organization. Then it applies that knowledge to make organizations work more effectively. This course will expose students to gain knowledge on the basic principles of management and organization behavior.

Course Content

Unit: I

Emergence of Management as a discipline, Principles of management, (Planning, organizing, staffing and controlling) Contributions to management by Luther Gullick , Henri Fayol and Peter F. Drucker and Introduction: Concept and models of OB, Approaches to OB (Systems, Human resource and Contingency)

Unit: II

Individual System: Learning, Perception, Personality and Motivation,

Unit: III

Social System: Group Dynamics and Leadership.

Books Recommended:

1. Robins & Sanghii; Organizational Behavior, Pearson
2. Luthans ,F; Organizational Behavior-TMH
3. Udai Pareek ; Understanding Organizational Behavior, Oxford
4. Prasad,L.M; Organization behavior, S.Chand.
5. K. Aswathappa; Organization behaviour
6. Prasad.L.M ; Principles of Management,

FCMG0104 PRODUCTION AND OPERATION MANAGEMENT

<i>Pre - requisites</i>	<i>Course Type</i>	<i>Credits</i>
<i>Nil</i>	<i>Theory</i>	<i>2</i>

Course Objective:

The course is designed to acquaint the students with decision making in production and operation function of an organization.

Course Outcomes :

- Acquire a working understanding of the roles/functions of production management in the context of business enterprise.
- The learner will have a deep knowledge of the fundamental theory and mathematical principles involved in Production and Operation Management.
- They can use specialized knowledge in Operations Management to solve business processes.
- They will be capable of applying these principles to solve relevant production or service system problems.

Module 1:

Operations Management- An Introduction : Primary topics in Operations Management, Operations Function and Transformation process . Manufacturing Strategy and Mass customization, Product Development and Service Design , New Product design, Product life cycle, Process design, Process life cycle

Module 2:

Project scheduling Models: Project Network, Critical path Method (CPM), Programme Evaluation Review Technique (PERT).

Scheduling: Objective of Scheduling, Sequencing, Sequencing model: "n" jobs 1 machine, "n" jobs 2 machines.

Module 3:

Inventory Management: Concept of inventory with independent demand: Inventory cost structure, Deterministic inventory model - EOQ models, instantaneous receipt, Inventory model with discounts.

Module 4:

Quality Management: Concept of quality; Quality of design, Conformance & performance; Cost of poor process performance and quality. Statistical Quality Control - Process Control (X-bar, R & P chart, np chart).

Concept of TQM,Just in Time and Lean Production Basic element in JIT, Pull system, Push system

Books Recommended:

- 1) Chase, Jacobs, Aquilano, Agarwal, - "Operations Management", TMH
- 2) Krajewski,Ritzman,Kansal, - "Operations Management", Pearson
- 3) Everette. Adam Jr., Ronald J. Ebert, - "Production and Operations Management", PHI
- 4) Roberta S. Russell & Bernard W. Taylor III, - "Operations Management", Pearson/ PHI
- 5) Aswathappa& Sridhar Bhat, - "Production and Operations Management", HPH
- 6) Gaither, Frazier- Operations Management

FCMG0105MARKETING MANAGEMENT

<i>Pre - requisites</i>	<i>Course Type</i>	<i>Credits</i>
<i>Nil</i>	<i>Theory</i>	<i>2</i>

Course Objective:

- a) To familiarize the students with the concepts and theories and strategies of marketing.
- b) To focus on the application of these concepts to various marketing contexts
- c) To focus on the emerging areas of marketing

Course outcomes :

- ✓ The students will understand the various marketing approach in today's competitive scenario.
- ✓ The students will learn the application of various marketing tools for solving business problems
- ✓ The students will acquire and develop the marketing skills to be a successful marketing person

Module 1:

Introduction to marketing; What is marketing?, Importance of marketing function, Process of marketing, Concepts like need, want, value, satisfaction etc, Elementary idea of marketing mix. Understanding Marketing Environment; Factors affecting marketing environment (PESTEL), Porter's five forces model, Introduction to market research

Module 2:

Segmentation, Targeting & positioning (STP); What is market segmentation?, Criteria for effective segmentation, Targeting selected markets, Targeting strategies, Positioning, Effective positioning strategies, Positioning of brands and repositioning, introduction to consumer behavior.

Module 3:

Product Management; Classification of products, Product life cycle (PLC), Brand and branding. Pricing; Meaning & objective, steps in setting the price, pricing policies. Promotion; What is promotion, types of promotion, advertising, sales promotion, integrated marketing communication Place; Marketing channels, Channel conflict management, Distribution system. Introduction to services marketing, Emerging concepts like green marketing, e-marketing & social marketing.

Books Recommended:

1. *Marketing Management: A South Asian Perspective- Phillip Kotler, Kevin Lane Keller, Abraham Koshy and MithileshwarJha, 13th Edition Pearson, Education Publication*
2. *Marketing Mangement: Fourth edition- RajanSaxena*
3. *Positioning: The Battle for Your Mind- Al Ries& Jack Trout, Warner Books USA*

FCMG0108 INTRODUCTION TO RESEARCH

<i>Pre - requisites</i>	<i>Course Type</i>	<i>Credits</i>
<i>Nil</i>	<i>Theory</i>	<i>2</i>

Course Objectives:

- *To introduce the students about research, methods and techniques.*
- *To understand the process and apply in other areas.*

Course outcome:

- *Students will be able to understand the process of doing a research.*
- *Students will be able to write a research report.*

Course Contents:

Module: I Science and Social Science as Knowledge

Common sense view of Science, Seeing is believing?, Visual Experiences, Relevant Facts, Facts precede theory, Observation, Experiment as an adequate basis of Science, Deductive and inductive logic, falsification-A logical view,

Module: II Process of doing Research

Overview: Problem Definition, hypothesis and its function, Types of Research, Literature Review, Research Design, *Sampling:* Census and sample survey, different types of sample design, *Measurement:* Measurement and scaling techniques, *Methods of Data Collections:* Experimentation, observation, interview, Survey, case study; *Data Analysis and Interpretation:* Qualitative and quantitative data, data presentation, central tendency and dispersion, association, test of significance.

Module: III Report Writing and Presentation

Significance of report writing, different steps in report writing, layout of research report & Types of Report, Presentation, Ethics in Report Writing.

Books Recommended

1. *Ranjit Kumar, 2011, Research Methodology: A Step by Step Guide, Sage South Asia Publication.*

FCMG0113 INDIAN SOCIETY AND CULTURE

<i>Pre – requisites</i>	<i>Course Type</i>	<i>Credits</i>
<i>Nil</i>	<i>Theory</i>	<i>2</i>

Course Objectives:

- Develop an understanding social environment*
- Develop an understanding of cultural environment*
- Understanding the linkages among social, cultural and business environment*

Course outcomes :

- Students would develop an idea about the socio-cultural environment in which they would be working as scientists, researchers and entrepreneurs.*
- More specifically, they would get an appreciation of how societal and cultural issues interface with technology and science in the context of overall development of the country.*
- Attempt is also made to familiarise students with the science and technology policies that would benefit modern India.*

Course Contents:

Module 1: Introduction to Indian Society

Indian Society - Roots of Indian Society , Social Structure – Rural and Urban Contexts, Social Institutions in Indian Society, Caste, Tribe, Dalits and Other Excluded Groups, Power and Conflicts

Module 2: Introduction to Culture in Indian Society

Culture in Ancient, Medieval and Modern India, Languages and Literature in India, Culture Change and its Impact on Indian Society

Module 3: Social Movements

Reformers and Radicals – Rammohan Roy, Syed Ahmed Khan, JotiroPhule, Gopal Krishna Gokhale, BalGangadharTilak, TarabaiShinde, DayanandaSaraswatiand Vivekananda Nurturing a Nation – M. K. Gandhi, RabindraNath Tagore, B R Ambedkar, Mohammad Ali Jinnah, EV Ramaswami, Jawaharlal Nehru, RammanoharLohia, Jayaprakash Narayan, Verrier Elwin Peasant, Tribal, Women and Environment movement

Module 4: Social Issues in Modern India

Poverty, Gender Inequality, Disparity and Social Exclusion: SC, ST, Women, Child, Challenged

Module 5: Science, Technology and Society

Science, Technology and Development Linkage, Appropriate Technology, Science and Technology Policy

Books Recommended:

- Indian Society and Culture: Continuity and Change – by N. Hasnain*
- Social and Cultural History of India – O.M. Prakash*
- Makers of Modern India – RamachandraGuha*

Human Rights

Subject	Code	Type of course	Credit	Prerequisite
Human Rights	FCMG0115	Theory	1	Nil

Course Objective

The course is an introduction to human rights. Human beings are rational beings. They by virtue of their being human, possess certain basic and inalienable rights which are commonly known as human rights. Human Rights are defined as all those rights which are essential for the protection and maintenance of dignity of individuals and create conditions in which every human being can develop his or her personality to the fullest extent. The purpose of this course is for students to gain a holistic view of human rights and their implications.

Course outcome

Student would have an understanding of human rights, its history, characteristics, types, protection, violation and the legal framework for their protection, therefore, a fair knowledge of the Universal Declaration of Human Rights.

Evaluation Systems

<i>Methods</i>	<i>% of Marks</i>
<i>Internal(written exam/assignment/experiments/project/report writing etc.</i>	<i>40</i>
<i>Quiz, Presentations and Written exams</i>	
<i>External Exam</i>	<i>60</i>
<i>Total</i>	<i>100</i>

Course outline

Module I	Introduction to Human Rights
Topic	Meaning and Definition, History, Principles, Characteristics, Types
Pedagogy	Example: lecture (ppt), videos, etc
<i>Lab/Activity</i>	
<i>Assignment/practice</i>	
<i>No. of hours</i>	5
<i>Reference materials: Book/e- content/online source</i>	

Module 2	Human Rights Law
Topic	International Human Rights Law, Council of Human Rights, Universal Declaration of Human Rights, Legal Effects of the Declaration, International Humanitarian Law
Pedagogy	Example: lecture, videos, Case studies, etc
<i>Lab/Activity</i>	

Assignment/practice	
No. of hours	5
Reference materials: Book/e-content/online source	

Module 3	Conflicts of Rights and Future Challenges
Topic	Meaning and Definition, History, Principles, Characteristics, Types
Pedagogy	Example: lecture, videos, case studies, etc
Lab/Activity	
Assignment/practice	
No. of hours	5
Reference materials: Book/e-content/online source	

Reference

Text Books:

1. Arihants UGC NET Human Rights and Duties

2. Kapoor, S. K. Central Law Agency's Human Rights under International Law and National Law

Reference Books:

Clapham Andrew, 2015, Human Rights: A Very Short Introduction, Oxford University Press

Smith Rhona, 2015, Textbook on International Human Rights, Oxford University Press

Online Source:

8 Human Rights Study Books you can download for free

<https://www.humanrightscareers.com/.../10-human-rights-study-books-you-can-download>

<https://www.humanrightscareers.com/courses/>

Introduction to Ethics

Subject	Code	Type of course	Credit	Prerequisite
Introduction to Ethics	FCMG0116	Theory	1	Nil

Course Objective

<ul style="list-style-type: none"> · The course is an introduction to Ethics. This course will introduce the meaning of ethics and the historical development – utilitarianism, ethical relativism and virtue ethics. Will also examine some current ethical issues, especially in science and engineering. Questions which will be considered are: what is the good life? Do we have a moral duty to act in certain ways? Are there such things as natural human rights? Are some values more compelling than or better than others? · This course is designed to introduce undergraduate engineering students to the concepts, theory and practice of engineering ethics. It will allow students to explore the relationship between ethics and engineering and apply classical moral theory and decision making to engineering issues encountered in academic and professional careers.
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Course outcome

<p>By the end of the course, Student will be able to:</p> <ul style="list-style-type: none"> · Demonstrate knowledge of important ethical systems · Demonstrate their respect of different ethical perspectives · Critique some aspects of an ethical position · Clearly formulate their ethical position on an issue and develop arguments based on sound inferences and clear premises (through project) <p>The course will have three modules to cover the above expected learning outcomes.</p>

Evaluation Systems

<i>Methods</i>	<i>% of Marks</i>
<i>Internal(written exam/assignment/experiments/project/report writing etc.</i>	<i>20</i>
<i>Quiz, Group work, Presentations</i>	<i>20</i>
<i>Project</i>	<i>20</i>
<i>External Exam</i>	<i>40</i>
<i>Total</i>	<i>100</i>

Course outline

Module I	Introduction to Ethics
Topic	What is the study of ethics, Introduction to Indian and Western Ethics
Pedagogy	lecture (ppt),
Lab/Activity	
Assignment/practice	
No. of hours	2
Reference materials: Book/e-content/online source	

Module 2	Different Ethical systems and Perspectives
Topic	Ethical relativism and its implications, utilitarianism, duty ethics and virtue ethics
Pedagogy	lecture, Case studies, small group work
Lab/Activity	
Assignment/practice	
No. of hours	6
Reference materials: Book/e-content/online source	

Module 3	Critique of various aspects of ethical positions
Topic	Critique and development of the ability to formulate own ethical position on an issue
Pedagogy	lecture, small group work
Lab/Activity	
Assignment/practice	
No. of hours	3
Reference materials: Book/e-content/online source	

Session Plan

Topic coverage and Internal Test	No. of Sessions (in hrs.)	Activity (lecture, tutorial, lab practice, field studies/field-trip, Workshop etc.)	Assignment (project, assignment, field study, seminar, etc.)	Suggested Reading (Book, Video, Online source, etc.)
Module 1				
Meaning and Definitions of Ethics Morals and Ethics Comparison of ethics and engineering ethics The importance of ethics in science and engineering	1	Lecture		Lecture Notes and reference in books, online resources
Introduction to Ethics in different cultures The importance of core values Moral/ethical dilemmas and hierarchy of moral values Factors affecting moral responsibility, and degrees of responsibility	1	Lecture		Lecture Notes and reference in books, online resources
Module 2				
Ethical Relativism and its implications	1	Lecture		Lecture Notes and Articles, online resources
Utilitarianism and its implications Engineers in organizations: Ethics in the workplace Fairness (personal and social) Engineering Professionalism and Ethics, Leadership,	1	Lecture		Lecture Notes and Articles, online resources

Specific case example – Challenger Incident Reliability, risk and safety Risk management Resource allocations				
Duty ethics and its implications Law and Ethics	2	Lecture		Lecture Notes and Articles, online resources
Virtue ethics and its implications Ethics in the workplace Fairness (personal and social)	2	Lecture		Lecture Notes and Articles, online resources
Module 3				
Critique of various aspects of ethical positions Ethics in the electronic and digital age Ethics and the environment Sustainable engineering Privacy and confidentiality issue	1	Lecture		Handouts and online resources
How to formulate an ethical position on an issue	2	Lecture		Handouts and online resources
<i>Project work and presentations</i>	4 hours			

FCMG1201 DISASTER MANAGEMENT

<i>Pre – requisites</i>	<i>Course Type</i>	<i>Credits</i>
<i>Nil</i>	<i>Theory</i>	<i>2</i>

Course Objective			
<p>The aim is to impart knowledge on</p> <ul style="list-style-type: none"> ✓ To provide students an exposure to disasters, their significance, types & Comprehensive understanding on the concurrence of Disasters and its management. ✓ To ensure that students begin to understand the relationship between vulnerability, disasters, disaster prevention, risk reduction and the basic understanding of the research methodology for risk reduction measures. ✓ Equipped with knowledge, concepts, and principles, skills pertaining to Planning, Organizing, Decision-making and Problem solving methods for Disaster Management. ✓ The course also facilitates students to globally share their views, ideas and information pertaining to Disaster Management on a common platform. ✓ To develop rudimentary ability to respond to their surroundings with potential disaster response in areas where they live, with due sensitivity. 			
GUIDELINES ON GRADING AND STANDARDS OF ASSESSMENT			
A continuous evaluation system will be adopted to evaluate the students. There will be an individual and group assignments, presentations and written test.			
COURSE CONTENT			
Module - 1			
UNIT I – Introduction to Disaster Management (2hrs)			
Session	Topic	Coverage	Reading/Reference
4hrs	Disaster & Emergencies : Concept & Fundamentals of Disaster Management	<ul style="list-style-type: none"> ✓ Introduction/ Brain storming/ Group formation ✓ History of Disasters ✓ Concepts and Definitions ✓ Hazard, Risk, Vulnerability, Capacity, Disaster & Equations of Disaster Management 	
		<ul style="list-style-type: none"> ✓ Types & Classification of Disasters ✓ Factors responsible for disasters like flood, cyclone and Earthquake. 	
UNIT II – Effect and Impact of Disaster (4 Hrs)			
1hr	Effect and Impacts of Disasters (Group work)	<ul style="list-style-type: none"> ✓ Disasters Impact – Social, Economic, Political, Environmental, Health, Psychosocial, etc. ✓ Differential impacts- in terms of Caste, Class, Gender, Age, Location, Disability. 	Disaster Mgmt. and India: Responding Internally and Simultaneously in Neighboring Countries Kailash Gupta, BE (Elec.), MBA(IIMA)

1 hr	Disaster vs Development	<ul style="list-style-type: none"> ✓ Disaster is the causes of destruction ✓ Disaster leads to development 	
2 hrs	Global warming and climate change	<ul style="list-style-type: none"> ✓ Concept and understanding of global warming and climate change ✓ Causes and factors ✓ Remedial measures 	
Module – II		✓	
UNIT III – Disaster Risk Management - (6 hours)			
2 hrs	Community Managed Disaster Risk Reduction And Village Contingency Plan (Group work) Role of Task force/ ODRAF/ NDRF for DRR at community level.	<ul style="list-style-type: none"> ✓ Hazard analysis and assessment ✓ Vulnerability analysis ✓ Resource capability assessment ✓ Mapping & Seasonality Calendar ✓ Structural and Non Structural assessment. ✓ Task forces with various roles for DRR. 	CBDRM for Local Authorities: PARTICIPANT'S WORKBOOK – adpc www.adpc.net
2 hours	Rapid Need Assessment Pre and Post Disaster (Group work and Practical demo)	<ul style="list-style-type: none"> ✓ Meaning and Importance ✓ Rapid Need Assessment in emergency and its significance ✓ Process and Methods 	
2 hrs	Stress Management	<ul style="list-style-type: none"> ✓ Causes and consequences of Stress ✓ What are the best ways to handle pressure ✓ Psychosocial Support 	
UNIT IV – Disaster Management (8 hrs)			
2 hrs	Disaster Management Cycle	<ul style="list-style-type: none"> ✓ Disaster Management Cycle ✓ Phases of Disasters ✓ Prevention, Mitigation, Preparedness, Warning, Response, Rehabilitation, Reconstruction 	
2 hrs	Fire safety (Practical)	<ul style="list-style-type: none"> ✓ Practical 	
2 hours	First Aid & Driving Learning (Theory and Practical)	<ul style="list-style-type: none"> ✓ ABCD of First Aid ✓ Dressing and Bandages Practical session ✓ Emerging need and importance of learning driving 	
2hrs	Building Rescue operation or Demonstration of ODRAF/NDRAF rescue	<ul style="list-style-type: none"> ✓ Practical 	

	materials		
Module – III		✓	
UNIT V – Humanitarian Charter and Minimum Standards in Humanitarian Response (4 hrs)			
2hrs	Sphere Standards (Group Work)	<ul style="list-style-type: none"> ✓ The Humanitarian Charter ✓ Protection Principles ✓ Core Standards 	
2hrs	Restoring Life Line Services (WASH) (Group work)	<ul style="list-style-type: none"> ✓ Water , Sanitation & Hygiene Promotion ✓ Food Security & Nutrition ✓ Health Services ✓ Health Services ✓ Shelter and Settlement 	The Sphere Project , Humanitarian Charter and Minimum Standards In Humanitarian Response
UNIT VI – Disaster Management Projects –(6 hours)			
6hrs	Seminars / Workshop	<ul style="list-style-type: none"> ✓ Adapting Climate Change ✓ Disaster Resilience Structures and Buildings ✓ IT in Disaster Management ✓ Inter-relationship between Disasters and Development ✓ Urban Disaster ✓ Rain Water Harvesting ✓ Inclusions – Disability, Aged, Social etc 	
		✓	
		✓	

- ✓ Team of 10 – 15 members would be formed
- ✓ Each Team would take up a project work in one of the topics above or related topics with prior approval : 2 Weeks
- ✓ Each Team would organize one Seminar / Workshop during the session

FCMG1202MS Excel

<i>Pre – requisites</i>	<i>Course Type</i>	<i>Credits</i>
<i>Nil</i>	<i>Workshop</i>	<i>2</i>

Course Objective		
<p>The aim is to impart knowledge on</p> <ul style="list-style-type: none"> ✓ Indicate the names and functions of the Excel interface components. ✓ Enter and edit data. ✓ Format data and cells. ✓ Construct formulas, including the use of built-in functions, and relative and absolute references. ✓ Create and modify charts. ✓ Preview and print worksheets. ✓ Use the Excel online Help feature. 		
Course Outcome		
<ul style="list-style-type: none"> ✓ Navigate your way around Microsoft Excel ✓ Work with data analysis and presentation ✓ Create and work with formulas and functions, understand and use formula cell ✓ Use Excel for Business application 		
GUIDELINES ON GRADING AND STANDARDS OF ASSESSMENT		
A continuous evaluation system will be adopted to evaluate the students. There will be an individual and group assignments and presentations.		

Course Contents:

Unit 1: Excel Introduction, direct right, The Excel Interface, direct right, Basic Navigation and Editing,

Unit 2: Getting Going, Orientation & efficiency, Editing, Viewing, Spreadsheet Structure, Cell References, Named Ranges, Basic Macros, Design

Unit 3: Administration, Customising Excel, Housekeeping, Connecting Workbooks Documentation, Protecting and Sharing, Google Docs, Excel Troubleshooting, Data Handling, Sorting and Filtering, Controlling User Input, - Working with Dates & Times

Unit 4: U- Working with Text, Lookup and Reference, Logical Functions, Data Analysis, Working with Numbers, Summarising Data, PivotTables 1 - Simple Summaries, PivotTables 2 - Manipulating Data,

Unit 5: PowerPivot: Handling Big Data, Formula Auditing, Advanced Macros and VBA, Modelling, Presentation, Cell Formatting, Number Formatting, Conditional Formatting, Graphs and Charts, Page and print setup

Gender Issues in Development

Subject Name	Code	Type of course	T-P-Pr (Credit)	Prerequisite
Gender Issues in Development	FCMG0401	Theory & Project	1-0-0 (1 credit)	None

1. Objective

- ✓ In the traditional social order women have been assigned a subordinate status in society for centuries. They have been deprived of many social privileges and suffered from discriminations that prevented them from contributing to the development process. They have remained marginalized in society. To remedy the prevailing situation, gender concerns have become increasingly important in the development agenda in the last few decades. In spite of special policies and programmes being implemented, gender based injustice continues to exist and hinder development

2. Course outcome

- i) Develop an understanding of perspectives on gender and development
- ii) Discuss in detail the gender question in selected development sectors and globalisation
- iii) Familiarise with the different tools and techniques for gender planning, analysis and evaluation in the development sector

The course has three modules covering these three aspects of gender and development.

3. Evaluation Systems

<i>Internal Examination</i>	<i>Component</i>	<i>% of Marks</i>	<i>Method of Assessment</i>
	Midterm Test	20	Written examination
	Assignment		Report and Presentation
	Experiments		Lab work, report
	Project	20	Report and presentation
	Quiz	20	Surprise/preannounced ones
<i>External Examination</i>		40	Written examination
<i>Total</i>		100	

4. Course outline

Module I

UNDERSTANDING AND CONCEPTUALISING GENDER RELATIONS

Module II

GENDER ISSUES IN DEVELOPMENT SECTORS

Module III

GENDER ANALYSIS, TOOLS, TECHNIQUES AND FRAMEWORKS

5. References

- a) “Why Gender is a Development Issue”, Handout 4, Oxfam Gender Training Manual (1994)
- b) Freedman, Jane. (2002), “Introduction: Feminism or Feminisms?” in *Feminism*, Viva Books, N. Delhi.
- c) Chafetz, J.S. (1990), “The Coercive Bases of Gender Inequality”, in *Gender Equity: An Integrated Theory of Stability and Change*, Sage.
- d) Kabeer, Naila. (1994), “Connecting, Extending, Reversing: Development from a Gender Perspective”, in *Reversed Realities*, Verso, London.

- e) Moser, C.O.N. (1991), “Gender Planning in the Third World: Meeting Practical and Strategic Gender Needs”, in T. Wallace & C. March (eds.) *Changing Perceptions: Writings on Gender and Development*, Oxfam.

- f) Boonsue, K. (1992), “Development Models of WID, WAD and GAD” in *Women’s Development Models and Gender Analysis: A Review*, Gender Studies (AIT, Bangkok).
- g) Agarwal, B. (1994), “Conceptualising Gender Relations” in *A Field of One’s Own: Gender and Land Rights in South Asia*, Cambridge University Press.
- h) “Women and the Economy” in *Human Development in South Asia 2000: The Gender Question*, MahbubUIHaq Development Centre/OUP, Islamabad.
- i) Rajagopal, S. (1999), “Closing the Gender Gap in Education: The Shikshakarmi Programme” in N. Kabeer & R. Subrahmanian (eds.), *Institutions, Relations and Outcomes*, Kali for Women, Delhi.
- j) Thakur, S.G. (1995), “Access to Health Care – A Gender Perspective” *The Administrator*, Vol 11, April-June, pp 169-181.
- k) Kusum, K & Barua, K. (2001), “Gender Equality and Women’s Health – A Human Rights Perspective”, *Indian Journal of Adult Education*, Jan-Mar, pp 44-49.
- l) Mohanty, B. (1995), “Panchayati raj, 73rd Constitutional Amendment and Women”, *Economic and Political Weekly*, Dec 30, 3346-3350.
- m) Kapoor, N. (2002), “Women and Governance”, *Participation & Governance*, Vol. 8, No.23, pp 11.
- n) Resurreccion, B.P. (2005), “Women in-between: Gender, Transnational and Rural-Urban Mobility in the Mekong Region”, *Gender, Technology and Development*, Vol.9, No.1, Jan-April, pp 31-51.
- o) Gender and Globalisation – A Note
- p) Overholt, C.A. et.al. (1991), “Gender Analysis Framework”, in A. Rao et.al. (eds.), *Gender Analysis in Development Planning*, Kumarian Press.
- q) Handouts to be given in the class on Gender Assessment Study.
- r) The Gender Analysis Matrix: A Teaching Note.
- s) March. C. et.al (1999), “Women’s Empowerment (Longwe) Framework”, in *A Guide to Gender Analysis Frameworks*, Oxfam: Oxford.
- t) Gender and Organisations – Handout in the class.

6. Session Plan

Topic coverage and Internal Test	No. of Sessions (in hrs.)	Activity (lecture, student/field-practice, field trip, Workshop etc.)	Assignment (project, assignment, field study, seminar,	Suggested Reading (Book, Video, Online source, etc.)
Module 1				

Difference between Sex and Gender	1	Lecture		Lecture Notes and Book chapters
Why gender is a development issue?	1	Lecture		Lecture Notes and Book chapters
Gender system and inequality	1	Lecture		Lecture Notes and Book chapters
Understanding gender relations	1	Lecture		Lecture Notes and Book chapters
Gender planning – practical and strategic gender needs	1	Lecture		Lecture Notes and Book
Approaches to address gender inequality – WID, GAD and GID	1	Lecture		Lecture Notes and Monograph
Module 2				
Gender issues in the economic sector	1	Quiz 1 and Lecture		Lecture Notes and Articles
Gender issues in the education sector	1	Lecture		Lecture Notes and Articles
Gender issues in the health sector	1	Lecture		Lecture Notes and Articles
Gender issues in the governance sector	1	Lecture		Lecture Notes and Articles
Gender issues in globalisation	1	Lecture		Lecture Notes and Articles
Module 3				
Harvard Analytical Framework	1	Lecture		Handouts and Book chapter
Gender Assessment Study and Gender Analysis Matrix	1	Lecture		Handouts and Book Chapters
Gender Empowerment Framework	1	Quiz 2 and Lecture		Handouts and Book Chapters
Gender and Organisations	1	Lecture		Handouts and Book Chapters
Student Presentations based on group projects	Extra classes			

<i>Total (hrs)</i>	15 hours +3 hours			
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Centurion University of Technology and Management Odisha

Choice Based Credit System

Course Structure & Syllabus

BASKET- IV



CENTURIONUNIVERSITYOFTECHNOLOGYANDMANAGEMENT

School of Engineering & Technology

2018..

**Mechanical Engineering
Course Structure Basket
IV**

Code	Course Title	Type	Credit	Prerequisite
MECC0101	Quality Control and Reliability Engineering	Theory	2	Nil
MECC0102	Fluid Power Control	Theory	2	Nil
MECC0103	Introduction to Hybrid and Electric Vehicles	Theory	2	Nil
MECC0104	Renewable Energy Systems	Theory	3	Nil
MECC0401	Manufacturing Technology 1	Theory+ Practice	3	Workshop Practice
MECC0402	Manufacturing Technology 2	Theory+ Practice	4	Nil
MECC0403	Design for Manufacturing	Theory+ Practice	4	Workshop Practice
MECC0404	Finite Element Analysis	Theory+ Practice	4	Strength of Materials
MECC0405	Digital Manufacturing	Theory+ Practice	3	Nil
MECC0415	Fundamentals of Heat Engine	Theory+ Practice	3	Thermodynamics
MECC0407	Design of Thermal Energy Systems	Theory+ Practice	3	Thermodynamics
MECC0410	Mechanics of Machines	Theory+ Practice	3	Nil
CECC0411	Strength of Materials	Theory+ Practice	3	Engineering Mechanics
MECC0412	Design of Transmission Systems	Theory+ Practice	3	Mechanics of Machines
MECC0414	Fluid Mechanics and Heat Transfer	Theory+ Practice	3	Basic Fluid Mechanics
Total Credits			45	

Quality Control and Reliability Engineering

Course Title	Code	Type of course	T-P-P	Prerequisite
Quality Control and Reliability Engineering	MECC0101	Theory	2-0-0	Nil

Objective

<ul style="list-style-type: none"> · To introduce the concept of SQC · To understand process control and acceptance sampling procedure and their application. · To learn the concept of reliability
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Course outcomes

<ul style="list-style-type: none"> · Upon successful completion of this course, the students can be able to apply the concept of SQC in process control for reliable component production
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Evaluation Systems

	Component	% of Marks	Method of Assessment
Internal Examination	Internal Theory	30	Written examination
	Assignment	5	Report or Presentation + Learning Record
	Attendance	5	Based on class attended
External Examination	External Theory	60	Written examination
Total		100	

Course Outline

Module I: Introduction to Quality Control (3Hrs)

Theory

Definition of Quality, Basic Concept of Quality, Definition of SQC, Benefits and Limitation of SQC, Quality Assurance, Quality Control: Quality Cost-Variation in process Causes of Variation

Module II: Control Charts (5Hrs)

Theory

Theory of Control Chart, Uses of Control Chart, Control Chart for Variables, X-Chart, R-Chart and σ -Chart (Most of used in MINITAB Software), Process Capability, Process Capability Studies and Simple Problems. Concept of Six Sigma. Control Chart for Attributes, Control Chart for Non-conforming p-Chart and np-Chart; Control Chart for nonconformities – C and U Charts, (Most of

used in MINITAB Software) State of Control and Process out of Control Identification in Charts, Pattern Study.

Module III :Acceptance Sampling in Quality Control(6Hrs.)

Theory

Lot by Lot Sampling Types, Probability of Acceptance in Single, Double, Multiple Sampling Techniques, O.C. Curves (Use for MINITAB 17), Producer's Risk and Consumer's Risk. AQL, LTPD, AOQL (Most of used in MINITAB Software). Standard Sampling Plans for AQL and LTPD - uses of Standard Sampling Plans. (Most of used in MINITAB Software), Single Sampling, Double Sampling.

Module IV:Reliability Concepts(5Hrs)

Theory

Reliability engineering fundamentals; Lifetesting - Objective - Failure data Analysis, Failure rate; Mortality Curve (Used in MINITAB Software); Concept of burn in period; Use of life and wear out phase of a system; Mean Time to Failure (MTTF) (Used in MINITAB Software); and Mean Time to Repair (MTTR) Reliability in terms of Hazard rate and failure density, Conditional Probability and Multiplication Rules.

Module V :Reliability Improvement(3Hrs)

Theory

Techniques, Use of Pareto Analysis, Design for Reliability, Redundancy Unit and Standby Redundancy, Optimization in Reliability.

Module VI:Total Productive Maintenance(TPM)(3Hrs)

Theory

Introduction, Content, Methods and Advantages. Product Design, Product Analysis, Product Development, Product Life Cycles, TQM & TPM.

Module VII :Total Quality Management TQM(5Hrs)

Theory

Introduction, Definitions and Principles of Operation, Tools and Techniques, such as, Quality Circles, 5S Practice, Total Quality Control (TQC), Total Employee Involvement (TEI), Problem Solving Process, Quality Function Deployment (QFD), Failure Mode and Effect Analysis (FMEA), Fault Tree Analysis (FTA), Kizen, Poka-Yoke, QC Tools, PDCA Cycle, Quality Improvement Tools, TQM Implementation and Limitations.

Text Books

1. Mahajan, M, Stastical Quality Control, 2016, Dhanpat Rai & Co.
2. Srinath, LS, Reliability Engineering, 2005, East West Press

Reference Books

1. Park, SH, Robust Design for Quality Engineering and Six Sigma, 2009, World Scientific Publisher.

Session Plan

Topic	No. of Sessions (in hrs.)	Activity	Assignment	Suggested Reading
Module I (3 Hrs)				
Introduction, Definition of Quality, Basic Concept of Quality	1	Lecture		Text Book (TB) 1
Definition of SQC, Benefits and Limitation of SQC	1	Lecture		TB-1
Quality Assurance, Quality Control: Quality Cost- Variation in process Causes of Variation	1	Lecture	Assignment 1	TB-1
Module II (5 Hrs)				
Theory of Control Chart- Uses of Control Chart- Control Chart for Variables- X Chart, R Chart and σ Chart	1	Lab practice, (MI NITAB)		Reference Book (RB) 1
Process Capability Studies and Simple Problems	1	Lecture		RB-1
Concepts of Six Sigma.	1	Lecture		RB-1
Control Chart for Attributes Control Chart for non-conforming p-Chart and np-Chart; Control Chart for nonconformities- C and U Charts	1	Lab practice, (MI NITAB)		RB-1
State of Control and Process out of Control Identification in Charts, Pattern Study	1	Lab practice, (MI NITAB)	Assignment 2	RB-1
Module III (6 Hrs)				

Lot by Lot Sampling – Types – Probability of Acceptance in Single, Double, Multiple Sampling techniques – O.C. curves	2	Lab practice,(MI NITAB		RB-1
Producer's Risk and Consumer's Risk. AQL, LTPD, AOQL	2	Lab practice,(MI NITAB		RB-1
Concepts Standard Sampling Plans for AQL	2	Lab practice,(MI NITAB	Assignment 3	RB-1
Module IV (5 Hrs)				
LTPD-Uses of Standard Sampling Plans. Single Sampling, Double Sampling	1	Lab practice,(MI NITAB		RB-1
Reliability Concepts: Reliability engineering fundamentals; Lifetesting – Objective – Failed data Analysis	1	Lecture		TB-1
Mortality Curve; Concept of burn in period; Useful life and wear out phase of a system; Mean Time to Failure (MTTF) and Mean Time to Repair (MTTR)	2	Lab practice,(MI NITAB		TB-1
Reliability in terms of Hazard rate and failure density, Conditional Probability and Multiplication Rules	1	Lecture	Assignment 4	TB-1
Module V (3 Hrs)				
Reliability Improvements – Techniques – Use of Pareto Analysis	1	Lecture		TB-1
Design for Reliability – Redundancy Unit and Standby Redundancy –	2	Lab practice,(MI NITAB	Assignment 5	RB-1
Module VI (3 Hrs)				
Introduction to Total Productive Maintenance	1	Lecture		TB-1

(TPM):Introduction, Content, Methods and Advantages				
Product Design– Product Analysis– Product Development– ProductLife Cycles, TQM&TPM	2	Lecture	Assignment 6	TB-1
Module VII(5 Hrs)				
Total QualityManagement TQM:Introduction, Definitions and Principles of Operation, Tools and Techniques, suchas, Quality Circles, 5 S Practice, Total QualityControl (TQC),	1	Lecture		RB -1
Total EmployeeInvolvement (TEI), Problem Solving Process, QualityFunction Deployment (QFD),Failure Mode and Effectanalysis(FMEA),	2	Lecture		TB-1
FaultTreeAnalysis (FTA), Kizen, Poka-Yoke, QC Tools, PDCA Cycle, Quality, ImprovementTools, TQM Implementation and Limitations.	2	Lecture	Assignment 7	TB-2
Total	30			

Fluid Power Control

Course Title	Course Code	Type of Course	T-P-Pr	Prerequisite
Fluid Power Control	MECC0102	Theory	2-0-0	Nil

Objective

<ul style="list-style-type: none"> To impart knowledge to students on fundamentals of hydraulic and pneumatic power and their circuits with industrial applications
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Course Outcomes

<ul style="list-style-type: none"> Students will be able to identify various elements used in fluid power systems and will be able to deliver fluid power circuit diagrams Students will be able to design and test various control circuits using Fluidsim software
--

Evaluation System

Evaluation	Component	Marks	Method of Evaluation
Internal Evaluation	Internal Theory	30	Written examination
	Assignment	5	Report or Presentation + Learning Record
	Attendance	5	Based on class attended
External Evaluation	External Theory	60	Written examination
Total Marks		100	

Course Outline

Module I : Hydraulic Power Generating Systems (04 Hours)

Introduction of fluid power system - Hydraulic Fluids - Functions, Types, Properties, Selection & Application; **Power Generating Elements:** Hydraulic Turbines - Classification, Working and application of different turbines such as Pelton Wheel, Reaction turbine, Selection of turbines **(No Numerical to be asked in examination)** Pumps, Classification, Working of different Pumps such as Gear, Vane, Piston (Axial and Radial), Pump Performance or Characteristics, Pump Selection Factors

Module II : Hydraulic Power Utilizing Elements (03 Hours)

Fluid Power Actuators: Linear Hydraulic Actuators- Types and Construction of Hydraulic Cylinders- Single Acting, Double Acting, Special Cylinders like Tandem, Rodless, Telescopic, Cushioning Mechanism, Hydraulic Motors, Types- Gear, Vane, Piston (Axial & Radial)- Performance of Motors

Module III: Hydraulic Valves and Accessories (05 Hours)

Hydraulic Valves: Directional, Pressure and Flow Control Valves- Types and Applications; **Intensifier:** Applications of Intensifier- Intensifier Circuit; **Servo Systems:** Hydro Mechanical Servo Systems, Electro Hydraulic Servo Systems and Proportional Valves; **Accessories:** Switches, Filters, Seals, Fittings and other Accessories; **Accumulators:** Types and Applications

Module IV: Pneumatic Systems (07 Hours)

Introduction, Comparison with Hydraulic Systems and Electrical Systems, Construction, Operation, Characteristics and Symbols of Pneumatic Components, Air Treatment- Principles and Components; **Fluidics:** Introduction to Fluidic Devices, Simple Circuits, Introduction to Elector Pneumatic Logic Circuits, Ladder Diagrams For Various Fluid Power applications; **Pneumatic Sensors:** Types, Characteristics and Applications

Module V: Fluid Power Circuit (6 Hours)

Hydraulic/Pneumatic circuit: Design of Hydraulic/Pneumatic Circuit For Various Valves, Actuators, Filters, Pumps, Simple Reciprocating, Regenerative, Speed Control (Meter in, meter Out and Bleed Off), Sequencing, Synchronization, Transverse and Feed, Cascading Circuit (two and Three Cylinders), Automatic Reciprocating, fail Safe Circuit, Counter balance Circuit, Actuator Locking (**Most of topics will be taught through practice in Fluids sim software**)

Module VI: Applications (2 hours)

Industrial Circuits: Riveting Machine, Actuator Locking, Hydraulic Press, Unloading Circuit and Material handling systems

Module VII: Maintenance and Trouble Shooting (3 Hours)

Maintenance and Troubleshooting: Maintenance in fluid Power Systems, Preventive and Break down Maintenance Procedures. Trouble Shooting of Fluid Power Systems- Fault Finding Process, Equipment/Tools Used Causes and Remedies, Safety Aspects Involved

Text Books

- 1.Oil HydraulicSystems:Principles and MaintenancebyS.R Majumdar, TataMcGrawHill.
- 2.Pneumatic Systems: Principles and MaintenancebyS.R Majumdar, TataMcGraw Hill.

ReferenceBooks:

1. Hydraulics and pneumatics byAndrew Parr, Jaico PublishingHouse.
2. Fundamentals of Pneumatics byFESTOVolII,II,III.
3. Fluid Power with applications byAnthonyEsposito PrenticeHallInternational.

SessionPlan

Topics	No. of Sessions (in hrs.)	Activity	Assignment	Suggested Reading
Module I: Hydraulicpowergenerating systems(4 Hours)				
Introduction to fluid power system-HydraulicFluids-Functions,Types, Properties, Selection &Application	1	Lecture	Assignment - 1.1	Text Book(TB)-1 Chapter(Ch)-1,2
HydraulicTurbines-Classification, Workingand application of different turbines such asPelton Wheel, Reaction turbine,Selection of turbines	1	Lecture	Assignment - 1.2	TB-1 Ch-2
Pumps, Classification,Workingof different Pumps such as Gear, Vane, Piston (Axial and Radial), Pump Performanceor Characteristics, Pump Selection Factors	2	Lecture	Assignment - 1.3	TB-1 Ch-4
Module II :Hydraulic PowerUtilizing Elements (03 Hours)				
Linear HydraulicActuators-Types and Construction ofHydraulic Cylinders-Single Acting,Double Acting, Special Cylinders like Tandem, Rod less, Telescopic, CushioningMechanism	2	Lecture	Assignment - 2.1	TB-1 Ch-8
HydraulicMotors, Types- Gear, Vane, Piston (Axial &Radial)-Performanceof Motors	1	Lecture	Assignment - 2.2	TB-1 Ch-9

Module III: Hydraulic Valves and Accessories (05 Hours)				
Directional, Pressure and Flow Control Valves-Types and Applications	1	Lecture	Assignment - 3.1	TB-1 Ch-5,6
Applications of Intensifier-Intensifier Circuit	1	Lecture	Assignment - 3.2	TB-1 Ch-7
Hydro Mechanical Servo Systems, Electro Hydraulic Servo Systems and Proportional Valves	1	Lecture	Assignment - 3.3	TB-1 Ch-7
Switches, Filters, Seals, Fittings and other Accessories	1	Lecture	Assignment - 3.4	TB-1 Ch-13,14
Accumulators: Types and Applications	1	Lecture	Assignment - 3.5	TB-1 Ch-11
Module IV: Pneumatic Systems (07 Hours)				
Introduction, Comparison with Hydraulic Systems and Electrical Systems, Construction, Operation, Characteristics and Symbols of Pneumatic Components, Air Treatment-Principles and Components	3	Lecture	Assignment - 4.1	TB-2 Ch-6,7
Introduction to Fluidic Devices, Simple Circuits, Introduction to Elector Pneumatic Logic Circuits, Ladder Diagrams For Various Fluid Power applications	3	Lecture	Assignment - 4.2	TB-2 Ch-9
Pneumatic Sensors: Types, Characteristics and Applications	1	Lecture	Assignment - 4.3	TB-2 Ch-11
Module V: Fluid Power Circuit (6 Hours)				
Design of Hydraulic/Pneumatic Circuit For Various Valves, Actuators, Filters, Pumps,	2	Lecture+ Practice (Fluid Sim software will be used to design the circuits)	Assignment - 5.1	TB-2 Ch-10,11
Simple Reciprocating, Regenerative, Speed Control (Meter in, meter Out and Bleed Off)	2		Assignment - 5.2	TB-2 Ch-10,11
Sequencing, Synchronization, Transverse and Feed, Cascading Circuit (two and Three Cylinders)	1		Assignment - 5.3	TB-2 Ch-10,11

Automatic ,Reciprocating, fail SafeCircuit, Counterbalance Circuit,Actuator	1		Assignment - 5.4	TB-2 Ch-10,11
Module VI: Applications (2 hours)				
Industrial Circuits: Riveting Machine, ActuatorLocking, HydraulicPress, Unloading Circuitand Material handling systems.	2	Lecture	Assignment - 6.1	TB-1 Ch-15
Module VII: MaintenanceandTrouble Shooting (3 Hours)				
Maintenanceinfluid Power Systems, Preventive andBreak down MaintenanceProcedures.	1	Lecture	Assignment - 7.1	TB-2 Ch-12
TroubleShootingof Fluid Power Systems-FaultFindingProcess, Equipment/Tools Used Causes and Remedies. SafetyAspects Involved.	2	Lecture	Assignment - 7.2	TB-2 Ch-12
TOTALSESSIONS	30			

Introduction to Hybrid and Electric Vehicles

Course Title	Course Code	Type of Course	T-P-Pr	Pre-requisite
Introduction to Hybrid and Electric Vehicles	MECC0103	Theory	2-0-0	Nil

Objective

<ul style="list-style-type: none"> ✓ To teach the students on principles, technology and applications of electric and hybrid vehicles
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Course Outcomes

<ul style="list-style-type: none"> ✓ Students will acquire knowledge regarding the testing and performance of electric vehicles ✓ Students will learn the skill to carry out basic maintenance of these vehicles
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Evaluation Systems

	Component	% of Marks	Method of Assessment
Internal Examination	Internal Theory	30	Written examination
	Assignment	5	Report or Presentation + Learning Record
	Attendance	5	Based on class attended
External Examination	External Theory	60	Written examination
Total		100	

Course Outline

Module I: Introduction to Hybrid Vehicles (5 Hours)

Theory

Introduction to Hybrid Vehicles: History of Hybrid Vehicles, Pollution Comparison, Social and Environmental Importance, Roadway Fundamentals, Impact of Modern Drive-Train on Energy Supplies, Working Principle of Hybrid Vehicles.

Module II: Hybrid Drive-Trains (4 Hours)

Theory

Hybrid Drive-Trains: Basic Concept of Hybrid Traction, Types of Drive Train in Hybrid Vehicles, PowerFlow Control in Hybrid Drive-Train Topologies.

Module III: Introduction to Electric Vehicles (4Hours)

Theory

Introduction to Electric Vehicles: Reasons for Electric Vehicle Development, Advantages, Main Components of Electric Vehicles (Battery, Motor, Controller, DC to DC Converter), Working of Main Components.

Module IV: Energy Storage (5 Hours)

Theory

Energy Storage: Energy Storage Requirements in Electric Vehicles, Battery Monitoring and Charging Control, Combination of Batteries, Sizing of Battery Cell, Principles of Operation of Fuel Cell, Regenerative Braking System.

Module V: Energy Management Strategies (4 Hours)

Theory

Energy Management Strategies: Introduction to Energy Management Strategies Used in Hybrid and Electric Vehicles, Classification of Different Energy Management Strategies, Comparison of Different Energy Management Strategies, Implementation Issues of Energy Management Strategies.

Module VI: Electric Propulsion Unit (4 Hours)

Theory

Electric Propulsion Unit: Introduction to Electric Components Used in Hybrid and Electric Vehicles, DC Motor, Control of DC Motor Drives, BLDC (Brushless DC) Motor

Module VII: Types of Motors and Drives (4Hours)

Theory

Types of Motors and Drives: Induction Motor and Drives, Permanent Magnet Synchronous Motor Drives, Switched Reluctance Motor Drives.

Text Books

1. Hussein Iqbal, Electric and Hybrid Vehicles, Design Fundamentals, CRC Press
2. Chan C.C., Chau K.T., Modern Electric Vehicle Technology, Oxford Science Publications

Reference Books

1. Ehsani Mehrdad, Gao Yimi, Gay Sebastian E., Emadi Ali, Modern Electric Hybrid Electric and Fuel Cell Vehicles: Fundamentals, Theory and Design, CRC Press
2. Laminie James, Lowry Jhon, Electric Vehicle Technology Explained, Wiley

Online Source: <http://nptel.iitm.ac.in>

Session Plan

Topics	No. of Sessions (in hrs.)	Activity	Assignment	Suggested Reading
Module I: Introduction to Hybrid Vehicles (5 Hours)				
History of Hybrid Vehicles, Pollution Comparison, Social and Environmental Importance, Roadway Fundamentals, Impact of Modern Drive-Train on Energy Supplies, Working Principle of Hybrid Vehicles	5	Lecture	Assignment-1	Text Book (TB)-1, Chapter (Ch)- 1, 10 https://www.youtube.com/watch?v=pMTPUjfiQQw http://nptel.iitm.ac.in
Module II: Hybrid Drive-Trains (4 Hours)				
Basic Concept of Hybrid Traction, Types of Drive Train in Hybrid Vehicles, Power Flow Control in Hybrid Drive-Train Topologies,	4	Lecture	Assignment-2	TB-1, Ch-9 https://www.youtube.com/watch?v=axzTZZKm3mc http://nptel.iitm.ac.in
Module III: Introduction to Electric Vehicles (4 Hours)				
Reasons for electric vehicle development, Advantages and disadvantages of electric vehicle, Main components of electric vehicles	4	Lecture+Practice	Assignment-3	TB-1, Ch-1 https://www.youtube.com/watch?v=ytVyj10p0BI http://nptel.iitm.ac.in

(Battery, Motor, Controller, DC to DC converter), Working of main components				
Module IV: Energy Storage(5 Hours)				
Energystorage requirements in electricvehicles, Battery monitoring and charging control, Combination of batteries. Sizing of battery cell, Principles of operation of Fuel cell, Regenerative brakingsystem	5	Lecture+Practice	Assignment-4	TB-1,Ch-5 https://www.youtube.com/watch?v=N10IPLUxNWM https://www.youtube.com/watch?v=uLrCFStQQUU https://www.youtube.com/watch?v=2SQ2SYhVaaE http://nptel.iitm.ac.in
Module V: Energy Management Strategies (4 Hours)				
Introduction to Energy Management Strategies Used in Hybrid and Electric Vehicles, Classification of Different Energy Management Strategies, Comparison of Different Energy Management Strategies, Implementation Issues of Energy Management Strategies.	4	Lecture	Assignment-5	TB-1,Ch-7 https://www.youtube.com/watch?v=0DqPmACIeKA https://www.youtube.com/watch?v=gK6UUY3nTko http://nptel.iitm.ac.in
Module VI: Electric Propulsion Unit (4 Hours)				
Introduction to Electric Components Used	4	Lecture+Practice	Assignment-6	TB-1,Ch-5 https://www.youtube.com/watch?v=jAGTEAtPEzY

in Hybrid and Electric Vehicles, DC Motor, Control of DC Motor Drives, BLDC (Brushless DC) Motor				https://www.youtube.com/watch?v=bCEiOnuODach https://www.youtube.com/watch?v=LtJoJBUSE28 https://www.youtube.com/watch?v=Vk2jDXxZlhs&list=PLMHo_80Gkm https://www.youtube.com/watch?v=dAW8e3N9xDE http://nptel.iitm.ac.in
Module VII: Types of Motors and Drives (4 Hours)				
Induction motor and drives, Permanent magnet synchronous motor drives, Switched reluctance motor drives	4	Lecture+ Practice	Assignment- 7	TB-1, Ch-6 TB-2
Total (hrs)	30			

Renewable Energy Systems

Course Title	Code	Type of course	T-P-P	Prerequisite
Renewable Energy Systems	MECC0104	Theory	3-0-0	Nil

Objective

- To expose the students about energy demand and supply situation in India
- To expose students about Renewable energy systems in use

Course outcomes

- To have a knowledge of energy scene in India
- To acquire the skill of analyzing and designing renewable energy systems

Evaluation Systems

Evaluation	Component	Marks	Method of Evaluation
Internal Evaluation	Internal Theory	30	Written examination
	Assignment	5	Report or Presentation + Learning Record
	Attendance	5	Based on class attended
External Evaluation	External Theory	60	Written examination
Total		100	

Course outline

Module I: Energy Demand and Supply Situation in India, Introduction to Energy System (7 Hours)

Theory

Energy Demand and Supply Situation in India: Sectorial energy demands in India, Different Energy sources in India, Systems view of energy, Institutions and policies affecting energy systems.

Introduction to Energy System: Basic Principle of solar energy and its conversion to thermal and electrical energy.

Geothermal Energy: Structure of earth, Geothermal Regions, Geothermal Power generation.

Ocean Energy: Principle of ocean Thermal energy conversion, Ocean thermal power plants, important components of a Tidal Power plant.

Module II: Photovoltaic System(6 Hours)

Theory

Photovoltaic System: Principle of Photovoltaic effect, Types and Application: Domestic and Industrial, Photovoltaic system and its Components, PV system and its Design, PV system Installation and Testing.

All the topics to be taught through practicum mode.

Module III: Solar Thermal System(6 Hours)

Theory

Solar Thermal System: Types of Collector and its Application, Design of different types of Collectors, Testing and Installation of Solar Thermal System.

All the topics to be taught through practicum mode.

Module IV: Wind Energy(5 Hours.)

Theory

Wind Energy: Basic Principle of Wind Energy Conversion, Wind Data and Energy Estimation, Wind Energy Sources and Potential, Wind Power Systems: System components, Types of Turbine, Turbine Rating, Choice of Generator.

Module V: Controlling Systems of Wind Turbine Generator(6 Hours.)

Theory

Controlling Systems of Wind Turbine Generator: Variable speed operation, maximum power operation, control systems, Application of Wind energy in different sectors, system design features, testing and installation of Wind systems.

All the topics to be taught through practicum mode.

Module VI: Bio Energy(5 Hours.)

Theory

Bio Energy: Basic Principle of Biomass Generation and Conversion, Sources and Potential of Bio-Gas, Application of Bio-Gas in different Sectors.

Module VII: Conversion of Energy(7 Hours.)

Theory

Conversion of Energy: Thermochemical Process, and Fermentation: Aerobic and Anaerobic digestion, Design and Construction details of Main Digester, Testing and Installation of Bio-Gas Plant. Alternative Liquid Fuels, Bio Diesel Production.

All the topics to be taught through practicum mode.

Practice

1. Photo-Voltaic Power Output Vs Tilt Angle, Ambient Temperature and Shade.
2. Solar PV System Installation and Performance test.
3. Thermal Analysis of Solar Flat Plate Collector Using ANSYS.
4. Performance Test of a Solar Dryer.
5. Simulation for Wind Turbine Generator with DC Motor in Solar/Wind Energy Mobile Workstation.
6. Performance Testing of Bio gas Plant.
7. Energy Analysis of Different Biomass Products.
8. Preparation of Biodiesel.

Text Books

1. Rai G.D. Non-conventional Energy sources: Khanna Publishers, fifth edition, 2011.
2. Kothari D.P, Singal K.C and Ranjan Rakesh. Renewable Energy Sources and Emerging Technologies: PHI Learning private limited, Third edition, 2013.

References

1. Sukhatme S.P and Nayak J.K: Solar Energy Principles of Thermal collection and Storage: MCGRAW Hill Education (India) Private Limited, Third edition, 2008.
2. Solanki C.S. Solar Photovoltaic Fundamentals, Technologies and Applications: PHI Learning private limited, Second edition, 2015
3. Online Source: NPTEL, You tube

Session Plan

Topic coverage and Internal Test	No. of Sessions (in hours)	Activity	Assignment	Suggested Reading
Module I: Energy Demand and Supply Situation in India, Introduction to Energy System (7 Hours)				
Energy demands in India, Energy sources in India	1	Lecture	Assignment 1.1	Text Book (TB)-2, Chapter (Ch)-1
Systems view of energy, Institutions and policies affecting energy systems	1	Lecture	Assignment 1.2	TB-2, Ch-1

Introduction to Energysystem:Solar Energy Basic Principle of solar energy and its conversiontothermal andelectricalenergy. Geothermal Energy: Structure of earth, Geothermal Regions.	2	Lecture	Assignment 1.3	TB-2, Ch-3
Geothermal Power generation. Ocean Energy: Principleof ocean Thermal energyconversion	2	Lecture	Assignment 1.4	TB-2, Ch-10,11
Ocean thermal power plants, important components of a Tidal Power plant.	1	Lecture	Assignment 1.5	TB-2,Ch-11
Module II:PhotovoltaicSystem(6 Hours)				
Photovoltaicsystem: Principleof Photovoltaic effect, Typesand application: domestic and industrial	1	Lecture	Assignment 2.1	Ref.-2 ,Ch-13 https://www.youtube.com/watch?v=Rq5Nzv_6v98
Photovoltaicsystem and its components	1	Lecture	Field study	https://www.youtube.com/watch?v=f1QSPBTJs5I
PV system and it design	2	Lecture	Assignment 2.2	Ret.-2,Ch-14 https://www.youtube.com/watch?v=q7hW9XQLf6g
PV system installation and testing	2	Lecture	Field study	https://www.youtube.com/watch?v=Q5X6sMScwvM https://www.youtube.com/watch?v=ffmsR_xdRkY

ModuleIII:Solar Thermal System(6 Hours)				
Solarthermal system: Types of Collector and its application	2	Lecture	Assignment 3.1	TB-1,Ch-3
Design of different types ofcollectors	2	Lecture	Assignment 3.2	TB-1, Ch-3 https://www.youtube.com/watch?v=wvl0QAQCJyc
Testingand installation ofsolar thermal system	2	Lecture	Field study	
ModuleIV:WindEnergy(5 Hours)				
WindEnergy:Basic Principle of Wind Energy Conversion, Wind Data and Energy Estimation, wind energy sources and potential	3	Lecture	Assignment 4.1	TB-1,Ch-6,sec- 0.3.0.4,0.5
Wind power systems: system components, Types of Turbine, Turbine rating. Choiceofgenerators	2	Lecture	Assignment 4.2	TB-1, Ch-6 https://www.youtube.com/watch?v=LNXTm7aHvWc https://www.youtube.com/watch?v=DILJwsFl3w
Module V:Controlling Systems ofWindTurbineGenerator(6 Hours)				
Controlling systems of Wind Turbine Generator: Variable speed operation, maximum power operation, maximum power operation, control systems, Application of Wind energy in different sectors	3	Lecture	Assignment 5.1	TB-1, Ch-6
System design features, testing and installation ofWind systems.	3	Lecture	Assignment 5.2	

ModuleVI:Bio Energy(5 Hours)				
Bio Energy Basic Principle of Biomass Generation and Conversion	1	Lecture	Assignment 6.3	TB-1,Ch-7
Sources and potential of Bio-Gas	1	Lecture	Assignment 6.4	TB-1,Ch-7,sec.-7.9
Application ofBio-Gas indifferent sectors	1	Lecture	Assignment 6.5	TB-1, Ch-7,sec.- 7.11
Testingand installation ofBio-Gas Plant	2	Lecture	Field study	https://www.youtube.com/watch?v=PmBx5Zo8KZo
ModuleVII:ConversionofEnergy(7 Hours)				
Types of Conversion: Thermal, Thermo chemical Process	2	Lecture	Assignment 7.1	TB-1,Ch-7, sec.- 7.27,7.28
Fermentation: Aerobic and Anaerobicdigestion	2	Lecture	Assignment 7.2	TB-1 ,Ch-7
Design and Construction details of Main Digester, Testing and Installation of Bio-GasPlant.Alternative Liquid Fuels, Bio Diesel Production.	3	Lecture	Field study	https://www.youtube.com/watch?v=24Zxr2KH W6s

Manufacturing Technology I

Course Title	Code	Type of course	T-P-P	Prerequisite
Manufacturing Technology I	MECC0401	Theory+ Practice	2-1-0	Workshop Practice

Objective

<ul style="list-style-type: none"> • To understand the importance of manufacturing processes like primary shaping/forming processes and joining/fabrication processes • To impart knowledge on practical applications of the technologies through actual experiments and to make Products

Course Outcomes

<ul style="list-style-type: none"> • Students will have knowledge and skills to understand actual manufacturing processes used in industry and will be able to correlate a specific process with the part/component being produced • Students will be able to select the most optimum manufacturing process for a specific product design and application

Evaluation Systems

Internal Examination	Component	% of Marks	Method of Assessment
	Internal Theory	20	Written examination
	Internal Practice	30(20+10)	Labwork + Learning Record
External Examination	External Theory	30	Written examination
	External Practice	20	Labwork
Total		100	

Course Outline

Module I: Metal Casting Process (9 Hours)

Theory

Introduction, Basic Factors Involved in Casting, Patterns (Classifications, Allowances and Considerations), Mold Materials & Mould Making, Principles of Gating Design, Principles of Risers, Core Making Process, Chills and Chaplets, Solidification of Castings, Inspection and Defects in Castings.

Practice

1. Pattern & Mold Making in Sand Casting.

Module II: Special Casting Processes (9 Hours)

Theory

Permanent Mould Casting, Die Casting, Slush Casting, Centrifugal Casting, Investment Casting, Carbon Dioxide Casting, Stir Casting, Continuous Casting, Shell and Plaster Molding Process, Full Mould Process, Vacuum Sealed Molding Process, Ceramic Mould Casting.

Practice

2. To Prepare a Green Sand Mould for gear manufacturing.
3. Furnace Operation & Aluminum Melting to Pour a Casting.
4. Casting Simulation in CATIA.

Module III: Fundamentals of Arc and Gas Welding (9 Hours)

Theory

Physics of Welding, Welding Classification & Applications, Welding Positions, Edge Preparation, Gas Welding and Cutting, Types of Flame, Flux and Filler, Arc Welding: SMAW Principle and Power Source, Types of Electrodes, Functions of Flux Coatings and AWS Classification and Coding.

Practice

5. Butt Joint by using Oxy Acetylene Gas Welding.
6. Edge Preparation to make Lap Joint and Butt Joint.

Module IV: Welding Processes (9 Hours)

Theory

GTAW, GMAW, SAW, Resistance Welding (Spot, Seam, Projection & Flash Butt), Solid State Welding (Forge, Friction & Explosive), Thermit Welding, Radiant Energy Welding (LBW, EBW, Ultrasonic), Brazing and Soldering.

Practice

7. Bead on Plate Varying Current & Voltage for SMAW using E6013.
8. GTAW Torch Assembly and Bead on Aluminum Plate without & with Filler.
9. Joining of Sheets using Spot Welding.
10. Soldering & Brazing Practice.
11. Welding of Two Cylindrical Jobs using Friction Welding.

Module V: Defects, Testing & Economics of Welding (5 Hours)

Theory

Heat Affected Zone, Weld Defects, Testing of Weldments, Economics of Welding (Welding Costs, Standard Time).

Practice

12. Testing of Tensile Strength of a Welded Job.
13. Testing of Weld by Liquid Dye Penetrate.

Module VI: Metal Forming: Rolling & Forging of Metals (9 Hours)

Theory

Plastic Deformation and Yield Criteria, Relation between Tensile and Shear stress, Cold and Hot Working, Rolling: Principle and mechanism, Defects, Types of Rolling Mills, Forging: Classification, Open-Die Forging, Impression-Die and Closed-Die Forging, Drop and Press Forging, Forging defects.

Practice

14. Making a hexagon Section from 20mm Round MS Bar.

Module VII: Metal Forming: Drawing, Extrusion & Sheet Metalworking (10 Hours)

Theory

Drawing: Methods and Variables, Wire Drawing, Extrusions: Advantages and Disadvantages, Direct, Indirect, Impact and Hydrostatic Extrusion and their Applications, Extrusion of Tubes, Extrusion Defects.

Sheet Metal Work: Bending, Forming and Deep drawing, Shearing, Punching and Blanking- Method and Application.

Practice

15. Shearing of 2 mm MS Sheet to Manufacturing a Washer.

Text Books

1. Rao, PN, Manufacturing Technology, Volume 1, 2015, 4th Edition, Tata Mc-Graw Hill Education Private Limited, India.
2. Ghosh, A & Mallik, AK, Manufacturing Science, 2010, 2nd Edition, Pearson India.

Reference Books

1. Kaushish, JP, Manufacturing Processes, 2010, 2nd Edition, PHI Learning Pvt. Ltd.
2. Sharma, PC, A Text Book of Production Technology (Manufacturing Processes), 2014, 8th Edition, S. Chand & Company Pvt. Ltd.

Session Plan

Topic	No. of Sessions (in hrs.)	Activity	Assignment	Suggested Reading (Book, Video, Online source, etc.)
Module I (9 Hrs)				

Basic Factors Involved in Casting.	01	Lecture	Field study	<ol style="list-style-type: none"> 1. http://nptel.ac.in/courses/112107144/13 2. https://www.youtube.com/watch?v=YtksJ12suFM 3. https://www.youtube.com/watch?v=rL3dLQYEEKw TextBook (TB)-1, Page-59
Patterns Classifications Design Allowances, Design Considerations.	01	lecture	Assignment 1.1	<ol style="list-style-type: none"> 1. http://nptel.ac.in/courses/112107144/15 2. https://www.youtube.com/watch?v=-g18ycqbLJY 3. https://www.youtube.com/watch?v=Yf-71Yl_FPI 4. https://www.youtube.com/watch?v=khEvhjllh_SM TextBook (TB)-1, Page-64; R2, Page-84
Technology of Mould making.	01	Lecture	Field study	<ol style="list-style-type: none"> 1. https://www.youtube.com/watch?v=6ZuxO--vNDU 2. nptel.ac.in/courses/112107215/11 TextBook (TB)-1, Page-81
Principles of Gating Design.	01	Lecture	Assignment 1.2	<ol style="list-style-type: none"> 1. https://www.youtube.com/watch?v=CoO_akMDBbo 2. https://www.youtube.com/watch?v=IJF426aMCJA 3. https://www.youtube.com/watch?v=GyN6DRjPnxs 4. http://nptel.ac.in/courses/112107144/metalcasting/lecture13&14.htm TextBook (TB)-1, Page-125
Principles of Risers, Problem solving.	01	Lecture	Assignment 1.3	<ol style="list-style-type: none"> 1. https://www.youtube.com/watch?v=2UzsJNlkZxY http://nptel.ac.in/courses/112107239/13 2. http://nptel.ac.in/courses/112107215/25 ReferenceBook (RB)-1, Page-248
Solidification of castings.	01	Lecture		<ol style="list-style-type: none"> 1. https://www.youtube.com/watch?v=pvmu9Sk2gXk 2. https://www.youtube.com/watch?v=8xVDy8OzeKc 3. https://www.youtube.com/watch

				h?v=wTbcEu8SdAY 4. ReferenceBook (RB)-1, Page-262
Inspection of Castings.	01	lecture	Assignment 1.4	1. https://mechanicalengineering.com/methods-inspection-finding-out-defects-in-casting/ 2. https://www.youtube.com/watch?v=18LQShYjsHg 3. Text Book (TB)-1, Page-187
Practice 1	2	Lab. Practice		
Practice 2	2	Lab. Practice		
Module – II (9 Hrs)				
Permanent Mould Casting, Die Casting.	01	Lecture	Assignment 2.1	1. http://nptel.ac.in/courses/112107078/7 2. https://www.youtube.com/watch?v=CuRiFL4UZQ0 3. http://nptel.ac.in/courses/112107219/24 4. http://nptel.ac.in/courses/112107144/metalcasting/lecture7.htm 5. https://www.youtube.com/watch?v=ps2cWctKLBQ 6. Text Book (TB)-1, Page-213
Slush Casting, Centrifugal Casting, Investment Casting.	01	Lecture	Assignment 2.2	1. https://www.youtube.com/watch?v=ps2cWctKLBQ 2. https://www.youtube.com/watch?v=oNZrxFvODtw 3. https://www.youtube.com/watch?v=U81LJAdzFsY 4. Text Book (TB)-1, Page-223
CarbonDioxide Casting, Stir Casting, Continuous Casting.	01	Lecture	Assignment 2.3	1. https://pdfs.semanticscholar.org/3937/3d4257ff9cb366a1690ebc3151b692740744.pdf 2. https://www.youtube.com/watch?v=vnNKYYsY4Wc 3. http://nptel.ac.in/courses/112104221/23 4. https://www.youtube.com/watch?v=ytOUkOdra3E 5. http://nptel.ac.in/courses/113104059/33 6. https://www.youtube.com/watch?v=6WIABd84404

Shell and Plaster Molding Process, Full Mould Process, Vacuum Sealed Molding Process.	01	Lecture	Assignment 2.4	<ol style="list-style-type: none"> 1.http://nptel.ac.in/courses/112107078/11 2.https://www.youtube.com/watch?v=tDYF2Q1r78Q 3.http://nptel.ac.in/courses/112107144/21 4.http://nptel.ac.in/courses/112107215/15 5.https://www.youtube.com/watch?v=ZSie37pNqak 6.https://www.youtube.com/watch?v=ZmAkMgl3V3w
Graphite & Ceramic Mould Casting, Semi-solid Metal Casting.	01	lecture	Assignment 2.5	<ol style="list-style-type: none"> 1.www.nptel.ac.in/courses/112101005/downloads/Module_3_Lecture_2_final.pdf 2.http://thelibraryofmanufacturing.com/ceramic_mold_casting.html
Practice 3	02	Lab. Practice		
Practice 4	02	Lab. Practice		
Practice 5	02	Lab. Practice		
Module III(9 Hrs)				
Physics of Welding, Welding Classification Applications of various welding processes.	01	Lecture	Field study	<ol style="list-style-type: none"> 1.https://www.youtube.com/watch?v=lzTj9FRyUM0 2.https://www.youtube.com/watch?v=CCzhT81GrBo 3.https://www.youtube.com/watch?v=AvXoEp53zAY 4.https://www.youtube.com/watch?v=3nX0oYHnzy0 5.http://nptel.ac.in/courses/112107144/27 Text Book (TB)-1, Page-359
Gas Cutting & Brazing Gas Flames.	01	Lecture	Field study	<ol style="list-style-type: none"> 1.https://en.wikipedia.org/wiki/Oxy-fuel_welding_and_cutting 2.https://www.youtube.com/watch?v=3EtEM17C6MI Text Book (TB)-1, Page-370
SMAW Principle and Power Source.	01	Lecture	Field study	<ol style="list-style-type: none"> 1.nptel.ac.in/courses/112107090/module4/lecture1/lecture1.pdf 2.http://nptel.ac.in/courses/112107089/14

				<p>3.https://www.youtube.com/watch?v=5hRgwnejWPs</p> <p>4.https://www.youtube.com/watch?v=yOdXvagHK_M</p> <p>5. Text Book (TB)-1, Page-374</p>
Types of Electrodes, Functions of Flux Coatings and AWS Classification and Coding.	01	Lecture	Field study	1. http://nptel.ac.in/courses/112107144/welding/lecture5&6.htm
Practice 6	2	Lab. Practice		
Practice 7	2	Lab. Practice		
Module – IV (9 Hrs)				
GTAW, GMAW, SAW&Flux-cored ArcWelding.	02	Lecture	Field study	<p>1.http://nptel.ac.in/courses/112107089/16</p> <p>2.https://www.youtube.com/watch?v=Vg1UXBHNh6U</p> <p>3.http://nptel.ac.in/courses/112107089/20</p> <p>4.http://nptel.ac.in/courses/112107089/19</p> <p>5.https://www.youtube.com/watch?v=TPSQJXqSwTg</p> <p>6.https://www.weldguru.com/support-files/flux-cored-arc-welding.pdf</p> <p>7.http://nptel.ac.in/courses/112107078/30</p> <p>8.https://www.youtube.com/watch?v=Zc3Fu1AVCjc</p> <p>9. ReferenceBook (RB)-1, Page-538</p>
Resistance Welding, Spot and Seam welding Flash Butt Thermit welding, Friction welding.	01	Lecture	Assignment 3	<p>1.https://www.youtube.com/watch?v=Op68bH0bi6I</p> <p>2.http://www.avio.co.jp/english/products/assem/principle/welding/index.html</p> <p>3.https://www.youtube.com/watch?v=66-RK0DPXfU</p> <p>4.https://www.youtube.com/watch?v=pcF7i297aZE</p> <p>5.https://www.youtube.com/watch</p>

				h?v=bg_fDRr7tUc 6. https://www.youtube.com/watch?v=8LQUlzSwc-k 7. https://www.youtube.com/watch?v=-wNMHFWCJ88 8. https://www.youtube.com/watch?v=amaHurtwYTc 9. https://www.youtube.com/watch?v=gXp3aRKO4Yc 10. https://www.youtube.com/watch?v=M2zdRBcDZWY 11. https://www.youtube.com/watch?v=-aEuAK8bsQg
Plasma Arc, Laser Beam, Electron Beam, Ultrasonic Explosive Welding, Diffusion bonding.	01	Lecture	Assignment 4	1. https://www.youtube.com/watch?v=mgaukC25Hqk 2. https://www.youtube.com/watch?v=588EJInHLsc 3. https://www.youtube.com/watch?v=hX2SMbewGwo 4. https://www.youtube.com/watch?v=o4W8nsrvQ6E 5. nptel.ac.in/courses/112107077/35 6. nptel.ac.in/courses/112107077/module4/lecture3/lecture3.pdf 7. nptel.ac.in/courses/112107213/24 8. https://www.youtube.com/watch?v=ykf2Zckqcl4 9. https://www.youtube.com/watch?v=ERrUlzcaqMw
Brazing and Soldering.	01	Lecture	Field Study	1. https://www.youtube.com/watch?v=_mbXkA5FH2U 2. https://www.youtube.com/watch?v=B-vKcEVO4AE 3. https://www.youtube.com/watch?v=0v2SNH_ho08 4. Reference Book (RB)-1, Page-610
Practice 8	2	Lab. Practice		
Practice 9	2	Lab. Practice		
Module – V (5 Hrs)				
Welding Positions,	01	Lecture	Field study	1. https://www.youtube.com/watch

Edge Preparation in Butt & Fillet Welding.				h?v=IWVPbib_HwI 2. https://www.youtube.com/watch?v=13b6mcCS-1c 3. https://www.youtube.com/watch?v=avyy_iEJKxY 4. https://www.youtube.com/watch?v=0c6PESMOazI 5. Text Book (TB)-1, Page-421
Destructive and NDT Welding Defects, Design considerations in welding.	01	Lecture	Assignment 5	1. https://www.youtube.com/watch?v=WoHiE5eGaD4 2. https://www.youtube.com/watch?v=DK1dItmI8mM 3. Reference Book (RB)-1, Page-583
Practice 10 Practice 11	04	Lab. Practice		
Practice 12	02	Lab. Practice		
Practice 13	02	Lab. Practice		
Module VI (9 Hrs)				
Plastic deformation and Yield criteria, Relation between Tensile and Shear stress Cold and Hot working.	01	Lecture	Assignment 6.1	1. https://www.youtube.com/watch?v=MdQDS7BwrtA 2. nptel.ac.in/courses/112106153/Module%202/Lecture%204/Module_2_Lecture_4.pdf 3. http://nptel.ac.in/courses/112107145/4# 4. https://www.youtube.com/watch?v=dNbVsmVgOnM 5. Text Book (TB)-2, Page-104
Rolling: principle and mechanism, defects, types of rolling mills.	02	lecture	Assignment 6.2	1. https://www.youtube.com/watch?v=Xf08dgnlwXg 2. https://www.youtube.com/watch?v=ZD8gW_OzkCQ 3. nptel.ac.in/courses/112106153/Module%204/Lecture%205/Module_4_Lecture_5.pdf 4. www.nptel.ac.in/courses/112106153/22
Forging: classification. Analysis of Forging, Drop and Press forging,	01	lecture	Assignment 6.3	1. https://www.youtube.com/watch?v=dFnN1YtomNc 2. http://nptel.ac.in/courses/112107145/5 3. https://www.youtube.com/watch

Forging defects.				h?v=bgMPuYn2ips 4. Reference Book (RB)-1, Page-693
Practice 14	02	Lab.		
Module – VII(10 Hrs)				
Sheet metal work: Bending, Forming and deep drawing, shearing, Punching and blanking- method and application.	02	Lecture	Field Study	1. https://www.youtube.com/watch?v=8yBZkwR5fuk https://www.youtube.com/watch?v=1qgInojazXA 2. https://www.youtube.com/watch?v=JgNaSII8Obo 3. https://www.youtube.com/watch?v=o5zTUo2t7_w&list=PL4OEy4gx0_rfIEo6TXvZMeMptbMfQdYr7 4. https://www.youtube.com/watch?v=xlLxCVuplis 5. http://nptel.ac.in/courses/112106153/29 6. Text Book (TB)-1, Page-300
Drawing: methods and variables, wire drawing.	02	Lecture	Assignment 7.1	1. https://www.youtube.com/watch?v=9RtAis5pnq4 2. https://www.youtube.com/watch?v=pd4Uk8vk09c 3. nptel.ac.in/courses/112106153/.../Module_8_SheetMetalDrawing-Lecture_1.pdf 4. nptel.ac.in/courses/112106153/Module%206/.../Module_6_Drawing-Lecture_2.pdf 5. nptel.ac.in/courses/116102010/28
Extrusions, Direct, Indirect, Impact and Hydrostatic extrusion Applications, Extrusion of Tubes, defects.	02	Lecture	Assignment 7.2	1. https://www.youtube.com/watch?v=773oOz38wJM 2. https://www.youtube.com/watch?v=743fHkOvOkA 3. nptel.ac.in/courses/112106153/23 4. nptel.ac.in/courses/107103012/module4/lec1.pdf 5. Text Book (TB)-1, Page-279
Practice 15	2	Lab. Practice		
Repeat /Test-1	2			
Total	60			

Manufacturing Technology II

Course Title	Code	Type of Course	T-P-P	Prerequisite
Manufacturing Technology II	MECC0402	Theory+ Practice	2-2-0	Nil

Objective

- To understand the importance and application of conventional & unconventional machining processes
- To understand the basic classification, components and functions of conventional and NC machine tools used in manufacturing

Course Outcomes

- Students will be able to do machining of usable products
- Students will have knowledge in computer-aided part programming and ISO coding system

Evaluation Systems

Internal Examination	Component	% of Marks	Method of Assessment
	Internal Theory	20	Written examination
	Internal Practice	30(20+10)	Labwork + Learning Record
External Examination	External Theory	30	Written examination
	External Practice	20	Labwork
Total		<i>100</i>	

Course Outline

Module I: Conventional Machining (15 Hours)

Theory

Mechanics of Metal cutting; Cutting Tool Materials (Principal Tool Materials, Advanced Tool Materials, Indexable Inserts, Tool Coatings); Cutting Fluids and Lubricants (Characteristics, Types, Selection Criteria, Dry machining, MQL).

Practice

1. Kinematic study of machine tools.
2. Chip characteristics study.
3. Measurement of Cutting Tool Temperature using Thermocouple.

Module II: Machine Tools and Machining Processes (20 Hours)

Theory

Tool Signature, Theory of Machinability (Tool Life, Cutting Forces, Power Consumption, Surface Roughness, Thermal Aspects).

Metal Cutting using Single Point Cutting Tool - Lathe & Operations, Shaper, Planer and Slotter; Metal Cutting using Multipoint Cutting Tool - Milling Machine, Shaper Machine and Drilling Machine.

Practice

4. Measurement of Cutting Forces using Dynamometer.
5. Design of single point cutting tool in CATIA.
6. Measurement of Surface Roughness using Talysurf.
7. Process Optimization using Minitab and Matlab.

Module III: Finishing Operations (5 Hours)

Theory

Abrasives, Grinding Process, Super-finishing Operations, Deburring Operations

Practice

8. Grinding of Single Point Cutting Tool.

Module IV: Unconventional Machining (10 Hours)

Theory

Unconventional Machining Process, Principle and Equipment (Electro-Chemical Machining; Electric Discharge Machining, Abrasive Jet Machining, Laser Beam Machining; Electron Beam Machining).

Practice

9. Study of EDM working Principle and Process Parameters. Die Sinking, micro-hole drilling

Module V: Additive Manufacturing (10 Hours)

Theory

Additive Manufacturing (3D Printing, Rapid Prototyping); Developments in Additive Manufacturing; Classifications of Additive Manufacturing systems.

Practice

10. Component Manufacturing Using 3D Printer.

Module VI: Computer Aided Manufacturing (25 Hours)

Theory

CAM-Introduction, Types- NC, CNC, DNC, Machining Centers, Adaptive Control, Part Programming G-Codes, M-Codes, Programming & Machining for Simple Components, Automation.

Practice

11. Manual Programming Related to Facing, Turning, Drilling, Boring & Pocketing in CNC Machines.
12. Simple Contouring Operation using CNC Milling Machine.
13. 3D Modeling & Product Design with CATIA and Solidworks (3D Experience)
14. Generation of NC Program and Product Manufacturing by Using Master CAM Software.

15. Process Planning, Programming, Simulation and Optimization of Machining Processes Using DELMIA.

Module VII: Micro-manufacturing & Surface Treatment (5 Hours)

Theory

Film Deposition, Oxidation, Lithography, Etching, Vapor Deposition, Thermal Spraying.

Text Books:

1. Rao, PN, Manufacturing Technology, Volume 2, 2015, 4th Edition, Tata Mc-Graw Hill.
2. Chattopadhyay, A B, Machining & Machine Tools, 2011, Wiley India.
3. Groover, MP, CAD/CAM: Computer Aided Design & Manufacturing by MP Groover, 1st Edition, 2003, Pearson Education.

Reference Books:

1. Shaw, M C, Metal Cutting Principles, 2005, 2nd Edition, Oxford University Press.
2. Bhattacharya, A, Metal Cutting - Theory and Practice, 2008, New Central Book Agency.
3. Raghuvanshi, BS, A Course in Workshop Technology, Volume 2, 2013 by BS, Dhanpat Rai & Co.

Session Plan

Topic	No. of Sessions (in hrs.)	Activity	Assignment	Suggested Reading (Book, Video, Online source, etc.)
Module I (15 Hrs)				
Mechanics of Metal cutting	1	Lecture		1. https://www.youtube.com/channel/UCCqGTvGZgWw8mFX5KYTHCkw NPTEL: 2. http://nptel.ac.in/courses/112105127/ 3. Text Book (TB)-1, Page-5; T2, Page-6
Cutting Tools- Types, Materials	1	Lecture	Assignment 1.1	1. http://nptel.ac.in/courses/112105127/ 2. Text Book (TB)-1, Page-26
Cutting Fluids and Lubricants (Characteristics, Types, Selection	1	Lecture	Assignment 1.2	1. http://nptel.ac.in/courses/112105127/ 2. https://www.youtube.com/watch?v=81Fdif5e85c

Criteria, Dry Machining, MQL)				3.nptel.ac.in/courses/112104225/21 4. Text Book (TB)-1, Page-50
Practice 1	4	Lab. Practice		
Practice2	4	Lab. Practice		
Practice3	4	Lab. Practice		
Module II (20 Hrs)				
Tool Signature & Machinability	2	Lecture	Assignment 2	1. http://nptel.ac.in/courses/112105127/ 2. https://www.youtube.com/watch?v=OnGXJA7oX 3. https://www.youtube.com/watch?v=x_4Feo_ETWk 4. Text Book (TB)-2, Page-27
Metalcutting using single pointcutting tool	1	Lecture		1. Text Book (TB)-2, Page-35
Metalcutting using multipoint cutting tool	1			1. Text Book (TB)-2, Page-35
Practice 4	4	Lab. Practice		
Practice 5	4	Lab. Practice		
Practice 6	4	Lab. Practice		
Practice 7	4	Lab. Practice		
Module III(05 Hrs)				
Super-finishing Operations	1	Theory	Assignment 3	1. Text Book (TB)-1, Page-242
Practice 8	4	Lab. Practice		
Module IV (10 Hrs)				
Electro-Chemical Machining; Electric Discharge Machining, Abrasive Jet Machining,Laser	4	Practice	Assignment 4	1. https://www.youtube.com/watch?v=KXFpTb9cBpY 2. https://www.youtube.com/watch?v=Hc6mfNWT8oQ 3. http://nptel.ac.in/courses/112105126/41

Beam Machining; Electron Beam Machining.				4. http://nptel.ac.in/courses/112107078/23 5. https://www.youtube.com/watch?v=mgaukC25Hqk 6. https://www.youtube.com/watch?v=ptEmX9O4nDw
Practice 9	6	Lab. Practice		
Module V(10 Hrs)				
Additive Manufacturing (3D Printing, Rapid Prototyping)	1	Lecture	Assignment 5.1	1. http://nptel.ac.in/courses/112104204/47 2. http://nptel.ac.in/courses/112107078/37 3. https://www.youtube.com/watch?v=cwguTQEKdOY 4. https://www.youtube.com/watch?v=NkC8TNts4B4
Developments in Additive Manufacturing; Classifications of Additive Manufacturing systems.	1	Lecture	Assignment 5.2	1. https://www.ntnu.no/documents/10401/.../92ff1f88-c0cb-4b28-b605-21c354301281
Practice 10.	8	Lab. Practice		
Module VI(25 Hrs)				
Types-NC,CNC, DNC, Machining Centers, Adaptive Control	2	Lecture	Assignment	1. https://www.youtube.com/watch?v=KXFpTb9cBpY 2. https://www.youtube.com/watch?v=gG0IHYSIQsU 3. Text Book (TB)-3, Page-224, 315
Part Programming– G Codes, M-Codes	3	Practice		1. Text Book (TB)-3, Page-175
Practice 11.	4	Lab. Practice		
Practice 12.	4	Lab. Practice		
Practice 13.	4	Lab. Practice		
Practice 14.	4	Lab. Practice		
Practice 15.	4	Lab.		

		Practice		
Module VII(5 Hrs)				
FilmDeposition, Oxidation, Lithography, Etching	2			1. https://nptel.ac.in/courses/113106062/Lec26.pdf
VaporDeposition, Thermal Spraying.	3			1. textofvideo.nptel.ac.in/112107248/lec54.pdf
Total (hrs)	90			

Design for Manufacturing

Course Title	Code	Type of course	T-P-P	Prerequisite
Design for Manufacturing	MECC0403	Theory+Practice	2-2-0	Workshop Practice

Objective

- To provide the students detailed understanding of primary manufacturing processes and product design from concept-to-mass production
- To impart knowledge on use and application of software to solve design engineering problems in metal casting, forging and sheet metal forming processes

Course outcomes

- Students will be able to select appropriate manufacturing technology and process to produce a product effectively with quality and optimized production cost
- Students will have skills and knowledge to use software like CATIA, Novaflow and Solid CV, ProCAST, Flow-3D Cast, DEFORM-3D and PAM-STAMP2G

Evaluation Systems

Internal Examination	Component	% of Marks	Method of Assessment
	Internal Theory	20	Written examination
	Internal Practice	30(20+10)	Labwork + Learning Record
External Examination	External Theory	30	Written examination
	External Practice	20	Labwork
Total		100	

Course Outline

Module I: Introduction (8 Hrs)

Theory

Introduction to Design: Problem and Solutions, Design as Model-making, Design, Creativity, Innovation and Invention, Concept of DFMA, The Boothroyd Dewhurst Design for Manual Assembly Method, Product Complexity, Product Variants, Reusable/Modularity/Standard Design, Product Costs, Quality, Regulatory & Safety Requirements, Aesthetic and Ergonomic Considerations in Design, Design for Maintenance.

Module II: Selection of Materials & Manufacturing Processes (10 Hrs)

Theory

Assembly, Shipping, Maintenance, Design Efficiency, Materials Selection, Manufacturing Considerations in Design: Role of Processing in Design, Types of Manufacturing Processes, Design for Manufacturability, Design for Castings, Forgings, Sheet Metal Forming, Design for Machining, Powder Metallurgy, Welding, Heat Treatment, Assembly, Corrosion Resistance, Designing with Plastic Processing.

Module III: Cost-Efficient Design (6 Hrs)

Theory

Economics of Manufacturing: Product Target Cost Evaluation: Categories of Costs, Methods of Developing Cost Estimates, Cost Indexes, Cost Capacity Factors, Estimating Plant Cost, Design to Cost, Manufacturing Costs, Value Analysis in Costing.

Module IV: Design for Metal Casting (15 Hrs)

Theory

Design for Castability; Introduction to Casting, Types of Casting, Mathematical Modeling of Liquefying the Material, Viscosity and Fluidity Parameter included as Flow Equation, Casting Microstructure and Defects, Casting Design Process; Sprue, Gate, Runner Design according to Flow Equations, Analysis Prediction for Metal Casting, Liquid Phase Fraction, Shrinkage Prediction, Calculating Feeder, Secondary Dendrite Arm Spacing (SDAS).

Module V: Simulation of Casting Process (15 Hrs)

Theory

STL Part Design Generation from CAD Package, Simulation of Solidification, Calculation of Riser, Design of Gating and Simulation of Mold Filling, Simulation of Riser and Gating System. Components: Die Casting Design and Simulation of Casting of Engine Block using Aluminum Alloy Specifically Al-Si-Cu-Mg-Fe Alloy. Simulation of Casting for Shell Housing.

Practice

1. Casting Design & Analysis using CATIA, Novaflow and Solid CV, ProCAST, Flow-3D Cast.

Module VI: Design for Forging (15 Hrs)

Theory

Design Aspect of Forging and its Significance, Procedure of Working out of Forging Drawing and Technology for Open and Close Die Forgings. Developing the Forging Drawing of Some Jobs. Factors Affecting the Metal Flow in Closed Dies. Forgeability, Friction and Lubrication, Die Temperature, Size and Shape Factor, Flash and Gutter. Designing Performing, Finisher, Trimming and Punching Dies; Selection of Forging Equipments; Die Wear, Die Materials, Forging Defects, Heat Treatments of Dies and Forgings.

Practice

2. Forging Design & Flow Simulation using CATIA and DEFORM-3D.

Module VII: Design for Sheet Metalworking (15Hrs)**Theory**

Design for Formability; Formability of Sheet Metal, Press for Sheet Metal Process, Die & Punch, High Energy Rate Forming Process, Extrusion Process and Bulk Deformation Process. Blank Holder Force Estimation, Incremental Forming Analysis Residual Stress Vs Blanking Force Analysis and Optimization, Hot Stamping Process.

Analysis Prediction: Differential heating and Differential Cooling in Hot Forming Process, Force Required for Product Shape. Components: B-pillar Trim, Bonnet, Suspension Rocker Arms, Roof Liner, Body Side Outer.

Practice

3. Sheet Metal Tool Design in CAD.
4. Use of CATIA and PAM-STAMP2G.

Text Books

1. Boothroyd, G, Dewhurst, P, & Knight A W, Product Design for Manufacture & Assembly, 2011, 3rd Edition, CRC Press.
2. Chitale, A K, Gupta, R C, Product Design & Manufacturing, 2013, 6th Edition, PHI Learning Pvt. Ltd.

Reference Books

1. Bralla, J G, Design for Manufacturability Handbook, 1998, 2nd Edition, Tata McGraw-Hill.
2. Ulrich, K T & Eppinger, S D, Product Design & Development, 2008, 3rd Edition, Tata McGraw-Hill.

Session Plan

Topic	No. of Sessions (in hrs.)	Activity	Assignment	Suggested Reading
Module I (8 Hrs)				
Introduction to Design, Problem and Solutions	02	Lecture		1. http://nptel.ac.in/courses/112101005/ 2. Text Book (TB)-1, Page-01
Design as Model-	02	Lecture		1. Text Book (TB)-1, Page-

making, Design, Creativity, Innovation and Invention. The Concept of DFM/A,				19
The Boothroyd Dewhurst Design for Manual Assembly Method,	02	Lecture		1. Text Book (TB)-1, Page-22
Product Complexity, Product Variants, Reusable/Modularity/Standard Design, Product Costs, Quality, Regulatory & Safety Requirements, Design for Maintenance	02	Lecture	Assignment 1	1. Text Book (TB)-1, Page-28
Module II (10 Hrs)				
Assembly, Shipping, Maintenance, Design Efficiency	02	Lecture		1. http://nptel.ac.in/courses/112101005/20
Materials Selection, Manufacturing Considerations in Design: Role of Processing in Design, Types of Manufacturing Processes, Economics of Manufacturing	02	Lecture		1. http://nptel.ac.in/courses/112101005/4 2. Text Book (TB)-1, Page-29

Designfor Castings, Forgings, Sheet Metal Forming, Design forMachining	03	Lecture		1. Text Book (TB)-2, Page-100 2. http://nptel.ac.in/downloads/112101005/
Powder Metallurgy, Welding, Heat Treatment, Assembly, Corrosion Resistance	03	Lecture	Assignment 2	1. http://nptel.ac.in/downloads/112101005/ 2. TextBook(TB)-1,Page-461
Module III(6Hrs)				
Product Target Cost Evaluation: Categories of Costs, Methods of DevelopingCost Estimates, Cost Indexes, Cost CapacityFactors,	03	Lecture		1. http://www.nptel.ac.in/courses/110101010/downloads/mod3/Module%20III-Lec1.pdf
EstimatingPlant Cost, Design to Cost, Manufacturing Costs, Value Analysisin Costing.	03	Lecture	Assignment 3	1. http://www.nptel.ac.in/courses/110101010/downloads/mod3/Module%20III-Lec1.pdf
Module IV (15 Hrs)				
Designfor Castability; Introduction to Casting, Types of Casting	02	Lecture		1. efoundry.iitb.ac.in/TechnicalPapers/1999/1999Sourcecon_DesignForCasting.pdf 2. nptel.ac.in/courses/112101005/12 3. TextBook(TB)-1,Page-527
Mathematical Modellingof	03	Lecture		1. Text Book (TB)-1, Page-545

Liquefying the Material, Viscosity and Fluidity Parameter included as Flow Equation				
Casting Design Process; Sprue, Gate, Runner Design according to Flow Equations, Simulation of Casting Process	10	Lecture	Assignment 4	1. Text Book (TB)-1, Page-527
Module V (15 Hrs)				
Simulation of Casting Process; STL Part Design Generation from CAD Package, Simulation of Solidification	03	Practice		
Calculation of Riser, Design of Gating and Simulation of Mold Filling, Simulation of Riser and Gating System.	03	Lecture		1. Text Book (TB)-2, Page-101
Analysis Prediction: Liquid Phase Fraction, Shrinkage Prediction, Calculating Feeder, Secondary Dendrite Arm Spacing (SDAS).	03	Practice		
Components: Die Casting Design and	03	Practice	Assignment 5	

Simulation of Casting of Engine Block using Aluminium Alloy Specifically Al-Si-Cu-Mg-Fe Alloy.				
Simulation of Casting for Shell Housing. Casting Design & Analysis using CATIA, Novaflow and Solid CV, ProCAST, Flow-3D Cast	03	Practice	Lab. Practice	
Module VI (15 Hrs)				
Forging Design: Design Aspect of Forging and their Significance. Procedure of Working out of Forging Drawing and Technology for Open and Close Die Forgings.	03	Lecture		1. Text Book (TB)-1, Page-599
Developing the Forging Drawing of Some Jobs. Factors Affecting the Metal Flow in Closed Dies. Forgeability, Friction and Lubrication	03	Lecture		2. Text Book (TB)-1, Page-599
Die Temperature, Size and Shape Factor, Flash and Gutter. Designing Performing, Finisher, Trimming and Punching Dies;	03	Lecture		1. nptel.ac.in/courses/107103012/module4/lec7.pdf

Selection of Forging Equipments; Die Wear, Die Materials, Forging Defects				
Heat Treatments of Dies and Forgings.	03	Lecture	Assignment 6	
Forging Design & Flow Simulation using CATIA and DEFORM-3D	03	Practice	Lab. Practice	
Module VII (15 Hrs)				
Sheet Metal: Design for Formability;	02	Lecture		1. web.mit.edu/2.810/www/files/lectures/2015.../lec6-sheet-metal-forming-
Die & Punch, High Energy Rate Forming Process, Extrusion Process and Bulk Deformation Process.	02	Lecture		1. http://nptel.ac.in/courses/112101005/downloads/Module 3 Lecture 5 final.pdf 2. Text Book (TB)-1, Page-375
Blank Holder Force Estimation, Incremental Forming Analysis Residual Stress vs Blanking Force Analysis and Optimization, Hot Stamping Process.	02	Lecture		1. Text Book (TB)-1, Page-375
Analysis Prediction: Differential heating and Differential Cooling in Hot	02	Lecture		

FormingProcess, Map of Meso Patch on the component, ForceRequiredfor Product Shape				
Components: B- pillar Trim,Bonnet, Suspension Rocker Arms, RoofLiner, BodySide Outer.	01	Lecture	Assignment 7	
Sheet Metal Tool Design in CAD	03	Practice	Lab. Practice	
Useof CATIAand PAM-STAMP2G	03	Practice	Lab. Practice	
Total	84 hrs			

Finite Element Analysis (FEA)

Subject Name	Code	Type of course	Credit	Prerequisite
Finite Element Analysis	MECC0404	Theory+Practice	3-1-0	Strength of materials

Course Objective

- To Teach the Students Principles and Applications of Finite Element Analysis

Course Outcome

- Students will Acquire Knowledge Application of Matrix Algebra
- Students will Learn the Skill of using Finite Element Technique to solve Physical and Thermal Problems of Solids and Fluids

Evaluation Systems

Evaluation	Component	Marks	Method of Evaluation
Internal Evaluation	Internal Theory	20	Written Examination
	Internal Practice	30 (20+10)	Lab Work+Learning Record
External Evaluation	External Theory	30	Written Examination
	External Practice	20	Lab Work
Total Marks		100	

Course Outline

Module I: Introduction to FEA (8 Hours)

History of FEA; Need for Studying FEA; Types of Analysis; Discretization of a Structure; Element Shapes, Nodes and Degrees of Freedom; Mesh Refining, Element Aspect Ratio, Use of Symmetry and Principle of Convergence; General Procedure of FEA; Review of Matrix Algebra and Simultaneous Linear Equations.

Module II: Analysis through Simulation (10 Hours)

Role of Computer; General Steps of Commercial Software Packages; Preprocessing: Type of Analysis, Geometric Modelling, Material Properties, Mesh Generation and Refining, Load Data, Boundary Conditions; Solution/Analysis; Postprocessing: Graphical Output, Contour Plot, Animation; Result Interpretation; Report Generation.

Practice

1. Introduction to ANSYS Workbench
2. Defining Material Properties

Module III: Static Structural Analysis (10 Hours)

Field Variable, Shape Functions, Element Stiffness Matrix and Load Vector, Element and Global Equations, Material Assignment and Imposition of Boundary Conditions.

Practice

3. Part Modelling I
4. Part Modelling II
5. Part Modelling III
6. Mesh Generation and Material Assignment

Module IV: Analysis of Bar and Spring (10 Hours)

1D Finite Element Modelling; Shape Functions and Element Stiffness Matrix of 2-noded linear bar/spring element; Uniform and Tapered Bar under Axial Load; Consideration of Self-weight and Temperature Effect. Truss and Beam Elements.

Practice

7. Solution of Axially Loaded Bar/Spring Problems
8. Solution of Strut/Column Problems

Module V: Analysis of Truss and Beam (12 Hours)

Stiffness Matrix for a Truss and Beam Element; Transverse Loading on Beams with Point, UDL and UVL loads.

Practice

9. Solution of Plane Truss Problems
10. Solution of Beam/Frame Problems

Module VI: Dynamic Analysis (13 Hours)

Fundamentals of Vibration; Consistent and Lumped Mass Matrix; Evaluation of Natural Frequencies and Mode Shapes (Eigenvalues and Eigenvectors); Non-linear Analysis, Fatigue Analysis.

Practice:

11. Dynamic Analysis of Spring-mass System
12. Dynamic Analysis of Bar/Truss/Beam Problems
13. Analysis of Material and Geometric Non-linear Problems
14. Solution of Fatigue Analysis Problems

Module VII: Heat Transfer and Fluid Flow Analysis (12 Hours)

Modes of Heat Transfer; 1D Steady-state Heat Transfer; Element Stiffness Matrix for Conduction and Convection; Fluid Flow in Pipes, Formulation of Fluid Flow Problems.

Practice

15. Thermal Analysis of Heat Transfer Problems
16. Analysis of Fluid Flow Problems

Text Books

1. Senthil S., Panneerdhass R., Finite Element Analysis, Lakshmi Publication, Chennai, 2016.
2. Tickoo Sham, ANSYS Workbench A Tutorial Approach, CADCIM Technologies, USA, 2012,
3. Bhavikatti S.S., Finite Element Analysis, New Age International Limited Publishers, New Delhi, 2005.

Reference Books

1. Hutton D.V., Fundamental of Finite Element Analysis, McGraw-Hill Publishing Company Limited, USA, 1st edition, 2004.
2. Moaveni S., Finite Element Analysis, Theory and Application with ANSYS, Pearson Prentice Hall, New Delhi, 3rd edition, 2011.

Session Plan

Topic	No. of Sessions	Activity	Assignment	Suggested Reading
Module I				
History of FEA	01	Lecture	Field study	Text book (TB)-1 Chapter (Ch)-1
Need for studying FEA	01	Lecture	Field study	TB-1 Ch-1
Types of Analysis	01	Lecture	Field study	TB-1 Ch-1
Discretization of a Structure; Element Shapes, Nodes, Degrees of Freedom	01	Lecture	Assignment 1.1	TB-1 Ch-1
Mesh Refining, Element Aspect Ratio, Use of Symmetry, Principle of Convergence	01	Lecture	Assignment 1.2	TB-1 Ch-1
General Procedure of FEA	01	Lecture	Assignment 1.3	TB-1 Ch-1

Review of Matrix Algebra, Simultaneous Linear Equations	02	Lecture	Assignment 1.4	TB-1 Ch-1
Module II				
Analysis through Simulation: Role of Computer; General Steps of Commercial Software Packages;	02	Lecture	Assignment 2.1	TB-2 Ch-1,2
Preprocessing: Type of Analysis, Geometric Modeling, Material Properties, Mesh Generation and Refining, Load Data, Boundary Conditions	02	Practice	Assignment 2.2	TB-2 Ch-1,2
Solution/Analysis; Post processing: Graphical Output, Contour Plot, Animation	03	Practice	Assignment 2.3	TB-2 Ch-1,2
Result Interpretation; Report Generation	03	Practice	Assignment 2.4	TB-2 Ch-1,2
Module III				
Static Structural Analysis: Field Variable, Shape Functions, Element Stiffness Matrix and Load Vector, Element and Global Equations, Material Assignment and Imposition of Boundary Conditions.	2	Lecture	Assignment 3.1	TB-2,3
Part Modeling I	2	Practice	Assignment 3.2	TB-2 Ch-3,4,5
Part Modeling II	2	Practice	Assignment 3.3	TB-2 Ch-3,4,5
Part Modeling III	2	Practice	Assignment 3.4	TB-2

			3.4	Ch-3,4,5
Mess Generation and Material Assignment	2	Practice	Assignment 3.4	TB-2 Ch-6,7,8
Module IV				
Analysis of Bar and Spring: 1D Finite Element Modeling; Shape Functions and Element Stiffness Matrix of 2-noded linear bar/spring element	3	Lecture	Assignment 4.1	TB- Ch-2,3 TB-3 Ch-11
Uniform and Tapered Bar under Axial Load; Consideration of Self-weight and Temperature Effect. Truss and Beam Elements	3	Lecture	Assignment 4.2	TB-3 Ch-11
Solution of Axially loaded Bar/Spring problems	2	Practice	Assignment 4.3	TB-3 Ch-2,3
Solution of Strut/Column Problems	2	Practice	Assignment 4.3	TB-1 Ch-2,3
Module V				
Analysis of Truss and Beam: Stiffness matrix for a Truss and Beam element	2	Lecture	Assignment 5.1	TB-1 Ch-3
Transverse Loading on Beams with Point, UDL and UVL loads.	3	Lecture	Assignment 5.2	TB-1 Ch-3
Solution of Plane Truss Problems	3	Practice	Assignment 5.3	TB-1 Ch-3 TB-2 Ch-3,4,5
Solution of Beam/Frame Problems	4	Practice	Assignment 5.4	TB-2 Ch-3,4,5
Module VI				

Dynamic Analysis: Fundamentals of Vibration; Consistent and Lumped Mass Matrix	2	Lecture	Assignment 6.1	TB-1 Ch-4
Evaluation of Natural Frequencies and Mode Shapes (Eigenvalues and Eigenvectors)	1	Lecture	Assignment 6.2	TB-1 Ch-4
Non-linear Analysis, Fatigue Analysis.	1	Lecture	Assignment 6.3	TB-1 Ch-4
Dynamic Analysis of Spring-mass System	2	Practice	Assignment 6.4	TB-1 Ch-1 TB-2
Dynamic Analysis of Bar/Truss/Beam Problems	2	Practice	Assignment 6.5	TB-2 Ch-6,7,8
Analysis of Material and Geometric Non-linear Problems	2	Practice	Assignment 6.6	TB-2 Ch-6,7,8
Solution of Fatigue Analysis Problems	3	Practice	Assignment 6.7	TB-2 Ch-6,7,8
Module VII				
Heat Transfer and Fluid Flow Analysis: Modes of Heat Transfer	1	Lecture	Assignment 7.1	TB-1 Ch-5
1D Steady-state Heat Transfer;	1	Lecture	Assignment 7.2	TB-1 Ch-5
Element Stiffness Matrix for Conduction and Convection	2	Lecture	Assignment 7.3	TB-1 Ch-5
Fluid Flow in Pipes, Formulation of Fluid Flow Problems	2	Lecture	Assignment 7.4	TB-1 Ch-5
Thermal Analysis of Heat Transfer Problems	3	Practice	Assignment 7.5	TB-1 Ch-5
Analysis of Fluid Flow Problems	3	Practice	Assignment 7.6	TB-1 Ch-5
Total Hours	75			

Digital Manufacturing

Course Title	Code	Type of course	T-P-P	Prerequisite
Digital Manufacturing	MECC0405	Theory+Practice	1-2-0	Nil

Objective

<ul style="list-style-type: none"> ✓ To Educate the Students on Entire Stages of Product Life Cycle Beginning From Concept Stage, Design, Testing, Validation, Manufacturing and Servicing etc. ✓ To Educate the Students on Industry 4.0 Standards

Course Outcomes

<ul style="list-style-type: none"> ✓ Students will be Able to Use Modern Software Like DELMIA-Quest (Dassault System) to Conceptualise and Create 3D Factory Layouts and Optimise Resource Planning ✓ Students will be Able to Do Simulation of Manufacturing Processes Using Software Tools
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Evaluation Systems

Internal Examination	Component	% of Marks	Method of Assessment
	Internal Theory	20	Written examination
	Internal Practice	30(20+10)	Labwork + Learning Record
External Examination	External Theory	30	Written examination
	External Practice	20	Labwork
Total		<i>100</i>	

Course Outline

Module I: Digital Manufacturing (8 Hours)

Theory

Overview, Industry challenges, End to End solution for various industry, Digital Twin, Benefits, Industry Case studies, Introduction of Industry 4.0, Convention & Emerging Technological Solution.

Practice

1. Product Design and Development Software Tools.
2. Tear Down of Existing Product and Its Bench Marking.

Module II: Product Life Cycle (PLM) (8 Hours)

Theory

Overview of PLM, Design & Manufacturing BOM, Model & Variants

Practice

3. Study of System and Subsystem and Preparing BOM.
4. Designing and Development of Systems and Subsystems.
5. Product Validation by Using Simulia and Product Integration

Module III: Digital Twin (7 Hours)

Theory

Introduction of Facility/Layout Planning, Digital Factory with Plant Facilities &resources, Assembly/Di-assembly

Practice

6. Creation of Facility Layout.
7. Creation of Manufacturing Resources.

Module IV: Plant Layout Design (7 Hours)

Theory

Importance of plant layout, Objective of plant layout, factors influencing plant layout, Types of layout-fixed position layout, product layout, process layout, combined or group layout.

Practice

8. Creation of Manufacturing Support System.
(Tools: Creating a Catalog, Creating a Template, Defining the Resources, Managing a Resource footprint, positioning the Resources, Snapping the Resources, Repositioning the Resources.)

Module V: Process Planning (10 Hours)

Theory

Manufacturing planning, types of production-job, batch and mass production, steps involved in process planning, calculation of man and machine hour, computer aided process planning

Practice

9. Introduction to DELMIA APP.
10. Manufacturing Item Definition.
11. Preparation of Process Planning.

(Tools: Setting up the Working Environment, Creating the Process Planning, Time Analysis, Planning Premises, Creating Automatic Line Balancing, Managing a Multi-model)

Module VI: Work Study (8 Hours)

Theory

Method study, objective of method and work study, Basic procedure for method study, Recording technique used in method study.

Practice

12. Defining the Manufacturing Resources in Equipment Allocation.
13. Simulation of Resources using Delmia.
(Tools: Equipment Allocation)

Module VII: Digital Machining (12 Hours)

Theory

Introduction to Machining, 3 axis and 5 axis CNC machining, Tools used in CNC machining, Machining parameters,DNC,FMS,LeanManufacturing,Computerintegratedmanufacturing system.

Practice

14. Modeling of Manufacturing Support System and Application of Kinematics to It.
15. Modeling of NC Machine and its Simulation.
16. Generation of NC codes and its validation.

Textbooks

1. Zahou,Z, Fundamentals of Digital Manufacturing Science, 2012, Springer Series.
2. Jain, RK, Production Technology, 2004, 17th Edition, Khanna Publishers.

Reference Books

1. Kalpakjian,S,&Schmid,SR,Manufacturing Engineering & Technology,2018,7th Edition, Pearson Education.
2. Adithan, M, Process Planning & Cost Estimation,2007, New Age International.

Session Plan

Sl. No	Topic	No. of Sessions (in hrs.)	Activity	Assignment	Suggested Reading (Book, Video, Online source, etc.)
Module-I (8 Hrs)					
1	Digital Manufacturing: Overview, Industry challenges, End to End solution for various industry, Digital Twin, Benefits, Industry Case studies, Introduction of Industry 4.0, Convention & Emerging Technological Solution.	2	Lecture	Assignment 1	1. https://www.youtube.com/watch?v=G3s4aPgcnw
2	Practice1	3	Lab. Practice		
3	Practice2	3	Lab. Practice		
Module-II (11 Hrs)					
4	Product Life Cycle (PLM): Overview of PLM, Design &	2	Lecture	Project	1. https://www.youtube.com/watch?v=HPRURtORnis

	Manufacturing BOM, Model & Variants				
5	Practice3	3	Lab. Practice		
6	Practice4	3	Lab. Practice		
7	Practice5	3	Lab. Practice		
Module-III (7 Hrs)					
8	Introduction of Facility/Layout Planning, Digital Factory with Plant Facilities & resources, Assembly/Di-assembly	1	Lecture		1. https://www.youtube.com/watch?v=8MeHL0j-oKE 2. https://www.youtube.com/watch?v=TPkhxWJvPw 3. https://www.youtube.com/watch?v=m-ni_0no-JE 4. https://www.youtube.com/watch?v=SiJXVdfCCiA
9	Practice6	3	Lab. Practice		
10	Practice7	3	Lab. Practice		
Module-IV(7 Hrs)					
11	Importance of plant layout, Objective of plant layout, factors influencing plant layout, Types of layout- fixed position layout, product layout, process layout, combined or group layout.	4	Lecture		1. https://www.youtube.com/watch?v=r_2GRLxAsEs 2. https://www.youtube.com/watch?v=SK9fxHw-Nxk 3. https://www.youtube.com/watch?v=UZs-cCsMqaI 4. https://www.youtube.com/watch?v=l_ePLMV7NnA 5. https://www.youtube.com/watch?v=11ttgmRJFOk
12	Practice8	3	Lab. Practice		
Module-V (12 Hrs)					
13	Manufacturing planning, types of production-job, batch and mass production, steps involved in process planning, calculation of man and machine hour, computer aided process planning	3	Lecture		1. https://www.youtube.com/watch?v=zGQP6sURiLQ 2. https://www.youtube.com/watch?v=kBby1Cdc44M 3. https://www.youtube.com/watch?v=wfxfxlzV2mIc Reference Book (RB)-2 Page-49

14	Practice9	3	Lab. Practice		
15	Practice10	3	Lab. Practice		
16	Practice11	3	Lab. Practice		
Module-VI (8 Hrs)					
17	Method study, objective of method and work study, Basic procedure for method study, Recording technique used in method study.	2	Lecture		1. https://www.youtube.com/watch?v=iFydS5Hq1SY Reference Book (RB)-2 Page-1
18	Practice12	3			
19	Practice13	3			
Module-VII (12 Hrs)					
20	Introduction to Machining, 3 axis and 5 axis CNC machining, Tools used in CNC machining, Machining parameters, DNC, FMS, Lean Manufacturing, Computer integrated manufacturing system.	3	Lecture		1. https://www.youtube.com/watch?v=PusvVnC_4Uc 2. https://www.youtube.com/watch?v=nFu4FFgbMY4 3. https://www.youtube.com/watch?v=lRGlRH3FDoU
21	Practice14	3	Lab. Practice		
22	Practice15	3	Lab. Practice		
23	Practice16	3	Lab. Practice		
Total Hours		64			

Fundamentals of Heat Engines

Course Title	Code	Type of Course	T-P-P	Prerequisite
Fundamentals of Heat Engines	MECC0415	Theory+Practice	2-1-0	Thermodynamics

Objective

- To teach the students about various parameters and variables of IC Engines.
- To enable students to learn about various systems used in IC Engines and applications of IC engines.

Course Outcomes

- On successful completion of course, Students will acquire good knowledge on the basics of IC engines, influence of various parameters on performance of IC Engines.

Evaluation Systems

Evaluation	Component	Marks	Method of Evaluation
Internal Evaluation	Internal Theory	20	Written examination
	Internal Practice	30(20+10)	Labwork + Learning Record
External Evaluation	External Theory	30	Written examination
	External Practice	20	Labwork
Total Marks		100	

Course Outline

Module I: Heat Engine, Its Characteristics and Performance Parameters (12 Hours)

Theory

Heat Engine, Its Characteristics and Performance Parameters: Introduction to Heat Engine, Classification of Heat Engines, Indicated and Brake Power, Engine Efficiency, Engine Performance Characteristics, ECU, Variables Affecting Performance Characteristics, Methods of Improving Engine Performance, Heat Balance.

Practice

1. Heat Balance Study of Petrol Engine.
2. Heat Balance Study of Diesel Engine.
3. Load Test on Petrol Engine.
4. Load Test on Diesel Engine

Module II: Fuel (6 Hours)

Theory

Fuel: Fuels of SI and CI Engine, Properties, Potential and Advantages of Alternative Fuels (Liquid and Gaseous) for SI and CI Engines.

Practice

5. Determination of Flash Point and Fire Point of a Liquid Fuel.
6. Determination of Calorific Value by Using Bomb Calorimeter.

Module III: Mechanical Injection Systems (8 Hours)

Theory

Mechanical Injection Systems: Functional Requirements of an Injection System, Classification of Injection Systems, Fuel Feed Pump, Injection Pump, Governor, Fuel Injector, Nozzle.

Practice

7. Determination of Sensitivity of a Governor.

Module IV: Electronic Injection Systems (6 Hours)

Theory

Electronic Injection Systems: Multi-Point Fuel Injection (MPFI) System, Injection Timing, Gasoline Injection System, CRDI.

Module V: Ignition (6 Hours)

Theory

Ignition: Energy Requirement for Ignition, Battery Ignition Systems, Modern Ignition Systems, Firing Order.

Practice

8. Study of Electric Circuit and Ignition System of Automobile.

Module VI: Combustion (12 Hours)

Theory

Combustion: Stages of Combustion in SI and CI Engines, Flame Propagation and Ignition Delay, Abnormal Combustion, Phenomena of Knock in SI and CI Engines, Detonation, Diesel Knock & Methods to Control Diesel Knock. SI and CI Engine Combustion Chambers.

Practice

9. To Verify the Combustion Characteristics of Diesel in VCR Engine.
10. To Verify the Characteristics of Pressure Rise During Combustion in VCR Engine.
11. Performance Test on Variable Compression Ratio I. C. Engine.

Module VII: Cooling, Lubrication, Engine Emission and Control Systems (10 Hours)

Theory

Cooling and Lubrication System: Air Cooling and Water Cooling Systems, Properties of Lubricants and Different Types of Lubricating System.

Engine Emission and Control Systems: Mechanism of Pollutant Formation and its Harmful Effects. Methods of Measuring Pollutants and Control of Engine Emission.

Practice

12. Study of air cooling and water cooling system
13. Exhaust emission analysis by using exhaust gas analyser.

Text Books

1. Ganesan V., Internal Combustion Engines, TMH, 3rd Edition
2. Rajput R. K., A Textbook of Internal Combustion Engine, LP.

Reference Books

1. Domkundwar V.M., A Course in IC Engines, Dhanpat Rai and Sons.
2. Heywood J.B., Internal Combustion Engine Fundamentals, McGraw Hill Book Co.

Session Plan

Topics	No. of Sessions (in hrs.)	Activity	Assignment	Suggested Reading
Module I: Heat Engine, Its Characteristics and Performance Parameters (12 Hours)				

Introduction to Heat Engine, Classification of Heat Engines, Indicated and Brake Power, Engine Efficiency, Engine Performance Characteristics, ECU, Variables Affecting Performance Characteristics, Methods of Improving Engine Performance, Heat Balance.	12	Lecture+ Practice	Assignment -1	Text Book(TB)-1, Chapter(Ch)-1 https://www.youtube.com/watch?v=PgvD9mx9Do o
Module II: Fuel (6 Hours)				
Fuels of SI and CI Engine, Properties, Potential and Advantages of Alternative Fuels (Liquid and Gaseous) for SI and CI Engines.	6	Lecture+ Practice	Assignment -2	TB-1, Ch-6
Module III: Mechanical Injection Systems (8 Hours)				
Functional Requirements of an Injection System, Classification of Injection Systems, Fuel Feed Pump, Injection Pump, Governor, Fuel Injector, Nozzle.	8	Lecture+ Practice	Assignment -3	TB-1, Ch-9 https://www.youtube.com/watch?v=P5-yxENaLDU&t=49s
Module IV: Electronic Injection Systems (6 Hours)				
Multi-Point Fuel Injection (MPFI) System, Injection Timing, Gasoline Injection System, CRDI.	6	Lecture	Assignment -4	TB-2, Ch-10
Module V: Ignition (6 Hours)				

Energy Requirement for Ignition, Battery Ignition Systems, Modern Ignition Systems, Firing Order.	6	Lecture+ Practice	Assignment -5	TB-1, Ch-11
Module VI: Combustion(12 Hours)				
Stages of Combustion in SI and CI Engines, Flame Propagation and Ignition Delay, Abnormal Combustion, Phenomena of Knock in SI and CI Engines, Detonation, Diesel Knock & Methods to Control Diesel Knock. SI and CI Engine Combustion Chambers.	12	Lecture+ Practice	Assignment -6	TB-2, Ch-12 https://www.youtube.com/watch?v=ZxkLgv8c3OE
Module VII: Cooling, Lubrication, Engine Emission and Control Systems(10 Hours)				
Air Cooling and Water Cooling Systems, Properties of Lubricants and Different Types of Lubricating System.	6	Lecture+ Practice	Assignment -7.1	TB-2, Ch-13
Mechanism of Pollutant Formation and its Harmful Effects. Methods of Measuring Pollutants and Control of Engine Emission.	4	Lecture+ Practice	Assignment -7.2	TB-2, Ch-15
Total(Hrs)	60			

Design of Thermal Energy Systems

Course Title	Code	Type of course	T-P-P	Prerequisite
Design of Thermal Energy Systems	MECC0407	Theory+Practice	2-1-0	Thermodynamics

Objective

- To educate the students on principles, technology and applications of various thermal energy systems as used in industry
- To impart technical knowledge and skills on design of various thermal energy systems

Course Outcomes

- Students will be able to identify and select, design and implement appropriate thermal energy system corresponding to specific need
- Students will be able to take up testing, maintenance of thermal energy systems with minimum additional input

Evaluation Systems

Evaluation	Component	Marks	Method of Evaluation
Internal Evaluation	Internal Theory	20	Written examination
	Internal Practice	30(20+10)	Labwork + Learning Record
External Evaluation	External Theory	30	Written examination
	External Practice	20	Labwork
Total		100	

Course outline

Module I: Power Cycles, Power Generating Systems (8 Hours)

Theory

Power Cycles: Introduction, Power Cycles, Carnot Vapor Cycle and its Limitations, Rankine Cycle, Means of Increasing Rankine Cycle Efficiency, Reheat Cycle, Regenerative Feed Heating Cycle, Binary Vapor Cycle, Gas-Vapor Coupled Cycles.

Power Generating Systems: Types of steam turbines, Thermodynamics of steam Turbine Elements, steam Turbine operation, Turbine Performance at Varying Load, Performance of supersonic Turbine Nozzles.

Module II: Heat Transfer Systems (12 Hours)

Theory

Heat Transfer Systems: Classification and Thermal Design of Heat Exchangers, Overall Heat Transfer Coefficient, Fouling Factor or Dirt Factor, Temperature Profiles in Heat Exchangers, LMTD Correction Factor, Pressure Drop in Heat Exchanger, Correlation for Tube Side Pressure Drop, Correlation for Shell Side Pressure Drop, Heat Transfer Effectiveness and Number of Transfer Units, Calculation and Designing of the Heat Exchanger, Double-Pipe Heat Exchanger.

Practice

1. Determination of Overall Heat Transfer Coefficient of Concentric Tube Heat Exchanger.
2. Determination of Effectiveness and Efficiency of Cross Flow Heat Exchanger.
3. Determination of Overall Heat Transfer Coefficient of Shell and Tube Heat Exchanger.
4. Ansys Fluent analysis of Double pipe Heat exchanger.

Module III: Types of Refrigerants and Environmental Safety (6 Hours)

Theory

Types of Refrigerants and Environmental Safety: Introduction, Unit of Refrigeration, Coefficient of Performance, Characteristics of Different Refrigerants, Types of Refrigerants, Refrigerants with the least environmental impact, Ozone Depletion Potentials, Green House Potential Refrigerants, Natural Organic Refrigerants, Use of Non-Polluting Refrigerants.

Module IV: Vapor Compression System (12 Hours)

Theory

Vapor Compression System: Analysis of Theoretical Vapor Compression Cycle, Representation of Cycle on T-S and P-H Diagram, Simple Saturation Cycle, Sub-Cooled Cycle and Super-Heated Cycle, Effect of Suction and Discharge Pressure on Performance.

Practice

5. Determination of C.O.P of Vapor Compression Refrigeration System
6. Determination of C.O.P and Capacity of an Ice Plant.
7. Leak Detection and Charging of Refrigerants in a Domestic Refrigerator.
8. Hands on Practice on Soldering and Brazing.

Module V: Vapor Absorption System (4 Hours)

Theory

Vapor Absorption System: Simple Ammonia Absorption System, Improved Absorption System, Electrolux Refrigerator, Lithium-Bromide Absorption Refrigeration System.

Module VI: Air Conditioning (10 Hours)

Theory

Air Conditioning: Factors Affecting the Air Quality, Dry Bulb Temperature, Wet Bulb Temperature, Relative Humidity, Dew Point Temperature, Specific Humidity, Absolute Humidity, Specific Enthalpy, Pressure, Ventilation, Study on Psychrometric Chart. HVAC System.

Practice

9. Calculation of C.O.P. of Air Conditioning System
10. Performance Test of Window Type Air Conditioner
11. To Carry Out Cooling Process of Fresh Air and Find Out Relevant Parameter of Air
12. To Carry Out Heating Process of Fresh Air and Find Out Relevant Parameter of Air

Module VII: Heating and Cooling Load Calculation (8 Hours)

Theory

Heating and Cooling Load Calculation Building: Heat and Cooling Load Calculation, Air Distribution System, Calculation for Duct Size, Water and Air Cooled Chillers, Cooling Towers.

Practice

13. Determination of Efficiency of Cooling Tower
14. Calculation of Cooling Load of a Confined Space

Text Books

1. Holman J.P. and Bhattacharyya Souvik. Heat Transfer: McGraw-Hill Education, 10th Edition, 2016.
2. Nag P.K. Engineering Thermodynamics: Tata McGraw Hill Companies, fourth edition, 2008.

References

1. Rajput R.K. Refrigeration and Air Conditioning: Kataria and sons, 2005.

Session Plan

Topic coverage and Internal Test	No. of Sessions (in hours)	Activity	Assignment	Suggested Reading
Module I: Power Cycles, Power Generating Systems (8 Hours)				
Introduction, Power	8	Lecture	Assignment,	Text book (TB)-

<p>Cycles, Carnot Vapor Cycle and its Limitations, Rankine Cycle, Means of Increasing Rankine Cycle Efficiency, Reheat Cycle, Regenerative Feed Heating Cycle, Binary Vapor Cycle, Gas-Vapor Coupled Cycles.</p> <p>Types of steam turbines, Thermodynamics of steam Turbine Elements, steam Turbine operation, Turbine Performance at Varying Load, Performance of supersonic Turbine Nozzles.</p>			1	<p>3, Chapter (Ch)-2,3 https://www.youtube.com/watch?v=ouWOhk1INjo https://www.youtube.com/watch?v=ZJto bHMiXyQ https://www.youtube.com/watch?v=HtXjbA3h3wQ</p>
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Module II: Heat Transfer Systems (12 Hours)

<p>Classification and Thermal Design of Heat Exchangers, Overall Heat Transfer Coefficient, Fouling Factor or Dirt Factor, Temperature Profiles in Heat Exchangers, LMTD Correction Factor, Pressure Drop in Heat Exchanger, Correlation for Tube Side Pressure Drop, Correlation for Shell Side Pressure Drop, Heat Transfer Effectiveness and</p>	12 (Th-6, Pr-6)	Lecture + practice	Assignment, 2	<p>TB-1, Ch-10 https://www.youtube.com/watch?v=-AdmxCJIWBk https://www.youtube.com/watch?v=eraQJ3Z9Mb8 https://www.youtube.com/watch?v=o0UJDQfwPaM</p>
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Number of Transfer Units, Calculation and Designing of the Heat Exchanger, Double-Pipe Heat Exchanger.				
Module III: Types of Refrigerants and Environmental Safety (6 Hours)				
Introduction, Unit of Refrigeration, Coefficient of Performance, Characteristics of Different Refrigerants, Types of Refrigerants, Refrigerants with the least environmental impact, Ozone Depletion Potentials, Green House Potential Refrigerants, Natural Organic Refrigerants, Use of Non-Polluting Refrigerants.	6	Lecture	Assignment, 3	TB-1, Ch1 https://www.youtube.com/watch?v=-AdmxCJIWBk https://www.youtube.com/watch?v=eraQJ3Z9Mb8 https://www.youtube.com/watch?v=o0UJDQfwPaM
Module IV: Vapor Compression System (12 Hours)				
Analysis of theoretical vapor compression cycle, representation of cycle on T-S and p-h diagram, simple saturation cycle, sub-cooled cycle and super-heated cycle, effect of suction and discharge pressure on performance	12 (Th-4, Pr-8)	Lecture + Practice	Assignment, 4	Ref.-1, Ch-3, 4 https://www.youtube.com/watch?v=cobFAMZDS0o
Module V: Vapor Absorption System (4 Hours)				
Simple ammonia absorption system, improved absorption system, Electrolux refrigerator, lithium-bromide absorption refrigeration system	4	Lecture	Assignment, 5	Ref.-1, Ch-5 https://www.youtube.com/watch?v=Ll8KumFQxE https://www.youtube.com/watch?v=Ll8KumFQxE

				om/watch?v=TFxbHp8uIyQ
Module VI: Air Conditioning (10 Hours)				
Factors Affecting the Air Quality, Dry Bulb Temperature, Wet Bulb Temperature, Relative Humidity, Dew Point Temperature, Specific Humidity, Absolute Humidity, Specific Enthalpy, Pressure, Ventilation, Study on Psychrometric Chart. HVAC System.	10 (Th-3, Pr-7)	Lecture+ Practice	Assignment, 6.1	Ref.-1, Ch-12 https://www.youtube.com/watch?v=fqvo7bSr6t8 https://www.youtube.com/watch?v=YrDZ9u2_GAQ
Module VII: Heating and Cooling Load Calculation (8 Hours)				
Building Heating and Cooling Load Calculation, Air Distribution System, Calculation for Duct Size, Water and Air Cooled Chillers, Cooling Towers.	8 (Th-4, Pr-4)	Lecture+ Practice	Assignment, 7.1	Ref.-1, ch-18 https://www.youtube.com/watch?v=jygiuS-9ubU https://www.youtube.com/watch?v=1cvFIBLo4u0
Total (hrs)	60			

Mechanics of Machines

Subject Name	Code	Type of course	Credit	Prerequisite
Mechanics of Machines	MECC0410	Theory+Practice	3(2-1-0)	NIL

Objective

- To teach the students on basic theories, concepts and methods used for study and analysis of commonly used mechanisms in various applications
- To teach the students on some of the widely used mechanical power transmission elements

Course Outcomes

- Students will have knowledge and skills to analyse, design and develop mechanisms suitable for specific applications
- Students will have knowledge and skills to study and understand working of complex mechanisms and machines enabling them to safely operate and maintain such installations

Evaluation Systems

Internal Examination	Component	% of Marks	Method of Assessment
	Internal Theory	20	Written examination
	Internal Practice	30(20+10)	Labwork + Learning Record
External Examination	External Theory	30	Written examination
	External Practice	20	Labwork
Total		<i>100</i>	

Course Outline

Module I: MECHANISMS(09 Hours)

Theory

Planar Mechanisms: Kinematic Link, Pair, Chain and Mechanism, Types of Links and Joints, Degree of Freedom, Grashof's Law for four bar Mechanism; Inversion of four bar Mechanism, Single Slider Crank Mechanism and Double Slider Crank Mechanism;

Practice

1. Position Analysis of Grashof and Non-Grashof four bar Mechanism
2. Position Analysis of Slider Crank Mechanism, Scotch Yoke Mechanism and Elliptical Trammel

Module II: MOTION ANALYSIS(14 Hours)

Theory

Instantaneous Centre of Rotation, Number and Types of Instantaneous Centers, Kennedy Theorem, Relative Velocity Method, Velocities in Four Bar and Slider Crank Mechanism, Crank and Slotted Lever Mechanism, Angular Velocity Ratio Theorem, Acceleration Diagram of Single Slider-Crank Mechanism, Coriolis Component of Acceleration;

Practice

3. Instantaneous Center Method to Find Velocity of Various Mechanisms
4. Klein's Construction for Determination of Velocity and Acceleration of Reciprocating Parts
5. Velocity Analysis of Grashof and Non-Grashof Four Bar Mechanism
6. Velocity Analysis of Slider Crank Mechanism and Scotch Yoke Mechanism
7. Acceleration Analysis of Slider Crank Mechanism

Module III: GEARS(09 Hours)**Theory**

Classification and Basic Terminology, Fundamental Law of Gearing, Standard forms of Tooth, Length of Path of Contact and Arc of Contact, Contact Ratio, Interference in Involute Gears. Gear trains: Simple, Compound, Reverted and Epi-Cyclic Gear Trains;

Practice

08. Study of Various Gear Trains in Automobiles

Module IV: CAMS(07 Hours)**Theory**

Various Types of Cams and Followers; Displacement, Velocity and Acceleration Diagrams for Different Follower Motions; Nomenclature of Cam Profile;

Practice

09. Construction of cam profile using Solid works software
10. Cam analysis of a Knife edge follower mechanism

Module V: INERTIA FORCES(05 Hours)**Theory**

Inertia forces in reciprocating parts: Velocity and Acceleration of a Piston, Angular Velocity and Angular Acceleration of Connecting Rod, Engine Force Analysis, Dynamically Equivalent System.

Module VI: GYROSCOPE(08 Hours)**Theory**

Gyroscopic Couple, Gyroscopic Effect on Naval Ships and Aeroplanes, Stability of four wheeler Vehicles.

Static and Dynamic Balancing, Balancing of Several Masses Revolving in the Same Plane and Different Planes, Balancing of Reciprocating Mass, Partial Primary Balancing, Partial Balancing of four wheeler;

Practice

11. Determine Gyroscopic Couple on Motorized Gyroscope Balancing
12. Balancing of Several Masses Revolving in the Same and Different Planes
13. Balancing of Reciprocating masses by Simulation

Module VII: VIBRATION(08 Hours)**Theory**

Basic Concepts and Types of Vibration, Methods of Vibration Analysis, Free Undamped Longitudinal, Transverse and Torsional Vibrations, Damped Free Vibrations, Logarithmic Decrement, Forced Vibration with Harmonic Excitation, Vibration Isolation and Transmissibility;

Practice

13. Determination of Critical or Whirling Speed of Shaft
14. Simple and Compound Pendulum

Text Book

1. Bansal R. K, Theory of Machines, Laxmi Publication
2. Rattan S.S, Theory of Machines, Tata McGraw-Hill.

Reference Books

1. Singh. S, Theory of Machines, Khanna publishers
2. Norton R.L, Design of Machinery, McGraw-Hill

Lesson Plan

Topics and Coverage	No. of Sessions (in hrs.)	Activity	Assignment (Project, assignment, field study, seminar, etc.)	Suggested Reading (Books, Online source)
MODULE-I				
Kinematic link, pair, chain and mechanism; types of links and joints, degree of freedom; Grashof's law for four bar mechanism	3	Lecture	Assignment 1.1	Text book (TB)-1 Chapter (Ch)-1 http://mm-nitk.vlabs.ac.in/index .
Inversions of four bar mechanism	2	Lecture	Assignment 1.2	TB-1 Ch-1

Singleslider crank mechanism Double slidercrank mechanism.	4	Lecture	Assignment1.3	TB-1 Ch-1 http://mm-nitk.vlabs.ac.in/index.html
MODULEII				
Instantaneous centerof rotation, number andtypes ofinstantaneous centers, Kennedytheorem,relative velocitymethod	3	Lecture	Assignment2.1	TB-1 Ch-3
Velocities in fourbar,slider crankmechanism,crankand slotted levermechanism	2+2	Lecture	Assignment2.2	TB-1 Ch-3 http://mm-nitk.vlabs.ac.in/index.html# http://mm-nitk.vlabs.ac.in/index.html#
Angular velocitytheorem	1	Lecture	Assignment2.3	TB-1 Ch-3
Acceleration diagram of singleslidercrank mechanism	2+2	Lecture Practice	Assignment2.4	TB-1 Ch-4 http://mm-nitk.vlabs.ac.in/index.h
Coriolis component acceleration	2	Lecture		TB-1 Ch-4
MODULE-III				
Classification And basic terminology, fundamental lawofgearing	2	Lecture	Assignment3.1	TB-1 Ch-9 https://www.youtube.com/watch?v=Z1f29M4

Standard forms of tooth, Length of path of contact, Arc of contact, contact ratio, Interference in involute gears.	3	Lecture		TB-1 Ch-9
Simple, compound, reverted and epicyclic gear trains.	2+2	Lecture+ Practice		TB-1 Ch-9
MODULE-IV				
CAM: Cams and followers	1	Lecture	Assignment 4.1	TB-1 Ch-18 https://www.youtube.com/watch?v=YbjmphKVVpA
Displacement, velocity and acceleration diagrams for different follower motions; nomenclature of cam profile+	2+2+2	Lecture+ Practice		TB-1 Ch-18 https://youtu.be/Wn7CW9y42Pg Cam profile practice by Solid works
MODULE-V				
Velocity and acceleration of a piston, Angular velocity and angular acceleration of connecting rod	3	Lecture	Assignment 5.1	TB-2 Ch-13
Engine force analysis, dynamically equivalent system	2	Lecture		TB-2 Ch-13
MODULE-VI				
Gyroscope: Gyroscopic couple, Gyroscopic effect on naval ships	1+2	Lecture+ Practice	Assignment 6.1	TB-2 Ch-17
Gyroscopic effect on airplanes Stability of two wheeler vehicles	1	Lecture		https://www.youtube.com/watch?v=ZsaVIW1BFUQ

Balancing: Static and dynamic balancing.	1+1	Lecture +Practice		TB-2 Ch-14 https://youtu.be/4jk9H5AB4IM https://youtu.be/QAffR0XV-Q
Balancing of several masses revolving in different planes	1	Lecture	Assignment 6.2	https://www.youtube.com/watch?v=_CwACU8Zfug
Balancing of reciprocating mass. Partial primary balancing	1	Lecture		https://www.youtube.com/watch?v=Eg9Awoxvw1Q https://youtu.be/4jk9H5AB4IM
MODULE-VII				
Vibration: Basic concepts and types of vibration. Methods of vibration analysis Free vibrations Longitudinal, transverse and torsional vibrations	2+2	Lecture + Practice	Assignment 7.1	TB-2 Ch-18 https://www.youtube.com/watch?v=qV65LJ6LpI4 https://youtu.be/02w9lSii_Hs https://youtu.be/3uZ_Boyt_AI
Damped free vibrations, Logarithmic decrement	2	Lecture		https://www.youtube.com/watch?v=Zp9g0Xbv7G4
Forced Vibrations with harmonic excitation Vibration isolation and transmissibility	2	Lecture		https://www.youtube.com/watch?v=cGFjNhbGwUY
Total (hrs)	60			

Strength of Materials

Course Title	Code	Type of course	T-P-P	Prerequisite
Strength of Materials	CECC0411	Theory+ Practice	1-2-0	Engineering Mechanics

Objective

- To teach the Students on basic theories behind Mechanics of Solids
- To teach the Students on using ANSYS for analysis of various mechanical structures and load transmitting elements

Course Outcomes

- Students will have Knowledge and practical engineering skills in analysis of mechanical strength of structures and load transmission elements and will be able to design them based on input data
- Students will be able to deploy ANSYS to develop mechanical design solutions

Evaluation Systems

1. Evaluation Systems

Evaluation	Component	Marks	Method of Evaluation
Internal Evaluation	Internal Theory	20	Written Examination
	Internal Practice	30 (20+10)	Lab Work+ Learning Record
External Evaluation	External Theory	30	Written Examination
	External Practice	20	Lab Work
Total Marks		100	

Course Outline

Module I: Analysis of beams (07 Hrs)

Theory

Shear and Bending Moment in Beams: Types of Beams and Loads, Concept of Shear force, Bending moment and Sign Conventions, Relation Between Load, Shear force and Bending moment, Procedure for Drawing Shear force and Bending moment Diagrams, Point of Contra Flexure.

Practice

1. Simulation (Using ANSYS): Evaluate Shear Force and Bending Moment
2. Simulation (Using ANSYS): Beam Analysis with Point Load, UDL, UV and Moment

Module II: Stresses in Beams (04 Hrs)

Theory

Simple or Pure Bending, Flexure Formula, Section Modulus, Neutral Axis, Determination of Bending Stresses, Shear Stress Distribution for Different Sections.

Practice

3. Simulation (Using ANSYS): To Analyze the Bending Stress of a Cantilevered and Simply Supported Beam

<https://www.youtube.com/watch?v=ekKQvGna0ig>

Module III: Deflection of Beams (05 Hrs)

Theory

Equation of Elastic Curve, Direct Integration Method, Strain Energy Method, Castigliano's Theorem

Practice

4. Stress & Deflection Analysis of Mechanical Component (Using ANSYS)
5. Double Shear Test and Deflection Test Using UTM

Module IV: Analysis of Column and Shaft (06 Hrs)

Theory

Column Analysis: Failure of a Column, End Conditions, Euler's Critical Load for Long Columns, Rankine's Empirical Formula, Effective Length and Slenderness Ratio, Eccentric Loading and Secant Formula.

Practice

6. Simulation (Using ANSYS): Buckling Analysis of a Square Column, I-Beam and RCC Beam

Module V: Torsion(06 Hrs)

Theory

Torsion Equation, Design of Shafts, Power Transmitted by Shafts, Composite Shafts, Combined Bending and Torsion, Closed-Coiled Helical Springs, Spring Connected in Series and Parallel.

Practice

7. Simulation(Using ANSYS): Static and Dynamic Analysis of Shaft
8. Simulation(Using ANSYS): Spring Structural Analysis
<https://www.youtube.com/watch?v=rJ2e4DximL0>
9. Simulation(Using ANSYS): Stress Analysis of Suspension System
https://www.youtube.com/watch?v=xI-NqAKZ_60
10. Stiffness Test of a Helical Spring

Module VI : Theories of Failure(06 Hrs)

Theory

Failure Under Biaxial Loading, Rankine's Theory, Guest's or Tresca's Theory, Von Mises Theory, Graphical Representation of Failure, Safety Factors, Prevention of Failure in Design Stage, Diagnosis of Failure in Post-Manufacturing Stage.

Practice

11. Simulation: Spur Gear Fatigue Analysis in Ansys
<https://www.youtube.com/watch?v=2SGqcLZISQ0>
12. Simulation: Chair Structural Analysis in ANSYS
<https://www.youtube.com/watch?v=DIII8bI-ea8>
13. Simulation(Using ANSYS): Bicycle Frame Structural Analysis
https://www.youtube.com/watch?v=p-CUK_pEfR4

Module VII: Fatigue (11 Hrs)

Theory

Failure under Cyclic Loading, Endurance Limit, S-N Curve, Stress Concentration, Goodman and Soderberg Criteria.

Practice

14. Fatigue Failure Analysis (Using ANSYS)
<https://www.youtube.com/watch?v=ywDsB3umK2Y>
15. Fatigue Analysis of a Plate with Hole (Using ANSYS)
<https://www.youtube.com/watch?v=c3yM5fT5Ztc>
16. Fatigue Analysis (Using ANSYS) of Crankshaft of Two Wheeler

Text Books

1. Rattan S.S. , Strength of materials, Tata Mc-Graw Hill Publication.
2. Bansal RK , Strength of materials, Laxmi Publication (P)Ltd.

Reference Books

1. Boresi A.P. and Schmidt R.J., Advanced mechanics of materials, Wiley India
 2. P. Popov Egor Engineering Mechanics of Solids, Pearson publication
- Online Source: YouTube, NPTEL

Session Plan

Topic	No. of Sessions (in hrs.)	Activity	Assignment	Suggested Reading (Book, Video, Online source, etc.)
Module-I				
Shear And Bending Moment In Beams: Types of Beams and Loads, Concept of Shear force, Bending moment and Sign Conventions	1		Assignment-1.1	Text book (TB)-1, chapter (Ch) no-4, page-99

Relation Between Load, Shear force and Bending moment, Procedure for Drawing Shear force and Bending moment Diagrams, Point of Contra Flexure.	2		Assignment-1.2	TB ₁ ,chapterno-4,page-103
Simulation (Using ANSYS): Evaluate Shear Force and Bending Moment Simulation (Using ANSYS): Beam Analysis with Point Load, UDL, UVL and Moment	2	Lab practice	Assignment-1.3	
Module-II				
Stresses in beams: Simple or Pure Bending, Flexure Formula, Section Modulus, Neutral Axis Determination Bending Stresses, Shear Stress Distribution for Different Sections.	2		Assignment-2.1	TB ₁ ,chapter-5,page-129 2. https://www.youtube.com/watch?v=ekKQvGna0ig
Simulation (Using ANSYS): To Analyze The Bending Stress of a Cantilevered and Simply Supported Beam	2	Lab practice	Assignment-2.2	

Module-III

Deflection of beams: Equation of Elastic Curve, Direct Integration Method, Strain Energy Method,	1			TB2 ,chapter-12,page-511
Stress & Deflection Analysis of Mechanical Component(Using ANSYS) Double Shear Test and Deflection Test Using UTM	4	Lab practice	Assignment-3.1	

Module-IV

Column analysis: Failure of a Column, End Conditions, Euler's Critical Load for Long Columns, Rankine's Empirical Formula, Effective Length and Slenderness Ratio, Eccentric Loading and Secant Formula.	4		Assignment-4.1	TB1,chapter-12,page-388
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Simulation(Using ANSYS): Buckling Analysis of a Square Column, I-Beam and RCC Beam	2	Lab practice	Assignment-4.2	
Torsion: Torsion Equation, Design of Shafts, Power Transmitted by Shafts, Composite Shafts, Combined Bending and Torsion, Closed-	3		Assignment-5.1	RB ₂ , chapter-6, page no-200 2. https://www.youtube.com/watch?v=rJ2e4DximL0 3. https://www.youtube.com/watch?v=xI-NqAKZ_60
Simulation(Using ANSYS): Spring Structural Analysis. Stiffness Test of a Helical Spring.	4	Lab practice	Assignment-5.2	
Module-VI				

<p>Theories of failure: Failure Under Biaxial Loading, Rankine's Theory, Guest's or Tresca's Theory, Von Mises Theory, Graphical Representation of Failure, Safety Factors, Prevention of Failure in Design Stage, Diagnosis of Failure in Post-Manufacturing Stage.</p>	2		Assignment-6.1	<p>TR, chapter-3 page-91</p> <p>2. https://www.youtube.com/watch?v=2SGqcLZISQ0</p> <p>3. https://www.youtube.com/watch?v=p-CUK_pEfR4</p> <p>4. https://www.youtube.com/watch?v=hETp6TDi7-k</p>
<p>Simulation: Spur Gear Fatigue Analysis in Ansys. Simulation (Using ANSYS): Bicycle Frame Structural Analysis</p>	5	Lab practice	Assignment-6.2	
Module-VII				
<p>Fatigue: Failure Under Cyclic Loading, Endurance Limit. S-N Curve, Stress Concentration, Goodman and Soderberg Criteria.</p>	3		Assignment-7.1	RB ₁ , chapter-16, page no-567.

Fatigue Analysis of a Plate With Hole (Using ANSYS). Fatigue Analysis (Using ANSYS) of Crankshaft of Two Wheeler	6	Lab practice	Assignment-7.2	
Tensile Test, Compression Test	2	Lab practice	Assignment-7.4	
Total (hrs)	45			

Design of Transmission Systems

Course Title	Code	Type of course	T-P-P	Prerequisite
Design of Transmission Systems	MECC0412	Theory+Practice	2-1-0	Mechanics of Solids

Objective

- To Familiarize the Various Mechanical Power Transmission Elements and Systems as used in Industry
- To Enable the Students to Design Basic Transmission Elements using prior theoretical Knowledge

Course outcomes

- To Convert basic Input Data into Engineering Design and drawing using CATIA and ANSYS

Evaluation System

Evaluation	Component	Marks	Method of Evaluation
Internal Evaluation	Internal Theory	20	Written examination
	Internal Practice	30(20+10)	Labwork + Learning Record
External Evaluation	External Theory	30	Written examination
	External Practice	20	Labwork
Total Marks		<i>100</i>	

Course outline

Module I: Basic Power Transmission Elements (10 Hrs)

Theory

Design of Shaft Coupling: Keys and Splines; Strength of a Sunk Key; Rigid and Flexible Coupling, Hooke's Joint and Constant Velocity Joint; Fluid Coupling.

Practice

1. Design of Flange Coupling using CATIA
2. Design of Hooke's Joint using CATIA

Module II: Design of Belt, Rope and Chain Drives (10 Hrs.)

Theory

Flat, V-Belt and Rope Belts; Slip and Creep of Belt; Velocity Ratio of Belt Drives; Centrifugal and Initial Tension; Maximum Power Transmission Through a Belt Drive, Power Transmitting Chains.

Practice

3. Design of Flat belt pulley using CATIA
4. Design of V-belt pulley using CATIA

Module III: Design of Gears (10 Hrs)

Theory

Selection of Materials; Force Analysis, Beam Strength of Gear Tooth, Gear Tooth Failure.

Practice

4. Computer aided spur gear design and analysis using CATIA and ANSYS
5. Computer aided helical gear design and analysis using CATIA and ANSYS
6. Gear Box Used in Automobiles, Machine Tool, etc.

Module IV: Clutch & Brake (12 Hrs)

Theory

Clutch: Friction, Centrifugal, Vacuum and Free Wheel Clutch, Construction and Working Principle.

Brakes: Single and Double Shoe Brake, Internal Expanding Brake, Band Brake, Electromagnetic Brakes, Concept of Regenerative Braking.

Practice

5. Disc type and Drum types Brakes used in Automobiles
6. Power Transmission using Cardan Shaft in Rolling Mills and Conveyors

Module V: Application of Tribology (06 Hrs)

Theory

Lubrication, Tribology in Design-Mechanical design of oil seals and gasket-Tribological design of oil seals and gasket, Tribology in Industry (Maintenance), Rolling Contact Bearing, Journal Bearings-Finite Bearings. Friction Theory.

Practice

7. Journal Bearing Test: Experimental measurement of the pressure distribution and
8. frictional torque in the journal bearing for different applied load

Module VI: Material Handling Systems (06 Hrs)

Theory

Load handling attachments, Standard forged hook, Hook weights, Hook bearings, Cross piece and casing of hook, Crane grab for unit and piece loads, Carrier beams and clamps, Load platforms and

sidedumpbuckets,Electricliftingmagnets,Grabbingattachmentsforloosematerials,Crane attachments forhandling liquid materials.

Practice

- 9. Conveyorwith theApplication ofBeltDrives
- 10. ElectricOverhead Cranes and Goods/PassengerLifts UsingRopeDrives
- 11. Ball Screw Mechanisms Used in CNC Machines

Module VII: Mechanical Handling Equipment (6Hrs)

Theory

Differentdrivesof hostinggears like individualandcommonmotor drive for severalmechanisms, Traveling gear, Traveling mechanisms for moving trolleys and cranes on runway rails, Mechanismsfortrackless,Rubber-tyredandcrawlercranesmotorpropelledtrolley hoistsand trolleys, Rails and travelingwheels;

Practice

- 12. Measurement of Torque and Power usingRopeBrakeDynamometer

Text Book

- 1. Kannaiah P., MachineDesign, Scitech Publication Pvt.Ltd.
- 2. KhurmiR.S., GuptaJ.K., Machine Design, S.Chand Publication
- 3. Jalaludeen S.Md.,Design DataHandbook, AnuradhaPublications
- 4. RaySiddhartha., MaterialHandling,New Age Publications

ReferenceBook

- 1. Bhandari V.B.,Designof MachineElements, Tata McGraw Hill Education PrivateLimited

SessionPlan

Topic coverage andInternal Test	No. of Sessions (in hrs.)	Activity (lecture, tutorial, lab practice, field studies/field -trip, Workshop etc.)	Assignment (Project, assignment, field study, seminar, etc.)	SuggestedReading (Book, Video,Online source, etc.)
Module I (10 Hrs)				

Keys and Splines; Strength of a Sunk Key	02	Lecture	Assignment 1.1	Text book(TB) -1 Chapter(Ch) -14 TB-3 Ch-5 https://www.youtube.com/watch?v=S8Qmy4fGnnE
Rigid and Flexible Coupling	03	Lecture	Assignment 1.2	TB-1 Ch-15 TB-3 Ch-6 2. https://www.youtube.com/watch?v=CwiaS075YzQ 3. https://www.youtube.com/watch?v=9idc0CzMjCo
Hooke's Joint and Constant Velocity Joint; Fluid Coupling	01	Lecture	Assignment 1.3	TB-2 Ch-13 2. https://www.youtube.com/watch?v=EJL9qHhQing . 3. https://www.youtube.com/watch?v=LCMZz6YhbOQ
Design of Flange Coupling using CATIA, Design of Hooke's Joint using CATIA	04	Lab Practice		TB-2 Ch-13
Module – II (10 Hrs)				
Flat, V-Belt and Rope Belts; Slip and Creep of Belt; Velocity Ratio of Belt Drive	04	lecture	Assignment 2.1	TB-1 Ch-20 TB-3 Ch-21,22 2. https://www.youtube.com/w

				atch?v=0mb_XMGja_c 3. https://www.youtube.com/watch?v=j7njM22izc
Centrifugal and Initial Tension; Maximum Power Transmission Through a Belt Drive. Power Transmitting Chains	02	lecture	Assignment 2.2	TB-1 Ch-20,21 TB-3 Ch-21,22 2. https://www.youtube.com/watch?v=4PsJkXO70Xc
Design of Flat belt pulley using CATIA, Design of V-belt pulley using CATIA	04	Lab. Practice		TB-1 Ch-20,21
Module III (10 Hrs)				
Selection of Materials; Force Analysis, Beam Strength of Gear Tooth, Gear Tooth Failure	03	lecture	Assignment 3.1	TB-1 Ch-22 TB-3 Ch-25 2. https://www.youtube.com/watch?v=P4rNX0gCm3E
Computer aided spur gear design and analysis using CATIA and ANSYS Computer aided helical gear design and analysis using CATIA and ANSYS Gear Box Used in Automobiles, Machine Tool, etc	07	Lab. Practice		TB-1 Ch-22
Module – IV (12 Hrs)				
Friction, Centrifugal, Vacuum and Free	04	lecture	Assignment 4.1	TB-1 Ch-26 TB-3

Wheel Clutch, Construction and Working Principle				Ch-17 2. https://www.youtube.com/watch?v=devo3kdSPQY 3. https://www.youtube.com/watch?v=pqF-aBtTBnY&t=108s
Single and Double Shoe Brake, Internal Expanding Brake, Band Brake, Electromagnetic Brakes, Concept of Regenerative Braking.	05	lecture	Assignment 4.2	TB-1 Ch-27 TB-3 Ch-18 2. https://www.youtube.com/watch?v=w45s
Disc type and Drum types Brakes used in Automobiles. Power Transmission using Cardan Shaft in Rolling Mills and Conveyors	03	Lab Practice		TB-1 Ch-27
Module – V (6 Hrs)				
Lubrication, Tribology in Design - Mechanical design of oil seals and gasket- Tribological design of oil seals and gasket, Tribology in Industry (Maintenance), Rolling Contact Bearing, Journal Bearings- Finite Bearings. Friction Theory	2	lecture	Assignment 5.1	TB-1 Ch-19 TB-3 Ch-19,20
Journal Bearing Test: Experimental measurement of the pressure distribution and	4	Lab Practice		TB-1 Ch-19

frictional torque in the journal bearing for different applied load				
Module – VI (6 Hrs)				
Load handling attachments, standard forged hook, hook weights, hook bearings, cross piece and casing of hook, crane grab for unit and piece loads, carrier beams and clamps, load platforms and side dump buckets, electric lifting magnets, grabbing attachments for loose materials, crane attachments for handling liquid materials	2	Lecture	Assignment 6.1	TB-4 Ch-1 Materials Handling Equipment– N. Rudenko , Envee Publishers, New Delhi
Conveyor with the Application of Belt Drives, Electric Overhead Cranes and Goods/Passenger Lifts Using Rope Drives, Ball Screw Mechanisms Used in CNC Machines	4	Lab Practice		TB-4 Ch-3,6
Module – VII (6 Hrs)				
Different drives of hoisting gears like individual and common motor drive for several mechanisms, traveling gear, traveling	2	Lecture	Assignment 7.1	TB-4 Ch-5 Materials Handling Equipment– N. Rudenko , Envee Publishers, New Delhi

mechanisms for moving trolleys and cranes on runway rails, mechanisms for trackless, rubber-tyred and crawler cranes motor propelled trolley hoists and trolleys, rails and traveling wheels				
Measurement of Torque and Power using Rope Brake Dynamometer.	4	Lab Practice		TB-4 Ch-7
Total	60			

Fluid Mechanics and Heat Transfer

Course Title	Code	Type of Course	T-P-P	Prerequisite
Fluid Mechanics and Heat Transfer	MECC0414	Theory+Practice	2-1-0	Basic Fluid Mechanics

Objective

- ✓ To teach the students about concepts of fluid mechanics and Heat Transfer useful in different field of engineering applications
- ✓ To provide a good exposure for the students to various phenomena associated with fluid flow and different modes of heat transfer

Course Outcomes

- ✓ Students will be able to analyze and design various Equipment used in industry using principles of Fluid Mechanics and Heat Transfer

Evaluation Systems

Evaluation	Component	Marks	Method of Evaluation
Internal Evaluation	Internal Theory	20	Written Examination
	Internal Practice	30(20+10)	Lab Work+Learning Record
External Evaluation	External Theory	30	Written Examination
	External Practice	20	Lab Work
Total Marks		100	

Course Outline

Module I: Compressible flow (12 Hours)

Theory

Compressible flow: Basic Equations of Compressible Fluid Flow: Continuity Equation and General Energy Equation, Velocity of Pressure Wave in a Fluid, Subsonic, Sonic and Supersonic Flow, Mach Number, Wave Propagation in Compressible Fluid, Stagnation Properties. Introduction to Air Foil Theory.

Module II: Compressors (8 Hours)

Theory

Compressors: Introduction to Centrifugal and Reciprocating Compressor, Classification of Compressors, Multistage Compression with Intercooling, Advantages of Multi Stage Compression. Uses of Compressors.

Practice

1. Determination of Efficiency of Reciprocating Compressor.
2. Determination of Efficiency of Centrifugal Compressor.

Module III: Conduction (8 Hours)

Theory

Conduction: Fourier's Law of Conduction, General Heat Conduction Equation in Different Coordinate Systems (No Derivation), One Dimensional Steady State Conduction in Plane Wall, Composite Wall, One Dimensional Steady State Conduction in Composite Cylinders and Composite Spheres with Convective Atmosphere. Electrical Analogy, Conduction with Internal Heat Generation.

Practice

3. Determination of Overall Heat Transfer Coefficient of Composite Slab.
4. Determination of Thermal Conductivity of Liquid.

Module IV: Fins and Transient Conduction (10 Hours)

Theory

Fins and Transient Conduction: Overall Heat Transfer Coefficients, Critical Thickness of Insulation, Heat Transfer from Extended Surfaces, Effectiveness and Efficiency, Unsteady State Heat Conduction, Lumped Heat Capacity System and Lumped Capacitance Method.

Practice

5. Experiment on Transient Heat Conduction Apparatus.
6. Determination of Efficiency and Effectiveness of Pin Fin.

Module V: Convection (10 Hours)

Theory

Convection: Hydrodynamic and Thermal Boundary Layer, Principles and Governing Equations, Forced Convection: External Flow over a Flat Plate, Cylinder, Sphere and Non-Circular Ducts, Use of Empirical Relations, Internal Flow Through Pipe, Annular Spaces and Non-Circular Conduits, Natural Convection: Vertical, Horizontal, Inclined Surfaces. Different Types of Heat Exchangers, Parallel Flow and Counter Flow Heat Exchangers.

Practice

7. Determination of Heat Transfer Coefficient in Forced Convection.
8. Determination of Heat Transfer Coefficient in Natural Convection.
9. Determination of Effectiveness and Efficiency of Parallel Flow and Counter Flow Heat Exchanger.
10. Simulation of Boundary Layer for Flow over a Flat Plate Using ANSYS FLUENT.

Module VI: Radiation (5 Hours)

Theory

Radiation: Electromagnetic Spectrum, Black Body Emission, Emissive Power, Laws of Radiation, Nature of Black and Grey Bodies, Concepts, Radiation Shape Factor, Thermal Resistance and Electrical Analogy, Radiation Heat Transfer Between Two Surfaces, Reradiating Surface, Radiation Shield.

Practice

11. Determination of Surface Emissivity.
12. Verification of Stefan Boltzmann's Law.

Module VII: Heat Transfer with Phase Change (7 Hours)

Theory

Heat Transfer with Phase Change: Film Wise and Drop Wise Condensation, Boiling Heat Transfer, Regimes of Boiling.

Practice

13. Determination of Critical Heat Flux during Boiling Heat Transfer.
14. Determination of Heat Transfer in Drop and Film Wise Condensation.

Text Books

1. Bansal, R.K., Fluid Mechanics and Hydraulic Machines, Laxmi Publications.
2. Rajput, R.K., Heat Transfer, Laxmi Publication.

Reference Books

1. Sachdeva, R.C., Fundamentals of Heat and Mass Transfer
2. Modi, P.N., Seth, S.N., Hydraulics & Fluid Mechanics, Rajsons Publications.

Session Plan

Topics	No. of Sessions (in hrs)	Activity	Assignment	Suggested Reading
Module-I: Compressible flow(12Hours)				
Basic Equations of Compressible Fluid Flow: Continuity Equation and General Energy Equation, Velocity of Pressure Wave in a Fluid, Subsonic, Sonic and Supersonic Flow, Mach Number, Wave Propagation in Compressible Fluid, Stagnation Properties. Introduction to Air Foil Theory.	12	Lecture	Assignment -1	Text Book(TB)-1, Chapter(Ch)-15 https://www.youtube.com/watch?v=5ltjFEei3AI
Introduction to Centrifugal and Reciprocating Compressor, Classification of Compressors, Multistage Compression with Intercooling, Advantages of Multi Stage Compression. Uses of Compressors.	8	Lecture+ Practice	Assignment-2	TB-1 https://www.youtube.com/watch?v=JH3l-NliCkM
Module III: Conduction(8 Hours)				
Fourier's Law of Conduction, General Heat Conduction Equation in Different Coordinate Systems (No Derivation), One Dimensional Steady State Conduction in Plane Wall, Composite Wall, One Dimensional Steady State Conduction in Composite Cylinders and Composite Spheres With Convective Atmosphere.	8	Lecture+ Practice	Assignment-3	TB-2.Ch-2 https://www.youtube.com/watch?v=4EADzHBIjtE

Electrical Analogy, Conduction with Internal Heat Generation.				
Module IV: Fins and Transient Conduction (10 Hrs)				
Overall Heat Transfer Coefficients, Critical Thickness of Insulation, Heat Transfer from Extended Surfaces, Effectiveness and Efficiency, Unsteady State Heat Conduction, Lumped Heat Capacity System and Lumped Capacitance Method.	10	Lecture+ Practice	Assignment-4	TB-2, Ch-2,4 https://www.youtube.com/watch?v=gcY6832h_Nw https://www.youtube.com/watch?v=bA3EzToAWOE https://www.youtube.com/watch?v=pRnURDgfByE https://www.youtube.com/watch?v=Atnjo7dD_bA http://nptel.ac.in/courses/112108149/pdf/M1/Student_Slides_M1.pdf https://www.youtube.com/watch?v=VO_3WW6ZcWw https://www.youtube.com/watch?v=zFkJy_VocCk
Module V: Convection (10 Hours)				
Convection: Hydrodynamic and Thermal Boundary Layer, Principles and Governing Equations, Forced Convection: External Flow over a Flat Plate, Cylinder, Sphere and Non-Circular Ducts, Use of Empirical Relations, Internal Flow Through Pipe, Annular	10	Lecture+ Practice	Assignment-5	TB-2, Ch-5,7,8 http://nptel.ac.in/courses/112108149/pdf/M6/Student_Slides_M6.pdf

Spaces and Non-Circular Conduits, Natural Convection: Vertical, Horizontal, Inclined Surfaces. Different Types of Heat Exchangers, Parallel Flow and Counter Flow Heat Exchangers.				
Module VI: Radiation(5 Hours)				
Electromagnetic Spectrum, Black Body Emission, Emissive Power Laws of Radiation Nature of Black And Grey Bodies. Concepts. Radiation Shape Factor, Thermal Resistance and Electrical Analogy, Radiation Heat Transfer Between Two Surfaces, Reradiating Surface, Radiation Shield.	5	Lecture+ Practice	Assignment-6	TR-2 Ch-11 12 https://www.youtube.com/watch?v=5GoZZKcNZiQ https://www.youtube.com/watch?v=tZliZyoYT80 http://nptel.ac.in/courses/112108149/pdf/M9/Student_Slides_M9.pdf
Module VII: Heat Transfer with Phase Change(7Hours)				
Film Wise and Drop Wise Condensation, Boiling Heat Transfer, Regimes of Boiling.	7	Lecture+ Practice	Assignment-7	TB-2, Ch-9
TOTAL(Hrs)	60			

The following colour represents the syllabus revision, skill, employability and entrepreneurship.

Green : Skill

Pink : Employability

Sky : Entrepreneurship

Code	CourseTitle	Course Type	Course Type	Credit	Prerequisite
DESE0601	Product Design, CATIA	Elective	Practice+ Project	5	Engineering Drawing
DESE0602	Product Validation, SIMULIA	Elective	Practice+ Project	5	Basic Engg, Strength of Material Machine Design, Material Science, Conventional Drawing (CAD)
DESE0603	Digital Manufacturing; DELMIA	Elective	Practice+ Project	5	CATIA
DESE0604	Product E learning, 3DVia	Elective	Practice+ Project	5	CATIA– 3D Experience Windows Operating System
DESE0605	Product Rendering & Visualization, 3DExcite	Elective	Practice+ Project	5	CATIA– 3D Experience Windows Operating System
DESE0606	Design Programmable logic Controller	Elective	Practice+ Project	5	Nil
DESE0607	Project Lifecycle Management,Enovia	Elective	Practice+ Project	5	Java Programming
DESE0608	PLM Customization & Development, Enovia	Elective	Practice+ Project	5	Java Programming
DESE0609	Programming, Logics and Scripting	Elective	Practice+ Project	5	Java Programming
DESE0610	System Engineering ;DYMOLA	Elective	Practice+ Project	5	Nil
DETE0300	Project	Core	Project	6	
DESE0800	Internship	Core	Practice	4	

Note:Students willselect courses out ofabovelectives basedonproject need.

**Syllabus
Product Design; CATIA**

Course Title	Code	Type of course	T-P-P	Prerequisite
Product Design; CATIA	DESE0601	Practice+Project	0-3-2	Engineering Drawing

Objective

- To Learn Industry Challenges, End-to-End Digital Modeling, Product Designing Tools and Technologies, PLM, NPI, Product design and development.

Course Outcome

- Students Will Able to Do Product Design, Digital modeling, and Hot Skills with Current & Future Technologies.

Evaluation Systems

Internal Examination	Component	% of Marks	Method of Assessment
	Internal Practice	50(40+10)	Lab Work+Learning Record
	Internal Project	50	Project Work
External Examination	External Practice	50	Lab Work
	External Project	50	Project Work +Report
Total		200	

Course Outline

Practice: 62 hours

Introduction to 3D EXPERIENCE CATIA: Denotation about 3D Experience log with contrast of previews platform. Offer of industry-leading applications in 3D Experience Platform. Explain about Preference, setting & dashboard. Exploded view and swap turn/turning table Overview, Axis system creation, Constraints, Tree structure.

Part Design: Part design features recognition, Effective modelling practices and design methodology review, Advanced multi-sections solid and rib/slot operations, advanced draft and fillet creation and troubleshooting techniques, Advanced patterning techniques and user patterns Holedimension Table, Solid Combine, Power Copy and User Feature recreation and instantiation, Sketch positioning and Axis orientation, Reference elements (Plane, Line and Point) Sketch based features, Boolean operations, Transformation features (Mirror, Symmetry, Translate)

Generative Shape Design: Overview, Surfacing terminology, Surface design process, Creating wireframe geometry, Creating simple surfaces, Creating complex surfaces, Performing operations on wireframe and surface geometry, Working with surface geometry in the Part Design Workbench, Geometrical Element Management, Surface Fillets, Boundary Representations, Best practices for surface modelling, Swept Surfaces, Blend Surfaces, Adaptive Sweep, Advanced Surface Fillets, Offset Surfaces Surface, Wireframe, Thick Surface, Closed Surface, Split and Trim operation.

Assembly Design: Overview, Creating an Assembly Document, Inserting a Component, Inserting a New Product, Inserting a New Part, Defining a Multi-Instantiation, Fast Multi-Instantiation, Using Assembly Constraints, Coincidence Constraint, Contact Constraint, Offset Constraint, Angle Constraint, Fixing a Component Product Edition, Top-Down approach and Bottom-Up Approach, Engineering Connection.

Drafting: Projections of Views, Section View, Hatching, Dimensions, Start a generative drawing Define the main views, Define section views and cuts, Define secondary views: detail, clipping, broken, breakout, auxiliary, isometric and unfolded views, Edit a view and sheet properties, Add sheets to a drawing, Reposition views, Modify section, detail and auxiliary profiles, Modify section, detail and auxiliary graphical definitions, Modify section hatching representations.

Project (any one of the following): 78 hours

1. E-Rickshaw
2. Electric Vehicle
3. Drone
4. Pick-n-Place Robo
5. Humanoid
6. Gyroplane
7. Any other GTM project

6. Reference

Online Source:

3D experience Peer Learning: www.pearlearningexperience.3ds.com

Product Validation; Simulia

Course Title	Code	Type of course	T-P-P	Prerequisite
Product Validation; Simulia	DESE0602	Practice+ Project	0-3-2	Basic Engg, Strength of Material Machine Design, Material Science, Conventional Drawing (CAD)

Objective

- Basics of Finite Element analysis.
- Rayleigh and Ritz methods for static analysis.
- Different elements like truss, beam, triangular, quadrilateral and brick elements.
- Analysis of one-dimensional and two-dimensional problem with the help of software.
- Students will be exposed to governing equations required for CFD and their mathematical behavior.
- Students will be exposed to modeling of Fluid flow and heat transfer problem.

Course Outcomes

- To understand the basics of finite element analysis and its applications in engineering.
- To impart knowledge about various computational methods for fluid flow and heat transfer problems so as to enable the student to write computer programs for solving elementary fluid dynamics/heat transfer problems.

Evaluation Systems

Internal Examination	Component	% of Marks	Method of Assessment
	Internal Practice	50(40+10)	Lab Work+Learning Record
	Internal Project	50	Project Work
External Examination	External Practice	50	Lab Work
	External Project	50	Project Work +Report
Total		200	

Course Outline

Practice: 134 hours

Simulia Simulation Process Essentials:

Simulation model design, model assembly design, structural model creation, structural validation, 3D display simulation experience, result analytics, process composer, physics result explorer, process experience studio, simulation companion, structural model creation geometry, structural scenario creation, multiscale experimental creation.

Simulia Applied Simulation Essentials:

Performance study, composites simulation engineer, static study, fluid mechanics analyst, mechanical scenario creation, Simulia durability validation, fluid mechanics validation.

Project (any one of the following): 78 hrs

1. E_Rickshaw
2. Electric Vehicle
3. Drone
4. Pick-n-Place Robo
5. Humanoid
6. Gyroplane
7. Any other GTM project

Reference:

Source: 3D Experience peer learning material

Digital Manufacturing; DELMIA

Course Title	Code	Type of course	T-P-P	Prerequisite
Digital Manufacturing; DELMIA	DESE0603	Practice+Project	0-3-2	CATIA

Objective

<ul style="list-style-type: none"> To learn industry challenges, end-to-end digital manufacturing, digital manufacturing tools and technologies, PLM, NPI, product, process planning & resources, digital twin, introduction of industry 4.0 and material/factory flow simulation.

Course Outcomes

<ul style="list-style-type: none"> Students will be able to do product development, digital manufacturing solutions, and hot skills with current & future technologies.
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Evaluation Systems

Internal Examination	Component	% of Marks	Method of Assessment
	Internal Practice	50(40+10)	Lab Work+Learning Record
	Internal Project	50	Project Work
External Examination	External Practice	50	Lab Work
	External Project	50	Project Work +Report
Total		200	

Course Outline

Practice: 62 hours

Digital Manufacturing: Overview, Industry Challenges, End-to-End Solution for Various Industry, Benefits, Introduction of Industry 4.0, Conventional & Emerging Technological Solution. Industry 4.0: 4th Industrial Revolution & Its Pillars, Autonomous Robots. Horizontal & Vertical Systems Integration, C-Flex, Flexible Manufacturing System (FMS)

Process Planning: Overview, Capacity Planning, Process/Operations, Process Planning, Assembly & Job Shop Planning, Cycle Time, Standard Man Hour (SMH), Time Analysis – MOST, Maynard Operation Sequence Technique (MOST) Technique, Balancing, Shop Floor Process and Quality Documentation (PFD, PFMEA, CP).

Digital Twin: Introduction of Facility/Layout Planning, Digital Factory with Plant Facilities & Resources, Assembly/Di-assembly, Tool, Process Manufacturability Simulation, Ergonomics Analysis, Visibility & Reachability Simulation, Robotics Simulation, Virtual Commissioning, E-Learning / 3D Work Instruction.

Material/Factory Flow Simulation: Factory Layout and Alternate Material Handling Systems, Factory Flow & Logistics Simulation, Virtual Factories in 3D Environment and Analyses,

Bottleneck Identification and Corrective Actions, Labor Requirements or Resource Requirements, Throughput of the Production System, Productivity and Utilizations.

Lean Manufacturing: Introduction: Overview of a pre-built Model, Modeling Methodology, Running a Model, Creating Reports and Charts.

Material Handling Systems: Modeling Labor, Modeling Conveyor Systems, Creating Pallets, Modeling AGV, Modeling Power and Free Systems, Getting Started: Setting the Startup Options, Creating the Library, Creating Basic Simulation Mode.

Animation & Kinematics: Building Basic CAD, Positioning Way Points, Building Kinematics Device, Assigning Resource Kinematics, Creating & Playing a Script, Adding a Grab and Release.

Shifts and Schedules: Creating Shifts, Setting Schedules, Handling Interrupts, Handling Failures, Preview of Advanced Usage: Creating CRANES, Creating Reports, Debugging, Data Interface Methodology (in or out of Excel), Using Simulation Control Language (SCL), Using Batch Control Language (BCL), Report & Video Creation.

Project (any one of the following): 78 hours

1. E-Rickshaw
2. Electric Vehicle
3. Drone
4. Pick-n-Place Robo
5. Humanoid
6. Gyroplane
7. Any other GTM project

Reference

3D experience Peer Learning: www.pearlearningexperience.com

Product E learning; 3DVia

Course Title	Code	Type of course	T-P-P	Prerequisite
Product E learning; 3DVia	DESE0604	Practice & Project	0-3-2	CATIA – 3D Experience Windows Operating System

Objective

- To Gain experience about 3DVia platform.
- To Learn Industry Challenges, End to End 3DVia

Course Outcomes

- This course will teach you how to work with a 3D model using 3DVIA Composer to capture its views, add annotations, and change its rendering.
- Students will learn how to create technical illustrations and high resolution images.
- Students will also learn how to create animations; publish and share the content.

Evaluation Systems

Internal Examination	Component	% of Marks	Method of Assessment
	Internal Practice	50(40+10)	Lab Work + Learning Record
	Internal Project	50	Project Work
External Examination	External Practice	50	Lab Work
	External Project	50	Project Work + Report
Total		200	

Module-1 (20 Hours)

Introduction to 3DVia and learning

1. Open and navigate in a model using 3DVIA Composer
2. Capture views of the model
3. Enhance the model by adding annotations and changing its rendering
4. Create technical illustrations
5. Create high resolution images
6. Create animations
7. Publish and share the 3DVIA Composer content

Module-2(40Hours)

A project work will be given on selected GoToMarket product to work on:

1. Create product technical explanation
2. Technical illustration step by step for assembly and dis-assembly
3. Manufacturing process creation

Product Rendering & Visualization; 3DExcite

Course Title	Code	Type of course	T-P-P	Prerequisite
Product Rendering & Visualisation; 3DExcite	DESE0605	Practice & Project	0-3-2	CATIA – 3D Experience Windows Operating System

Objective

- To Gain experience about 3DExcite platform.
- To Learn Industry Challenges, End to End 3DExcite
- 3DEXCITE roles and apps promote real-time, high-end visualizations for powerful product experiences, images and animations

Course Outcomes

- Professional High-End 3D Visualization
- Marketing Suite
- Rapid Rendering and scalability
- Intuitive Product Presentation
- Media production. Online and on demand

Evaluation Systems

Internal Examination	Component	% of Marks	Method of Assessment
	Internal Practice	50(40+10)	Lab Work + Learning Record
	Internal Project	50	Project Work
External Examination	External Practice	50	Lab Work
	External Project	50	Project Work + Report
Total		200	

Module-1 (20Hours)

Introduction to 3DExcite and learning

1. User interface
2. Preferences
3. Scene and geometry setup
4. Box selection mode for scene elements
5. Look library
6. Texture
7. Animation and variants
8. Query and Targets widget

9. Tools.
10. Navigation
11. Rendering
12. Material editor
13. RealisticCameraModel
14. UV editor
15. Docking
16. Fileformats
17. Converters
18. HMIinterface

Module-2(40Hours)

A project work will be given on selected GoToMarket product to work on:

1. Visualization of product
2. Rendering of product
3. Environment creation
4. Create marketing & sales kit

Design Programmable Logic Controller

Course Title	Code	Type of course	T-P-P	Prerequisite
Design Programmable Logic Controller	DESE0606	Practice+ Project	0-3-2	Nil

Objective

- To equip learners with the skills and knowledge necessary to successfully carry out basic service and maintenance of PLC controlled Industrial Systems in a safe and environmentally sound manner.

Course Outcomes

- Gain the Knowledge of various skills necessary for Industrial applications of Programmable logic controller (PLC) • Understand the basic programming concepts and various logical instructions used in Programmable logic controller (PLC) • Solve the problems related to I/O module, Data Acquisition System and Communication Networks using Standard Devices. • Design and analysis of general structure of an automated process for real time applications using Programmable logic controller (PLC) and SCADA

Evaluation Systems

Internal Examination	Component	% of Marks	Method of Assessment
	Internal Practice	50(40+10)	Lab Work+Learning Record
	Internal Project	50	Project Work
External Examination	External Practice	50	Lab Work
	External Project	50	Project Work +Report
Total		200	

Course Outline

Practice: 77 hours

Introduction and SCADA Basics: General SCADA theory, Importance of SCADA in Industrial Automation, Benefit of SCADA, DATA ACQUISITION, Features of SCADA, SCADA Cost Analysis-Tag & Tag types & Packages of SCADA, Leading SCADA Vendors, Architecture of SCADA (Open & Proprietary)

Introduction to In-Touch: Basic operations related to In Touch Editor, types of windows, How to Open window, windows property.

General toolbar: New window, Open window, close window, save window, save all, duplicate selection, cut to clipboard, copy, paste, undo and redo.

Wizard ActiveX toolbar: Alarm display, Buttons, clock, lights, meter, runtime tools (for alarm monitor), slider, switches, SYMBOL FACTORY, Text Display, Trend, Value Display Fonts, Bold/Italic/Underline, Enlarge/ reduce font, Left/Centre/Right.

Format toolbar: Justification, Line colour /fillcolour / text colour/ windowcolour

Drawobjecttoolbar:Selectmode,rectangle,roundedrectangle,ellipse,line,H/Vline,polyline, polygon, text, bitmap, real-time trend/ hist trend, button.

View toolbar: classicview, project view, hide/restoreall, full screen, snap to grid, ruler.

Arrange toolbar:Alignleft/centre/right/top/middle/button,alignCenterPoint,sendtoback,bring to front, space horizontal/ vertical, Make/break symbol, Make/break cell rotate clockwise/counter clockwise,fliphorizontal/vertical. Pan&Zoom:Zoomin/out,zoomnormal, hand tool. Status bar: XY co-ordinate, height/width.

SCADA Features:

Dynamicrepresentation:Discreteproperties-UserInputs,LineColour,fillColour,touchpush button, user defined object, system defined objects, blink property with different types of conditions,Keyequivalent, valuedisplay, textColour, discretealarm(foralarm), examples:

Analogproperties-UserInputs,LineColour,fillColour,textColour,Percentagefill(vertical/horizontal), Location (vertical/ horizontal), Object size(height/ width), Slider(vertical/horizontal),Misc.(blink,orientation, valuedisplay, userdefined/predefined object,analogalarm,example:Stringproperties-UserInputs, valuedisplay, tooltipAdditional

properties-Action, showwindow,hide window, visibility, disable Develop some applications

Alarm: Alarm Basics, types, Priorities, alarm generation, alarm printing

Trends:TrendBasics,types,formulafortimesetting,Realtime&Historicaltrend,historical scooter, trendzoom/control panel, 16 -pen trend

Scripts:Basics,types,conditions,DetailsaboutWindow,Application,Key,Condition,Data change& QuickFunction scripts with examples

Recipe:Basics,Templatedefinition,recipedefinition,unitdefinitionandsomeapplicationwith procedures

Data connectivity: with MSexcel by using Memory &IO tag

DeviceConnectivity: SCADA to PLC Communication with applications

Networking: SCADA to SCADA 2 pc application

Security Report: Basics of security, access level, application development using InTouch security

Generation: in Excel

PLC Allen Bradley:

Introduction:ControllerFamily,Architecture:Rack,slot,channel,etc.fullstructure description and maxexpansion, SLC 500 features: Details about CPUs, Memory Organization, Program files and Data files

Addressing:PhysicalI/Oaddressing(bothDigital&Analog),MemoryInstructionsAddressing likeTimer, Counters, Binary,Integers etc.

Hardwarelinking:Using RSLinx, details about protocols AB_DF1-1, TCP-1, EMU-500

Programming Basics: Using RSLogix 500, Basicsof Ladder Programming (rung, rail, rulesetc.)

NO-NC concept, LogicGatesImplementation using Ladder diag.

User section: New rung,Rung branch,IC, XIO, OTE, OTL, OUT

BitLogic: OSR

Timers: Timerbasics, Detail programming of TON, TOF, RTO, RES with applications

Counters: Basics of Counter, Detail Programming of CTU, CTD, RES with applications

Comparators: Implementation of LIM, MEQ, EQU, NEQ, LES, GRT, LEQ, GEQ in ladder diag.

Compute: Implementation of CPT for linear equation solving in ladder diagram.

Drive -Allen Bradley:

introduction to drives (VFD): Applications of VFD, Features, inside components of VFD, Block Diagram and Architecture.

Introduction to ab powerflex: 4M Parameters in AB Power flex 4M, Display group parameters, parameter commissioning, local control, Ramp time, DC Brake, Skip Frequency, Freqncontrol. Remotemode control, connecting with pushbuttons and sensors, PLC VFDintegration.

Project (any one of the following): 78 hours

1. E-Rickshaw
2. Electric Vehicle
3. Drone
4. Pick-n-Place Robo
5. Humanoid
6. Gyroplane
7. Any other GTM project

Reference:

Source: 3D Experience peer learning material

Project Lifecycle Management;Enovia

CourseTitle	Code	Typeof course	T-P-P	Prerequisite
Project Lifecycle Management; Enovia	DESE0607	Practice& Project	0-3-2	JavaProgramming

Objective

- To Gain experience about ENOVIA platform.
- To Learn Industry Challenges, End to End Project Lifecycle Management.

Course Outcomes

- To help students to understand the implementation of PLM in ENOVIA
- 2. To understand various features in 3DEXperience Platform

Evaluation Systems

Internal Examination	Component	% of Marks	Method of Assessment
	Internal Practice	50(40+10)	Lab Work+Learning Record
	Internal Project	50	Project Work
External Examination	External Practice	50	Lab Work
	External Project	50	Project Work +Report
Total		200	

Module I(20Hours)

Enovia IP Protection Classification Essentials: ENOVIA IP Protection Classification App, Creating IP Protection Libraries and Classes, Classifying and Enforcing Data, Defining Security Rules and Exceptions, Creating Export Control Logs and Shippers Export Declarations.

Enovia Collaboration and Approvals Essentials: Introduction To The Collaboration And Approvals Essentials, BPS: Defining Business Process Services (BPS), Combining BPS Components, Application Exchange Framework, BPS Common components, Business Metrics Module.

Module II(20 Hours)

Enovia Collaborative Lifecycle Management Essentials: Collaborative Lifecycle Management, Creating and Saving a New Product Structure, Managing the Product Structure.

Enovia Design Review Essentials: Creating and Managing Reviews, Creating Sections, Creating Measures, Comparing Objects.

Enovia Design Synthesis Essentials: Creating and Managing Reviews, Creating Sections, Creating Measures, Comparing Objects, Finalizing the Review.

Module III(20 Hours)

Enovia Engineering BOM Management Essentials: Introduction to Enovia Engineering BOM App, Features of Enovia Engineering BOM, Engineering BOM-Terminology.

Enovia Materials Compliance Reporting Essentials: Materials Declaration, Validating the materials declarations submissions, Creating Material Declaration Requests, Reviewing the Material Declaration Requests, Reviewing the supplier Data, Accepting or Rejecting a Material Declaration Requests, Viewing the attributes of compliance reported parts.

PLM Customization & Development; Enovia

Course Title	Code	Type of course	T-P-P	Prerequisite
PLM Customization & Development; Enovia	DESE0608	Practice & Project	0-3-2	Java Programming

Objective

- To Gain experience about ENOVIA platform.
- To Learn Industry Challenges, End to End PLM Customization.

Course Outcomes

- To help students to understand the implementation of PLM Customization in ENOVIA
- To understand various features in PLM Customization

Evaluation Systems

Internal Examination	Component	% of Marks	Method of Assessment
	Internal Practice	50(40+10)	Lab Work + Learning Record
	Internal Project	50	Project Work
External Examination	External Practice	50	Lab Work
	External Project	50	Project Work + Report
Total		200	

Module I (20 Hours)

Introduction to Business Modular

Introduction to Business Modeling, The role of the Business Administrator, Business Modeling Application. The basic Matrix Schema, building a Matrix schema development model using a case study and the Business Modeling application, Defining Matrix schemas using information contained on project definition worksheets, Defining and creating Attributes, Types, Relationships, Formats, Persons, Groups, Roles, Associations, Stores, Vaults, Policies, Rules, Reports and Forms.

Module II (20 Hours)

Introduction to UI3 Components

UI3 Introduction, UI3 Advantages, UI3 Components, UI3 Menus and Commands, UI3 Web Forms, UI3 Tables and Inquiry UI3 Navigation, UI3 Channels and Portals

Mql: Understand the MQL command syntax, Be able to create and execute MQL scripts, Use MQL to perform the following Matrix operations: extract general and specific object information, create and modify as schema connect objects, promote an object through its lifecycle, invoke implicit and explicit transactions

Module III(20 Hours)

Concepts of Matrix

Concept of JPO with all the subtopics, the visualization of schema from UI (Created schema to show in UI interaction between UI and Schema), Settings and URL parameters for Ui3 components, Explanation with these Case.

Advanced Topics:

- a) Unified Typing (Need customization licenses)
- b) Spinners to create Schema (Need Spinner license)

Programming, Logics and Scripting

CourseTitle	Code	Typeof course	T-P-P	Prerequisite
Programming, Logics and Scripting	DESE0609	Practice& Project	0-3-2	JavaProgramming

Objective

- To Gain experience about Object Oriented programming and Scripting
- To Learn Industry Challenges, End to End Application Development.

Course Outcomes

- To help students to understand the implementation of Programming in JAVA
- To understand various features in Java and Scripting Language

Evaluation Systems

Internal Examination	Component	% of Marks	Method of Assessment
	Internal Practice	50(40+10)	Lab Work+Learning Record
	Internal Project	50	Project Work
External Examination	External Practice	50	Lab Work
	External Project	50	Project Work + Report
Total		200	

MODULE1: (24 hours)

Introduction

Basics of JAVA, control statements, defining an Array, Initializing & Accessing Array, Multi-Dimensional Array, working with Strings

Object Oriented Programming

Class Fundamentals, Creating and Operating Objects, Access Control, Modifiers, Constructor

Extending Classes and Inheritance

Use and Benefit of Inheritance in OOP, Types of Inheritance in Java, Role of Constructors in inheritance, Use of "super", Implementing interfaces.

Package

Organizing Classes and Interfaces in Packages, Package as Access Protection, Defining Package, Naming Convention For Packages

Exception Handling:

Exceptions&Errors, Types of Exception, Use of try, catch, finally, throw, throws in Exception Handling. In-built and User Defined Exceptions, Checked and Un-Checked Exceptions

Thread:

Understanding Threads, Needs of Multi-Threaded Programming, Thread Life-Cycle, Thread Priorities, Synchronizing Threads

Applet

Applet & Application, Applet Architecture, Parameter to Applet Embedding Applets in Web page.

MODULE II : (28 hours)**GUI Programming**

Designing Graphical User Interfaces in Java, Components and Containers, Basics of Components Using Containers, Layout Managers, AWT Components, Adding a Menu to Window

Event Handling

Event-Handling Process, Event Classes, Event Sources, Event Listeners, Adapter Classes

Database Programming using JDBC

Introduction to JDBC, JDBC Drivers & Architecture and JDBC Programming.

J2EE

Introduction to J2EE, J2EE Overview, Why J2EE?, J2EE Architecture, J2EE APIs
J2EE Containers

Java Server Technologies**Servlet**

Servlet life cycle, Developing and Deploying Servlets, Exploring Deployment Descriptor (web.xml), Handling Request and Response, Initializing a Servlet, Accessing Database, Session Tracking & Management, Dealing with cookies

Java Server Pages:

Basic JSP Architecture, Life Cycle of JSP (Translation, compilation), JSP with Database, JSP Implicit Objects, Tag Libraries, JSP Expression Language (EL), Exception Handling, Session Management

RMI (Remote Method Invocation)**Enterprise JAVABeans****MODULE III (26 hours)**

HTML : Basic Syntax, HTML Attributes, Images, Links, Creating Tables, Using Frames, Using Forms and Input Elements, Introduction to CSS, Creating Style Sheet, CSS Properties, CSS Styling (Background, Text Format, Controlling Fonts), CSS Id and Class.

Introduction to JavaScript, Basic Syntax, Control Structures, Writing Functions, Working with Arrays, The Document Object Model, The Document Object Model.

System Engineering: DYMOLA

Course Title	Code	Type of course	T-P-P	Prerequisite
System Engineering: DYMOLA	DESE0610	Practice+ Project	0-3-2	Nil

Objective

- To Understanding Multi-Engineering Modeling and Simulation using Dymola
- To find solutions for modeling and simulation of dynamic behavior and complex interactions between systems of many engineering fields.
- To know use of Modelica language and Modelica Standard Library

Course Outcomes

- To find solutions for modeling and simulation of dynamic behavior and complex interactions between components of multi-engineering problems

Evaluation Systems

Internal Examination	Component	% of Marks	Method of Assessment
	Internal Practice	50(40+10)	Lab Work+Learning Record
	Internal Project	50	Project Work
External Examination	External Practice	50	Lab Work
	External Project	50	Project Work +Report
Total		200	

Course Outline

Practice: 52 hours

Understanding System Engineering: V-Cycle Process, Mathematical Modelling: Traditional Vs Simulation based Product Development of DC Motor and Quarter Car suspension System.

Introduction to Dymola and Modelica: Understanding Multi-Engineering Modeling and Simulation using Dymola

Application: Usage of Dymola in Aerospace Industry, Aerospace Use Cases

Opening and Exploring Behavior Modeling App (Industrial Robot): Browser: Package, Component, Parameter and Variable Editor, Tree, Editor Window, Tools: Behavior Authoring, behavior tool, Diagram, View, AR-VR, Tools, Touch

Creating a Model for electric DC Motor: Creating a library for component, Creating a model for an DC motor model, Documenting the model, Testing the model, Creating a model for motor drive

Rudder Actuator–Use Case: Concept: Business or mission analysis process, Stakeholder needs and Requirements process, Development: System requirement definition process, Architecture definition process, Design definition process, System analysis process (Rudder model): Creating

anew DBM library, Create PackageClass, Createmodelicaclass, a) Multibody model of Rudder, b) Calculatestroke valueof rudder movement,c) modeltotestcalibrateddisplacement value, d)model to test new displacement value providedby supplier

Buildingamechanicalmodel:Createamultibodypackage,CreateandanalyzeModelofFuruta andInverted pendulum

Project (any oneof thefollowing):78 hours

1. E-Rickshaw
2. ElectricVehicle
3. Drone
4. Pick-n-PlaceRobo
5. Humanoid
6. Gyroplane
7. Any otherGTM project

Reference:

Source: 3D Experiencepeer learning material

2019-20

The following colour represents the syllabus revision, skill, employability and entrepreneurship.

Yellow : Syllabus Revision

Green : Skill

Pink : Employability

Sky : Entrepreneurship

Centurion University of Technology and Management Odisha

**CHOICE BASED CREDIT SYSTEM
COURSE STRUCTURE & SYLLABUS**

BASKET - I



School of Engineering & Technology

2019

BASKET - I
(Basic Sciences)

<i>Course Code</i>	<i>Course Title</i>	<i>Course Type</i>	<i>Credits</i>	<i>Prerequisite</i>	<i>Department Offering</i>
<i>FCBS0101</i>	<i>Environmental Science</i>	<i>Theory</i>	<i>3</i>	<i>Nil</i>	<i>Chemistry</i>
<i>FCBS 0102</i>	<i>Differential Equations</i>	<i>Theory</i>	<i>3</i>	<i>Nil</i>	<i>Mathematics</i>
<i>FCBS 0103</i>	<i>Linear Algebra & Vector Calculus</i>	<i>Theory</i>	<i>3</i>	<i>Nil</i>	<i>Mathematics</i>
<i>FCBS 0104</i>	<i>Integral Transform</i>	<i>Theory</i>	<i>3</i>	<i>Nil</i>	<i>Mathematics</i>
<i>FCBS 0105</i>	<i>Complex Analysis</i>	<i>Theory</i>	<i>3</i>	<i>Nil</i>	<i>Mathematics</i>
<i>FCBS0106</i>	<i>Discrete Mathematics</i>	<i>Theory</i>	<i>3</i>	<i>Nil</i>	<i>Mathematics</i>
<i>FCBS0107</i>	<i>Calculus</i>	<i>Theory</i>	<i>3</i>	<i>Nil</i>	<i>Mathematics</i>
<i>FCBS0108</i>	<i>Probability & Statistics</i>	<i>Theory</i>	<i>3</i>	<i>Nil</i>	<i>Mathematics</i>
<i>FCBS0109</i>	<i>Numerical Methods</i>	<i>Theory</i>	<i>3</i>	<i>FCBS0102 Differential Equations</i>	<i>Mathematics</i>
<i>FCBS0401</i>	<i>Applied Analytical Chemistry</i>	<i>Theory + Practice</i>	<i>3</i>	<i>Nil</i>	<i>Chemistry</i>
<i>FCBS0402</i>	<i>Industrial Chemistry</i>	<i>Theory + Practice</i>	<i>3</i>	<i>Nil</i>	<i>Chemistry</i>
<i>FCBS0403</i>	<i>Applied Engineering Materials</i>	<i>Theory + Practice</i>	<i>3</i>	<i>Nil</i>	<i>Chemistry</i>
<i>FCBS0404</i>	<i>Electricity and Magnetism</i>	<i>Theory + Practice</i>	<i>4</i>	<i>Nil</i>	<i>Physics</i>
<i>FCBS0405</i>	<i>Basic Mechanics and Properties of Matter</i>	<i>Theory + Practice</i>	<i>4</i>	<i>Nil</i>	<i>Physics</i>
<i>FCBS0406</i>	<i>Optics and Optical Fibres</i>	<i>Theory + Practice</i>	<i>4</i>	<i>Nil</i>	<i>Physics</i>

Environmental Science

Course Name	Code	Type of course	T-P-PJ (Credit)	Prerequisite
Environmental Science	FCBS0101	Theory	3	Nil

Course Objective:

- *To understand the concept of multi-disciplinary nature of Environmental Science where different aspects are dealt with a holistic approach.*
- *Students will develop a sense of community responsibility by becoming aware of environmental issues in the larger social context.*
- *One must be environmentally educated.*

Course Outcome:

- *Understand the natural environment and its relationships with human activities.*
- *Characterize and analyze human impacts on the environment.*
 - *Integrate facts, concepts, and methods from multiple disciplines and apply to environmental problems.*
- *Design and evaluate strategies, technologies and methods for sustainable management of environmental systems and for the remediation or restoration of degraded environments.*

Evaluation System

	Component	% of Marks	Method of Assessment
Internal Examination	Midterm Test	30	Written examination
	Assignment	05	Report and Presentation
	Attendance	05	Attendance percentage
	Total	40	
External Examination		60	Written examination
Total		100	

MODULE-I

Environment and its multidisciplinary nature; Need for public awareness; Renewable and non renewable resources—forest, water, mineral, land, food and energy resources; Structure and function of ecosystems of forest, grass land, desert and aquatic types.

MODULE -II

Biodiversity and its conservation: Biodiversity at global, national and local levels; Threats to biodiversity - Habitat loss; wild life poaching and man - wildlife conflicts; Endangered and endemic species; conservation measures.

Causes, effects and control measures of pollution, air, water and noise pollution; Nuclear hazards; solid-waste management—Causes, effects and control measures; Management of disasters due to natural causes of floods, earthquakes, cyclones and landslides.

MODULE-III

Social issues and the environment; Sustainable environment, Water conservation measures; Rain water harvesting; Resettlement and rehabilitation of people; Climate change and global warming; Acid rain; Ozone layer depletion; water land reclamation; Consumerism and waste products; Features of Environment Protection Act, Air pollution and Control of Pollution Acts; Water Pollution and its Control Act. Effects of Pollution explosion on environment and public health; Need for value education to Protect environment and resources.

Text Book: Anubhav Kaushik & C.P. Kaushik : Environmental Studies-New age International Publishers.

Reference Books:

1. Benny Joseph : Environmental Studies-Tata Mac Graw Hill

2. E. Bharucha : Text book of Environmental Studies for Under graduate courses– Universities Press. (Book prepared by UGC Committee.

Differential Equations

Course Name	Code	Type of course	T-P-PJ (Credit)	Prerequisite
Differential Equations	FCBS 0102	Theory	3	Nil

Course Objectives:

- To understand most of the physical phenomena from Science and Engineering which are modeled by differential equations.
- To find and interpret the solutions of the ODE & PDE appearing in signal systems, dynamical systems, stability theory and a number of applications to scientific and engineering problems.
- To develop the ability to apply differential equations to significant applied and/or theoretical problems.

Course Outcomes: Upon successful completion of this course, the student will be able to:

- Learn fundamental concepts of ODE & PDE theories and where and how such equations arise in applications to scientific and engineering problems.
- Be competent in solving linear/non-linear 1st & higher order ODEs & PDEs using analytical solution methods to obtain their exact solutions.
- Recognize the major classification of ODEs & PDEs and the qualitative differences between the classes of equations.

Evaluation System

	Component	% of Marks	Method of Assessment
Internal Examination	Midterm Test	30	Written examination
	Assignment	05	Report and Presentation
	Attendance	05	Attendance percentage
	Total	40	
External Examination		60	Written examination
Total		100	

MODULE-I (12 Hours)

First Order Differential Equations: Separable Equations, Homogeneous & Non-homogeneous Equations, Exact Differential Equations, Integrating Factor, Linear Differential Equations, Bernoulli Equation.

MODULE-II (15 Hours)

Second & Higher Order Linear Differential Equations: Linear Dependence and Independence of Solutions, Wronskian, Constant Coefficient Homogeneous Equations, Cauchy-Euler Equation, Nonhomogeneous Equations, Method of Variation of Parameter, Method of Inverse Operator, Legendre Equation.

MODULE-III (15Hrs)

Partial Differential Equation of First Order, Linear and Non-linear Partial Differential Equations, Charpit's Method, Homogeneous and Non-homogeneous Linear Partial Differential Equations with Constant Coefficients, Cauchy Type Differential Equation.

Text Book:

1) *Higher Engineering Mathematics* by B.V. Raman Publisher: TMH

Chapters: 8 (8.1 to 8.10); 9 (9.1 to 9.7), 18 (18.1 to 18.8) **Reference**

Book: 1) *Advanced Engineering Mathematics* by P.V.O' Neil

Publisher: Thomson

Linear Algebra & Vector Calculus

Course Name	Code	Type of course	T-P-PJ (Credit)	Prerequisite
Linear Algebra & Vector Calculus	FCBS 0103	Theory	3	Nil

Course Objectives:

- To apply concepts of Linear Algebra & Vector Calculus to the problems related to models in work, circulation and flux Problems, hydrodynamics and fluid dynamics, electrical circuits, networking, linear programming, graph theory, computer graphics, cryptography, thermodynamics, construction of curves and surfaces through specified points etc.
- To solve the system of linear equations appearing in the problems of electrical engineering, mechanical engineering, applied mechanics etc.
- To apply vectors in higher dimensional space in experimental data, storage and warehousing, electrical circuits, graphical images, mechanical systems and in physics.

Course Outcomes:

Upon successful completion of this course, the student will be able to:

- Use matrix operations to solve systems of linear equations and be able to determine the nature of the solutions.
- Compute with the characteristic polynomial, eigenvalues, eigenvectors and eigenspaces of a matrix as well as the geometric and the algebraic multiplicities of an eigenvalue and then to diagonalise that matrix.
- Determine the important quantities associated with scalar and vector fields.

Evaluation System

	<i>Component</i>	<i>% of Marks</i>	<i>Method of Assessment</i>
Internal Examination	Midterm Test	30	Written examination
	Assignment	05	Report and Presentation
	Attendance	05	Attendance percentage
	Total	40	
External Examination		60	Written examination
Total		100	

MODULE-I (14 Hours)

Linear Algebra, Basic Concepts, Linear System of Equations, Solution by Gauss Elimination, Conditions of Existence and Uniqueness of Solutions, Rank of a Matrix, Determinants and Cramer's Rule, Linear Dependence and Independence.

MODULE-II (14 Hours)

Eigen Values and Eigen Vectors, Basis, Symmetric, Skew-Symmetric and Orthogonal Matrices, Complex Matrices, Similarity of Matrices, Diagonalization.

MODULE-III (14 Hours)

Vector Differential Calculus: Vector Algebra, Inner Product, Vector Product, Vector & Scalar Functions and Fields, Derivatives, Gradient of a Scalar Field, Directional Derivative, Divergence of a Vector Field, Curl of a Vector Field.

Text Book:

1) *Advanced Engineering Mathematics* by E. Kreyszig Publisher: John Wiley & Sons Inc-8th Edition Chapters: 6 (6.1 to 6.6); 7 (7.1, 7.3 to 7.5), 8 (8.1 to 8.4, 8.9 to 8.11) **Reference Books:**

1) *Advanced Engineering Mathematics* by P.V.O' Neil Publisher: Thomson

Mathematical Methods by Potter & Goldberg ; Publisher : PHI

Integral Transform

Course Name	Code	Type of course	T-P-PJ (Credit)	Prerequisite
Integral Transform	FCBS 0104	Theory	3	Nil

Course Objectives: To describe the ideas of Fourier and Laplace Transforms and indicate their applications in the fields such as Signal & System, Digital Signal Processing, Image Processing, Theory of Control Systems, Differential Equations and many others.

- To use Fourier series for solving boundary value problems appearing in scientific & engineering problems.
- To get acquainted with the fact that the Laplace transform is related to the Fourier transform, but the Fourier transform expresses a function or signal as a series of modes of vibration (frequencies), whereas the Laplace transform resolves a function into its moments.

Course Outcomes: Upon successful completion of this course, the student will be able to:

- Obtain Laplace transform of simple functions, functions expressed in graphical form, integrals and derivatives.
- Solve differential & integral equations with initial conditions using Laplace transform.
- Compute the Fourier series representation of a periodic function, in both exponential and sine-cosine forms.
- Evaluate the Fourier transform of a continuous function and be familiar with its basic properties.

Evaluation System

	<i>Component</i>	<i>% of Marks</i>	<i>Method of Assessment</i>
<i>Internal Examination</i>	Midterm Test	30	Written examination
	Assignment	05	Report and Presentation
	Attendance	05	Attendance percentage
	Total	40	
<i>External Examination</i>		60	Written examination
<i>Total</i>		100	

MODULE-I (16 Hours)

Laplace Transforms, Transforms of Derivatives and Integrals, Derivatives and Integrals of Transforms, Shifting Properties, Unit Step Function, Dirac's Delta Function, Convolution, Inverse Transforms, Solution to Differential Equation, Integral Equation.

MODULE-II (12 Hours)

Periodic Functions, Trigonometric Series, Fourier Series, Fourier Expansion of Functions of any Period, Even and Odd Functions, Half Range Expansions,

MODULE-III (14Hrs)

Fourier Integrals: Fourier Sine Integral, Fourier cosine Integral. Fourier Transforms: Fourier Sine Transform, Fourier Cosine Transform.

Text Book:

Advanced Engineering Mathematics by E.Kreyszig

Publisher: Johnwiley & Sons Inc-8th Edition

Chapters: 5 (5.1 to 5.6); 10 (10.1 to 10.4, 10.8, 10.9)

Reference Books:

1) *Advanced Engineering Mathematics by P.V.O'Neil .Publisher: Thomson*

2) *Higher Engineering Mathematics by B.V.Raman .Publisher: TMH*

Complex Analysis

Course Name	Code	Type of course	T-P-PJ (Credit)	Prerequisite
Complex Analysis	FCBS 0105	Theory	3	Nil

Course Objectives:

- To understand the application of Complex Analysis to Two-Dimensional problems in Physics including Hydrodynamics and Thermodynamics and also in Engineering fields such as; Nuclear, Aerospace, Mechanical and Civil engineering, signal processing & communications.
- To acquire the skill of contour integration to evaluate complicated real integrals appearing in Engineering problems via residue calculus.

Course Outcomes: Upon successful completion of this course, the student will be able to:

- To get equipped with the understanding of the fundamental concepts of functions of a complex variable along with the concepts of analyticity, Cauchy-Riemann relations and harmonic functions.
- Evaluate complex contour integrals applying the Cauchy integral theorem, Cauchy integral formula and Residue theorem.
- Illustrate the applications of the calculus of residues in the evaluation of real integrals.

Evaluation System

	Component	% of Marks	Method of Assessment
Internal Examination	Midterm Test	30	Written examination
	Assignment	05	Report and Presentation
	Attendance	05	Attendance percentage
	Total	40	
External Examination		60	Written examination
Total		100	

MODULE-I (14 Hours)

Complex Analysis: Analytic Function, Cauchy-Riemann Equations, Laplace Equation, Harmonic Function, Linear Fractional Transformation.

MODULE-II (14 Hours)

Parametric representation, Line Integral in the Complex plane, Cauchy's Integral Theorem, Cauchy's Integral Formula, Derivatives of Analytic Function.

MODULE-III (14Hrs)

Power Series, Taylor's Series, Maclaurin Series, Laurent's Series, Singularities and Zeroes, Residue Theorem, Residue Integration Method, Evaluation of Real Integrals.

Text Book:

1) *Advanced Engineering Mathematics* by E. Kreyszig Publisher: John Wiley & Sons Inc-8th Edition Chapters: 12 (12.1 to 12.4, 12.9); 13, 14 (14.2, 14.4) & 15.

Reference Books:

- 1) *Advanced Engineering Mathematics* by P.V. O'Neil Publisher: Thomson
- 2) *Fundamentals of Complex Analysis (with Applications to Engineering and Science)* by E.B. Saff & A.D. Snider Publisher: Pearson

Discrete Mathematics

Course Name	Code	Type of course	T-P-PJ (Credit)	Prerequisite
Discrete Mathematics	FCBS 0106	Theory	3	Nil

Course Objectives:

- To learn a particular set of mathematical facts and to apply their applications in many subjects of Computer Science and Engineering such as Cryptography, Theory of Computation & Data Networking.
- To understand mathematical reasoning in order to read, comprehend and construct mathematical arguments as well as to solve problems, occurred in the development of programming languages.
- To work with discrete structures such as graphs to study the structure of the world wide web, to model a computer network and to find the shortest path between two places in a transportation network.

Course Outcomes: Upon successful completion of this course, the student will be able to:

- Evaluate elementary mathematical arguments and identify fallacious reasoning.
- Apply the logical structure of proofs and work symbolically with connectives and quantifiers to produce logically valid, correct and clear arguments.
- Reformulate statements from common language to formal logic. Apply truth tables and the rules of propositional and predicate calculus.
- Model and solve real-world problems using graphs, both quantitatively and qualitatively.

Evaluation System

	Component	% of Marks	Method of Assessment
Internal Examination	Midterm Test	30	Written examination
	Assignment	05	Report and Presentation
	Attendance	05	Attendance percentage
	Total	40	
External Examination		60	Written examination
Total		100	

MODULE-I (12 Hours)

Propositional Logic, Propositional Equivalence, Predicates and Quantifiers, Nested Quantifiers, Rules of Inference, Recurrence Relations, Solving Linear Recurrence Relations.

MODULE-II (16 Hours)

Relations and its properties, Representation of Relations, Closure of Relations, Equivalence Relations and Partitions, Partial Ordering, POSet, Hasse Diagram, Maximal & Minimal elements of a Poset, Supremum & Infimum of a Poset, Lattice, Basic properties of Lattices.

MODULE-III (14Hrs)

Introduction to Graph Theory, Graph terminology, Representation of graphs, Graph Isomorphism, Connectivity, Euler and Hamiltonian Paths, Planar graph, Graph Coloring, **Text Books:**

- 1 *Discrete Mathematics and its Applications* by K.H.Rosen Publisher: TMH, Sixth Edition
Chapters: 1(1.1 to 1.5) ; 6 (6.1, 6.2) ; 7; 8(8.1 to 8.5, 8.7, 8.8)
- 2 *Elements of Discrete Mathematics* by C.L.liu & D.P. Mohapatra Publisher: TMH, Third Edition Chapter: 11 (11.1 to 11.4) **Reference Books:**
Discrete and Combinatorial Mathematics by R.P.Grimaldi Publisher: Pearson
Discrete Mathematics and Applications by Thomas Koshy Publisher: Elsevier
Discrete Mathematical Structures by B. Kolman, R.C. Busby & S. Ross Publisher: PHI

Calculus

Course Name	Code	Type of	T-P-PJ	Prerequisite
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		course	(Credit)	
Calculus	FCBS0107	Theory	3	Nil

Objective

- To study how things change. It provides a framework for modeling systems in which there is change, and a way to deduce the predictions of such models.
- To construct a relatively simple quantitative models of change, and to deduce their consequences.
- The fundamental idea of calculus is to study change by studying “instantaneous” change, by which we mean change over tiny interval of time.

Course Outcome

- Upon successful completion of this course, students will be able to:
- Understand the importance of linear functions in mathematics.
 - Understand the major problems of differential and integral calculus.
 - Understand and recognize other important classes of functions (such as trigonometric and rational functions), and be able to use calculus with these functions.

Evaluation Systems

	<i>Component</i>	<i>% of Marks</i>	<i>Method of Assessment</i>
<i>Internal Examination</i>	Midterm Test	30	Written examination
	Assignment	05	Report and Presentation
	Attendance	05	Attendance percentage
	Total	40	
<i>External Examination</i>		60	Written examination
<i>Total</i>		100	

MODULE-I

(6 Hours)

Asymptotes

MODULE-II

(6 Hours)

Curve Tracing

MODULE-III

(6 Hours)

Curvature

MODULE-IV

(6 Hours)

Reduction Formulae

MODULE-V

(6 Hours)

Vector Integral Calculus: Line Integrals.

MODULE-VI

(6 Hours)

Surface Integrals, Green’s Theorem

MODULE-VII

(6 Hours)

Volume Integrals, Gauss’s Theorem, Stokes’ Theorem (without proof).

Text Books:

- 1) A Text book of Calculus Part-III : Shantinakaran
Chapters: 1 (Art 1 & 3), 3(Art 7, 8, 9)
- 2) A Text book of Calculus Part – II : Shantinakaran
Chapter: 8 (Art. 24, 25, 26),
- 3) A Text book of Calculus Part – II : Shantinakaran
Chapter: 10 (Art.33, 34, 35, 36, 37)

- 4) A Textbook of Vector Calculus by Shanti Narayan & P. K. Mittal, S. Chand & Co. , 2003
Chapters: 7 (7.1 to 7.6, 7.8 & 7.11)

Probability & Statistics

Course Name	Code	Type of course	T-P-PJ (Credit)	Prerequisite
Probability & Statistics	FCBS0108	Theory	3	Nil

Objective

- To translate real-world problems into probability models.
- To motivate in students an intrinsic interest in statistical thinking.
- To recognize the role of and application of probability theory, descriptive and inferential statistics in many different fields of engineering.

Course Outcome

- Upon successful completion of this course, students will be able to:
- Define and illustrate the concepts of sample space, events and compute the probability and conditional probability of events.
 - Define, illustrate and apply the concepts of discrete and continuous random variables, the discrete and continuous probability distributions.
 - Define, illustrate and apply the concept of the expectation to the mean, variance and covariance of random variables.
 - Compute probabilities based on practical situations using the Binomial, Poisson and Normal distributions.

Evaluation Systems

	Component	% of Marks	Method of Assessment
Internal Examination	Midterm Test	30	Written examination
	Assignment	05	Report and Presentation
	Attendance	05	Attendance percentage
	Total	40	
External Examination		60	Written examination
Total		100	

MODULE-I

(6 Hours)

Probability: Sample space and Events, Principles of Counting, Classical definition of probability.

MODULE-II

(6 Hours)

Axioms of probability, Elementary theorems, Addition and Multiplication rules, Conditional probability.

MODULE-III

(6 Hours)

Probability Distributions: Discrete and Continuous Random Variables.

MODULE-IV

(6 Hours)

Probability Density and Distribution functions, Mean and Variance of Distributions. Binomial Distribution.

MODULE-V

(6 Hours)

Poisson Distribution, Normal Distributions, Poisson and Normal Distributions as Limiting forms of Binomial Distribution.

MODULE-VI**(6 Hours)**

Statistics: Random Sampling, Population and Sample, Sample Mean and Variances.

MODULE-VII**(6 Hours)**

Point and Interval Estimations, Confidence Intervals, Fitting Straight Lines, Correlation and Regression.

Text Book:

1) Advanced Engineering Mathematics by E. Kreyszig

Publisher: John Willey & Sons Inc-8th Edition

Chapters: 22(22.1 to 22.8), 23(23.1 to 23.3, 23.9, 23.10)

Reference Books:

1) Statistical Methods By S.P. Gupta (31st Edition); Publisher: Sultan Chand & Sons.

2) Mathematical Statistics By S.C. Gupta & V.K. Kapur (10th Edition); Publisher: Sultan Chand & Sons.

Numerical Methods

Course Name	Code	Type of course	T-P-PJ (Credit)	Prerequisite
Numerical Methods	FCBS0109	Theory	3	FCBS0102 Differential Equations

Objective

- To understand the limitations of analytical methods and the need for numerical methods and the ability to apply these numerical methods to obtain the approximate solutions to engineering and mathematical problems.
- Ability to decide and to derive appropriate numerical methods for approximating the solutions of various types of problems in engineering and science and analyze the error incumbent in any such numerical approximation.
- Ability to report analysis, solution and results in a standard engineering format.

Course Outcome

- Upon successful completion of this course, students will be able to:
- Perform error analysis to select an appropriate numerical model and to estimate errors in numerical solution of a given problem.
 - Derive a variety of numerical algorithms/methods & compare the viability of different approaches to the numerical solutions of various mathematical problems arising in roots of linear and non-linear equations, interpolation and approximation, numerical differentiation and integration, system of linear algebraic equations and differential equations.
 - Analyze and evaluate the accuracy of common numerical methods.

Evaluation Systems

	<i>Component</i>	<i>% of Marks</i>	<i>Method of Assessment</i>
<i>Internal Examination</i>	Midterm Test	30	Written examination
	Assignment	05	Report and Presentation
	Attendance	05	Attendance percentage
	Total	40	
<i>External Examination</i>		60	Written examination
<i>Total</i>		100	

MODULE-I

(6 Hours)

Approximation and round of errors, Truncation error and Taylor's series, Roots of equation using Bisection Method.

MODULE-II

(6 Hours)

Roots of equation using the false-position method, fixed point iteration, Newton-Raphson method, Secant method.

MODULE-III

(6 Hours)

Solution of System of Linear algebraic equations: Gauss-Seidel method, Lagrange Interpolation.

MODULE-IV

(6 Hours)

Newton divided difference interpolation, Inverse Interpolation, Lagrange Interpolation, Newton's forward and backward interpolation.

MODULE-V**(6 Hours)**

Numerical Differentiation, Numerical integration by the trapezoidal rule.

MODULE-VI**(6 Hours)**

Numerical integration by the Simpson's rules, Gauss quadrature rule.

MODULE-VII**(6 Hours)**

Solution of Ordinary Differential Equations: Euler's method, Improvement of Euler's method, Runge-Kutta methods.

Text Book:

- 1) Advanced Engineering Mathematics by E. Kreyszig
Publisher: John Willey & Sons Inc-8th Edition
Chapters: 17 (17.1 to 17.3, 17.5), 18 (18.3), 19 (19.1)

Reference Books:

- 1) Numerical Methods for Scientific and Engineering Computation by M. K. Jain, S. R. K. Iyengar & R.K. Jain; New Age International Publishers.
- 2) Introductory Methods of Numerical Analysis by S.S. Sastry; Third Edition, Prentice Hall India.

Applied Analytical Chemistry

Course Name	Code	Type of course	T-P-PJ (Credit)	Prerequisite
Applied Analytical Chemistry	FCBS0401	Theory + Practice	3	Nil

Course Objective

- The aim of this course is to give students that are going to carry out an experimental work the necessary comprehension in analytical chemistry.
- The course will also provide the student with knowledge to be able to understand and critically evaluate experimental data produced by others.

Course outcome

- Explain fundamental principles for environmental analytical methods (titration, electrochemistry, instrumentation and basic parameters of water, soil, fuel etc)
- Point out suitable analytical techniques for analyzing a specific compounds in an environmental matrix
- Point out suitable techniques for sampling and handling of environmental samples
- Apply quality control on chemical analysis and laboratory work and explain its importance
- Plan and carry out laboratory experiments, including data analysis and conclusions
- Describe simple approaches for troubleshooting

Evaluation System

	Component	% of Marks	Method of Assessment
Internal Examination	Internal	20	Written examination
	Assignment	30	Report and Presentation
External Examination	End Sem	30	Written examination
	Practice	20	Experiment followed by Viva
Total		100	

Module-1

Water Analysis: Importance of water, different types of water, sources and uses of water, types of water pollutants and domestic and industrial significance of analysis of water. Removal of hardness by Lime-Soda, Zeolite and Ion exchange methods. Removal of DO and dissolved CO₂ from water by De-aeration method. Desalination of brackish water by Reverse osmosis and electro dialysis process. Water disinfection by bleaching powder, liquid Cl₂, and chloramine.

Practice:

1. Determination of total hardness by EDTA method, total dissolved solids, total alkalinity
2. Determination of Turbidity by nepheloturbidity meter, pH, Conductivity.
3. Determinations of BOD, COD, DO.

NB: The above parameters can also be determined by using water kits and the results are to be compared with those obtained manually.

Module-2

Soil Analysis: Composition of rocks and minerals, soil profile and properties.

Practice:

1. Determination of texture of soil.
2. Determination of moisture content in a soil sample, pH, electrical conductivity,
3. Determination of water holding capacity of soil.
4. Measurement of Calcium and Magnesium Using EDTA methods.

Module-3

Chemistry of fuels: Classification of fuels, composition and properties of Petroleum, LPG, Water gas, producer gas, CNG. Knocking – Mechanism of knocking, harmful effects, Anti knocking agents – TEL, Catalytic converters – Principle & working, Unleaded petrol, Power alcohol & Biodiesel. Photovoltaic cells - construction & working of a PV cell **Practice:**

1. Proximate analysis of fuel (Coal, biomass etc.) Moisture, Volatile content, Ash, fixed carbon
2. Testing of fuel properties of the plastic oil and bio diesel: Specific gravity by picnometer, flash point and fire point by pesky-Marten flash point apparatus, viscosity by Redwood viscometer, calorific value by bomb calorimeter

Industrial Chemistry

Course Name	Code	Type of course	T-P-PJ (Credit)	Prerequisite
Industrial Chemistry	FCBS0402	Theory + Practice	3	Nil

Course Objective

Students may also explore in depth specialized areas of chemistry of materials, including ores, metals, cemenas well as dyes, oils, soaps

- *Introduce the students to industrial processing principles as applicable to chemical and allied industries.*
- *Provide the students with the knowledge of how raw materials are sourced for various chemical industries and how these materials are processed.*
- *Provide students with advanced technical skills in Chemical Engineering that will enable them to (a) translate fundamental discoveries in materials and other high technology areas to commercial exploitation, and (b) adapt readily to the challenges presented in a diverse range of industrial sectors that can benefit from process engineering approaches.*

Course outcome

- *Appreciate better their future roles as chemists in Industrial establishments*
- *Be able to explain the origin of raw materials used in the chemical and allied industries*
- *Have a good understanding of how chemical raw materials are processed into finished products.*
- *Graduates find employment in, quality control, oil and petroleum industry, textile industry, dyes and paints industry, cement industry, just to name a few.*

Evaluation System

	<i>Component</i>	<i>% of Marks</i>	<i>Method of Assessment</i>
<i>Internal Examination</i>	Internal	20	Written examination
	Assignment	30	Report and Presentation
<i>External Examination</i>	<i>End Sem</i>	30	Written examination
	<i>Practice</i>	20	Experiment followed by Viva
<i>Total</i>		100	

Module 1: Preparation of soap, dyes and oil analysis :

Introduction: Types of soap (soft and hard soap), methods of preparation of soap, mechanism, difference between fats and oils, physical properties of fats and oil, general introduction to chemistry of dye, various example of dyes, types of dyes.

Practice:

- Preparation of soap by saponification
- Determination of the properties different type of soap
 1. pH test
 2. Foam test

- Hard water test
- Determination of iodine number of oil
- Preparation of dyes (azo dyes): 2- naphthol + 4 - nitro aniline: salicylic acid + 4- nitro aniline
- Preparation of Phenyle.

Applications: Effect of water hardness in cleansing action of soap. Application of dyes to cloth

Module 2: Metals estimation from ores

Introduction: General introduction on ores, types of ore, important ore minerals, application of ores.

Practice:

- Estimation of Cu in copper ore
- Determination of Fe as ferrous iron in an ore sample
- Determination of Zn in Zinc ore by EDTA complex metric method

Module 3: Analysis of cement

Introduction: what is cement? types of cement, composition of cement, preparation of cement, applications.

Practice:

- Estimation of calcium in Portland cement
- Cement hydration and pH evaluation during caving
- To check the quality of cement (colour, texture, smell test, float test, shape test and strength test)

Applied Engineering Materials

Course Name	Code	Type of course	T-P-PJ (Credit)	Prerequisite
Applied Engineering Materials	FCBS0403	Theory + Practice	3	Nil

Course Objective

- To understand the importance of the chemical approach to nanomaterials
- To study the preparation, analysis and applications of metal nanoparticles
- To develop an understanding of conjugated polymers and their applications
- To understand how polymer composition and architecture imparts unique properties and behavior
- To study organic-inorganic hybrid materials (COMPOSITES) and how the incorporation of metals in the polymer architecture leads to new properties and applications

Course outcome

- Know what it takes to have a career in nanotechnology
- Understand the need to increase Nanotechnology awareness
- Understand the definition of Nanotechnology
- Know the processing of Nanoparticles and Nanomaterials □ Know the application of Nanotechnology and nanomaterials

Evaluation System

<i>Internal Examination</i>	<i>Component</i>	<i>% of Marks</i>	<i>Method of Assessment</i>
	Internal	20	Written examination
	Assignment	30	Report and Presentation
<i>External Examination</i>	<i>End Sem</i>	30	Written examination
	<i>Practice</i>	20	Experiment followed by Viva
<i>Total</i>		100	

Module 1: Nano Materials:

Introduction, nano scale, applications in various fields.

Practice:

- Synthesis of Ag, Au nano particles by wet chemical methods. □ Synthesis of ZnO Nanoparticles by Precipitation Method □ Synthesis of Cu nano particles Sonochemical method.
- Synthesis of Fe nano particles Co-precipitation method.
- Thickness measurement by sol-gel process of coating.

Module 2: Polymers

Introduction, types of polymers, Polymerisation mechanisms.

Practice:

- Synthesis of Thiokol Rubber
- Synthesis of a Rubber Ball from Rubber Latex
- Synthesis of Polystyrene (PS)
- Synthesis of Polymethyl Methacrylate (PMMA) □ Synthesis of Nylon-6:6.
- Determination of molecular weight of polymers by visometry method.

Module 3: Composites

Introduction :Biopolymers or synthetic polymers reinforced with natural or biofibers(termed as bio composites) as a viable alternative to glass fibre composites.Biocomposites“ refers to those composites that can be employed in bioengineering.Biocomposites are composite materials, that is, materials formed by a matrix (resin) and a reinforcement of natural fibers (usually derived from plants or cellulose). Bio composites are the combination of natural fibers (biofibers) such as wood fibers (hardwood and softwood) or non - wood fibers (e.g., wheat, kenaf, hemp, jute, sisal, and flax) with polymer matrices from both renewable and non-renewable resources.

Practice:

- Synthesis of bio composite materials by using jute fibres and wood fibres

Electricity and Magnetism

Course Name	Code	Type of course	T-P-PJ (Credit)	Prerequisite
Electricity and Magnetism	FCBS0404	Theory + Practice	4	Nil

Course Objective

- To understand electric circuit components and their use.
- To learn and verify the fundamental laws of electricity, learn how to use certain electrical devices.
- Understanding magnetic properties of matter and performing experiments to realize magnetism.

Course outcome

- Realizing the importance and use of electrical components in a circuit.
- Learning how to do different connections and their purpose.
- Understanding magnetism of matter and its applications

Evaluation Criteria

Internal Examination	Component	% of Marks	Method of Assessment
	Internal	20	Written examination
	Assignment	30	Report and Presentation
External Examination			
	End Sem	30	Written examination
	Practice	20	Experiment followed by Viva
Total		100	

Practice I Theory:

Electric field, Potential, EMF, capacitance, resistance, series connection, parallel connection, Kirchoff’s laws, RC circuits, LC circuits.

Lab:

1. Use a Multi-meter for measuring (a) Resistance, (b) AC and DC Voltages, (c) DC Current, (d) Capacitance and (e) Checking electrical fuses.
2. To determine an unknown Low Resistance using Potentiometer.
3. To determine an unknown Low Resistance using Carey Foster’s Bridge.

Practice II

Theory: Electrical Circuits: AC Circuits: Kirchoff's laws for AC circuits. Complex Reactance and Impedance. Series LCR Circuit: (1) Resonance, (2) Power Dissipation and (3) Quality Factor, and (4) Band Width. Parallel LCR Circuit.

Lab:

1. To verify the Superposition, and Maximum power transfer theorems.
2. To determine self-inductance of a coil by Anderson's bridge.
3. To study response curve of a Series LCR circuit and determine its (a) Resonant Frequency, (b) Impedance at resonance, (c) Quality factor Q, and (d) Band width.
4. To study the response curve of a parallel LCR circuit and determine its (a) Anti- resonant frequency and (b) Quality factor Q.

PRACTICE III

Theory: Magnetic Properties of Matter: Magnetization vector (**M**). Magnetic Intensity (**H**). Magnetic Susceptibility and permeability. Relation between **B**, **H**, **M**. Ferromagnetism. B-H curve and hysteresis. Electromagnetic Induction: Faraday's Law. Lenz's Law. Self Inductance and Mutual Inductance. Reciprocity Theorem. Energy stored in a Magnetic Field.

Lab:

2. To study the induced e.m.f. as a function of the velocity of the magnet.
3. Measurement of field strength B and its variation in a solenoid.
4. Determination of μ_r ratio.

Text Book:

1. *Electricity and Magnetism* By K. K. Tiwari, S. Chand Publishing References:
2. *Electricity and Magnetism*, By M. C. Saxena, Satya Prakash, V. P. Arora, Publisher: Pragati Prakashan
3. *Introduction to Electrodynamics*, by David J. Griffiths Prentice-Hall; 3 edition (2011)
4. *Electricity and Magnetism* by - D. C. Tayal, Himalaya Publishing, 2009.

Basic Mechanics and Properties of Matter

Course Name	Code	Type of course	T-P-PJ (Credit)	Prerequisite
Basic Mechanics and Properties of Matter	FCBS0405	Theory + Practice	4	Nil

Course Objective

- To give the students overall idea about material properties and also hands on experience to measure them.
- To make them realize the applications of material properties.
- To expose them to phenomena like hydrostatics, elasticity, viscosity, surface tension and their applications in various places.
- Encouraging them to build simple models to explain the mechanical properties. **Theory:**

Course outcome

- To understand material properties and perform experiments on them.
- To understand the applications of material properties in real life.
- To be able to make small models for explain few mechanical properties.

Evaluation System

	Component	% of Marks	Method of Assessment
Internal Examination	Internal	20	Written examination
	Assignment	30	Report and Presentation
External Examination	End Sem	30	Written examination
	Practice	20	Experiment followed by Viva
Total		100	

Elasticity: Elastic constants, Relation among elastic constants, torsion of right circular cylinder, bending of beams, Vibration of loaded cantilever.

Lab:

1. Young's modulus by single/double cantilever
2. Young's modulus by Searle's method
3. Rigidity modulus using Barton's apparatus
4. Poisson's ratio

Practice II Theory:

Hydrostatics: hydrostatic force on a body, buoyancy, metacentric height, hydrostatic pressure, pressure measurement: manometer

Viscosity: Viscosity of fluids, Stoke's law, terminal velocity, Poiseuille's equation, Searle's viscometer.

Surface tension & surface energy: Pressure difference across curved liquid surface. **Lab:**

1. Viscosity by Stokes method
2. Viscosity by Poiseuille's method
3. Metacentric height of floating body

4. Measurement of Pressure by manometer
5. Surface tension by capillary rise method
6. Determination of surface tension by Quincke's method

Practice III:

Basic Mechanics

Theory: Kinematics and Kinetics, Effort amplification using levers and pulleys, Friction, Laws of friction.

Rotational Motion: Moment of Inertia, Theorem of Parallel and Perpendicular axes. Moment of inertia of circular disc.

Lab:

1. Effort-output ratio using combination of pulleys
2. Verification of laws of static and dynamic friction
3. Moment of inertia of fly wheel

Text Book:

1. Elements of Properties of Matter, Dec 2010 by D.S. Mathur, S.Chand (G/L) & Company Ltd

Reference Books:

- 1. A Text Book of Fluid Mechanics by R.K. Bansal, Laxmi Publishers, 2005*
- 2. Engineering Mechanics Statics and Dynamics by A. K. Tayal, Umesh Publications.*

Optics and Optics Fibre

Course Name	Code	Type of course	T-P-PJ (Credit)	Prerequisite
Optics and Optics Fibre	FCBS0406	Theory + Practice	4	Nil

Course Objective

To understand optical phenomena.

- *To understand different light sources and their use*
- *Understand designing of microscope and artificial light sources*
- *Understanding optical fiber and its applications*

Course outcome

- *Students should understand optical phenomena.*
- *Students should learn about different light sources and their use*
- *Students should be able to understand optical fiber principle, operations and its applications.*

Evaluation System

	Component	% of Marks	Method of Assessment
Internal Examination	Internal	20	Written examination
	Assignment	30	Report and Presentation
External Examination	End Sem	30	Written examination
	Practice	20	Experiment followed by Viva
Total		100	

Practice I

Theory: Reflection and refraction of light. Mirror formula, lens maker's formula. Refraction through a prism. Dispersion, light sources: Principle and operations of sodium lamp, mercury lamp and LASER.

Lab:

1. To determine refractive index of the Material of a prism using sodium source.
2. To determine the dispersive power and Cauchy constants of the material of a prism using mercury source.
3. To determine the refractive index of glass slab using travelling microscope.
4. Designing of a compound microscope.

Practice II

Theory: Interference. Young's experiment, conditions for interference, Intensity distribution of fringes, Interference in thin films, Newton's rings.

Diffraction: types of diffraction, Fraunhofer diffraction at a single slit, diffraction at N-parallel slits and plane diffraction grating.

Polarization: Polariser and analyser, optical rotation and Polarimeter

Lab:

1. Determination of wavelength of light by Newton's ring method.
2. Determination of wavelength of LASER source by diffraction grating method
3. Thickness of thin paper by wedge-shaped films
4. Dispersive power and resolving power of a plane diffraction grating.
5. Polarimetry

Practice-III

Theory: Optical properties—scattering, refraction, reflection, transmission & absorption. Introduction, principle of Laser, stimulated and spontaneous emission, Coherence (temporal and spatial) Ruby Laser, Application of Lasers.

Optical Fibres: Introduction, numerical aperture, step index and graded index fibres, attenuation & dispersion mechanism in optical fibers (Qualitative only), application of optical fibres, optical communication (block diagram only)

Lab:

1. Measurement of attenuation and bending losses of an optical fibre.
2. Measurement of numerical aperture of an optical fibre
3. Study of spatial and temporal coherence of LASER
4. Making of a light guide

Text Book:

1. *A Text Book of Optics by M.N. Avadhanulu, Brij Lal, N. Subrahmanyam, S Chand; 23rd Rev. Edn.*

References:

2. *Optics by Ajoy Ghatak, McGraw Hill Education; 5 edition*
3. *Physics-I for engineering degree students by B.B. Swain and P.K.Jena.*
4. *Concepts in Engineering Physics by I Md. N. Khan.*

Centurion University of Technology and Management Odisha

COURSE STRUCTURE & SYLLABUS

BASKET - II



Centurion
UNIVERSITY

Shaping Lives...
Empowering Communities...

CENTURION UNIVERSITY OF TECHNOLOGY AND MANAGEMENT

School of Engineering & Technology

2019

CURRICULUM

COURSES OFFERED BY DEPARTMENT OF HUMANITIES AND MANAGEMENT BASKET - II

Course Code	Course Title	Course type	Credits	Prerequisite
FCHU1201	Foundations of English Communication	Workshop	2	Nil
FCHU1202	Communicative Practice Laboratory -1	Workshop	2	Nil
FCHU1203	Business Communication	Workshop	2	Nil
FCHU1204	Communicative Practice Laboratory-II	Workshop	2	Nil
FCHU1205	Corporate Readiness Laboratory	Workshop	2	Nil
FCHU1206	IT Enabled Communication	Workshop	2	Nil
FCHU1207	Career Communication	Workshop	2	Nil
FCHU1208	Personality Development	Workshop	2	Nil
FCHU1209	Seminar and Technical Writing	Workshop	2	Nil

FCHU1210	Professional Etiquette	Workshop	2	Nil
FCHU1211	Creative Writing	Workshop	2	Nil
FCHU1212	English for Competition (GRE/GMAT/TOEFL/IELTS)	Workshop	2	Nil
FCHU1213	Be a Contributor	Workshop	2	Nil
FCHU0213	Life Skills Development (LSD) – I	Practice	2	Nil
FCHU0214	Life Skills Development (LSD) – II	Practice	2	Nil
FCHU0215	Life Skills Development (LSD) - III	Practice	2	Nil
FCHU0216	Life Skills Development (LSD) - IV	Practice	2	Nil
FCMG0114	Economics	Theory	2	Nil
FCMG0102	Accounting & Finance	Theory	2	Nil
FCMG0103	Management Processes and OB	Theory	2	Nil
FCMG0104	Production and Operation Management	Theory	2	Nil
FCMG0105	Marketing Management	Theory	2	Nil
FCMG0108	Introduction to Research	Theory	2	Nil
FCMG0113	Indian Society and Culture	Theory	2	Nil
FCMG1203	Introduction Human Rights	Workshop	2	Nil
FCMG1204	Introduction to Ethics	Workshop	2	Nil
FCMG1201	Disaster Management	Workshop	2	Nil
FCMG1202	Ms Excel	Workshop	2	Nil
FCMG1205	Introduction to Gender	Workshop	2	Nil

Note: The evaluation for Workshop type subject will be 100% internal by the concerned faculty.

SYLLABUS
FCHU1201 FOUNDATIONS OF ENGLISH COMMUNICATION

Pre - requisites	Course Type	Credits
Nil	Workshop	2

COURSE OBJECTIVES

- To develop vocabulary and grammar knowledge
- To develop reading comprehension skills

COURSE OUTCOMES

- Development of academic and sub-technical vocabulary
- Enhancement of basic language skills, i.e., listening, speaking, reading and writing
- Development of grammatical competence
- Confidence level improvement

This course aims to build the vocabulary, comprehension, and writing skills for effective communication in English language. It will focus on reading, listening to, and writing passages, as a means of learning communications skills.

The essential elements of this course will include:

MODULE-I: READING SKILLS (7hrs.)

Read **one** of the following books:

- Animal Farm
- Alice in Wonderland
- Guide
- Malgudi Days
- Harry Potter
- Amar Chitra Katha

Comprehension Skills: Students will respond to comprehension lessons from the chosen book.

MODULE-II: WRITING SKILLS (7hr.)

Students learn grammar and usage by writing passages, and getting formal feedback on these.

MODULE-III: LISTENING SKILLS (6hrs.)

Students respond to questions based on listening to videos, audio, or speaking assignments of classmates.

MODULE-IV: SPEAKING SKILLS (7hrs.)

Speaking assignments based on chosen book or contemporary topics.

TEXT BOOKS:

Esteras, Santiago Remacha and Fabre, Elena Marco. (2007). Professional English in Use ICT Student's Book. Cambridge: Cambridge University Press.

REFERENCES:

Grellet, F. (1981). Developing Reading Skills. Cambridge: Cambridge University Press

McCarthy, M. & O'Dell, F. (2008). Academic Vocabulary in Use. Cambridge: Cambridge University Press.

Ur Penny, (1992). Five-Minute Activities: A Resource Book of Short Activities (Cambridge Handbooks for Language Teachers). Cambridge: CUP

F Klippel. (1984). Keep Talking. Cambridge: CUP

EVALUATION SYSTEM (CONTINUOUS INTERNAL ASSESSMENT)

Methods	Conversations	Listening Comprehension	Book Review Presentation	Vocab.	Mid-I (Presentation)	Mid-II (Online) Common Errors	Mid-III (Written)	% of Marks 100(Best 5)
Total	20	20	20	20	20	20	20	100

S. No.	Topic	Pedagogy	Details	Instructional Hrs			
				Th	Pract	vide o	Pro j
1	Getting to Know Each Other	Activity Based Learning	Catch the Ball Introductions Ice-breaker Share an interesting fact, stories, questions, memories, embarrassing moments or sometimes relevant to the context.	0	1	0	0

			Useful link: http://www.icebreakers.ws/small-group/catch-ball-introductions-icebreaker.html				
2	Conversation Practice	Pair work using Realia	Formulaic Expressions Doing Things with Words/ Objects <u>Description:</u> Student practice real life situations like using maps, asking for directions, small talk on weather, holidays, parties and eating out.	0	1	1	0
3	Formal and Informal Communication	Degrees of Formality	Worksheet: Ask the students to work in small groups of 2/3. They must read through the phrases in the table, deciding whether each phrase is formal or informal in conversation a conversation situation. When they have finished, review the exercise as a class (answers provided in the worksheet)	0	1	1	0

S. No.	Topic	Pedagog	Details	Instructional Hrs			
				Th	Pract	vide o	Pro j
4	Shadowing	Pronunciation – intonation, stress, pause	Find an Audio to Listen & Repeat – BBC News, Seminar Talk, Ted Talk etc. https://www.youtube.com/watch?v=GVWFGIyNs wI	0	1	1	0
5	Speech Acts	Plain English	Students can 'become' anyone they like for a short time! They will be encouraged to come forward and perform small speech acts and role-plays.	0	1	0	0
6	Ask Me Questions Challenge	Questions & Responses	Individual to respond- the whole class to ask questions. In this session, a student will learn communication management.	0	1	0	0
7	TED Talk Listening	Listening Comprehension	Ice-breaker: Talkathon Assignment: In groups of 4, you are going to create/write 10 questions about the TED Talk Afterwards, the groups of 4 will split up in new groups of 4 to discuss and compare their questions. Comprehension Test	0	1	1	0
8	Ted Talks	Communication & Confidence Body Language	Listen to a Ted Talk & make a presentation on a popular/contemporary topic	0	1	1	0
9	Reading Comprehension	Pre-reading	Students are encouraged to read any two books in the first semester. [Animal Farm/Old Man and The Sea/	0	1	1	0

	Strategies - 1		Guide/Malgudi Days/Amar Chitra Katha]				
10	Reading Comprehension Strategies - 2	Mid - reading	Students respond to comprehension lessons from the chosen books. [Comprehension Passages, Gap filling and Sentence Completion]	0	1	1	0
11	Reading Comprehension Strategies - 3	Post Reading	Students respond to comprehension lessons from the chosen books. [Summarizing/ Narrating/ Enacting/Vocabulary Quiz/]	0	1	0	0
12	Book Review	Writing Short Passages/ Paragraphs	Write a review of your favorite book in at least 250 words. Mention 3 specific learnings and 3 distinct ways in which you plan to incorporate them in your life. To choose from the recommended books.	0	1	0	0
13	News Reading	7 Cs of Communication	Group Activity: Campus/ National News Reading Students read notice boards and visit departments Prepare campus news headlines Present in the class	0	1	0	0

S. No.	Topic	Pedagog	Details	Instructional Hrs			
				Th	Pract	vide o	Pro j
14	Writing to the Point	Word Usage and Sentence Structure Main Idea, Coherence & Cohesion	Each group is seated in a circle. In this activity, the leader of each group cannot see (either blind or blind fold using a handkerchief), but can hear the peer voice. Ask the leader to flip through the pages, and put the finger randomly on fifteen words from the chosen book in five minutes. The other participates copy the words that are closest to the finger. This time bound activity increases the curiosity of the students and engages them in exciting communication and completion of the task. Then, I ask the students to shape the randomly chosen disconnected words into a short poem/story/essay by adding a title to it. Read Out Loud in the Class	0	1	0	0
15	Word Power	Synonyms & Antonyms	App: SPEAK ENGLISH	0	1	1	0
16	Homonym	Some conf	Activity: Select the correct option, Use the	0	1	0	0

	s	words Minimizing errors through discussions	confusables in sentences to bring out their meaning				
17	Reading and Writing about visuals	Useful Expressions	Presentation about visuals Task: Selecting information from a visual	0	1	0	0
18	Word Formation	Word structure Word hunt Vocabulary explorations	Group Activity: Students make word clouds	0	1	0	0
19	Vocabulary Building	Descriptive words	Activity : Describe yourself/ your favorite person using 5 descriptive words	0	1	0	0
20	Listen to Popular Songs	Verb tense and aspect of grammar Vocabulary Idioms and expressions	Listen to the song with lyrics Ask questions about the title Gap Filling Exercises	0	1	0	0
21	Vocabulary Development	Word Power	Quiz/ Puzzle	0	1	0	0
22	Grammar	Common Errors	Surprise Quiz && debriefing	0	1	0	0
23	Grammar	Correct Usage	Easy Grammar App-Practice Sets	0	1	0	0
24	English Language Enhancement-I	Tenses	Usage, Question and explanation Fill in the blanks	0	1	0	0
25	English Language Enhancement -II	Active and Passive	I am passive..../I am active activity	0	1	0	0
26	English Language Enhancement-III	Reported Speech	Assignment & debriefing	0	1	0	0

27	English Language Enhancement -IV	Subject-verb agreement	Online Quiz & debriefing	0	1	0	0
28	Learn Grammar with Fun	Conditionals	Activity: The whole class is divided into The Zero Conditional, The First conditional, The Second conditional, and The Conditional to perform the task	0	1	0	0

FCHU1202 COMMUNICATIVE PRACTICE LABORATORY –I

Pre - requisites	Course Type	Credits
Nil	Workshop	2

The language laboratory acts as a platform for learning, practicing and producing language skills through interactive lessons and communicative mode of teaching.

COURSE OBJECTIVES

- To expose the students to a variety of self- instructional, learner- friendly modes of language learning.
- To enable them to learn better pronunciation through stress on word accent, intonation, and rhythm.
- To maintain good linguistic - through accuracy in grammar, pronunciation and vocabulary.

COURSE OUTCOMES

- Ability to communicate fluently in different business situation
- Effective oral and written communication
- Appropriate word usage with correct pronunciation
- Clarity of word stress and intonation

A student is required to take up five lab tests of 100 marks- three tests in spoken mode and two tests in written mode.

MODULE-I: FRIENDLY COMMUNICATION (9 HOURS)

- Doing Things with Words: To ask for information, help, permission; To instruct, command, request, accept, refuse, prohibit, persuade
- Practice of Formulaic Expressions: Greetings, farewells, introductions, thanks, apologies, regrets, good wishes, congratulations, condolences, offers.
- Conversation Practice in familiar and unfamiliar situations

(This module will be practiced through conversation activities in pairs & groups)

MODULE-II: GRAMMAR AND VOCABULARY (9 HOURS)

The focus will be on the appropriate usage of language.

- Elimination of common errors
- Editing passages
- Word power A-Z: Easy and quick techniques
- Vocabulary building exercises

(Open Source Language Laboratory will be used to take quizzes and practice grammar & vocabulary)

MODULE-III: PHONETICS AND SPOKEN ENGLISH (12 HOURS)

Students will be trained to find out the correct pronunciation of words with the help of a dictionary /software, to enable them to monitor and correct their own pronunciation.

- Pronunciation Guidelines: Consonants and Vowels
- Pronunciation practice (for accent neutralization), particularly of problem sounds, in isolated words as well as sentences
- Speaking Techniques: Using correct stress patterns, developing voice quality
- Rhythm and Intonation

(Reading aloud of dialogues, speeches etc. for practice in pronunciation)

(In this module, the learners will use video series from BBC & Sky Pronunciation Suite to improve spoken English)

TEXT BOOKS:

Dwyer, J. (2000). The Business Communication Handbook. New Jersey: Prentice Hall.

REFERENCES:

Brown, G & Yule, G. (1983). Teaching the Spoken Language. Cambridge: Cambridge University Press.

Brown, H. D. (1994). Teaching by Principles: An Interactive Approach to Language Pedagogy. New Jersey: Prentice Hall.

EVALUATION SYSTEM (CONTINUOUS INTERNAL ASSESSMENT)

Methods	Role play	Speech Acts	Grammar Quiz	Story Telling	JAM	Vocabulary-Exercise	Vocabulary-Quiz	% of Marks 100(Best 5)
Total	20	20	20	20	20	20	20	100

SESSION PLAN: COMMUNICATIVE PRACTICE LABORATORY -1

MODULE I: FRIENDLY COMMUNICATION (9 HOURS)

S. No.	Topic	Pedagogy	Details	Instructional Hrs.			
				Th	Prac	Vide o	Pro j
Lab-1	Ice-Breaking/ Introductory Session	Name Game and Other Ice-breaking Activities	Knowing Each Other http://www.buzzle.com/articles/classroom-icebreaker-activities-for-students.html http://cutmlanguagelab.org/course/view.php?id=3	0	2	0	0

Lab - 2	Conversation Practice-I	Role Plays OSL (Moodle)	Speech Acts/ Formulaic Expression http://cutmlanguagelab.org/course/view.php?id=3	0	2	0	0
Lab - 3	Conversation Practice-II	Small Skits	Small Skits Using Formulaic Expressions http://www.lazybeescripts.co.uk/Scripts/Results.aspx?iSh=5&iSk=1&iMR=11&iXR=15&iPo=2&i17=1&iAS=2&iPS=2 http://cutmlanguagelab.org/course/view.php?id=3	0	2	0	0

MODULE II: GRAMMAR AND VOCABULARY (12 HOURS)

S. No.	Topic	Pedagogy	Details	Instructional Hrs.			
				Th	Prac	Video	Proj
Lab-4	Elimination of Common Grammatical Errors	Quiz OSL (Moodle)	Emphasis on Tense, Verbs, Modals, Conditionals, Active and Passive Voice, Statements, Questions and Responses, Articles, Preposition & Concord http://cutmlanguagelab.org/course/view.php?id=3 http://www.learnenglishfeelgood.com	0	2	0	0
Lab - 5	Document Makeover	Assignment OSL (Moodle)	Editing passages: Grammatical and Construction errors http://cutmlanguagelab.org/course/view.php?id=3	0	2	0	0
Lab - 6	Vocabulary Building- Word Power	Assignment and Online practice	http://a4esl.org/ http://cutmlanguagelab.org/course/view.php?id=3	0	2	0	0
Lab - 7 & 8	Vocabulary Building	Assignment and Online practice	Synonyms, Antonyms, Homophones, One-Word Substitution, Phrasal Verbs http://www.majortests.com/word-focus/vocabulary-tests.php http://www.grammarbank.com/synonyms-antonyms-worksheet.html http://cutmlanguagelab.org/course/view.php?id=3	0	2	0	0

MODULE-III: PHONETICS AND SPOKEN ENGLISH (12 HOURS)

S. No.	Topic	Pedagogy	Details	Instructional Hrs.			
				Th	Prac	Video	Proj

Lab -9	Phonetics-I	Online Practice OSLL (Moodle)	Phonemic Transcription Using IPA Symbols, Stress Pattern in Words and Phrases http://usefulenglish.ru/phonetics/practice-consonants http://www.agendaweb.org/phonetic.html http://cutmlanguagelab.org/course/view.php?id=3 https://www.youtube.com/watch?v=htmkblboG9Q	0	1	1	0
Lab -10	Phonetics-Ii	Online Practice OSLL (Moodle) Sky Pronunciation Suite	Rhythm and Intonation http://www.learning-english-online.net/areas/pronunciation/stress-and-intonation/ http://www.tolearnenglish.com/english_lessons/intonation-exercises http://cutmlanguagelab.org/course/view.php?id=3	0	2	0	0
Lab -11	Event Narration, Story Telling	Assignment	http://gdpi.hitbullseye.com/other-selection-tools-extempore.php http://cutmlanguagelab.org/course/view.php?id=3 http://grammar.about.com/od/developingessays/a/topnarrative07.htm	0	2	0	0
Lab -12	Speaking - Jam, Extempore	Activity Based OSLL (Moodle)	http://orelt.col.org/module/unit/3-practice-public-speaking http://cutmlanguagelab.org/course/view.php?id=3 https://www.youtube.com/watch?v=wV566cH5uQ https://www.youtube.com/watch?v=Mnw-4T7qQS4	0	2	0	0

FCHU1203 BUSINESS COMMUNICATION

Pre - requisites	Course Type	Credits
Nil	Workshop	2

COURSE OBJECTIVES

- The course on Business Communication focuses on the basic skills required to be an effective communicator. It aims at imparting the communication skills that are needed in the academic and professional pursuits.
- This is directed towards helping the students gain skills in comprehension, group discussions, presentations, interviews, active listening, technical writing and the ability to manage cross-cultural interactions. The focus is on the difficulty experienced by individual students, and the effort to

explore a useful strategy for self-improvement. This is achieved through an amalgamation of lecture oriented approach of teaching with the task based skill oriented methodology of learning.

COURSE OUTCOMES

- Understand the differences between general communication and business communication
- Development of basic language skills, i.e., listening, speaking, reading and writing
- Effective participation in group discussion and job interviews

MODULE-I: UNDERSTANDING COMMUNICATION IN BUSINESS (8 hrs.)

The module is a guide to organization communication. It is directed towards enabling students to develop the skills necessary to manage the human resources of their organization.

- General Communication and Business Communication
- Communication in Organizational Settings: Patterns of Communication in the Business World – Upward, Downward, Horizontal Grapevine etc, Channels of Communication- Internal and External, Formal and Informal
- Introduction to Cross Cultural Communication
- Strategies to Overcome Communication Barriers

MODULE-II: READING AND WRITING (10 hrs.)

This unit works on the competency in reading and writing skills through such tasks/activities as reading books, articles, magazines, novels, developing outlines, key expressions, situations, slogan writing and theme building exercises, dialogue writing, interpreting pictures, technical writing.

- Importance of Developing Reading Skills
- Sub-Skills of Reading: Predicting Content, Skimming & Scanning, Topic sentence and supporting details, Inferential Reading, Guessing the Meaning of Unfamiliar Words, Note Making
- Importance of Writing Skills and Principles of Effective Writing
- Writing Process: Pre-writing, Drafting and Re-Writing
- Paragraph Writing
- Summaries and Abstracts
- Business Correspondence: Writing Business Letters, E-mail Messages, Memo, Notice, Circulars, Reports, Proposals
- Career Communication: Writing Resume/ CV and Job Application Letter

MODULE-III: LISTENING AND SPEAKING (9 HOURS)

Listening is the mother of all speaking. This unit aims to achieve competence in speaking i.e., the ability to communicate orally in clear, coherent, and persuasive language appropriate to purpose, occasion, and audience. The module focuses on developing this competency which includes acquiring poise and developing control of the language through experience in making presentations to small groups, to large groups, and through the media.

- Listening Skills: Listening Process, Hearing and Listening, Types and Barriers, Effective Listening Strategies
- Common forms of Oral Communication in the Business World:
- Meetings: Organize Meetings, Preparing an Agenda, Chairing a Meeting, Drafting Resolutions, Writing Minutes
- Persuasive Speaking: Improving Fluency and Self-Expressions, Articulation, Good Pronunciation, Voice Quality
- Making an Oral Presentation: Planning, Preparing and Delivery
- Facing an Interview: Preparation, Types of Interview, Do's and Don'ts
- Group Discussions: Debate and GD, Types of GD, GD Etiquette

(Treatment: Developing listening and speaking skills through various activities, such as role play activities, practicing short dialogues, JAM, group discussions, debates, speeches, listening to news bulletins, viewing and reviewing documentaries and short films etc.)

TEXT BOOKS:

An Introduction to Professional English and soft skills by B.K Das et al., Cambridge University Press

REFERENCES:

Effective Technical Communication, M. Ashraf Rizvi, TMH Publications.

Business Communication, Krizan. Merrier. Logan. Williams, Thomson

Business Communication Today, Courtland L Bovee, John V Thill&MukeshChaturvedi, Pearson Education.

Business communication by Meenakshi Raman and Prakash Singh (Oxford)

Business Communication, UrmilaRai& S.M Rai, Himalaya Publishing House

EVALUATION SYSTEM (CONTINUOUS INTERNAL ASSESSMENT)

Methods	Role Plays (Org. Comm.)	Reading Comprehension & Note –Making	Listening & Individual Presentation	GD	Mid-I (Online Test on Vocabulary)	Mid-II (Written exam on module 2)	Mid-III (Oral Presentation)	% of Marks 100(Best 5)
Total	20	20	20	20	20	20	20	100

SESSION PLAN: BUSINESS COMMUNICATION

S. No.	Topic	Pedagogy	Details	Instructional Hrs			
				Th	Pract	vide o	Pro j
1	Introduction To Business Communication	Business games Written Assignment	What is Business Communication? General Communication vs. Professional Comm. Das, AIPE & SS,	0	1	0	0
2	General Communication & Business Communication	Audio-visual clips Communication game- Change your style	Difference in Style Degrees of Formality pp. 6-7 http://christopherhouse.blogspot.in/2012/08/difference-between-business.html	0	1	0	0
3	Communication In Organisational Settings	Small group work Role Plays Quiz	Internal Communication: Formal Communication Network Informal Communication Network External Communication Raman, BC, pp- 13-21 http://keydifferences.com/difference-	0	1	0	0

			between-formal-and-informal-communication.html				
4	Understanding The Importance Of Cross-Cultural Communications	Flip class- Match your points Role Plays	The Global Marketplace The Multicultural Workforce Krizen, BC, Chapter 2 & Bovee, BCT, pp. 63- 65 http://study.com/academy/lesson/cross-cultural-communication-definition-strategies-examples.html	0	1	0	0

S. No.	Topic	Pedagogy	Details	Instructional Hrs			
				Th	Pract	vide o	Pro j
5	Improving Intercultural Sensitivity	Communication Games and activities	Recognise Cultural Differences Overcome Ethnocentrism Study other Cultures Overcome Language Barriers Develop Effective intercultural Skills Bovee, BCT, pp. 66-82	0	1	0	0
6	Over Coming Miscommunication	Workshop (Emphasis on listening skill)	The Information Gap principle Organizational Structure Difference in Status Incorrect Choice of Medium Message Complexity Cultural Differences Psychological Barriers Noise, and barriers http://www.businesscoachphil.com/overcoming-miscommunication-at-work Raman, BC, pp.22-27	0	1	0	0
7	Strategies For Improving Organisational Communication	Good Listener Case Studies Role plays & presentations	Open Feedback, Simple Language, Avoid Overload, Walk the Talk http://debo10199businesscommunication.blogspot.in/2012/02/strategies-for-improving-organizational.html Raman, BC, pp.34-40	0	1	0	0

MODULE II: READING AND WRITING

S. No.	Topic	Pedagogy	Details	Instructional Hrs			
				Th	Pract	vide o	Pro j
8	Importance Of Developing Reading	Reading News clips	<i>The Importance of Developing Reading Skills</i> <i>Vocabulary Skills</i> <i>Word Meaning Recognition</i> <i>Guessing the Meaning from Word</i>	0	1	0	0

	Skills & Reading Strategies		<i>Structure and Context</i> <i>Guidelines for Improving Reading Skill</i> <i>Types of Reading</i> <i>Tips for Improving Reading Speed</i> Rizvi, ETC, pp. 219- 224 http://www.nclrc.org/essentials/reading/s tratread.htm				
9	The Sub-Skills of Reading	Guessing Game	Understanding the Main Idea and Supporting Details Reading between the Lines: Inferential Reading Understanding the Writer's Point Of View Making Predictions <ul style="list-style-type: none"> • Guessing the Meanings of Unfamiliar Words • Skimming and Scanning Rizvi, ETC, pp. 228-250 http://literallycommunication.blogspot.in/2013/06/reading-skills-and-its-sub-skills.html	0	1	0	0
10	Note-Making	Topicalizing Schematising Use of Reduction Devices Methods of Sequencing Practice in Note	Mechanics of Note Making Note Writing Techniques Rizvi, ETC, pp.273-289 <ul style="list-style-type: none"> • http://www2.le.ac.uk/offices/ld/resources/study/notes 	0	1	0	0

S. No.	Topic	Pedagogy	Details	Instructional Hrs			
				Th	Pract	vide o	Pro j
11	Importance of Writing Skills	Tasks on small paragraphs Creative writing	Writing Process: Pre-writing, Drafting and Re-writing Idea Mapping Writing and Editing Rai, BC, pp. 182-192 http://smallbusiness.chron.com/importance-writing-skills-business-845.html	0	1	0	0
12	Paragraph Writing	Written Assignment Developing story outline	Unity in writing Topic sentence Chronological order of development Using Connectives Organizing a Paragraph Adequate Development of supporting	0	1	0	0

			<p>details Cohesion & Coherence in a Paragraph Rizvi, ETC, pp.337-350 http://www.wikihow.com/Write-a-Paragraph</p>				
13	Summaries & Abstracts	Written Assignment based on guidelines	<p>Differences between Abstract and Summary Procedure for Writing Abstracts Procedure for writing summary Rizvi, ETC, pp.290-307 http://www.uts.edu.au/current-students/support/helps/self-help-resources/academic-writing/abstract-and-executive-summary</p>	0	1	0	0
14	Writing Business Letter & Proposal	Written Assignment based on guidelines	<p>Purpose & goal Principles of effective letter writing: Courtesy and consideration, Directness and conciseness, Avoid verbosity, Participial endings, Positive and direct statements, Clarity and precision Structure and layout Rizvi, ETC, pp.351-365 & Raman, BC, PP.256-260 http://www.writing-business-letters.com/business-proposal-letter.html</p>	0	1	0	0
15	Memo, Notice, Circulars & Email	Written Assignment based on guidelines	<p>What is a Memo? Email writing format Characteristics of Effective Memo Difference between notice and circular Essentials of notice and notice format Rizvi, ETC, pp.423-436 http://www.umuc.edu/writingcenter/writingresources/effective_memos.cfm http://www.englishtransform.com/2014/04/difference-between-circular-memo-notice.html</p>	0	1	0	0
16	Reports	Written Assignment based on guidelines	<p>Definition and Types Deciding on Format and Length Structure / Parts of Formal Report Topics Covered in a Report Introduction, Body and Closing Krizen, BC, pp 259-303 & Rizvi, ETC, pp. 452-467 http://cgu.edu/pages/852.asp</p>	0	1	0	0

TREATMENT: Tasks/activities as reading books, articles, magazines, novels, developing outlines, key expressions, situations, slogan writing and theme building exercises, dialogue writing, interpreting pictures, technical writing.

MODULE III: LISTENING AND SPEAKING

S. No.	Topic	Pedagogy	Details	Instructional Hrs			
				Th	Pract	video	Proj
17	Listening Skills	Effective Listening Strategies TED Talks: Listening and individual presentation	Listening Process Hearing and Listening Types and Barriers Rizvi, ETC, pp. 59-75 Video : https://www.youtube.com/watch?v=C8zNx_IarUw	0	1	0	0
18	Listening Attentively	News video clips and quizzing	Overall comprehension Extracting Detail information Listening between the lines Note taking Video https://www.youtube.com/watch?v=t2z9mdX1j4A	0	1	0	0
19	Persuasive Speaking	Inspirational audio-video clips for language improvement	Communication module for persuasive meeting Feed back Taking care of non-verbal elements Decoding message Handling noise Raman, BC, pp. 123- 169 & Rizvi, ETC, pp.195 -218 Video: https://www.youtube.com/watch?v=NBObNfR2n_4 Reference: http://www.speaking.pitt.edu/student/public-speaking/persuasive.html	0	1	0	0
20	Oral Presentation	Individual presentation on Events	Improving Fluency and Self-Expressions Articulation Good Pronunciation, Voice Quality Planning & Preparing your Oral Presentation Types of Delivery Guidelines for Delivery: Verbal elements, non-verbal elements, visual elements Practice delivery elements Controlling Nervousness and Stage freight Handling questions responsively narration/JAM Raman, BC, pp. 123- 169 & Rizvi, ETC, pp.195 -218	0	2	0	0

			http://www4.caes.hku.hk/epc/presentation/ VIDEO https://www.youtube.com/watch?v=WJlOZfLQ5w4				
21	Group Discussions	GD Sessions on current/ social issues	Nature of Group Discussion Characteristics of Group Discussion Skills Selection Group Discussions Subject knowledge Oral communication skills Team management Group Discussion Strategies Role Functions in Group Discussions Rizvi, ETC, pp 165-187 https://www.youtube.com/watch?v=ymcMo7JWSu8 http://placement.freshersworld.com/what-is-group-discussion/33122049	0	2	0	0
22	Group Discussions	GD Sessions on current/ social issues	Debate and GD Types of GD GD Etiquette		1		
23	Revision	TUTORIAL	Module - I		1		
24	Revision	TUTORIAL	Module - I		1		
25	Revision	TUTORIAL	Module - I		1		

FCHU1204COMMUNICATIVE PRACTICE LABORATORY –II

Pre - requisites	Course Type	Credits
Nil	Workshop	2

The suggestive assignments in the laboratory are intended as learning activities to facilitate the students in accomplishing the language skills which are needed to succeed in the business world.

COURSE OBJECTIVES

- To master Study Skills
- To acquire strategic competence to use both spoken & written language to use in a wide range of communication strategies
- To acquire Business Performance Skills

COURSE OUTCOMES

The students will be able to

- Write effectively for a variety of professional and social settings. They will practice writing as a process of motivated inquiry engaging others writers' ideas as they explore and develop their own. They will demonstrate an ability to revise for content and edit for grammatical and stylistic clarity. And they will develop an awareness and confidence in their own voice as a writer.
- Become accomplished, active readers who appreciate ambiguity and complexity, and who can articulate their own interpretations with an awareness and curiosity for other perspectives.
- Demonstrate the skills needed to participate in a conversation that builds knowledge collaboratively; listening carefully and respectfully to others' view points; articulating their own ideas in relation to other voices and ideas. Students will be able to prepare, organize and deliver and engaging oral presentation.

A student is required to take up five lab tests of 100 marks- at least two tests in written mode and three tests in spoken mode.

MODULE-I: LISTENING (6 HOURS)

Exercises on Active Listening: The whole group listens to any speech/news broadcast in English and notes down the important points. They listen again to check their points and evaluate themselves. The group then compares points to see how well they have understood the broadcast.

MODULE- II: SPEAKING (8 HOURS)

- Situational Dialogues / Role Play: Organization Communication
- Oral Presentations- Prepared and Extempore
- 'Just a minute' Sessions (JAM)
- Debates
- Mock Meetings
- Cracking Job Interviews: Mock Sessions
- Group Discussions on current topics

(This module will be practiced through speaking activities like role plays, presentations, and discussions)

MODULE-III: READING (8 HOURS)

Students will be given practice in reading and comprehension 6-8 passages of 100-300 words each, on topics of General as well as professional interest. The texts will be supported by suitable exercises designed to foster comprehension skills and vocabulary enrichment. Students are encouraged to read newspapers, articles, books and novels.

- Reading Comprehension Exercises Through Tests, Writing Summary and Presenting, Note Making
- Review Presentation (Movie/ Article/ Book)
- Vocabulary Building Exercises

(This module encourages extensive use of reading materials)

MODULE-IV: WRITING (8 HOURS)

The Writing Lab content is designed to acquaint the students not only with the techniques of effective writing but also give them an insight into planning and writing documents that produce results.

- Short Paragraphs on current general and technical topics
- Creative Writing: Idea Generation
- Business Letters, Email Messages, Project Writing

- Writing Resumes and Cover Letters

(* Students will be required to produce and submit by the end of second semester a 350-500 word project report on a topic of their choice. The project should involve data collection, analysis and reporting. Ten marks (out of 100 marks allocated for Lab Test) will be set apart for the project.)

TEXT BOOK:

An Introduction to Professional English and soft skills by B.K Das et al., Cambridge University Press

REFERENCES:

Effective Business Communication, AshaKaul, Prentice Hall

Professional Communication, ArunaKoneru, TMH

EVALUATION SYSTEM (CONTINUOUS INTERNAL ASSESSMENT)

Methods	Listening Skills	Movie Review	Role Plays	Group Discussion	Mock Interview	JAM	Vocabulary/ Comprehension	% of Marks
Total	20	20	20	20	20	20	20	100(Best 5)

SESSION PLAN: COMMUNICATIVE PRACTICE LABORATORY –II

MODULE I: LISTENING (6 HOURS)

S No.	Topic	Pedagogy	Details	Instructional Hrs			
				Th	Pract	Video	Proj
Lab-1	Introduction and Ice Breakers	Activity - Based	Knowing Each Other, People’s Bingo http://cutmlanguagelab.org/course/view.php?id=4	0	2	0	0
Lab - 2	Exercises On Active Listening	Activity Based	Feedback, Note Taking, Summarizing, Paraphrasing and Non-verbal Cues http://cutmlanguagelab.org/course/view.php?id=4 https://www.youtube.com/watch?v=cSohjlYQI2A	0	1	1	0
Lab - 3	Movie Review Presentation	Activity Based	The October Sky/ In Pursuit of Happiness/A Beautiful Mind/ Any Other http://cutmlanguagelab.org/course/view.php?id=4	0	1	1	0

MODULE II: SPEAKING (8 HOURS)

S. No.	Topic	Pedagogy	Details	Instructional Hrs			
				Th	Pract	Video	Pro
Lab-4	Organization Communication	Role play	Business Situations and Mock Meeting http://cutmlanguagelab.org/course/view.php?id=4	0	2	0	0

			http://eduscapes.com/distance/course_activities/simulations.htm https://www.youtube.com/watch?v=3X51J-ZDMmE				
Lab - 5	Oral Presentations	Activity OSL (Moodle)	Prepared and Extempore/ Debate / 'Just a Minute' Talk (JAM) http://cutmlanguagelab.org/course/view.php?id=4	0	2	0	0
Lab - 6	Interview /Group Discussion	Mock Interview /Group Discussion OSL (Moodle)	Frequently Asked Questions (FAQs) Discussion on Current Topics - General, Social, Political, Management, Creative, Education and Sports http://cutmlanguagelab.org/course/view.php?id=4 https://www.youtube.com/watch?v=ymcMo7JWSu8 https://www.youtube.com/watch?v=7gcsZ9H2I6s	0	2	0	0

MODULE-III: READING (8 HOURS)

S. No.	Topic	Pedagogy	Details	Instructional Hrs			
				Th	Pract	Video	Pro
Lab -7	Reading Assignment - I	Assignment , online practice and discussion	Reading abridged texts, relevant topics, and news articles http://cutmlanguagelab.org/course/view.php?id=4	0	2	0	0
Lab -8	Reading Assignment - Ii		Reading for comprehension and vocabulary http://cutmlanguagelab.org/course/view.php?id=4 http://www.majortests.com/sat/reading-comprehension.php	0	2	0	0

MODULE-IV: WRITING (8 HOURS)

S. No.	Topic	Pedagogy	Details	Instructional Hrs			
				Th	Pract	Video	Pro
Lab -9	Writing Short Paragraphs - General, Current and Technical Topics	Assignment , online practice and discussion	Write, Rewrite, Expand, Correct, Complete, and Improve Paragraphs http://cutmlanguagelab.org/course/view.php?id4	0	2	0	0
Lab -10	Idea Generation and Creative Writing	Assignment and discussion	Problem solving/decision making, Strategy development, Outline a proposal, Create a timeline Collaboration technique, Expression of creativity, Condensing various thoughts, Put visuals and text together http://cutmlanguagelab.org/course/view.php?id=4	0	2	0	0
Lab -11	Memo Writing & Emails	Assignment and discussion	Adopt the steps of writing process for preparing of memo and emails http://cutmlanguagelab.org/course/view.php?id=4 https://www.youtube.com/watch?v=6zHLHc9CcvQ	0	2	0	0
Lab -12	Preparation Of Business Reports/ Proposals And Presentation	Project Work and discussion	Adopt the steps of writing process for preparing business reports and proposals http://cutmlanguagelab.org/course/view.php?id=4 mails https://www.youtube.com/watch?v=eIKVDBAMvQ	0	2	0	0

FCHU1205CORPORATE READINESS LABORATORY

Pre - requisites	Course Type	Credits
Nil	Workshop	2

A real-time project approach in the laboratory is intended to provide a developmentally appropriate ambience, make the students proactive, encourage and motivate as well as develop skills to become a good listener, good communicator and responsible. A student will experience the challenging application process and at the same time prepare for the challenging world. The experience gained from working on projects can help one understand the appropriate and effective use of language skills. It also creates context in which learners engage in purposeful communication.

All communication activities are supported with the help of live projects on general techno-management or local themes which provide exposure to the students and help them to find a suitable job in the industry.

A student is required to take up five laboratory tests of 100 marks.

COURSE OBJECTIVES

- Understand the process of communication
- View communication from the perspective of each stakeholder
- Plan and manage communication difficulties
- Learn exactly how, when and what of communication

COURSE OUTCOMES

- Understanding the convention of project report
- Understanding the process of data collection and documentation
- Preparation and presentation of project report
- Preparation for various academic and professional needs

INSTRUCTION AND DELIVERY

Instruction- led facilitation highlights interactions between students and their facilitators, and emphasizes guidance from the facilitator who will track, assess and mentor them.

Students will make a team of four members who will take up real problems and run through the semester trying to solve the problems. The lab program will augment this learning with the right theory.

Participants will use PPTS, flash presentations or high impact presentations, flip charts, blogs, boards with graphical or pictorial representations, with captions and outlines, video display or any other best mode of presentation, post-it notes and group activities to document all processes and methodology.

OUTLINE

LAB1: Introduction to the Lab Program (Session will be driven by the Facilitators)

(Structure, Objective, Methodology, Objective of Choosing Project as a Vehicle to Learn the Course, Process of Carrying out the Project, Announcing the List of Projects)

LAB2: Discussion on Project Approach and Communication (Session will be driven by the Facilitators)

LAB3: Win Your Project: A Presentation by Groups (Session will be driven by the Students)

LAB4: Project Plan Presentation by Groups (Session will be driven by the Students)

LAB5: Review of Weekly Status Reports by the Guide, and Discussions (Session will be driven by the Students)

LAB6: Progress Presentation by Groups, and Feedback by Guide and Co-Guide (Session will be driven by the Students)

LAB7: Review of Documentation File/Dossier, and Feedback by Guide

LAB8: Progress Presentation and Submission of Dossier Containing Documentary Notes

(E.g., compilation of weekly status reports, minutes, photocopies of emails, feedbacks, testimonials, photographs)

LAB 9: Presentation on the Project, Feedback by the Guide and Co-guide

LAB 10: Final Presentation by Groups in front of a Panel and Submission of Project Work

TEXT BOOK:

The Essential Guide to Doing your Research Project by O'LEARY (2011)

REFERENCES:

Logical Framework Analysis, Capacity Building Workshop for Dryland Management, May 3-5, 2000

Professional Presentations by Goodale (2007)

EVALUATION SYSTEM (CONTINUOUS INTERNAL ASSESSMENT)

Methods	Win Your Project	Project Plan Presentation	Weekly Reports	Progress Presentation	Project Presentation	Documentation	Project Report	% of Marks 100 (Best 5)
Total	20	20	20	20	20	20	20	100

S. No.	Topic	Pedagogy	Details	Instructional Hrs			
				T h	Prac t	vide o	Pro j
1	Introduction to the Lab Program	Project-based Learning Discussion Beyond the class Learning	Structure, Objective, Methodology, Objective of Choosing Project as a Vehicle to Learn the Course, Process of Carrying out the Project (Session will be driven by the Facilitators)	0	2	0	0
2	Announcing the List of Projects		Topics available in OSLL (Moodle) http://cutmlanguageLab.org/	0	1	0	1
3	Project Approach & Communication		(Session will be driven by the Facilitators) https://www.youtube.com/watch?v=1ybtFwYb7Oc	0	1	0	1
4	Win Your Project		Rationale for choosing the project topic What makes you say that you deserve the project?/ Why should we give you the project (Session will be driven by the Students)	0	1	0	1
5	Project Plan		Stakeholder Analysis, Objective Analysis, Situation Analysis, Problem Analysis, Strategy Analysis (Session will be driven by the Students)	0	1	0	1

6	Review of Weekly Status		Dossier Verification/Reports by the Guide	0	1	0	1
7	Review of Progress	Project-based Learning Group Presentation with Facilitator Beyond the class Learning	Progress Presentation by Groups, and Feedback by Guide and Co-Guide (Session will be driven by the Students)	0	1	0	1
8	Documentation Review		Review of Documentation File/Dossier, and Feedback by Guide	0	1	0	1
9	Progression Presentation and Report Submission	Project-based Learning Presentation and Report Writing Beyond the class Learning	Progress Presentation and Submission of Dossier Containing Documentary Notes (E.g., compilation of weekly status reports, minutes, photocopies of emails, feedbacks, testimonials, photographs)	0	1	0	1
10	Presentation on the Project	Project-based Learning Presentation Beyond the class Learning	Presentation on the Project, Feedback by the Guide and Co-guide	0	1	0	1
11	Project Work	Discussion	Performance Analysis	0	0	0	2
12	Communication	Discussion	Performance Analysis	0	2	0	0

FCHU1206IT ENABLED COMMUNICATION

Pre - requisites	Course Type	Credits
Nil	Workshop	2

COURSE OBJECTIVE AND OUTCOME

Upon completing the syllabus, students should be able to:

- Speak confidently and fluently, in both formal and informal contexts.
- Write clearly, correctly and cogently
- Design and have a Home Page/Blog Space, Facebook Page and post comments/reports for collaboration & online presence
- Evolve from the role of an 'information provider', through 'motivator' and 'catalyst of change', to 'Change Agent'.

COURSE OUTLINE

MODULE I: CONCEPTUAL FOUNDATIONS

- Pre-Course Assessment
- Tell me a bit about yourself: Your background, your major, your professional aspirations ... your likes ... and maybe your favorite movie, and what you like to do in your spare time...
- Do you know?
- Introduction to IT Enabled Communication
- Communication in the New Age Context and Demand for Communication Interventions

(This module includes pre-course assessments and presentations)

MODULE II: BLOG DESIGNING & POSTING

- Step-by- Step to Writing a Blog: Researching, Brainstorming and Structuring, Writing, Posting, Editing and Accessorizing
- Photoshop for Image, Editing and graphic design

(This module will be driven through methods like self-learning, learning by doing, and workshop)

MODULE III: TECHNOLOGY AND COMMUNICATION

- Tools for Business Correspondence and web-based exercises
- Creating and delivering high impact presentations with Slides and other Visuals
- Video Documentaries
- Video Conferencing Sites, Skype, Team Viewer

(This module will be facilitated through presentations, use of tools and technology)

TEXT BOOKS

- Shirley Taylor, Model Business Letters (MBL) and Other Business Documents, 5th Edition. Krizen. Merrier. Logan. Williams, Business Communication, and Thomson (BC: Krizen).
- M.M. Monippally, Business Communication Strategies (BCS: MMM), TMH, New Delhi, 2001.
- Arthur H. Bell & Dayle M. Smith, Management Communication (MC: AHB & DMS), Wiley Student Edition, 2005

LINKS

http://ctb.ku.edu/en/tablecontents/section_1017.htm

Useful websites for some topics will be linked to the course for improving language proficiency skills of the students.

www.a4esl.org

www.learnenglishfeelgood.com

EVALUATION SYSTEM (CONTINUOUS INTERNAL ASSESSMENT)

Methods	Presen- tation	Blog Design	Video Documentary	E-mail Writing	Business Letters	Poster/ Template	Mid-Sem written	% of Marks 100(Best
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		& Post				Design	Exam	5)
Total	20	20	20	20	20	20	20	100

MODULE I: CONCEPTUAL FOUNDATIONS (3HRS)

S. No.	Topic	Pedagogy	Details	Instructional Hrs			
				Th	Pract	vide o	Proj
1	Pre-Course Assessment [IT Enabled Communication]	Record pre-course assessments on communication management & technology by 'Probing & Doing'	Do you Know?	0	1	0	0
2	Tell me a bit about yourself	Know each other, and create a classroom philosophy through a game	Your background, your major, your professional aspirations ... your likes ... and maybe your favorite movie, and what you like to do in your spare time...	0	1	0	0
3	Communication in the New Age	Presentation	Context and Demand for Communication Interventions Explore top five social networking sites relevant to technology sector and present in the class, create and maintain online presence on Facebook, Google + or any other	0	1	0	0

MODULE II: BLOG DESIGNING & POSTING

S. No.	Topic	Pedagogy	Details	Instructional Hrs			
				Th	Pract	vide o	Pro j
4	Step-by- Step to Writing a Blog - 1	Learning to Learn (Self-learning)	Researching	0	1	0	0
5	Step-by- Step to Writing a Blog - 2	Learning to Learn (Self-learning)	Brainstorming & Structuring	0	1	0	0
6	Step-by- Step to Writing a Blog - 3	Learning to Learn (Self-learning)	Writing & Posting	0	1	0	0
7	Step-by- Step to Writing a Blog - 4	Learning to Learn (Self-learning)	Editing & Accessorizing	0	1	0	0

8	Blog	Workshop (Self-learning)	One Day Workshop On Blog Design (CUTM e-content)	0	1	1	0
9	Blog Design	Posting assignments/ weekly reports/share what he/she has learnt (Doing)	Assignment: "Me in a Minute" blog post, email your blog's web address to the facilitators and peer group	0	1	0	0
10	Photoshop - 2	Self- Learning & Peer Learning	Editing and Graphic Design	0	1	1	0
11	Photoshop -3	Photoshop (FOSS) Training	Video tool www.spoken-tutorial.org	0	1	0	0
12	Photoshop	Workshop	One Day Workshop On Blog Design (CUTM e-content)	0	1	1	0

MODULE III: TECHNOLOGY AND COMMUNICATION

S. No.	Topic	Pedagogy	Details	Instructional Hrs			
				Th	Pract	vide o	Proj
13	Business Correspondence	Document Makeover, Web-based Exercises	Letters & Emails [Write to the point with correctness, conciseness, coherence and completeness]	0	1	0	0
14	Impress Presentation	Training and Practice	Language Laboratory Impress (FOSS)- Presentations (www.spoken-tutorial.org)	0	1	0	0
15	Enhancing presentation through slides and other visuals	Use of media for presenting the visual contents to reinforce the message, and create online presence	Equip the learners with techniques where they feel more confident in front of an audience Assignment [Improve the slides] Slide Share/ Upload on YouTube or Google +	0	1	0	0
16	Delivering High Impact Presentations	Video Recording & Peer Evaluation	Mastering the Art of Delivery, Preparing to Speak, Overcoming	0	1	0	0

			Anxiety, Handling Questions Watch-YouTube: Steve Jobs and iPod				
17	Video Documentaries	Video documentary (Self- Learning)	Each student/group will make a short documentary movie (CSR, Facilities Labs, Student Projects etc.)	0	1	0	0
18	Making of Video Documentary	Workshop	One Day Workshop on Making Video Documentaries	0	1	1	0
19	Documentary Movie	10 min. video presentation by individuals/ groups	Feedback and Analysis	0	1	0	0
20	Video Conferencing	Free conference calls, webcam chat, video conferencing, group calls	Create Account & Practice [Skype, TeamViewer, Mobile]	0	1	0	0
21	Organize and Manage a Video Conference	Use video conference for business meetings Video conference etiquette & tips	Organise, Share & Collaborate	0	1	0	0

FCHU1207CAREER COMMUNICATION

Pre - requisites	Course Type	Credits
Nil	Workshop	2

OBJECTIVES

- Prepare the graduates to acquire their dream jobs.
- Build their mindset with right attitude, self-awareness, pro-activeness.
- Build confidence, and enhance their communication skills to handle all situations.

OUTCOMES

- Build the confidence of students
- Trigger the thinking and analyzing ability of the learners to solve problems.
- Readiness to work on their dream jobs.

List of Experiments

LAB 1: Introduction to Career Communication

LAB 2: Presentation on Corporate House

- Create an awareness and exposure on corporate life and culture.
- Learners get exposure to corporate life and culture.

LAB 3: Corporate Quiz

LAB 4: Telephonic Conversation

- Learners are equipped with basic knowledge and skill practice for improved telephonic communication.

LAB 5: Email Writing

- Learn the characteristics of successful e- mail messages.

- Create an effective e-mail message.

LAB 6: Mini Test on Email Writing

LAB 7: Learning Etiquette

- Understand what etiquette is & why it's important.
- Provide practical techniques and generally-accepted professional and ethical conduct or behaviour that will help create a favourable impression in social and professional life.
- Practice proper manners like greeting, saying 'please', 'thank you'.
- Appear professional and well groomed.

LAB 8 :Identifying Traits for Professional and Interpersonal Success

- Understand the importance of effective interpersonal communication and traits for professional success.
- Explore the significance of Active Listening, Problem Solving, Respect, Decision Making, Empathy, Co-operation and Non-verbal communication for professional success.

LAB 9: Job-Application -Cover Letter

- Develop the career writing skills of the learners with special emphasis on their interest in specific job positions, their strengths and what values they will bring to the organisation.

LAB 10: Job-Applications – CV

- Produce a polished and impressive CV that can be tailored to each specific job application.
- Develop the career writing skills of the learners with special emphasis on Statement of Purpose.
- Provide with tools to showcase Unique Selling Points for the specified job description.

LAB 11: Participating in Group Discussion (GD)

- Mock Interview on basic questions

LAB 12: Facing an Interview

EVALUATION SYSTEM (CONTINUOUS INTERNAL ASSESSMENT)

Methods	Presentation	Corporate Quiz	Telephonic Conversation	Email Writing	CV	GD	Interview	% of Marks 100(Best 5)
Total	20	20	20	20	20	20	20	100

SESSION PLAN: CAREER COMMUNICATION

S. No.	Topic	Pedagogy	Details	Instructional Hrs.			
				Th	Pract	vide o	Pro j
LA B-1	Introduction to Career Communication	Discussion	The Course introduces students to the resources and skills necessary for a successful job or internship search http://cutmlanguagelab.org/course/view.php?id=2	0	2	0	0
LA B - 2	Presentation on Corporate House	Team Presentation OSL (Moodle)	Create an awareness and exposure on corporate life and culture. Learners get exposure to corporate life and culture. http://cutmlanguagelab.org/course/view.php?id=2 https://www.youtube.com/watch?v=g-_xABU21Yc	0	1	1	0

LAB -3	Corporate Quiz	Quiz OSLL (Moodle)	This Corporate Quiz is an initiative to bring forth all the updates and insights from various industries. Through this quiz , students will be updated with the current happening in the present Corporate world http://cutmlanguagelab.org/course/view.php?id=2	0	2	0	0
LAB-4	Telephonic Conversation	Role play (Pair Work)	Learners are equipped with basic knowledge and skill practice for improved telephonic communication https://www.youtube.com/watch?v=mmXAqMQe0AI https://www.youtube.com/watch?v=6tfFRD0enV0	0	1	1	0
LAB - 5	Email Writing	Doing	Learn the characteristics of successful e- mail messages.Create an effective e-mail message. http://cutmlanguagelab.org/course/view.php?id=2 https://www.youtube.com/watch?v=mmXAqMQe0AI	0	1	1	0
LAB -6	Email Writing	Mini Test OSLL (Moodle)	(Questions from TCS) http://cutmlanguagelab.org/course/view.php?id=2 https://www.youtube.com/watch?v=LTKb5Fexcuk	0	2	0	0

S. No.	Topic	Pedagog	Details	Instructional Hrs.			
				Th	Pract	vide o	Pro j
LAB -7	Learning Etiquette	Demonstration Video Analysis	Understand what etiquette is & why it's important. Provide practical techniques and generally-accepted professional and ethical conduct or behaviour that will help create a favourable impression in social and professional life. http://cutmlanguagelab.org/course/view.php?id=2 https://www.youtube.com/watch?v=ieYuoQ9sMvA	0	1	1	0
LAB -8	Identifying Traits for Professional and Interpersonal Success	Group Activity Video Analysis	Understand the importance of effective interpersonal communication and traits for professional success. Explore the significance of Active Listening, Problem Solving, Respect, Decision Making, Empathy, Co-operation and Non-verbal communication for professional success. http://cutmlanguagelab.org/course/view.php?id=2	0	1	1	0

LAB -9	Job- Application - Cover Letter	Docume nt Makeove r	Develop the career writing skills of the learners with special emphasis on their interest in specific job positions, their strengths and what values they will bring to the organisation. http://cutmlanguagelab.org/course/view.php?id=2 https://www.youtube.com/watch?v=37TbhadX0C8	0	2	0	0
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FCHU1208PERSONALITY DEVELOPMENT

Pre - requisites	Course Type	Credits
Nil	Workshop	2

The laboratory aims at the promotion of the strategies for the personality development of the participants. The rationale behind this endeavor is the recognition of the multifaceted influence of the personality of the participants.

A student is required to take up five laboratory tests of 100 marks.

COURSE OBJECTIVE

Project the force of inner self, assert individuality, influence others and power to success.

COURSE OUTCOME

Learners develop a positive attitude and graceful personality.

LIST OF EXPERIMENTS

Lab 1: Self-Discovery/Self-Analysis

Identifying strengths and weaknesses through games and activities

Lab 2: Impression Management

Formation of impression, first and lasting impression, change: warm-up discussion

Lab 3: Body Language and Communication Style Profile Test

Lab 4 : Working on Attitude: Assertive, Aggressive, Passive

Measure your attitude, case study and role plays

Lab 5: Build Your Skills

Interpersonal Communication and Self

Lab 6: Team Building and Teamwork

Ice-breaker, test your team skills, exercise on stages of formation and effective teams

Lab 6: Explore Your Personality

Lab 7 : Motivation and Success

Ted talks, invited talks and success stories

Lab 8: Time Management

Identifying important time wasters, time management exercises

Lab 10 : Stress Management

Case-based discussions to identify causes of stress, and manage stress

Lab 11: Etiquette and Manners

Test your etiquette and manners, practice good manners

Lab 12 : Personality and Career Choice

Matching your career & personality

TEXT BOOKS:

Basic Managerial Skills for All, 9th Edition, E.H. McGrath, S.J.

Personality Development by Harold R. Wallace & L. Ann Masters, 2006.

REFERENCES:

Personality Development by [John Aurther](#) .Reprint, 2009.

[Personality Development - Transform Yourself](#) by [Rajiv K. Mishra](#), 2004.

[Power of One - Personality and Self-Development](#) by [Dr. Abhishek Mishra](#), 2007.

EVALUATION SYSTEM (CONTINUOUS INTERNAL ASSESSMENT)

Methods	Self-introduction in sales pitch	Debate/Extempore	Presentation (USP)	Group Activity (Communication)	Public Speaking on Current Topic	Case-based Discussions	Motivation Speech	% of Marks 100 (Best 5)
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Tota 1	20	20	20	20	20	20	20	100
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SESSION PLAN: PERSONALITY DEVELOPMENT

S. No.	Topic	Pedagogy	Details	Instructional Hrs			
				Th	Prac t	vide o	Proj
1	Self-Discovery/ Self-Analysis	Activity Based Learning	Game	0	2	0	0
2	Impression Management	Videos and interactions	19 tips to impress others https://www.buzzfeed.com/carolynkylstra/impress-literally-everyone-you-meet?utm_term=.nbz2MKVQJO#.qyw.dZLkQXO	0	1	1	0
3	Body Language and Communication Style Profile Test	Understanding of different postures and gestures through online test	http://www.queendom.com/queendom_tests/transfer	0	1	1	0
4	Working on Assertive Aggressive Passive	Role Plays and are Encouraged to watch videos	https://www.youtube.com/watch?v=O6eyUUkpoU8 Role plays	0	1	1	0
5	Build Your Skills	Videos	https://www.youtube.com/watch?v=w97dR3OJB1k http://www.investopedia.com/video/play/interpersonal-skills/	0	1	1	0
6	Team Building and Teamwork	Activity Based Learning	Coin Logo Time Required: 5-10 minutes Begin by asking all participants to empty their pockets, purses, and wallets of any coins they may have and place them on the table in front of them. If someone doesn't have any coins or only has very few, others in the room can share their coins with them. Instruct each person to create their own personal logo using the coins in front of them in just one minute. Other materials they may have on them, such as pens, notebooks, wallets, etc. can also be used in creation of the logo. If there is a particularly large group, people can be broken up into teams of 3-6 people and instructed to create a logo that represents them as a team or the whole room can gather to use the coins to create	0	1	1	0

			a logo for the organization/group/department/etc. Each solitary participant can explain their logo to the group or if the room was split into groups, the leader can have each group discuss what led to the team logo and what it says about them. Not only does this activity promote self and mutual awareness, but it also enables participants to get to know each other on a more personal level. http://www.livestrong.com/article/219775-team-building-exercises-for-small-groups/				
7	Explore Your Personality	videos	https://www.16personalities.com/free-personality-test	0	1	1	0
8	Motivation and Success	videos	https://www.youtube.com/watch?v=ILEg5EZw3iQ https://www.youtube.com/watch?v=g-PNJHhf-ag	0	1	1	0
9	Stress Management	Classroom Exercise	Time Wasters Exercise.pdf	0	1	0	0
10	Etiquette and Manners	videos	https://www.youtube.com/watch?v=55cXVve0Ipw for table manners https://www.youtube.com/watch?v=VLqKVfSG-bk for interview etiquette. https://www.youtube.com/watch?v=4-8AlriF908 for manners.	0	1	1	0

S. No.	Topic	Pedagogy	Details	Instructional Hrs			
				Th	Pract	vide o	Proj
11	Personality and Career Choice	Classroom exercise	rs_self-assessment.pdf	0	1	0	0
12	Time Management	Group Activity	How long is a minute? At the beginning of session ask people to close their eyes for 30 seconds and after that to open it. Nobody can watch the clock and don't measure the time. Ask of participants to open their eyes after what they believe has been 30 seconds. Of course, they all open them at different times. Afterwards, we talk about our understanding of time. Even though	0	1	0	0

		<p>everyone has an equal (24 hours a day or 30 seconds for exercise), in fact, we experience it and use it in different ways. Some of us experienced it as a short period, other as a long. This always works as a good opener.</p> <p>2) Cover all the clocks in the room, then ask participants to remove their wrist watches and stand up. Instruct them to sit down when they think 1 minute has elapsed after you shout “Start” to begin the countdown. You will be surprised with the results. Just enjoy the fun that follows this activity</p>				
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FCHU1209 SEMINAR AND TECHNICAL WRITING

Pre - requisites	Course Type	Credits
Nil	Workshop	2

Seminar allows students the opportunity to put all of information together. The students are required to prepare technical reports including oral presentations supported by written technical papers. Seminar is designed to assist students in preparing for their career.

COURSE OBJECTIVES

- Understand the requirements and ethics of technical writing in the 21st Century workplace.
- Work professionally, individually and in a team to produce effective technical documents incorporating verbal, visual, and multimedia materials as necessary.
- Communicate effectively by analyzing audience, organizing documents, writing clearly and precisely with no grammar errors and presenting the document with skillful design.
- Locate, evaluate, and incorporate pertinent information.
- Write clear, intelligent technical reports
- Make seminar presentations

COURSE OUTCOMES

- Understand how technical communication is used in the workplace.
- Understand and use the principles of design in business and technical communication.
- Apply useful descriptive language to your technical documents.

- Students will gain experience in preparing a technical report including an oral presentation supported by a written technical paper.

MODULE-I: TECHNICAL COMMUNICATION ESSENTIALS

COURSE OUTCOMES

- Describe the writing process most useful in today's technical writing environment.
- Analyze an audience and consider appropriate writing situations to meet the audience's needs.
- Understand the ethics of the workplace and apply those ethics to their technical and business writing.

OUTLINE: Communicating in the Workplace, Technical Writing Process Today, Readers and Contexts of Use, Ethics in the Technical Workplace

MODULE- II: DOCUMENT DESIGN

COURSE OUTCOMES

- Create and use graphics that complement your business and technical communication.

OUTLINE: Designing Documents and Interfaces, Creating and Using Graphics

MODULE-III: TECHNICAL COMMUNICATION STRATEGIES AND RESEARCHED REPORT WRITING

COURSE OUTCOMES

- Define terms clearly in technical documents.
- Explain instructions and processes clearly.
- Write clear proposals for business and technical situations.
- Research and manage information.
- Write an analytical report.

OUTLINE: Researching and Managing Information, Organizing and Drafting, Technical Definitions, Technical Descriptions, Instructions and Documentation, Proposals, Analytical Reports

MODULE-IV: SEMINAR PRESENTATION

COURSE OUTCOME

- Students will not only learn from the experience gained in preparing and presenting their seminar, but will have the opportunity to observe and participate in the seminar given by their classmates.

OUTLINE: Technical Report, Seminar Presentation

(Planning, Preparing, Organizing and Seminar Presentation are the 4 stages of this module)

TEXT BOOK:

Gerson, Sharon J. and Gerson, Steven M. (2007). Technical Writing Process and Product. Delhi: Pearson Education.

REFERENCES:

Effective Technical Communication, M. Ashraf Rizvi, TMH Publications.

Business Communication Today, Courtland L Bovee, John V Thill & Mukesh Chaturvedi, Pearson Education.

EVALUATION SYSTEM (CONTINUOUS INTERNAL ASSESSMENT)

Methods	Proposal Writing	Report Writing	Organizing Seminar	Document Formatting	Preparing a Technical Paper	Seminar Presentation-I	Seminar Presentation-II	% of Marks 100 (Best)
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								5)
Total	20	20	20	20	20	20	20	100

SESSION PLAN: SEMINAR AND TECHNICAL WRITING

S. No.	Topic	Pedagogy	Details	Instructional Hrs			
				Th	Pract	vide o	Proj
1	Introduction to Technical Writing	Activity Based Learning	Writing Genres: Technical versus non-technical writings https://www.youtube.com/watch?v=LT Dsgd0ytbE	0	1	0	0
2	Preparing to Write	Doing	Audience Analysis Brainstorming Organizing information Link: https://www.youtube.com/watch?v=wxKJT13EhuM	0	1	0	0
3	Gathering information	Google Search	How do we gather information? Ways, techniques and tools	0	2	0	0
4	Focusing on Writing Skills	Workshop	Brainstorming , Drafting , Editing	0	2	0	0
5	Technical Writing Conventions	Analysis and Discussion	Analysis of different case studies	0	1	0	0
6	Reporting	Learning to Learn Analysis and Discussion	FORMAT: Preliminary pages, Summary, Main section, Conclusion, Recommendations References	0	2	0	0

S. No.	Topic	Pedagogy	Details	Instructional Hrs			
				Th	Pract	vide o	Proj
7	Using and interpreting Graphics	Group work and Discussion	Matching Games : Texts and graphic types	0	2	0	0
8	Document Formatting	Workshop	Layouts Use of MS Word for Documenting Document templates APA Format (6th) - Microsoft Word 2010 https://www.youtube.com/watch?v=aWT9zgMPyiY	0	2	0	0
9	Documentation	Workshop	Documenting Sources: https://www.youtube.com/watch?v=-H2fRG_Rtns	0	2	0	0
10	Introduction to Seminar	Discussion	Seminar : Needs and ways of preparation Video : https://www.youtube.com/watch?v=R	0	1	0	0

			z2II40tQuI				
11	Questioning Skills	Workshop	Asking and Responding to questions in Seminars TED TALK: https://www.youtube.com/watch?v=PkcHstP6Ht0	0	2	0	0
12	Analysis of various Seminars	Videos and Discussion	Analysis of Seminars: Pros and Cons How to make a seminar effective? https://www.youtube.com/watch?v=x7qPAY9JqE4	0	1	1	0
13	Preparing for a Seminar	Group Work	Grouping Selection of topics	0	1	0	0
14	Collection of Information	Workshop	Primary and secondary sources Preparing sample PPTs	0	2	0	0
15	Seminar Presentation-I	Group Work	Demonstration and Discussion	0	2	0	0
16	Seminar Presentation-II		Demonstration and Discussion	0	2	0	0

FCHU1210PROFESSIONAL ETIQUETTE

Pre - requisites	Course Type	Credits
Nil	Workshop	2

Etiquette begins with meeting and greeting. Good professional etiquettes indicate that you are a mature responsible, adult who can aptly represent any organization. Etiquettes center upon respect.

COURSE OBJECTIVES

- To recognize the importance of proper etiquette at workplace
- To understand the elements and characteristics of proper etiquette
- To behave professionally and gain respect
- To develop an action plan to improve professionalism

COURSE OUTCOMES

At the end of this course students would be able to learn:

- Professional behavior, standards for appearance, action and attitude in a business environment
- Handle a variety of social and business situation
- Different styles of communication based on different situations.

MODULE- I: MEETING AND GREETING ETIQUETTE, OFFICE ETIQUETTE (7hrs)

- Personal Branding and First Impressions
- Introducing yourself and introducing a guest
- Professionalism at office
- Language styles, tone and attitude

MODULE-II: COMMUNICATION EXCELLENCE (7hrs)

- Techno Etiquette
- Phone Etiquette
- Email Etiquette
- Social Media Etiquette

MODULE-III: NETWORKING ETIQUETTE (6hrs)

- Business Card Etiquette
- Names
- Titles
- Net Etiquette
- Proper Introductions

MODULE-IV: BUSINESS ETIQUETTE (7)

- Presentation Etiquette
- Meeting Etiquette
- Dining Etiquette
- Global Etiquette

TEXT BOOK:

The New Etiquette, Real Manners for Real People in Real situations- An A-to-Z Guide by Marjabella Young Stewart, St. Martin Griffin.

Soft Skills, Know Yourself and the World, K.Alex.

REFERENCES:

Do's and Taboos of Hosting International Visitors, Roger E. Axtell, John Wiley & Sons, Inc.

Breaking through Culture Shock: What You Need to Succeed in International Business by Elisabeth Marx.

Dos and Taboos of International Trade by Roger E. Axtell, John Wiley & Sons, Inc.

The Art of Writing Effective E-mails, Jayprakash, Sajitha, Himalayan Publications.

International Communication Management-Individual & Organizational Outcomes by Antonio Ragus, Bookboon, 2010.

Business Communication for Success by Scott Mac Lean, Flat World Knowledge, 2010.

Effective Technical Communication, M. Ashraf Rizvi, TMH Publications.

EVALUATION SYSTEM (CONTINUOUS INTERNAL ASSESSMENT)

Methods	Introducing others, Small Talk	Role Play in formal & informal situations	Presentation	Telephonic interview	Email	Mock Meeting	Quiz on Professional Etiquette	% of Marks 100(Best 5)
Total	20	20	20	20	20	20	20	100

LESSON PLAN: PROFESSIONAL ETIQUETTE

S. No.	Topic	Pedagogy	Details	Instructional Hrs			
	MODULE 1: MEETING & GREETING ETIQUETTE, OFFICE ETIQUETTE			Th	Prac t	vide o	Pro j
1	Personal Introduction	Role play on formal situation with proper introduction	http://smallbusiness.chron.com/first-impressions-business-etiquette-2908.html	0	1	0	0
2	Introducing Others	Knowing each other Fish bowl game	http://www.fasset.org.za/downloads/Office_Etiquette_Material/Handbook_Essential_Office_Etiquette.pdf				
3	Basics of Etiquette	Video clips Small skits	http://www.fasset.org.za/downloads/Office_Etiquette_Material/Handbook_Essential_Office_Etiquette.pdf	0	1	0	0
4	Interpersonal Etiquette	Video clips Activity on using speech acts with appropriate body language Guessing game	http://www.fasset.org.za/downloads/Office_Etiquette_Material/Handbook_Essential_Office_Etiquette.pdf	0	1	0	0
5	Professionalism And Front Office Etiquette	Video Clips Role play on front office management on their dream company Quiz	http://careerplanning.about.com/od/workplacesurvival/a/professionalism.htm http://www.octech.edu/sites/www/uploads/files/TRIO/Professionalism%20in%20the%20Workplace.pdf	0	1	0	0
6	Professional Conduct	Conversational practice and SWOT Analysis in pair/group task	http://www.fasset.org.za/downloads/Office_Etiquette_Material/Handbook_Essential_Office_Etiquette.pdf	0	1	0	0
7	Professionalism And Front Office Etiquette	Video Clips Role play on front office management on their dream company Quiz	http://careerplanning.about.com/od/workplacesurvival/a/professionalism.htm http://www.octech.edu/sites/www/uploads/files/TRIO/Professionalism%20in%20the%20Workplace.pdf	0	1	0	0
8	Formal & Informal Attire	Communication Game Quiz	http://www.fasset.org.za/downloads/Office_Etiquette_Material/Handbook_Essential_Office_Etiquette.pdf	0	1	0	0

9	Language Etiquette And Attitude	Enactment in different formal situations with appropriate communication styles	http://www.english.wisc.edu/rfyoung/336/attitudes.pdf https://blog.udemy.com/communication-styles/ http://www.english.wisc.edu/rfyoung/336/attitudes.pdf	0	1	0	0
10	Techno Etiquette	Conversational practice and Small skits	http://theedgeexecutivecoaching.com/articles/etiquette/techno-etiquette/# Question & Answers : http://www.workforce.com/articles/q-a-about-techno-etiquette	0	1	0	0
11	Smart Phone Etiquette	Dialogue Exchange Telephonic Quiz	http://www.talkenglish.com/LessonPractice.aspx?ALID=483	0	1	0	0
12	Email Etiquette Social Media Etiquette	Video Clips Written task practice Group work Debate	http://www.businessemail etiquette.com/business-e-mail-etiquette-basics/ http://www.realsimple.com/work-life/work-life-etiquette/manners/social-media-etiquette http://www.moneycrashers.com/social-media-etiquette-tips-personal-business/ Video : https://www.youtube.com/watch?v=RfZwtkoNGrk https://www.youtube.com/watch?v=otxiibcOWc	0	0	1	0

MODULE II: COMMUNICATION EXCELLENCE (7 HOURS)

S. No.	Topic	Pedagogy	Details	Instructional Hrs			
				Th	Pract	vide o	Pro j
10	Techno Etiquette	Conversational practice and Small skits	http://theedgeexecutivecoaching.com/articles/etiquette/techno-etiquette/# Question & Answers : http://www.workforce.com/articles/q-a-about-techno-etiquette	0	1	0	0
11	Smart Phone Etiquette	Dialogue Exchange Telephonic Quiz	http://www.talkenglish.com/LessonPractice.aspx?ALID=483	0	1	0	0
12	Email Etiquette Social Media Etiquette	Video Clips Written task practice Group work Debate	http://www.businessemail etiquette.com/business-e-mail-etiquette-basics/ http://www.realsimple.com/work-life/work-life-etiquette/manners/social-media-etiquette http://www.moneycrashers.com/social-media-etiquette-tips-personal-business/ Video :	0	0	1	0

			https://www.youtube.com/watch?v=RFZwtkoNGrk https://www.youtube.com/watch?v=ootxii bcOWc				
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MODULE-III NETWORKING ETIQUETTE (6HRS)

S. No.	Topic	Pedagogy	Details	Instructional Hrs			
				Th	Pract	vide o	Pro j
13	Netiquette	Written Assignment Drafting Email	http://jillbremer.com/articles/etiquette/techno-etiquette/ http://www.slideshare.net/MarcellineChitolie/techno-etiquette-final-copy	0	1	1	0
14	Business Card Etiquette	Presentations and small group work	http://www.careerealism.com/3-rules-to-smart-business-card-etiquette/	0	1	1	0
15	Forms of Addressing	Written assignment Scrabble and puzzles	http://www.talkenglish.com/LessonPractice.aspx?ALID=483	0	1	1	0

MODULE IV: BUSINESS ETIQUETTE (7 hours)

S. No.	Topic	Pedagogy	Details	Instructional Hrs			
				Th	Pract	vide o	Pro j
16	Presentation Etiquette	Demonstration	http://dianegottzman.com/2013/11/business-etiquette-9-powerful-presentation-tips/ http://dianegottzman.com/2012/07/stand-and-deliver-ten-tips-to-delivering-a-powerful-presentation/	0	1	1	0
17	Meeting Etiquette	Mock Meeting	http://businessculture.org/northern-europe/uk-business-culture/meeting-etiquette/ http://www.fasset.org.za/downloads/Office_Etiquette_Material/Handbook_Essential_Office_Etiquette.pdf	0	1	1	0
18	Dinning Etiquette	Activity on- Playing the role of the Host/Hostess, Playing the role of the Guest	Rizvi, ETC, pp.139-164 Soft Skill, Dr.K.Alex-pp-203-219	0	1	1	0

S.	Topic	Pedagogy	Details	Instructional Hrs			
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No.				Th	Prac t	vide o	Pro j
19	Golden Rules of Global Etiquette	Discussion and Activity	Developing intercultural skill http://www.kwintessential.co.uk/cultural-services/articles/international-business-etiquette.html http://www.kwintessential.co.uk/resources/country-profiles.html http://www.forbes.com/sites/susanadams/2012/06/15/business-etiquette-tips-for-international-travel/ http://www.marcaria.com/international-business-etiquette-customs-and-culture.asp	0	1	1	0
20	Doubt Clearing	One-to-One Interaction	Practice	0	1	0	0
21	Recap	Discussion	Performance Analysis	0	1	0	0

FCHU1211 CREATIVE WRITING

Pre - requisites	Course Type	Credits
Nil	Workshop	2

The aim of the course is to prepare students for careers in a workplace that is information-rich and that increasingly values communication skills and the ability to think creatively and critically. The class time will be devoted to writing workshop, innovation exercises, and the critical appreciation of write-ups. The Creative Writing course will focus on

- Reading
- Writing Creatively
- Presentations

Thus the main objective is to breed a culture of learning where students learn a variety of approaches to creative writing in a cooperative learning environment.

COURSE OBJECTIVES

- Develop thinking skills
- Acquire basic skills and techniques to develop a suitable practice of creative writing in context

- Use a constructive approach to critique his/her own work, as well as work by his/her peers
- Organize, prepare and present spoken presentations clearly and expressively

COURSE OUTCOMES

Upon the Completion of the course, a student will

- Create Blog/ Online Presence
- Submit works for publication
- Compose a variety of written responses for different purposes and audiences
- Collaborate by sharing ideas, examples and insights, productively and respectfully in informal conversations and discussions.
- Students will put into practice the learning into the personal, professional and technical sphere.

MODULE -I: WRITING CREATIVELY (12hrs)

Foundational activities

- Introduction to Class Standards

(Workshops, peer conferencing, blogging, reading outside the classroom)

- Collaborative Creation of Classroom Philosophy
- Basics of Creative Writing

Different forms of expression

- Memoirs/Writing the Personal Narratives
- Situational Writing/ Writing for the Target Audience
- Dialogues, Essay, Poetry Slam
- Script Writing
- Writing for Blogs
- Cooking Up Interview Stories

Writing from visuals

- Pictures, Graphs, Images, Diagrams and Designs, Cartoons
- Brochures and Newsletters

(This module will be facilitated through creative writing and speaking activities)

MODULE-II: READING AND CRITICAL APPRECIATION (8hrs)

- Book

(Independent Study: Two Master Piece)

- Article
- Movie

(Student Work: Free Choice, Discussion and Oral/ Written Critiquing, Editing/ Revision

- Publication/ Sharing, Short Report on Two Authors

(This module will be facilitated through reading activities and critical appreciation)

MODULE-III: POWER OF LATERAL THINKING TO CREATE NEW IDEAS (7hrs)

- General Concepts: Creativity and Lateral Thinking
- Using the Technique of Lateral Thinking in Writing
- Idea Generation Games and Activities
- Six Thinking Hats

(This module will be facilitated through idea generation activities and presentation)

TEXT BOOKS

Creative Writing: A Workbook with Readings- Linda Anderson

Creative Writing- By DevAnjanaNeira

REFERENCES

The Cambridge Companion to Creative Writing by David Morley, Philip Neilsen

Creative Writing- By Adele Ramet

The Creative Writing Mfa Handbook: A Guide for Prospective Graduate Students By Tom Kealey

EVALUATION SYSTEM (CONTINUOUS INTERNAL ASSESSMENT)

Methods	Memoirs	Essay/ Dialogue Writing	Slam Poetry	Script Writing	Writing for Blog	Presentation from Visuals	Cooking up Interview Stories	% of Marks 100(Best 5)
Total	20	20	20	20	20	20	20	100

**SESSION PLAN: CREATIVE WRITING
MODULE-1 : WRITING CREATIVELY (12 hours)**

S. No.	Topics	Pedagogy	Details	Instructional Hrs			
				Th	Prac t	Vide o	Proj
1	Foundational activities Introduction to Class Standards (Workshops, peer conferencing, blogging, reading outside the classroom)	Conversational practice, Role Plays	https://www.teachingchannel.org/videos/peer-conferencing https://blogging.org/	0	2	0	0
2	Collaborative Creation of Classroom Philosophy	Group tasks	http://writing-speech.dartmouth.edu/teaching/first-year-writing-pedagogies-methods-design/collaborative-learninglearning-peers	0	2	0	0
3	Basics of Creative Writing	Video links /Practice	https://www.earlham.edu/media/894432/creative_writing_rules.pdf http://www.idiotsguides.com/education/creative-writing/creative-writing-basics/ https://www.youtube.com/watch?v=syuuXYpV4zA	0	2	0	0
4	Different forms of expression Memoirs/Writing the Personal Narratives Situational Writing/ Writing for the Target Audience	Group work, writing, video links ,	http://classroom.synonym.com/difference-between-memoir-personal-narrative-1729.html https://www.quia.com/files/quia/users/learningcircle/Situational-Writing-Tips https://www.youtube.com/watch?v=PLHkuSpJxPs https://www.youtube.com/watch?v=ZA3xtoKkWas	0	2	0	0
5	Dialogues, Essay, Poetry Slam	Role Plays, Written tasks	https://www.youtube.com/watch?v=zJGX2raiafU https://en.wikipedia.org/wiki/Poetry_slam Examples of poetry slams : http://www.poetrysoup.com/poems/best/slam	0	2	0	0
6	Script Writing Writing for Blogs	Writing tasks individual/pa irs Video links	https://www.writersstore.com/how-to-write-a-screenplay-a-guide-to-scriptwriting/ https://www.youtube.com/watch?v=XZs	0	2	0	0

		Blog writing practice	zextv6yE BLOGS :https://www.youtube.com/watch?v=t21sKonfyk				
7	Cooking Up Interview Stories		https://www.themuse.com/advice/6-types-of-stories-you-should-have-on-hand-for-job-interviews http://lifehacker.com/prepare-these-15-stories-for-your-next-job-interview-1610270959 https://www.themuse.com/advice/the-interview-technique-you-should-be-using	0	1	0	0
8	Writing from visuals Pictures, Graphs, Images, Diagrams and Designs, Cartoons Brochures and Newsletters		https://twp.duke.edu/uploads/assets/Using%20Visual%20Rhetoric%20in%20Academic%20Writing.pdf https://www.youtube.com/watch?v=r6ZVGBQYNXE	0	1	0	0

MODULE-II: READING AND CRITICAL APPRECIATION 8 HOURS)

S. No.	Topics	Pedagogy	Details	Instructional Hrs			
				Th	Pract	Vide o	Proj
9	Book (Independent Study: Two Master Piece)		http://www.howtolearn.com/2012/08/different-reading-techniques-and-when-to-use-them/	0	2	0	0
10	Article writing			0	2	0	0
11	Movie Review (Student Work: Free Choice, Discussion and Oral/ Written Critiquing, Editing/ Revision			0	1	1	0
12	Publication/ Sharing, Short Report on Two Authors		https://www.elsevier.com/authors/book-authors/science-and-technology-book-publishing/overview-of-the-publishing-process	0	2	0	0

MODULE-III: POWER OF LATERAL THINKING TO CREATE NEW IDEAS (7hrs)

S. No.	Topics	Pedagogy	Details	Instructional Hrs			
				Th	Pract	Vide o	Proj
13	General Concepts: Creativity and Lateral	Role Plays/ Oral	www.brainstorming.co.uk/tutorials/definitions.html	0	1	1	0

	Thinking	Presentations Practice	http://www.trainingcoursematerial.com/free-training-articles/creativity-problem-solving-decision-making-and-lateral-thinking/defining-lateral-thinking-parallel-thinking-creativity-and-innovation Video : https://www.youtube.com/watch?v=H7PyFNzPSVY				
14	Idea Generation Games and Activities	Pair/group activities	http://study.com/academy/lesson/what-is-idea-generation-definition-process-techniques.html	0	1	1	0
15	Six Thinking Hats	Group task	http://www.debonogroup.com/six_thinking_hats.php	0	1	1	0
16	DOUBT CLEARING			0	1	0	0

FCHU1212ENGLISH FOR COMPETITION (GRE/GMAT/TOEFL/IELTS)

Pre - requisites	Course Type	Credits
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Nil	Workshop	2
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COURSE OBJECTIVE

- Familiarize the learners with the pattern of the TOEFL/GMAT/IELTS/GRE examination and improve overall English skills to face the competitive exams confidently.

COURSE OUTCOME

- Learners understand the pattern of the TOEFL, IELTS and GRE examination and apply test-taking strategies in exams.

A student is required to take up five laboratory tests of 100 marks.

LIST OF EXPERIMENTS

1: TOEFL Listening

Developing Listening Comprehension by taking notes after the short recorded conversations.

2: TOEFL Speaking

Developing test taking strategies to face speaking test of TOEFL exam through role play and Mock Interview.

3: TOEFL Reading

Practicing and improving student's confidence in completing the various sections of reading test in TOEFL examination.

4: TOEFL Writing

Learning and enhancing writing skills required for TOEFL writing test.

5: IELTS Listening

Practicing the listening comprehension of the students and handling questions while listening the recorded conversations.

6: IELTS Speaking

Developing test taking strategies to face speaking test of IELTS examination through role plays and mock interviews.

7: IELTS Writing

Summarizing or explaining information presented in a graph, chart, table or diagram.

8: IELTS Reading

Understanding and interpreting the text in its particular use of language, ideas and style.

9: GRE Reading Comprehension

Taking GRE Reading Comprehension examination with confidence utilizing the methods and strategies.

10: GRE SENTENCE COMPLETION

Developing sentence completion strategies through logical thinking.

11: GRE SENTENCE EQUIVALENCE

Learning and developing strategies to deal with sentence equivalence questions.

12: GRE VOCABULARY

Understanding and using appropriate choice of vocabulary in GRE vocabulary section.

13. GRE Vocabulary & Verbal-Sentence Corrections

14. GMAT Verbal-Critical Reasoning

15. GMAT Verbal- Reading Comprehension

(The entire lab will be facilitated through online quizzes, and practice sets available in language lab))

TEXT BOOKS:

NorthStar Building Skills for the TOEFL iBT, High Intermediate Level (Pearson Education).

NorthStar Building Skills for the TOEFL iBT, Intermediate Level (Pearson Education).

McGraw-Hill's New GRE: 2011-2012 Edition

Princeton Review: Cracking the New GRE 2012

REFERENCES:

Longman Preparation Course for the TOEFL Test – iBT Speaking (Pearson Education).

Longman Preparation Course for the TOEFL Test – iBT Listening (Pearson Education).
 Longman Preparation Course for the TOEFL Test – iBT Writing (Pearson Education).
 Longman Preparation Course for the TOEFL Test – iBT Reading (Pearson Education).
 NorthStar Building Skills for the TOEFL iBT, Advanced Level (Pearson Education).
 Achieve IELTS Workbook: Intermediate to Upper Intermediate: English for International Education
 (Achieve IELTS Intermediate/Upper) (Paperback).
 Kaplan New GRE Premier 2011-2012
 Barron’s New GRE 19th Edition Grade
 Manhattan GRE
 Gruber’s Complete GRE Guide 2012
 Nova’s GRE Prep Course Grade
 ETS’s Official Guide to the GRE Revised General Test
 Barron’s GRE Verbal Workbook
 Barron's IELTS with Audio CD: International English Language Testing System (Paperback)
 Achieve IELTS Teacher's Book: Intermediate to Upper Intermediate: English for International Education
 (Achieve IELTS Intermediate/Upper) (Paperback)
 Step Up to IELTS Self-study Student's Book [STUDENT EDITION] (Paperback)
 IELTS Collected Papers: Research in speaking and writing assessment (Studies in Language Testing)
 (Paperback)
EVALUATION SYSTEM (CONTINUOUS INTERNAL ASSESSMENT)

Methods	Listening & fill-up blanks, short answers, Multiple-choice	JAM/ Questions & Responses	Vocabulary Quiz, Sentence Completion & Re-order paragraphs	Reading Comprehension	Summarize /Data Comment	Essay Writing	Analytical Writing	% of Marks 100 (Best 5)
Total	20	20	20	20	20	20	20	100

SESSION PLAN: ENGLISH FOR COMPETITION

S. No.	Topic	Pedagogy	Details	Instructional Hrs			
				Th	Pract	vide	Pro
1	TOEFL Listening	Listening Activity Based Learning	http://www.examenglish.com/TOEFL/toefl_listening.htm	0	1	1	0
2	TOEFL Speaking	Listening and speaking activity	http://www.examenglish.com/TOEFL/TOEFL_Speaking_part5.htm	0	1	1	0
3	TOEFL Reading & Writing	Reading and Writing Practice	http://www.examenglish.com/TOEFL/TOEFL_reading1.htm (Reading) https://www.englishclub.com/esl-	0	2	0	0

			exams/ets-toefl-practice-writing.htm http://www.time4writing.com/toefl/ (Writing)				
4	IELTS Listening	Listening Practice	http://takeielts.britishcouncil.org/prepare-your-test/free-ielts-practice-tests/listening-practice-test-1	0	1	1	0
5	IELTS Speaking	Speaking Practice	http://takeielts.britishcouncil.org/prepare-your-test/free-practice-tests/speaking-practice-test-1	0	2	0	0
6	IELTS Writing & Reading	Writing & Reading Practice	http://takeielts.britishcouncil.org/prepare-your-test/free-practice-tests/writing-practice-test-1-ielts-academic http://takeielts.britishcouncil.org/sites/default/files/Writing_practice_test_1_IELTS_Academic_questions.pdf (writing) http://takeielts.britishcouncil.org/prepare-test/practice-tests/reading-practice-test-1-academic (Reading)	0	2	0	0
7	GRE Reading Comprehension	Reading Practice	http://gre.graduateshotline.com/reading_comprehension_practice.html#.V2kJDRITXCM https://www.ets.org/gre/revised_general/prepare/verbal_reasoning/reading_comprehension/sample_questions	0	2	0	0
8	GRE Sentence Completion & Sentence Equivalence	Online practice	http://gre.graduateshotline.com/gre_sentence_completion.pl https://www.ets.org/gre/revised_general/prepare/verbal_reasoning/text_completion/sample_questions http://www.examfocus.com/gre/pt/verbal/sentence-equivalence-1.html	0	2	0	0
9	GRE Vocabulary	Online practice	http://gre.graduateshotline.com/	0	2	0	0
10	GMA Verbal-Sentence Corrections	Online practice	http://freegmattest.net/Questions http://www.majortests.com/gmat/sentence_correction.php	0	2	0	0
11	GMAT Verbal-Critical Reasoning	Online practice	http://www.majortests.com/gmat/critical_reasoning_test01	0	2	0	0
12	GMAT Verbal-Reading Comprehension	Online practice	http://www.majortests.com/gmat/reading_comprehension_test01	0	2	0	0

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FCHU1213BE A CONTRIBUTOR

Pre - requisites	Course Type	Credits
Nil	Workshop	2

PROGRAM OBJECTIVES:



1. Build consciousness of ‘contributor thinking’ in students systematically by exposing them to the essential building blocks of contributor thinking. [The 4 sets of the program represent the 4 fundamental building block of the program]
2. Through projects expose students to the ‘realness’ of contributor way of thinking in the world around them.

SESSION PLAN:

Semester 1 of program delivery	SET 1: CONTRIBUTOR BASICS	
	UNIT 1: Who is a Contributor?	~5hrs
	UNIT 2: Scope of Contribution (Self, Organization, Society)	~5hrs
	UNIT 3: Depth of Contribution (From ‘opportunities to contribute’ to a ‘life of Purpose’)	~5hrs
	SET 2: BASIC AXIOMS OF LIFE	
	UNIT 4: The Contributor’s Response (From ‘victim’ to ‘creator of my destiny’)	~5hrs
	UNIT 5: The Contributor’s Identity (From ‘static identities’ to ‘dynamic identities’)	~5hrs
Semester 2 of program delivery	UNIT 6: The Contributor’s Vision of Success & Career (From an ‘acquisitive vision’ to a ‘contributive vision’)	
	SET 3: CONTRIBUTOR EFFECTIVENESS	
	UNIT 7: Engage Deeply	~5hrs
	UNIT 8: Design Solutions	~5hrs
	UNIT 9: Create Value	~5hrs
	SET 4: CONTRIBUTOR CONDUCT	
	UNIT 10: Thinking Win-win (Enlightened Self-Interest)	~5hrs
UNIT 11: Thinking Human-impact (Imaginative Sympathy)	~5hrs	
UNIT 12: Building Trust-surplus (Trust Behaviors)	~5hrs	

Full program duration	~60hrs
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1.0 | Faculty can utilise the 5 hours of classroom as follows –

<p>i. The Class Engagement Books (for each unit)</p>  <p>Students fill in the book, in the class, while going through a class engagement</p>	
<p>ii. The Program App (Channel Illumine App)</p>  <p>The app is used along with the book to create a rich learning experience</p> <p>Participants scan the QR-code given in the book to open the relevant app unit.</p>	<p>~ 4hrs for Book and App engagement.</p>
<p>iii. Projects (for each unit)</p> <p>Students can do 1-2 projects in each semester. The project is done out of class. In-class time is only for student presentation.</p>	<p>~1hr for project presentations</p>

Source: This document is an abridged version of ‘Overview of Become a Contributor Program’ given in your Facilitator Guide. It is strongly recommended that faculty refer the detailed Facilitator Guide for more details.

EVALUATION PARAMETERS (Total-100 Marks)

A] ENGAGEMENT IN CLASS		40 marks
1	Regular attendance across classes	10 marks
2	Quality of class participation (involvement in discussions, asking thoughtful questions, sharing examples, etc.)	15 marks
3	In-class assignments <ul style="list-style-type: none"> • Students can be asked to submit their filled books for specific in-class assignments (Illumine can provide a list of which class engagements in each book, can be checked for this) • Any 4 books (one from each set), can be considered for marking. 	15 marks
B] PROJECT WORK <ul style="list-style-type: none"> • Project assignments are provided by Illumine for the course. • Mark students on their best 3, from these project assignments. 		30 marks
1	Completion & submission of assigned projects, with basic quality	10 marks
2	Design and execution of the project (Methodology of project work) (students present how they went about the project – their approach, method, documentation of research work)	10 marks
3	Project presentation & project output uploads (assessed against the project goal)	10 marks
C] PRE & POST TEST		20 marks
1	Completion of pre-test	5 marks
2	Completion of post-test	5 marks
3	Improvement (sent by Illumine, based on test results)	10 marks
D] APP USAGE (sent by Illumine, based on app usage pattern)		10 marks

FCHU0213 LIFE SKILLS DEVELOPMENT-I [Aptitude & Reasoning]

Pre - requisites	Course Type	Credits
Nil	Practice	2

OBJECTIVES

- To provide ample opportunities for practice.
- To make the students solve each & every question within 30-40 seconds.
- To make the students visit all the questions in any exam.
- To make them learn the art of skipping questions which require more time.
- To make the students eligible to score 70% or more in each written tests.

OUTCOMES

- Quantitative Ability skills will be increased.
- Calculation & Logical thinking skills will be increased.
- Time spent per questions will be minimized.
- Students will be able to score minimum of 70%.
- Improved skills to qualify all competitive exams like Campus Written tests, Banking Exams, SSC Exams, Railway Exams, GATE Exams.

MODULE I: (12 HOURS)

S. No.	Topic	Pedagogy	Details	Instructional Hrs			
				Th	Pract	vide o	Proj
1	Speed Math-1	Classroom Practice	Multiplication tricks, Square, cube, square root, Cube root tricks	0	1	0	0
2	Speed Math-2	Classroom Practice	Speed Calculations	0	1	0	0
3	Number System-01	Classroom Practice	Operation on Numbers, Classification of Numbers, Tests of Divisibility, Unit Digit Calculation	0	2	0	0
4	Number System-02	Classroom Practice	Factors & Factorials, Trailing Zeroes, Remainder Theorem	0	2	0	0
5	Series-1	Classroom Practice	Arithmetic Progression, Geometric Progression, Number series (Missing & Wrong)	0	2	0	0
6	Series-2	Classroom Practice	Letter, Alpha numeric, Miscellaneous series	0	2	0	0
	Internal-I	Online / Offline Test	Test & Discussion	0	2	0	0

MODULE-2 (14 HOURS)

S. No.	Topic	Pedagogy	Details	Instructional Hrs			
				Th	Pract	vide o	Proj
	HCF & LCM	Classroom Practice	Concepts, short tricks, question discussion	0	3	0	0
	Average	Classroom Practice	Concepts, short tricks, question discussion	0	2	0	0
	Coding & Decoding	Classroom Practice	Letter Coding, Number coding, Message coding, Substitution coding, Conditional coding	0	3	0	0
	Word Problem	Classroom Practice	Analogy, Odd man out, word formation, letter pair	0	2	0	0
	Logical Thinking	Classroom Practice	Brain Riddles	0	2	0	0
	Internal-II	Online / Offline Test	Test & Discussion	0	2	0	0

EVALUATION SYSTEM: INTERNAL ASSESSMENT (50) + EXTERNAL ASSESSMENT (50)

Methods	Online/Offline Test-I	Online/Offline Test-II	Attendance	Assignment	% of Marks 50
Total	15	15	10	10	100

FCHU0214 LIFE SKILLS DEVELOPMENT-II [Aptitude & Reasoning]

Pre - requisites	Course Type	Credits
LSD-I	Practice	2

OBJECTIVES

- To provide ample opportunities for practice.
- To make the students solve each and every question within 30-40 seconds.
- To make the students visit all the questions in any exam.
- To make them learn the art of skipping questions which require more time.
- To make the students eligible to score 70% or more in each written tests.

OUTCOMES

- Quantitative Ability skills will be increased.
- Calculation & Logical thinking skills will be increased.
- Time spent per questions will be minimized.
- Students will be able to score minimum of 70%.
- Improved skills to qualify all competitive exams like Campus Written tests, Banking Exams, SSC Exams, Railway Exams, GATE Exams.

SESSION PLAN: APTITUDE MODULE I: (13 HOURS)

S. No.	Topic	Pedagogy	Details	Instructional Hrs			
				Th	Pract	video	Proj
1	Percentage-01	Classroom Practice	Basics of Percentage, Effective percentage, shortcuts	0	2	0	0
2	Percentage-02	Classroom Practice	Advanced questions and discussions	0	2	0	0
3	Profit & Loss-01	Classroom Practice	Basics and advanced questions of Profit & Loss and shortcuts	0	2	0	0
4	Profit & Loss-02	Classroom Practice	MRP, Discount, Successive discount	0	1	0	0
5	Order & Ranking	Classroom Practice	Ranking & Sequence	0	2	0	0
6	Direction Sense Test	Classroom Practice	Shortest Distance, Angular movement concept and Dusk & Dawn	0	2	0	0
7	Internal-I	Online / Offline Test	Test & Discussion	0	2	0	0

MODULE II: (13 HOURS)

S. No.	Topic	Pedagogy	Details	Instructional Hrs			
				Th	Pract	vide o	Pro j
1	Ratio & Proportion	Classroom Practice	Types of ratios, Basics & Advanced Question	0	2	0	0
2	Age	Classroom Practice	Concepts & Shortcuts	0	1	0	0
3	Partnership	Classroom Practice	Concepts & Shortcuts	0	1	0	0
4	Mixture & Allegations	Classroom Practice	Rule of Alligation, Basics & Advanced question, Short tricks	0	2	0	0
5	Clock	Classroom Practice	Concepts of Angle, Reflex angle, Right angle Opposite, Coincide and Incorrect clock	0	2	0	0
6	Calendar	Classroom Practice	All concepts & Shortcuts	0	1	0	0
7	Blood Relation	Classroom Practice	Jumbled-up descriptions, coded relations, Relation Puzzles	0	2	0	0
8	Internal-II	Online / Offline Test	Test & Discussion	0	2	0	0

EVALUATION SYSTEM: INTERNAL ASSESSMENT (50) + EXTERNAL ASSESSMENT (50)

Methods	Online/Offline Test-I	Online/Offline Test-II	Attendance	Assignment	% of Marks 50
Total	15	15	10	10	100

FCHU0215 LIFE SKILLS DEVELOPMENT – III [Aptitude & Reasoning]

Pre - requisites	Course Type	Credits
LSD-II	Practice	2

OBJECTIVES

- To provide ample opportunities for practice.
- To make the students solve each and every question within 30-40 seconds.
- To make the students visit all the questions in any exam.
- To make them learn the art of skipping questions which require more time.
- To make the students eligible to score 70% or more in each written tests.

OUTCOMES

- Quantitative Ability skills will be increased.
- Calculation & Logical thinking skills will be increased.
- Time spent per questions will be minimized.
- Students will be able to score minimum of 70%.
- Improved skills to qualify all competitive exams like Campus Written tests, Banking Exams, SSC Exams, Railway Exams, GATE Exams.

SESSION PLAN: APTITUDE MODULE I: (14 HOURS)

S. No.	Topic	Pedagogy	Details	Instructional Hrs			
				Th	Pract	video	Proj
1	Time, Speed, Distance	Classroom Practice	Concepts, Problems based on relations, Average speed, Stoppage time,	0	2	0	0
2	Trains	Classroom Practice	Relative Speed & All types of train problems	0	1	0	0
3	Boats & Streams	Classroom Practice	Basics, Upstream, Downstream & Shortcuts	0	1	0	0
4	Race	Classroom Practice	All concepts & Shortcuts	0	1	0	0
4	Time & Work	Classroom Practice	Time & Work (Efficiency, wages, alternative day, chain rule)	0	3	0	0
5	Pipes & Cistern	Classroom Practice	Pipes & Cisterns (-ve & +ve work)	0	1	0	0
6	Cubes & Dices	Classroom Practice	All concepts & Shortcuts	0	1	0	0
7	Cubes & Cuboids	Classroom Practice	All concepts & Shortcuts	0	1	0	0
8	Embedded Figure & Figure	Classroom Practice	All concepts & Shortcuts	0	1	0	0

	series						
9	Internal-I	Online / Offline Test	Test & Discussion	0	2	0	0

MODULE II: (13 HOURS)

S. No.	Topic	Pedagogy	Details	Instructional Hrs			
				Th	Pract	vide o	Proj
1	SI	Classroom Practice	Concepts & Shortcuts on Simple Interest & Installments	0	2	0	0
2	CI	Classroom Practice	Concepts & Shortcuts on Compound Interest & Installments	0	2	0	0
3	Logarithm	Classroom Practice	All Formulae, concepts & Shortcuts	0	1	0	0
4	Equation	Classroom Practice	Linear & Quadratic	0	2	0	0
5	Figure Puzzle & Figure grouping	Classroom Practice	All concepts & Shortcuts	0	1	0	0
6	Figure Counting	Classroom Practice	All concepts & Shortcuts	0	1	0	0
7	Mirror & Water Image	Classroom Practice	All concepts & Shortcuts	0	1	0	0
8	Paper Cutting & Paper folding	Classroom Practice	All concepts & Shortcuts	0	1	0	0
9	Internal-II	Online / Offline Test	Test & Discussion	0	2	0	0

EVALUATION SYSTEM: INTERNAL ASSESSMENT (50) + EXTERNAL ASSESSMENT (50)

Methods	Online/Offline Test-I	Online/Offline Test-II	Attendance	Assignment	% of Marks 50
Total	15	15	10	10	100

FCHU0216 LIFE SKILLS DEVELOPMENT – IV [Aptitude & Reasoning]

Pre - requisites	Course Type	Credits
LSD-III	Practice	2

OBJECTIVES

- To provide ample opportunities for practice.
- To make the students solve each and every question within 30-40 seconds.
- To make the students visit all the questions in any exam.
- To make them learn the art of skipping questions which require more time.
- To make the students eligible to score 70% or more in each written tests.

OUTCOMES

- Quantitative Ability skills will be increased.
- Calculation & Logical thinking skills will be increased.
- Time spent per questions will be minimized.
- Students will be able to score minimum of 70%.
- Improved skills to qualify all competitive exams like Campus Written tests, Banking Exams, SSC Exams, Railway Exams, GATE Exams.

SESSION PLAN: APTITUDE MODULE I: (14 HOURS)

S. No.	Topic	Pedagogy	Details	Instructional Hrs			
				Th	Pract	video	Proj
1	Permutation	Classroom Practice	All concepts & Shortcuts on factorial, fundamental principles of counting	0	2	0	0
2	Combination	Classroom Practice	All concepts & Shortcuts on Selection (Groups/teams)	0	2	0	0
3	Probability	Classroom Practice	Terms related to Probability, Event, Theorems related Probability, Conditional Probability. Shortcuts on coins, dices, balls, cards, etc	0	2	0	0
4	Sitting Arrangement	Classroom Practice	Circular, Square, Rectangular, Linear, Triangular	0	2	0	0
5	Puzzle	Classroom Practice	Box, Floor, Month, Day	0	2	0	0
6	Advanced Puzzle	Classroom Practice	3 variable	0	2	0	0
7	Internal-I	Online / Offline Test	Test & Discussion	0	2	0	0

MODULE II: (14 HOURS)

S. No.	Topic	Pedagogy	Details	Instructional Hrs			
				Th	Pract	vide o	Proj
1	Data Interpretation	Classroom Practice	(Bar/Pi-Chart /Line graph)	0	2	0	0
2	Mensuration	Classroom Practice	Area & Volume	0	2	0	0
3	Height & Distance	Classroom Practice	Lines of Sight, Horizontal line, Angle of Elevation, Angle of Depression	0	1	0	0
4	Logical Venn Diagram	Classroom Practice	All concepts & Shortcuts	0	1	0	0
5	Syllogism	Classroom Practice	All concepts & Shortcuts	0	2	0	0
6	Statement Assumption	Classroom Practice	All concepts & Shortcuts	0	1	0	0
7	Statement Conclusion	Classroom Practice	All concepts & Shortcuts	0	1	0	0
8	Data Sufficiency	Classroom Practice	All concepts & Shortcuts	0	2	0	0
9	Internal-II	Online / Offline Test	Test & Discussion	0	2	0	0

EVALUATION SYSTEM: INTERNAL ASSESSMENT (50) + EXTERNAL ASSESSMENT (50)

Methods	Online/Offline Test-I	Online/Offline Test-II	Attendance	Assignment	% of Marks 50
Total	15	15	10	10	100

FCMG0114 ECONOMICS

Pre - requisites	Course Type	Credits
Nil	Theory	2

Course Objective:

In today's dynamic economic environment, effective managerial decision making requires timely and efficient use of information. The basic purpose of this course is to provide students with a basic understanding of the economic principles, methodologies and analytical tools that can be used in business decision making problems. It provides an understanding of the economic environment and its impact on strategy formulation. The course also focuses on the impact of economic policies on managerial decision-making by providing an understanding of fiscal policy, and national and global economic issues affecting business.

The language of science (and all analytical thinking) is mathematics. Since economics is a social science, use of some mathematical tools, basically the constrained and un-constrained optimization techniques will help in measuring and solving the basic economic problems and thus improves decision-making. It becomes difficult and totally un-practicable to solve business (economic) problems logically and systematically without use of mathematics. The basic objective is to solve problems mathematically and interpret the results economically.

Module-1: Micro Economics

Introduction to economics: Scarcity, Choice and Efficiency, Fundamental issues of what, how and for whom to produce to make the best use of economics. Demand for a commodity: Law of demand, Demand schedule and demand curve, Individual and market demand, Change in demand, Consumer behavior: Analysing law of demand through Marshallian utility analysis, Indifference curve technique and Consumer Surplus.

Elasticity of demand: Price Elasticity of demand: Estimation, Types, Elasticity and revenue, Factors affecting price elasticity of demand. Income elasticity, Cross elasticity, Uses of different concepts of elasticity in business decisions.

Analysis of Supply: Law of Supply, Supply schedule and supply curve, Change in supply, Price elasticity of supply, Equilibrium of demand and supply: Equilibrium with demand and supply curves, Effect of a shift of demand and supply curves.

Production Function: Production function with one variable input, Production function with two variable inputs, optimal combination of inputs, Returns to scale

Cost Theory: Types of costs, Production and cost, Short-run cost functions, Long-run cost functions, Economies of scale and scope, Cost-Volume-profit Analysis

Market: Meaning, types and characteristics of different market structure (Perfect competition, Monopoly, Monopolistic competition and Oligopoly)

Module: 2: Macro Economics

National Income Accounting: Circular flow of Income, National Income Concept, Eight variants of national product aggregates, Measurement (Income, Value Added and Expenditure), Real and Nominal GNP, Difficulties in measuring the national income, Uses of National income statistics, Money and Inflation: Demand for and supply of money. Causes and consequences of Inflation. Commercial and central banking: Role and functions of commercial banks and R.B.I., Monetary Policy and Fiscal policy: Objectives and Instruments, Balance of Payment (BoP): Meaning, BoP Account, Disequilibrium in BoP, Measures to correct disequilibrium in BoP, Foreign Exchange: Floating Exchange Rate and Fixed Exchange Rates

Books & Reference:

- Managerial Economics in a Global Economy, by D. Salvatore, Sixth Edition, OUP, 2008

- Managerial Economics, Truett&Truett, Wiley Publication.
- Managerial Economics, by Petersen Craig H. Cris Lewis and S.K. Jain, Pearson, 2007
- Modern Micro Economics, ,Koutsoyiannis, (1975) , A, Macmillan Press
- Managerial Economics, Mehta, P. L (1999), Sultan Chand & Sons
- Principles of Microeconomics, Mankiw, N. G (2006), Cengage Learning
- Macroeconomics, Mankiw, N. G, (2009), Worth Publishers
- Macroeconomics, Theory and Policy, Dwivedy, D.N (2007), Tata McGraw Hill
- Macroeconomics, D'Souza, E (2008), Pearson Education
- Macroeconomic Analysis, Shapiro, E (2003), Galgotia Publications
- Environmental Economics in Theory and Practice – Hankey N, Shogren J F, and White B – 1999 – Macmillan Indian Limited
- Indian Economy, Mishra &Puri (2011), Himalaya Publishing House

FCMG0102 ACCOUNTING AND FINANCE

Pre - requisites	Course Type	Credits
Nil	Theory	2

Course Objective:

- To familiarize the students with basic terms of accounting, accounting principles, concepts and convention.
- To equip the students with various concepts, tools and techniques of Cost accounting as well as Management accounting essential for managerial decision making process.
- To aware students overview of Time Value of Money, Working Capital and Stock Market

Course outcomes:

On the successful completion of this paper the students should be able composed the information about:

- Develop a basic understanding of accounting and financial ratio analysis.
- Students will be able to create, balance and deliver a budget and use budget information for planning and decision purposes.
- Undertake various costing techniques and information for planning and decision-making
- Demonstrate time management by understand various financial funding options for project planning and working capital management of an organizations.
- Know how financial markets as well as the global economy are impacting their organization today and how they will impact their organization into the future.

Module 1:

Basic Accounting Concepts and Conventions, Basic Accounting Equation, Accounting Mechanism: Journals, Ledgers, Trial Balance, Basic Financial Statements: Analysis of Items found in Balance Sheet and Income Statement, Ratio Analysis

Module 2:

Cost Concepts and Cost Terms: Financial Accounting vrs. Cost Accounting, Direct and Indirect Costs, Fixed, Variable and Semi-variable Costs, Standard, Budgeted and Actual Costs, Controllable and Non-controllable costs, Preparation of Cost Sheet, Cost-Volume-Profit Analysis: Concept of Marginal Cost and Contribution, Concept of Break Even Analysis, Applications of Marginal Costing

Module 3:

Time Value of Money: Concept, Simple and Compound Interest, Present Value of a Single Amount, Present Value of an Uneven Series, Future Value of an Annuity, Present Value of an Annuity
Working Capital Management: Meaning and Components of Working Capital, Determinants of Working Capital, Profitability-Risk Trade-off, Types of Working Capital, Importance of Working Capital, Operating Cycle: Concept and Estimation
Stock Market: Types of Capital Issues: Initial Public Offer, Follow-on Public Offer, Rights Issues, Preferential Issues, Red-herring Prospectus, Free Pricing of Issues, Greenshoe Option, Lock-in Period, Safety Net, Listing of Securities on Stock Exchanges

Books Recommended:

1. Accounting for Management—Ashok Sehgal, Taxxman
2. Financial Accounting -- A managerial Perspective, R. Narayanswamy, PHI
3. Khan & Jain – Management Accounting, TMH.
4. Horngren ,Datar, Foster- Cost Accounting, Pearson.
5. Financial Accounting, Jain/Narang/Agrawal, Kalyani.
6. Basic Financial Accounting for Management, Shah, Oxford.
7. Financial Management by I. M. Pandey
8. Financial Management – Theory and Practice by Chandra
9. Financial Management – Text and Problems by Khan & Jain

FCMG0103 MANAGEMENT PROCESSES AND ORGANIZATIONAL BEHAVIOR

Pre - requisites	Course Type	Credits
Nil	Theory	2

Course Objectives:

Management as a subject of study has brought a new paradigm in managing organizations. The young professionals has to learn and reflect the basic principles of management. Along with it the knowledge of Individual and group behaviour and its impact at the workplace is vital. Organizational Behavior (OB) is a field of study that investigates the impact that individuals, groups, and structure have on behavior within an organization. Then it applies that knowledge to make organizations work more effectively. This course will expose students to gain knowledge on the basic principles of management and organization behavior.

Course Introduction

Management as a subject of study has brought a new paradigm in managing organizations. The young professionals has to learn and reflect the basic principles of management. Along with it the knowledge of Individual and group behaviour and its impact at the workplace is vital. Organizational Behavior (OB) is a field of study that investigates the impact that individuals, groups, and structure have on behavior within an organization. Then it applies that knowledge to make organizations work more effectively. This course will expose students to gain knowledge on the basic principles of management and organization behavior.

Course Content**Unit: I**

Emergence of Management as a discipline, Principles of management, (Planning, organizing, staffing and controlling) Contributions to management by Luther Gullick , Henri Fayol and Peter F. Drucker and Introduction: Concept and models of OB, Approaches to OB (Systems, Human resource and Contingency)

Unit: II

Individual System: Learning, Perception, Personality and Motivation,

Unit: III

Social System: Group Dynamics and Leadership.

Books Recommended:

1. Robins &Sanghii; Organizational Behavior, Pearson
2. Luthans ,F; Organizational Behavior-TMH
3. UdaiPareek ; Understanding Organizational Behavior, Oxford
4. Prasad,L.M; Organization behavior, S.Chand.
5. K. Aswathappa; Organization behaviour

6. Prasad.L.M ; Principles of Management,

FCMG0104 PRODUCTION AND OPERATION MANAGEMENT

Pre - requisites	Course Type	Credits
Nil	Theory	2

Course Objective:

The course is designed to acquaint the students with decision making in production and operation function of an organization.

Course Outcomes :

- Acquire a working understanding of the roles/functions of production management in the context of business enterprise.
- The learner will have a deep knowledge of the fundamental theory and mathematical principles involved in Production and Operation Management.
- They can use specialized knowledge in Operations Management to solve business processes.
- They will be capable of applying these principles to solve relevant production or service system problems.

Module 1:

Operations Management- An Introduction : Primary topics in Operations Management, Operations Function and Transformation process . Manufacturing Strategy and Mass customization, Product Development and Service Design , New Product design, Product life cycle, Process design, Process life cycle

Module 2:

Project scheduling Models: Project Network, Critical path Method (CPM), Programme Evaluation Review Technique (PERT).

Scheduling: Objective of Scheduling, Sequencing, Sequencing model: "n" jobs 1 machine, "n" jobs 2 machines.

Module 3:

Inventory Management: Concept of inventory with independent demand: Inventory cost structure, Deterministic inventory model - EOQ models, instantaneous receipt, Inventory model with discounts.

Module 4:

Quality Management: Concept of quality; Quality of design, Conformance & performance; Cost of poor process performance and quality. Statistical Quality Control - Process Control (X-bar, R & P chart, np chart).

Concept of TQM, Just in Time and Lean Production Basic element in JIT, Pull system, Push system

Books Recommended:

- 1) Chase, Jacobs, Aquilano, Agarwal, - “Operations Management”, TMH
- 2) Krajewski, Ritzman, Kansal, - “Operations Management”, Pearson
- 3) Everette. Adam Jr., Ronald J. Ebert, - “Production and Operations Management”, PHI
- 4) Roberta S. Russell & Bernard W. Taylor III, - “Operations Management”, Pearson/ PHI
- 5) Aswathappa & Sridhar Bhat, - “Production and Operations Management”, HPH
- 6) Gaither, Frazier- Operations Management

FCMG0105 MARKETING MANAGEMENT

Pre - requisites	Course Type	Credits
Nil	Theory	2

Course Objective:

- a) To familiarize the students with the concepts and theories and strategies of marketing.
- b) To focus on the application of these concepts to various marketing contexts
- c) To focus on the emerging areas of marketing

Course outcomes :

- The students will understand the various marketing approach in today’s competitive scenario.
- The students will learn the application of various marketing tools for solving business problems
- The students will acquire and develop the marketing skills to be a successful marketing person

Module 1:

Introduction to marketing; What is marketing?, Importance of marketing function, Process of marketing, Concepts like need, want, value, satisfaction etc, Elementary idea of marketing mix. Understanding Marketing Environment; Factors affecting marketing environment (PESTEL), Porter’s five forces model, Introduction to market research

Module 2:

Segmentation, Targeting & positioning (STP); What is market segmentation?, Criteria for effective segmentation, Targeting selected markets, Targeting strategies, Positioning, Effective positioning strategies, Positioning of brands and repositioning, introduction to consumer behavior.

Module 3:

Product Management; Classification of products, Product life cycle (PLC), Brand and branding. Pricing; Meaning & objective, steps in setting the price, pricing policies. Promotion; What is promotion, types of

promotion, advertising, sales promotion, integrated marketing communication Place; Marketing channels, Channel conflict management, Distribution system. Introduction to services marketing, Emerging concepts like green marketing, e-marketing & social marketing.

Books Recommended:

1. Marketing Management: A South Asian Perspective- Phillip Kotler, Kevin Lane Keller, Abraham Koshy and MithileshwarJha, 13th Edition Pearson, Education Publication
2. Marketing Mangement: Fourth edition- RajanSaxena
3. Positioning: The Battle for Your Mind- Al Ries& Jack Trout, Warner Books USA

FCMG0108 INTRODUCTION TO RESEARCH

Pre - requisites	Course Type	Credits
Nil	Theory	2

Course Objectives:

- To introduce the students about research, methods and techniques.
- To understand the process and apply in other areas.

Course outcome:

- Students will be able to understand the process of doing a research.
- Students will be able to write a research report.

Course Contents:

Module: I Science and Social Science as Knowledge

Common sense view of Science, Seeing is believing?, Visual Experiences, Relevant Facts, Facts precede theory, Observation, Experiment as an adequate basis of Science, Deductive and inductive logic, falsification-A logical view,

Module: II Process of doing Research

Overview: Problem Definition, hypothesis and its function, Types of Research, Literature Review, Research Design, Sampling: Census and sample survey, different types of sample design, Measurement: Measurement and scaling techniques, Methods of Data Collections: Experimentation, observation,

interview, Survey, case study; Data Analysis and Interpretation: Qualitative and quantitative data, data presentation, central tendency and dispersion, association, test of significance.

Module: III Report Writing and Presentation

Significance of report writing, different steps in report writing, layout of research report & Types of Report, Presentation, Ethics in Report Writing.

Books Recommended

1. Ranjit Kumar, 2011, Research Methodology: A Step by Step Guide, Sage South Asia Publication.

FCMG0113 INDIAN SOCIETY AND CULTURE

Pre – requisites	Course Type	Credits
Nil	Theory	2

Course Objectives:

- a) Develop an understanding social environment
- b) Develop an understanding of cultural environment
- c) Understanding the linkages among social, cultural and business environment

Course outcomes :

- Students would develop an idea about the socio-cultural environment in which they would be working as scientists, researchers and entrepreneurs.
- More specifically, they would get an appreciation of how societal and cultural issues interface with technology and science in the context of overall development of the country.
- Attempt is also made to familiarise students with the science and technology policies that would benefit modern India.

Course Contents:

Module 1: Introduction to Indian Society

Indian Society - Roots of Indian Society , Social Structure – Rural and Urban Contexts, Social Institutions in Indian Society, Caste, Tribe, Dalits and Other Excluded Groups, Power and Conflicts

Module 2: Introduction to Culture in Indian Society

Culture in Ancient, Medieval and Modern India, Languages and Literature in India, Culture Change and its Impact on Indian Society

Module 3: Social Movements

Reformers and Radicals – Rammohan Roy, Syed Ahmed Khan, JotiroPhule, Gopal Krishna Gokhale, BalGangadharTilak, TarabaiShinde, DayanandaSaraswatiand Vivekananda Nurturing a Nation – M. K. Gandhi, RabindraNath Tagore, B R Ambedkar, Mohammad Ali Jinnah, EV Ramaswami, Jawaharlal Nehru, RammanoharLohia, Jayaprakash Narayan, Verrier Elwin Peasant, Tribal, Women and Environment movement

Module 4: Social Issues in Modern India

Poverty, Gender Inequality, Disparity and Social Exclusion: SC, ST, Women, Child, Challenged

Module 5: Science, Technology and Society

Science, Technology and Development Linkage, Appropriate Technology, Science and Technology Policy

Books Recommended:

1. Indian Society and Culture: Continuity and Change – by N. Hasnain
2. Social and Cultural History of India – O.M. Prakash
3. Makers of Modern India – RamachandraGuha

Introduction to Human Rights

Course	Code	Type of course	Credit
Introduction to Human Rights	FCMG1203	Workshop	2

Objective

- The course is an introduction to human rights. Human beings are rational beings. They by virtue of their being human possess certain basic and inalienable rights which are commonly known as human rights. Human Rights are defined as all those rights which are essential for the protection and maintenance of dignity of individuals and create conditions in which every human being can develop his or her personality to the fullest extent. The purpose of this course is for students to gain a holistic view of human rights and their implications.

Course outcome

- Develop an understanding of human rights, its history, characteristics and types,
- Gain a nuanced understanding of protection, violation and the legal framework for their protection - International Human Rights Law, Council of Human Rights, Universal Declaration of Human Rights, Legal Effects of the Declaration, International Humanitarian Law
- Conflicts of Rights: Challenges of the past and Challenges for the future

Course outline

Module I	Introduction to Human Rights
Topic	Meaning and Definition, History, Principles, Characteristics, Types
Pedagogy	Example: lecture (ppt), videos, etc
Lab/Activity	
Assignment/practice	
No. of hours	6
Reference materials: Book/e-content/online source	

Module 2	Human Rights Law
Topic	Protection, violation and the legal framework for their protection - International Human Rights Law, Council of Human Rights, Universal Declaration of Human Rights, Legal Effects of the Declaration, International Humanitarian Law
Pedagogy	Example: lecture, videos, Case studies, etc
Lab/Activity	
Assignment/practice	
No. of hours	8
Reference materials: Book/e-content/online source	

Module 3	Conflicts of Rights: Challenges of the past and challenges for the future
Topic	Persistence of discrimination, poverty, and inequality in the region, efforts in the search for justice for past violations, continued struggle for human rights and accountability

Pedagogy	Example: lecture, videos, case studies, etc
Lab/Activity	
Assignment/practice	
No. of hours	16
Reference materials: Book/e-content/online source	

Reference

E-content:

Text Books:

1. Arihants UGC NET Human Rights and Duties
2. Kapoor, S. K. Central Law Agency's Human Rights under International Law and National Law

Reference Books:

1. Ciapham Andrew, 2015, Human Rights: A Very Short Introduction, Oxford University Press
2. Smith Rhona, 2015, Textbook on International Human Rights, Oxford University Press

Online Source:

8 Human Rights Study Books you can download for free

<https://www.humanrightscareers.com/.../10-human-rights-study-books-you-can-download>

<https://www.humanrightscareers.com/courses/>

Session Plan

Topic coverage and Internal Test	No. of Sessions (in hrs.)	Activity (lecture, tutorial, lab practice, field studies/field-trip, Workshop etc.)	Assignment (project, assignment, field study, seminar, etc.)	Suggested Reading (Book, Video, Online source, etc.)
Module 1				
Meaning and Definitions of Human Rights	2	Lecture		Lecture Notes and reference in books, online resources
History of Human Rights?	2	Lecture		Lecture Notes and reference in books, online resources
Principles, Characteristics and Types	2	Lecture		Lecture Notes and reference in books, online resources
Module 2				
Introduction - Protection, violation and the legal framework for the protection of Human Rights	2	Lecture		Lecture Notes and Articles, online resources
International Human Rights Law	2	Lecture		Lecture Notes and Articles, online resources
Council of Human Rights and Universal Declaration of Human Rights	1	Lecture		Lecture Notes and Articles, online resources
Legal Effects of the Universal Declaration of Human Rights	1	Lecture		Lecture Notes and Articles, online resources

International Humanitarian Law	2	Lecture		Lecture Notes and Articles, online resources
Module 3				
Persistence of discrimination, poverty, and inequality in the region	2	Lecture		Handouts and online resources
Efforts in the search for justice for past violations	2	Lecture		Handouts and online resources
Continued struggle for human rights and accountability	2	Lecture		Handouts and online resources
Project work and presentations	8 hours			

Introduction to Ethics

Course	Code	Type of course	Credit
Introduction to Ethics	FCMG1204	Workshop	2

Course Objective

<ul style="list-style-type: none"> The course is an introduction to Ethics. This course will introduce to the meaning of ethics and the historical development – utilitarianism, ethical relativism and virtue ethics. Will also examine some current ethical issues. Questions which will be considered are: what is the good life? Do we have a moral duty to act in certain ways? Are there such things as natural human rights? Are some values more compelling than or better than others?
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Course outcome

<ul style="list-style-type: none"> Demonstrate knowledge of important ethical systems Demonstrate their respect of different ethical perspectives Critique some aspects of an ethical position Clearly formulate their ethical position on an issue and develop arguments based on sound inferences and clear premises (through project)
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Course outline

Module I	Introduction to Ethics
Topic	What is the study of ethics, Introduction to Indian and Western Ethics
Pedagogy	lecture (ppt),
Lab/Activity	
Assignment/practice	
No. of hours	6
Reference materials: Book/e-content/online source	

Module 2	Different Ethical systems and Perspectives
Topic	Ethical relativism and its implications, utilitarianism, duty ethics and virtue ethics
Pedagogy	lecture, Case studies, small group work
Lab/Activity	
Assignment/practice	
No. of hours	8
Reference materials: Book/e-content/online source	

Module 3	Critique of various aspects of ethical positions
Topic	Critique an ethical issue/ problem and formulate own ethical position on the issue/ problem
Pedagogy	lecture, small group work
Lab/Activity	
Assignment/practice	
No. of hours	16
Reference materials: Book/e-content/online source	

Reference

E-content:

https://youtu.be/3_t4obUc51A

Text Books:

1. Frankena, WK, 1973, Ethics (2nd Edition), Pearson.

Reference Books:

2. Singer, P. 2011, Practical Ethics (3rd ed), Cambridge University Press.
3. Smart, JJC and Williams, B. 1973, Utilitarianism: For and Against, Cambridge University Press.

Session Plan

Topic coverage and Internal Test	No. of Sessions (in hrs.)	Activity (lecture, tutorial, lab practice, field studies/field-trip, Workshop etc.)	Assignment (project, assignment, field study, seminar, etc.)	Suggested Reading (Book, Video, Online source, etc.)
Module 1				
Meaning and Definitions of Ethics	2	Lecture		Lecture Notes and reference in books, online resources
Introduction to Indian and Western Ethics	4	Lecture		Lecture Notes and reference in books, online resources
Module 2				
Ethical Relativism and its implications	2	Lecture		Lecture Notes and Articles, online resources
Utilitarianism and its implications	2	Lecture		Lecture Notes and Articles, online resources
Duty ethics and its implications	2	Lecture		Lecture Notes and Articles, online resources
Virtue ethics and its implications	2	Lecture		Lecture Notes and Articles, online resources
Module 3				
Critique of various aspects of ethical positions	4	Lecture		Handouts and online resources
How to formulate an ethical position on an issue	4	Lecture		Handouts and online resources

Project work and presentations	8 hours			
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FCMG1201 DISASTER MANAGEMENT

Pre – requisites	Course Type	Credits
Nil	Workshop	2

Course Objective		
<p>The aim is to impart knowledge on</p> <ul style="list-style-type: none"> • To provide students an exposure to disasters, their significance, types & Comprehensive understanding on the concurrence of Disasters and its management. • To ensure that students begin to understand the relationship between vulnerability, disasters, disaster prevention, risk reduction and the basic understanding of the research methodology for risk reduction measures. • Equipped with knowledge, concepts, and principles, skills pertaining to Planning, Organizing, Decision-making and Problem solving methods for Disaster Management. • The course also facilitates students to globally share their views, ideas and information pertaining to Disaster Management on a common platform. • To develop rudimentary ability to respond to their surroundings with potential disaster response in areas where they live, with due sensitivity. 		

GUIDELINES ON GRADING AND STANDARDS OF ASSESSMENT

A continuous evaluation system will be adopted to evaluate the students. There will be an individual and group assignments, presentations and written test.

COURSE CONTENT			
Module - 1			
UNIT I – Introduction to Disaster Management (2hrs)			
Session	Topic	Coverage	Reading/Reference
4hrs	Disaster & Emergencies : Concept & Fundamentals of Disaster Management	<ul style="list-style-type: none"> • Introduction/ Brain storming/ Group formation • History of Disasters • Concepts and Definitions • Hazard, Risk, Vulnerability, Capacity, Disaster & Equations of Disaster Management 	
		<ul style="list-style-type: none"> • Types & Classification of Disasters • Factors responsible for disasters like flood, 	

		cyclone and Earthquake.	
UNIT II – Effect and Impact of Disaster (4 Hrs)			
1hr	Effect and Impacts of Disasters (Group work)	<ul style="list-style-type: none"> Disasters Impact – Social, Economic, Political, Environmental, Health, Psychosocial, etc. Differential impacts- in terms of Caste, Class, Gender, Age, Location, Disability. 	Disaster Mgmt. and India: Responding Internally and Simultaneously in Neighboring Countries Kailash Gupta, BE (Elec.), MBA(IIMA)
1 hr	Disaster vs Development	<ul style="list-style-type: none"> Disaster is the causes of destruction Disaster leads to development 	
2 hrs	Global warming and climate change	<ul style="list-style-type: none"> Concept and understanding of global warming and climate change Causes and factors Remedial measures 	
Module – II		•	
UNIT III – Disaster Risk Management - (6 hours)			
2 hrs	Community Managed Disaster Risk Reduction And Village Contingency Plan (Group work) Role of Task force/ ODRAF/ NDRF for DRR at community level.	<ul style="list-style-type: none"> Hazard analysis and assessment Vulnerability analysis Resource capability assessment Mapping & Seasonality Calendar Structural and Non Structural assessment. Task forces with various roles for DRR. 	CBDRM for Local Authorities: PARTICIPANT’S WORKBOOK – adpc www.adpc.net
2 hours	Rapid Need Assessment Pre and Post Disaster (Group work and Practical demo)	<ul style="list-style-type: none"> Meaning and Importance Rapid Need Assessment in emergency and its significance Process and Methods 	
2 hrs	Stress Management	<ul style="list-style-type: none"> Causes and consequences of Stress What are the best ways to handle pressure Psychosocial Support 	

UNIT IV – Disaster Management (8 hrs)			
2 hrs	Disaster Management Cycle	<ul style="list-style-type: none"> • Disaster Management Cycle • Phases of Disasters • Prevention, Mitigation Preparedness, Warning, Response, Rehabilitation, Reconstruction 	
2 hrs	Fire safety (Practical)	<ul style="list-style-type: none"> • Practical 	
2 hours	First Aid & Driving Learning (Theory and Practical)	<ul style="list-style-type: none"> • ABCD of First Aid • Dressing and Bandages Practical session • Emerging need and importance of learning driving 	
2hrs	Building Rescue operation or Demonstration of ODRAF/NDRAF rescue materials	<ul style="list-style-type: none"> • Practical 	
Module – III		<ul style="list-style-type: none"> • 	
UNIT V – Humanitarian Charter and Minimum Standards in Humanitarian Response (4 hrs)			
2hrs	Sphere Standards (Group Work)	<ul style="list-style-type: none"> • The Humanitarian Charter • Protection Principles • Core Standards 	
2hrs	Restoring Life Line Services (WASH) (Group work)	<ul style="list-style-type: none"> • Water , Sanitation & Hygiene Promotion • Food Security & Nutrition • Health Services • Health Services • Shelter and Settlement 	The Sphere Project , Humanitarian Charter and Minimum Standards In Humanitarian Response
UNIT VI – Disaster Management Projects –(6 hours)			
6hrs	Seminars / Workshop	<ul style="list-style-type: none"> • Adapting Climate Change • Disaster Resilience Structures and Buildings • IT in Disaster Management • Inter-relationship between Disasters and Development • Urban Disaster 	

		<ul style="list-style-type: none"> • Rain Water Harvesting • Inclusions – Disability, Aged, Social etc 	
		<ul style="list-style-type: none"> • 	
		<ul style="list-style-type: none"> • 	

- Team of 10 – 15 members would be formed
- Each Team would take up a project work in one of the topics above or related topics with prior approval : 2 Weeks
- Each Team would organize one Seminar / Workshop during the session

FCMG1202MS Excel

Pre – requisites	Course Type	Credits
Nil	Workshop	2

Course Objective		
<p>The aim is to impart knowledge on</p> <ul style="list-style-type: none"> • Indicate the names and functions of the Excel interface components. • Enter and edit data. • Format data and cells. • Construct formulas, including the use of built-in functions, and relative and absolute references. • Create and modify charts. • Preview and print worksheets. • Use the Excel online Help feature. 		
<p>Course Outcome</p> <ul style="list-style-type: none"> • Navigate your way around Microsoft Excel • Work with data analysis and presentation • Create and work with formulas and functions, understand and use formula cell • Use Excel for Business application 		
GUIDELINES ON GRADING AND STANDARDS OF ASSESSMENT		
<p>A continuous evaluation system will be adopted to evaluate the students. There will be an individual and group assignments and presentations.</p>		

Course Contents:

Unit 1: Excel Introduction, direct right, The Excel Interface, direct right, Basic Navigation and Editing,

Unit 2: Getting Going, Orientation & efficiency, Editing, Viewing, Spreadsheet Structure, Cell References, Named Ranges, Basic Macros, Design

Unit 3: Administration, Customising Excel, Housekeeping, Connecting Workbooks Documentation, Protecting and Sharing, Google Docs, Excel Troubleshooting, Data Handling, Sorting and Filtering, Controlling User Input, - Working with Dates & Times

Unit 4: U- Working with Text, Lookup and Reference, Logical Functions, Data Analysis, Working with Numbers, Summarising Data, PivotTables 1 - Simple Summaries, PivotTables 2 - Manipulating Data,

Unit 5: PowerPivot: Handling Big Data, Formula Auditing, Advanced Macros and VBA, Modelling, Presentation, Cell Formatting, Number Formatting, Conditional Formatting, Graphs and Charts, Page and print setup

Introduction to Gender

Subject Name	Code	Type of course	Credit
Introduction to Gender	FCMG1205	Workshop	2

Objective

- In the traditional social order women have been assigned a subordinate status in society for centuries. They have been deprived of many social privileges and suffered from discriminations that prevented them from contributing to the development process. They have remained marginalized in society. To remedy the prevailing situation, gender concerns have become increasingly important in the development agenda in the last few decades. In spite of special policies and programmes being implemented, gender based injustice continues to exist and hinder development

Course outcome

- Develop an understanding of perspectives on gender and development
- Discuss in detail the gender question in selected development sectors and globalisation
- Familiarise with the different tools and techniques for gender planning, analysis and evaluation in the development sector

The course has three modules covering these three aspects of gender and development.

Course outline

Module I

UNDERSTANDING AND CONCEPTUALISING GENDER RELATIONS

Module II

GENDER ISSUES IN DEVELOPMENT SECTORS

Module III

GENDER ANALYSIS, TOOLS, TECHNIQUES AND FRAMEWORKS

References

- a) "Why Gender is a Development Issue", Handout 4, Oxfam Gender Training Manual (1994)
- b) Freedman, Jane. (2002), "Introduction: Feminism or Feminisms?" in *Feminism*, Viva Books, N. Delhi.
- c) Chafetz, J.S. (1990), "The Coercive Bases of Gender Inequality", in *Gender Equity: An Integrated Theory of Stability and Change*, Sage.
- d) Kabeer, Naila. (1994), "Connecting, Extending, Reversing: Development from a Gender Perspective", in *Reversed Realities*, Verso, London.
- e) Moser, C.O.N. (1991), "Gender Planning in the Third World: Meeting Practical and Strategic Gender Needs", in T. Wallace & C. March (eds.) *Changing Perceptions: Writings on Gender and Development*, Oxfam.
- f) Boonsue, K. (1992), "Development Models of WID, WAD and GAD" in *Women's Development Models and Gender Analysis: A Review*, Gender Studies (AIT, Bangkok).
- g) Agarwal, B. (1994), "Conceptualising Gender Relations" in *A Field of One's Own: Gender and Land Rights in South Asia*, Cambridge University Press.
- h) "Women and the Economy" in *Human Development in South Asia 2000: The Gender Question*, MahabubUIHaq Development Centre/OUP, Islamabad.
- i) Rajagopal, S. (1999), "Closing the Gender Gap in Education: The Shikshakarmi Programme" in N. Kabeer & R. Subrahmanian (eds.), *Institutions, Relations and Outcomes*, Kali for Women, Delhi.
- j) Thakur, S.G. (1995), "Access to Health Care – A Gender Perspective" *The Administrator*, Vol 11, April-June, pp 169-181.
- k) Kusum, K & Barua, K. (2001), "Gender Equality and Women's Health – A Human Rights Perspective", *Indian Journal of Adult Education*, Jan-Mar, pp 44-49.
- l) Mohanty, B. (1995), "Panchayati raj, 73rd Constitutional Amendment and Women", *Economic and Political Weekly*, Dec 30, 3346-3350.
- m) Kapoor, N. (2002), "Women and Governance", *Participation & Governance*, Vol. 8, No.23, pp 11.
- n) Resurreccion, B.P. (2005), "Women in-between: Gender, Transnational and Rural-Urban Mobility in the Mekong Region", *Gender, Technology and Development*, Vol.9, No.1, Jan-April, pp 31-51.
- o) Gender and Globalisation – A Note
- p) Overholt, C.A. et.al. (1991), "Gender Analysis Framework", in A. Rao et.al. (eds.), *Gender Analysis in Development Planning*, Kumarian Press.
- q) Handouts to be given in the class on Gender Assessment Study.
- r) The Gender Analysis Matrix: A Teaching Note.
- s) March. C. et.al (1999), "Women's Empowerment (Longwe) Framework", in *A Guide to Gender Analysis Frameworks*, Oxfam: Oxford.
- t) Gender and Organisations – Handout in the class.

1. Session Plan

Topic coverage and Internal Test	No. of Sessions (in hrs.)	Activity (lecture, tutorial, lab practice, field studies/field-trip, Workshop etc.)	Assignment (project, assignment, field study, seminar, etc.)	Suggested Reading (Book, Video, Online source, etc.)
Module 1				
Difference between Sex and Gender	1	Lecture		Lecture Notes and Book chapters
Why gender is a development issue?	1	Lecture		Lecture Notes and Book chapters
Gender system and inequality	1	Lecture		Lecture Notes and Book chapters
Understanding gender relations	1	Lecture		Lecture Notes and Book chapters
Gender planning – practical and strategic gender needs	1	Lecture		Lecture Notes and Book
Approaches to address gender inequality – WID, GAD and GID	1	Lecture		Lecture Notes and Monograph
Module 2				
Gender issues in the economic sector	1	Quiz 1 and Lecture		Lecture Notes and Articles
Gender issues in the education sector	1	Lecture		Lecture Notes and Articles
Gender issues in the health sector	1	Lecture		Lecture Notes and Articles
Gender issues in the governance sector	1	Lecture		Lecture Notes and Articles
Gender issues in globalisation	1	Lecture		Lecture Notes and Articles
Module 3				

Harvard Analytical Framework	1	Lecture		Handouts and Book chapter
Gender Assessment Study and Gender Analysis Matrix	1	Lecture		Handouts and Book Chapters
Gender Empowerment Framework	1	Quiz 2 and Lecture		Handouts and Book Chapters
Gender and Organisations	1	Lecture		Handouts and Book Chapters
Student Presentations based on group projects	Extra classes			
Total (hrs)	15 hours +3 hours			

Centurion University of Technology and Management Odisha

Choice Based Credit System

Course Structure & Syllabus

BASKET - III



CENTURION UNIVERSITY OF TECHNOLOGY AND MANAGEMENT

School of Engineering & Technology

2019

Course Structure

Basket – III

Course Code	Course Title	Type of course	Cr	Prerequisite	CO 1	CO 2	CO 3	CO 4	CO 5	CO 6	CO 7	CO 8	PSO 1	PSO 2	PSO 3
ENFC 0101	Engineering Mechanics	Theory	3	Nil	H	-	-	-	-	-	-	H	-	H	-
ENFC 0102	Material Sciences	Theory	3	Nil	H	M	L	L	M	M	H	H		-	-
ENFC 0103	Thermodynamics	Theory	3	Nil	H	M	H	-	-	-	-	M	-	M	-
ENFC 0104	Introduction to Communication Engineering	Theory	3	Nil	H	H	H	L	M	L	-	L	M	H	L
ENFC 0105	Introduction to Aerospace Engineering	Theory	3	Nil	H	L	M	-	M	-	-	L	M	M	L
FCEN 0120	Introduction to Computer	Theory	3	Nil	H	M	M	L	H	M	H	H	H	H	L
FCEN 0118	Computer Fundamental and Organizational	Theory	3	Nil	H	M	L	L	M	L	M	M	M	H	L
FCEN 0119	Operating System Building Blocks	Theory	3	Nil	H	H	H	L	H	M	H	M	M	H	L
FCEN 0115	Introduction To Biotechnology	Theory	3	Nil	H	M	M	L	M	L	H	M	M	L	L
FCEN 0116	Introduction to Biophysics	Theory	3	Nil	H	M	M	L	M	L	H	M	H	M	M
FCEN 0117	Biosafety, bioethics,	Theory	3	Nil	M	M	M	M	M	M	M	M	H	H	L

	IPR and Patents														
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FCEN0111	Earth System Science	Theory	3	Nil	H	M	L	L	M	H	H	M	M	H	L
FCEN0112	Introduction to Mining	Theory	2	Nil	M	M	L	L	M	L	M	M	L	M	M
FCEN0113	Mine Development	Theory	3		H	H	L	M	M	M	M	L	H	M	L
FCEN0114	Mine Surveying I	Theory	3		H	H	H	M	H	L	L	H	H	M	L
ENFC0201	Workshop Practice	Theory	3		H	-	-	-	-	-	-	-	H	L	-
ENFC0202	Geometric Modelling Lab	Theory	3		H	H	M	M	M	L		L	H	H	M
ENFC0203	Introduction to Robotics	Practice	2	Nil	H	L	L	L	H	M		L	M	H	M
ENFC0204	3D Modeling	Practice	2	Nil	H	H	L	L	M	L	M	M	M	H	M
ENFC0205	Electrical Workshop	Practice	2	Nil	H	M	H	-	M	H	M	H	H	H	-
FCEN0214	Mine Surveying-I Lab	Practice	2	Nil	M	H	H	M	H	M	H	H	H	H	M
ENFC0208	Aerodynamics Laboratory	Practice	2	Nil	H	L	L	-	M	-	-	M	M	L	L
ENFC0401	Engineering Metrology and Measurements	Practice	2		H	-	-	-	H	H	-	H	H	H	-
ENFC0402	Basic Fluid Mechanics	Practice	2	Nil	H	M	M	M	H	M		L	H	M	M
ENFC0403	Basic Surveying	Theory+ Practice	3	Nil	H	M	M	H	H	L	H	H	M	H	L

ENFC040 4	Basic Electrical Engineering	Theory + Practice	3	Nil	H	H	H	-	M	M	H	H	M	M	L
ENFC040 5	Electrical Machines	Theory + Practice	3	Nil	H	H	H	-	H	M	M	H	H	H	-
ENFC040 6	Introduction to automation	Theory+ Practice	3	Nil	H	H	H	-	H	H	M	H	M	H	L
ENFC040 7	Introductio n to Web Technology	Theory+ Practice	3	Nil	H	H	H	L	H	M	M	H	H	H	L
ENFC040 8	Information Security I	Theory+ Practice	3	Nil	H	M	H	L	H	M	H	M	H	L	L
ENFC040 9	Programmi ng in C	Theory + Practice	3	Nil	H	H	H	L	H	M	H	H	H	H	L
ENFC041 0	Desktop Operating System (Windows 10)	Theory+ practice	3	Nil	H	L	M	L	M	L	L	L	M	L	L
FCEN040 8	Principles of Biochemistr y	Theory+ practice	3	Nil	H	M	L	L	L	M	H	H	H	M	M
FCEN040 9	Cell Biology	Theory+ Practice	3	Operatin g System Building Blocks	H	M	L	L	L	M	H	M	H	M	M
ENFC041 2	Programmi ng for Problem Solving – Java	Theory + Practice	5	Nil	H	H	H	M	H	H	-	M	H	M	-

ENFC041 4	Data Base Managem ent System	Theory + Practice	5	Nil	H	H	H	M	M	M	M	M	M	H	H	-
ENFC041 5	Electronics and Its Application	Theory + Practice	3	Nil	H	H	M	-	H	H	H	H	H	H	M	M
ENFC041 6	Electronic Devices	Theory + Practice	3	Nil	H	H	H	-	M	-	M	H	H	H	H	-
ENFC041 7	Sensors and IOT	Theory + Practice	3	Nil	H	H	M	-	H	H	H	H	H	H	H	H
ENFC041 8	Problem Solving & Programmin g	Theory & Practice	3	Nil	M	H	H	M	H	M	H	H	M	H	H	-
ENFC041 9	Data Structures	Theory & Practice	3	Nil	H	H	L	L	H	L	-	L	L	H	L	L
ENFC042 0	Switching Theory and Logic Design	Theory & Practice	3	Nil	H	L	L	L	H	H	-	L	H	H	H	H
ENFC042 2	Operating System	Theory & Practice	3	Nil	H	H	H	M	M	M	-	M	H	M	M	M
ENFC042 3	Big Data Analytics	Theory & Practice	3	Nil	M	M	M	-	-	-	-	H	H	M	M	M
ENFC042 4	Block Chain and Smart Contracts	Theory + Practice	3	Nil	H	H	L	L	H	L		L	H	H	L	L
ENFC060 1	Product Developme nt	Theory + Practice	3	Nil	M	M	-	-	-	-	-	H	-	-	L	L

ENFC060 3	AI Tools, Techniques and applications	Theory + Practice	3	Nil	M	M	M		L	-	-	-	L	L	L
ENFC060 2	Cloud Computing and its applications using Linux OS	Theory + Practice	2	Nil	M	M	M	-	-	-	-	-	-	M	-
ENFC090 1	Problem Solving using Python	Practice + Project	3	Nil	-	-	-	-	H	-	-	-	H	-	-
ENFC090 2	Object Oriented Programmi ng through Java	Practice + Project	3	Nil	M	M	M	-	-	-	-	M	H	M	L
ENFC090 3	Web Technologie s	Practice + Project	3	Nil	H	L	L	L	M	M		L	L	H	L
ENFC090 4	Software Engineering using Agile	Theory + Practice	3	Nil	H	H	H	L	M	L	-	L	H	L	M
ENFC140 7	Internet of Things	Theory + Practice + Project	3	Nil	M	M	M	-	-	-	-	H	H	-	-
ENFC140 2	Build your own Computer	Theory & Practice + Project	3	Nil	M	M	M	-	-	L	-	L	H	L	L
ENFC140 3	Cloud Computing Application	Theory + Practice + Project	3	Nil	M	M	M	M	-	-	-	-	-	M	-
ENFC140	Design thinking	Worksho p	2	Nil	M	M	M	-	-	-	-	-	L	L	-

5	and Innovation																
ENFC140 6	Problem solving Technique	Worksho P	2	Nil	L	L	-	-	-	-	-	L	H	M	H		

Syllabus

Engineering Mechanics

Course Title	Code	Type of course	T-P-PJ	Prerequisite
Engineering Mechanics	ENFC0101	Theory	3-0-0	Nil

Objective

- To provide the students with a clear and thorough understanding on theory and application of principles of mechanics as applied in engineering problems.

Course Outcome

- Students will acquire knowledge and skill to analyze the effect of force and motion on rigid bodies to solve engineering problems through application of basic laws of mechanics.

Evaluation Systems

	Component	% of Marks	Method of Assessment
Internal Examination	Internal Theory	30	Written examination
	Assignment	5	Report or Presentation + Learning Record
	Attendance	5	Based on class attended
External Examination	External Theory	60	Written examination
Total		100	

Course Outline

Module: I (9 Hrs)

Coplanar Forces : Principles of Statics, Law of Transmissibility of a Force, Composition and Resolution of Forces, Resultant and Equilibrant, Free Body Diagram, Equilibrium of Concurrent Coplanar Forces, Lami's Theorem (Case Studies : - Analysis of a Boom, Analysis of a Tripod Stand, Equilibrium Analysis of a Wall Bracket)

To Understand the Equilibrium of a Particle under the Action of Forces in a Plane using Gravesand's Apparatus or Coplanar Force Setup. (The theory can be taught in practice mode)

Module: II (6 Hrs)

Moment and Couple, Varignon's Principle of Moment, General Conditions of Equilibrium, Types of Supports and Support Reactions,

Friction :Equilibrium of Bodies on Rough Inclined Planes, Ladder Friction, Applications of Friction (Friction in Square Threaded Screw, Disc and Bearing Friction, Belt Friction)

To Determine the Coefficient of Static Friction between two given Material with the Help of an Inclined Plane. (The theory can be taught in practice mode)

Module : III (10 Hrs)

Center of Gravity : General Case of Parallel Forces in a Plane, Centre of Parallel Forces in a Plane, Centroid and Centre of Gravity, Axis of Symmetry, Centroid of Composite Plane Figures and Curves.

Moment of Inertia : Rectangular and Polar Moment of Inertia, Radius of Gyration, Parallel Axis Theorem and Perpendicular Axis Theorem, Moment of Inertia of Plane Composite Figures and Material Bodies.Determination of Moment of Inertia of a Flywheel. (The theory can be taught in practice mode)

Module : IV (6 Hrs)

Linear Motion : Motion under Gravity and Variable Acceleration, Principles of Dynamics such as Newton's Second Law, D'Alembert's Principle, Work-Energy Relation, Impulse-Momentum Relation, Law of Conservation of Momentum and Energy, Impact and its Types, Impact of a Body on a Fixed Plane.

Module : V (5 Hrs)

Concept of Stress and Strain :Types of Stresses and Strains, Hooke's Law, Stress-Strain Diagrams for Ductile and Brittle Materials, Analysis of Axially Loaded Bars. Stress Strain Curve of a Ductile Material (Mild Steel) using UTM.

Module: VI (5Hrs)

Bars of Varying Cross-section, Composite Bars, and Poisson are Ratio, Complimentary Shear Stress, Volumetric Strain, Elastic Constants and their Relationship. Longitudinal and Hoop Stress in Thin-walled Pressure Vessels Subjected to Internal Pressure.

Module : VII (4 Hrs)

Principal Stresses and Strains : Transformation of Stress and Strain, Principal Stresses, Principal Strains, Mohr's Circle for Stress and Strain.

Text Books :

Engineering Mechanics by D.S. Kumar, S.K. Kataria and Sons Strength of Materials by S.S. Rattan, Tata Mc-Graw Hill Publication. Reference Books : Engineering Mechanics by S. Timoshenko, D.H. Young and J.V. Rao, Tata McGraw Hill. Online Source : NPTEL, You tube

Session Plan

Topic coverage and Internal Test	No. of Sessions (in hrs.)	Activity (lecture, tutorial, lab practice, field studies/field-trip, Workshop)	Assignment (project, assignment, field study, seminar, etc.)	Suggested Reading (Book, Video, Online source, etc.)
Module I				
Principles of statics, law of transmissibility of a force, composition and resolution of forces	3	Lecture	Assignment	Engineering Mechanics by D.S. Kumar
Resultant and equilibrant, free body diagram	2	Lecture	Assignment	Engineering Mechanics by D.S. Kumar
Equilibrium of concurrent coplanar forces,	1	Lecture	Assignment	Engineering Mechanics by D.S. Kumar
Lami's theorem, (case studies : - analysis of a boom, analysis of a tripod stand, equilibrium analysis of a wall bracket)	1+2	Lecture + practice	Assignment	Engineering Mechanics by D.S. Kumar
Module II				
Moment and couple, Varignon's principle of moment, general conditions of equilibrium	2	Lecture	Assignment	Engineering Mechanics by D.S. Kumar
Types of supports and support reactions.	1	Lecture	Assignment	Engineering Mechanics by D.S. Kumar
Equilibrium of bodies on rough inclined planes, ladder friction	2	Lecture	Assignment	Engineering Mechanics by D.S. Kumar
Wedge friction, applications of friction (friction in square threaded screw, disc and bearing friction, belt	1	Lecture	Assignment	Engineering Mechanics by D.S. Kumar

friction				
Module III				
Center of Gravity : General case of parallel forces in a plane, centre of parallel forces in a plane, centroid and centre of gravity, axis of symmetry, centroid of composite plane figures and curves.	5	Lecture	Assignment	Engineering Mechanics by D.S. Kumar
Moment of Inertia : Rectangular and polar moment of inertia, radius of gyration, parallel axis theorem and perpendicular axis theorem, moment of inertia of plane composite figures and material bodies. Determination of moment of inertia of a flywheel.	5	Lecture	Assignment	Engineering Mechanics by D.S. Kumar
Module IV				
Linear Motion : Motion under gravity and variable acceleration, principles of dynamics such as Newton's second law, D'Alembert's principle, work-energy relation, impulse-momentum relation, law of conservation of momentum and energy, impact and its types, impact of a body on a fixed plane.	6	Lecture	Assignment	Engineering Mechanics by D.S. Kumar http : //vlab.amrita.edu/?sub=1 &brch=74&sim=189&cnt =4)
Module V				
Concept of stress and strain : Types of stresses and strains, Hooke's law,	3	Lecture	Assignment	Strength of materials by S.S. Rattan

stress–strain diagrams for ductile and brittle materials, analysis of axially loaded bars.				
Stress-strain curve of a ductile material (mild steel) using UTM	2	Practice		Strength of materials by S.S. Rattan
Module VI				
Mechanical properties of materials Rockwell and Brinell hardness tests	2	Practice		Strength of materials by S.S. Rattan
Bars of varying cross-section, composite bars, Poisson's ratio, complimentary shear stress, volumetric strain, Elastic constants and their relationship.	2	Lecture	Assignment	Strength of materials by S.S. Rattan
Longitudinal and hoop stress in thin-walled pressure vessels subjected to internal pressure.	1	Lecture	Assignment	Strength of materials by S.S. Rattan
Module VII				
Principal stresses and strains : Transformation of stress and strain, principal stresses, principal strains, Mohr's circle for stress and strain.	2+2	Lecture + Practice	Assignment	Strength of materials by S.S. Rattan
Total				45

Material Sciences

Course Title	Code	Type of course	T-P-PJ	Prerequisite
Material Sciences	ENFC0102	Theory	3-0-0	Nil

Objective

- To study classification and properties of materials used in day to day life
- To understand the material application and it's needed.

Course Outcome

- Students will able to identify materials for engineering use.
- Students will able to select best materials for a specific design and production.

Evaluation Systems

	Component	% of Marks	Method of Assessment
Internal Examination	Internal Theory	30	Written examination
	Assignment	5	Report or Presentation + Learning Record
	Attendance	5	Based on class attended
External Examination	External Theory	60	Written examination
Total		100	

Course Outline

Module: I (8 Hrs)

Steel, Stainless Steel & Types, HSLA Steels, Dual Phase Steels, Tool and Die Steels. Nonferrous Alloys- Aluminum & Alloys, Copper & Alloys, Zinc & alloys, Nickel & Alloys , Magnesium Alloys, Titanium Alloys, Super Alloys.

Module: II (7 Hrs)

Polymer- Thermosetting, Thermoplastics; Elastomers- Natural & Synthetic Rubber; Composites Material- Classification Based on Matrix and Topology, Particle Reinforced Composites, Fiber Reinforced Composites. Structural Composites, Constituents of Composites, MMC, PMC and FRP. Ceramic Composites, Geosynthetics, Pre-stressed Hollow Concrete Panel, Carbon Composites Fullerenes, C64, Bucky Ball Structures, Graphene.

Module: III (5 Hrs)

Prefabricated Materials: Types and Applications, Autoclaved Aerated Concrete (AAC), Cellular Lightweight Concrete (CLC).

Module: IV (8 Hrs)

Electrical & Magnetic Materials: Classifications, Properties, Advantages & Applications, Photo Voltaic Material, Dielectric Materials.

Module: V (6 Hrs)

Solar Cell and Super Conductivity, Ferro Electricity, Electro-active Polymers, Piezoelectric Material, Magneto Electric Materials, Electrorheological Fluids.

Module: VI (6 Hrs)

Fiber Optic Sensors, Photoconductivity; Introduction to Nano-materials, CNTs Production Process and Uses, Fibers Production and Uses.

Module: VII (8Hrs)

Smart Material, Shape Memory Alloys, Piezoelectric Ceramics, Biomaterials, Bioactive Glass & Ceramic, Polymer & Composite, UHTC, Soft Materials, Energy Materials.

Text Books:

1. Materials Science and Engineering, W D Callister, 2014, 2nd Edition, Wiley India Private Limited, India.

Reference Books:

1. Material Science and Engineering, V Raghavan, 2013, 5th Edition, PHI publication, India.
2. Material Science and Engineering, S Chawla, 2011, 1st Edition, Dhanpat Rai & co Private Ltd., India.

Session Plan

Topic coverage and Internal Test	No. of Sessions (in hrs.)	Activity (lecture, tutorial, lab practice, field studies/field-trip, Workshop etc.)	Assignment (Project, assignment, field study, seminar, etc.)	Suggested Reading (Book, Video, Online source, etc.)
Module I				

Steel	01	Lecture	field study	<p>nptel.ac.in/courses/113104059/lecture_pdf/Lecture%201.pdf Materials Science and Engineering, W D Callister, 2014, 2nd Edition, Wiley India Private Limited, India.</p> <p>https : //www.youtube.com/watch?v=917JqonyoKA https : //www.youtube.com/watch?v=sc24cSZJQcg https : //www.youtube.com/watch?v=hTw9LVMBLns</p>
Stainless Steel & Types	01	Lecture	field study	<p>https : //en.wikipedia.org/wiki/Stainless_steel Materials Science and Engineering, W D Callister, 2014, 2nd Edition, Wiley India Private Limited, India. http : //nptel.ac.in/courses/113104059/</p>
HSLA Steels, Dual Phase steels	01	Lecture		<p>https : //www.metalsupermarkets.com/what-is-hsla-steel/ https : //en.wikipedia.org/wiki/High-strength_low-alloy_steel https : //mme.iitm.ac.in/vsarma/mm5025/TRI-P-DP-TWP-Notes.pdf https : //www.worldautosteel.org/steel-basics/steel-types/dual-phase-dp-steels/</p>
Tool and Die Steels	01			<p>https : //www.hitachi-metals.co.jp/e/products/auto/ml/pdf/ys_s_tool_steels_d.pdf http : //www.substech.com/dokuwiki/doku.php?id=tool_and_die_steels</p>
Aluminium & Alloys	01	Lecture		<p>https : //materialsdata.nist.gov/.../Aluminum%20and%20Aluminum%20Alloys%20Davis nptel.ac.in/.../16%20-%20Properties%20and%20Applications%20of%20Materials.pdf nptel.ac.in/courses/112104203/12</p>

				Raghavan, V, Material science and Engineering, 2013, 5th Edition, PHI publication, India.
Copper & Alloys	02	Lecture		Material science and Engineering, V Raghavan, 2013, 5th Edition, PHI publication, India. nptel.ac.in/courses/103106109/.../Lecture%20%20Material%20of%20construction.pdf.
Magnesium Alloys, Titanium Alloys, Super Alloys	01	Lecture		W D Callister, Materials Science and Engineering, 2014, 2nd Edition, Wiley India Private Limited, India. https : //www.sciencedirect.com/topics/materials-science/aluminum-magnesium-alloys https : //uknowledge.uky.edu/cgi/viewcontent.cgi?article=1036&context=cme_etds nptel.ac.in/courses/113105057/25 http : //megamex.com/superalloys.html
Module II				
Polymer- Thermosetting, Thermoplastics	02	Lecture	field study	1.nptel.ac.in/courses/112107086/13 2.nptel.ac.in/courses/112104229/15 3. W D Callister, Materials Science and Engineering, 2014, 2nd Edition, Wiley India Private Limited, India.
Elastomers- Natural & Synthetic Rubber	01	Lecture		1.WD Callister, Materials Science and Engineering, 2014, 2nd Edition, Wiley India Private Limited, India.
Classification based on matrix and topology, Particle Reinforced Composites, Fiber Reinforced Composites	01	Lecture		1.W D Callister, Materials Science and Engineering, 2014, 2nd Edition, Wiley India Private Limited, India. 2. https : //onlinecourses.nptel.ac.in/noc18_me03 3.nptel.ac.in/downloads/112104168 4.http :

				//nptel.ac.in/courses/101104010
Structural Composites, Constituents of Composites	01	Lecture		1.nptel.ac.in/courses/112108150/pdf/PTs/MTS_12_m.pdf
MMC, PMC and FRP	01	Lecture	field study	http : //nptel.ac.in/courses/112107086/22 http : //nptel.ac.in/courses/113105028/32
Ceramic Composites, Geosynthetics, Pre-stressed Hollow Concrete Panel, Carbon Composites Fullerenes, C64,Bucky ball Structures, Grapheme	01	Lecture	field study	nptel.ac.in/courses/112107085/module6/lecture6/lecture6.pdf nptel.ac.in/courses/112104122/22
Module –III				
Prefabricated Materials : Types and Applications	02	Lecture	field study	https : //www.youtube.com/watch?v=ixNre1dGyp0 2. http : //www.hollowcore.com.au/ 3. https : //en.wikipedia.org/wiki/Fullerene
Autoclaved Aera ted Concrete (AAC), Cellular Lightweight Concrete (CLC).	03	Lecture	field study	https : //www.cogentoa.com/article/10.1080/23312009.2015.1026638.pdf www.understandingnano.com/what-is-buckyball-c60.html https : //en.wikipedia.org/wiki/Autoclaved_aerated_concrete textofvideo.nptel.ac.in/105102012/lec41.pdf nptel.ac.in/courses/105102088/27 https : //www.youtube.com/watch?v=uwbFxUXG2cM
Module IV				

Electrical & Magnetic Materials : Classifications, Properties, Advantages & Applications, Dielectric Materials	08	Lecture		1. nptel.ac.in/courses/115104088/42 2. V Raghavan, Material science and Engineering, 2013, 5th Edition, PHI publication, India.
Module V				
Photo Voltaic Material, Semi conductivity, Solar Cell and Super Conductivity	03	Lecture	field study	nptel.ac.in/courses/113106062/Lec19.pdf 2.nptel.ac.in/courses/113105025/40 3.nptel.ac.in/courses/113104012/34
Ferro electricity, Electro-active polymers	01	Lecture		https : //en.wikipedia.org/wiki/Electroactive_polymers https : //www.azom.com/article.aspx?ArticleID=13516
Piezoelectric Material , Magneto Electric Materials, Electrorheological Fluids	02	Lecture		1.nptel.ac.in/courses/113104005/69 2.nptel.ac.in/courses/112107088/module1/lecture28/lecture28.pdf
Module –VI				
Fiber optic Sensors, Photoconductivity	02	Lecture	field study	nptel.ac.in/courses/112104158/lecture39.pdf https : //onlinecourses.nptel.ac.in/noc18_ph06
Introduction to Nano-Materials, CNTs Production Process and Uses	02	Lecture	field study	http : //www.nptel.ac.in/courses/103103033/ 38 2.nptel.ac.in/courses/118104008/ 3.nptel.ac.in/courses/103103026/42 4. https : //www.cheaptubes.com/carbon-nanotubes-history-and-production-methods-2/ https : //www.youtube.com/watch?v=CuqS8GSpC-4

Fiber Production and Uses.	02	Lecture	field study	https : //www.youtube.com/watch?v=Ivveb58PCo
Module –VII				
Smart Material, Shape Memory Alloys	02	Lecture		nptel.ac.in/courses/112104173/Mod_1_smart_mat_lec_5.pdf 2. W D Callister, Materials Science and Engineering, 2014, 2nd Edition, Wiley India Private Limited, India.
Piezoelectric Ceramics	02	Lecture		1.https : //www.youtube.com/watch?v=qXLStQQxHzU
Biomaterials, Bioactive glass & Ceramic, Polymer & Composite	02	Lecture		1.https : //www.youtube.com/watch?v=XqFS1G6WKO0 2.https : //www.youtube.com/watch?v=yZKdFVAJcrE 3.https : //www.youtube.com/watch?v=s5mDURF8YuQ
UHTC	01	Lecture		1.https : //www.youtube.com/watch?v=A-pd3ia8Y4g 2.https : //www.youtube.com/watch?v=XllkWh1nYQ 3.ceramics.org/wp-content/uploads/2011/08/applications-uhtc-johnson.pdf 4.https : //en.wikipedia.org/wiki/Ultra-high-temperature_ceramics
Soft Materials, Energy Materials	01	Lecture		https : //www.youtube.com/watch?v=HdwFkEV8dek https : //www.youtube.com/watch?v=Od4g5kcWsu0 https : //www.youtube.com/watch?v=IipCijIBHeQ https : //www.youtube.com/watch?v=f5RwX_plgw
Total				48 Hrs

Thermodynamics

Course Title	Code	Type of Course	T-P-PJ	Prerequisite
Thermodynamics	ENFC0103	Theory	3-0-0	Nil

Objective

- To know the Laws of Thermodynamics and Conditions for Energy Transformation.
- To get Familiar with Different Thermodynamic Properties of Pure Substances.

Course Outcome

- Students will be able to prepare Energy Balance Sheet.
- Students will be able to determine Efficiency of Various Thermal Devices.

Evaluation Systems

	Component	% of Marks	Method of Assessment
Internal Examination	Internal Theory	30	Written examination
	Assignment	5	Report or Presentation + Learning Record
	Attendance	5	Based on class attended
External Examination	External Theory	60	Written examination
Total		100	

Course outline

Module: I (6 Hours)

Introduction : Difference between Statistical Thermodynamics and Classical Thermodynamics, Concept of Continuum, Traceability of Thermodynamic Change, Concept of Reversibility, Concept of Equilibrium, Design of Thermometers with Three Different Liquids Having Different Coefficient of Thermal Expansion, To Explain Zeroth Law of Thermodynamics. Ideal Gas Temperature Scale and Calibration of Thermometers.

Module: II (9 Hours)

Work Transfer Calculations: Various Modes of Displacement Work. Calculation of Work for Various Processes & Cycles.

Application of First Law of Thermodynamics : Closed Systems & Open Systems. Concept of Internal Energy, Enthalpy & Its Calculation Using Specific Heats.

Module: III (3 Hours)

Energy Balance analysis: Sheet for Opens Systems and Closed Systems : Nozzle, Diffuser, Compressor, Turbine, Heat Exchanger, Throttling Devices, Boilers and Condensers.

Module: IV (10 Hours)

Second Law of Thermodynamics: Working of Refrigerator and Heat Pump. Kelvin Planck and Clausius Statement of Second Law, Corollaries, Clausius Inequality.

Entropy : Definition, Principle of Increase of Entropy. Change of Entropy of Perfect Gas in Various Processes.

Module: V (5 Hours)

Properties of Pure Substance :P-V, P-T, T-S, H-S Diagram for Steam, Triple Point of Water. Different Types of Steam.

Introduction to Steam Tables : Specific Volume, Pressure, Temperature, Enthalpy and Entropy.

Module: VI (6 Hours)

IC Engines :Working Of IC Engines. Classification of IC Engines : 2 Strokes & 4 Strokes Engine, Petrol & Diesel Engines. Engine Nomenclature.

Module: VII (6 Hours)

Gas Power Cycles : Carnot Cycle, Air Standard Cycles-Otto, Diesel, Dual Combustion.

Introduction to Gas Turbine Cycles : Open & Closed Cycle.

Text Books:

1. A Text Book of Engineering Thermodynamics: R K Rajput,4th Edition. Laxmi Publications
2. Thermodynamics an Engineering Approach, Y.A Cengel, M. A Boles, Tata Mcgraw Hill Companies

Reference Books:

1. Fundamentals of Thermodynamics, C. Borgnakke, R. E. Sonntag, Wiley Publication.

Session Plan

Topic coverage and Internal Test	No. of Sessions (in hrs.)	Activity (lecture, tutorial, lab practice, field studies/field-trip, Workshop etc.)	Assignment (project, assignment, field study, seminar, etc.)	Suggested Reading (Book, Video, Online source, etc.)
Module I (6 Hrs)				

Difference between statistical thermodynamics and classical thermodynamics.	1	CRT	Assignment-I	A text book of Engineering Thermodynamics : R K Rajput,4 th edition. Laxmi publications. Thermodynamics Engineering. Approach, Y.A Cengel, M. A Boles, Tata McGraw Hill Companies.
Concept of continuum. Traceability of thermodynamic change : Concept of reversibility. Concept of equilibrium.	2	CRT	Assignment-I	A text book of Engineering Thermodynamics : R K Rajput,4 th edition. Laxmi publications. Thermodynamics An Engineering. Approach, Y.A Cengel, M. A Boles, Tata McGraw Hill Companies
Design of thermometers with 3 different liquids having different coefficient of thermal expansion to explain zeroth law of thermodynamics.	2	CRT & Video presentation	Assignment-I	A text book of Engineering Thermodynamics : R K Rajput,4 th edition. Laxmi publications Thermodynamics An Engineering. Approach, Y.A Cengel, M. A Boles, Tata McGraw Hill Companies <u>https : //www.youtube.com/watch?v=1nECy2s_qEo</u>
Ideal gas temperature scale and calibration of thermometers.	1	CRT	Assignment-I	A text book of Engineering Thermodynamics : R K Rajput,4 th edition. Laxmi publications. Thermodynamics An Engineering. Approach, Y.A Cengel, M. A Boles, Tata McGraw Hill Companies.
Module II (9 Hrs)				
Work Transfer Calculations : Various modes of displacement work.	5	CRT	Assignment-I	A text book of Engineering Thermodynamics : R K Rajput,4 th edition. Laxmi publications.

Calculation of work for various processes & cycles.				Thermodynamics An Engineering. Approach, Y.A Cengel, M. A Boles, Tata McGraw Hill Companies.
Application of first law of thermodynamics to closed systems & open systems. Concept of internal energy, enthalpy & its calculation using specific heats	4	CRT	Assignment-I	A text book of Engineering Thermodynamics : R K Rajput, 4 th edition. Laxmi publications. Thermodynamics An Engineering. Approach, Y.A Cengel, M. A Boles, Tata McGraw Hill Companies.
Module III (3 Hrs)				
Energy balance sheet for opens systems and closed systems : Nozzle, Diffuser, compressor, turbine, heat exchanger, throttling devices, boilers and condensers.	3	CRT & Video presentation	Assignment-I	A text book of Engineering Thermodynamics : R K Rajput, 4 th edition. Laxmi publications. Thermodynamics An Engineering. Approach, Y.A Cengel, M. A Boles, Tata McGraw Hill Companies. <u>https : //www.youtube.com/watch? v=Nv2G8Dpruxc</u> <u>https : //www.youtube.com/watch? v=-CRjNmIOdZo</u>
Module IV (10 Hrs)				
Working of refrigerator and heat pump.	3	CRT	Assignment-II	A text book of Engineering Thermodynamics : R K Rajput, 4 th edition. Laxmi publications. Thermodynamics An Engineering. Approach, Y.A Cengel, M. A Boles, Tata McGraw Hill Companies.
Kelvin Planck and Clausius statement	2	CRT	Assignment-	A text book of Engineering Thermodynamics : R K

of second law, corollaries.			II	Rajput, 4 th edition. Laxmi publications. Thermodynamics An Engineering. Approach, Y.A Cengel, M. A Boles, Tata McGraw Hill Companies.
Clausius inequality.	1	CRT & Video Presentation	Assignment-II	A text book of Engineering Thermodynamics : R K Rajput, 4 th edition. Laxmi publications. Thermodynamics Engineering. Approach, Y.A Cengel, M. A Boles, Tata McGraw Hill Companies. <u>https : //www.youtube.com/watch?v=wd0Rghxmf3M</u> <u>https : //www.youtube.com/watch?v=MbyfTw5YFZs</u>
Entropy : Definition, principle of increase of entropy.	2	CRT	Assignment-II	A text book of Engineering Thermodynamics : R K Rajput, 4 th edition. Laxmi publications. Thermodynamics Engineering. Approach, Y.A Cengel, M. A Boles, Tata McGraw Hill Companies.
Change of entropy of perfect gas in various processes	2	CRT	Assignment-II	A text book of Engineering Thermodynamics : R K Rajput, 4 th edition. Laxmi publications. Thermodynamics An Engineering. Approach, Y.A Cengel, M. A Boles, Tata McGraw Hill Companies.
Module V (5 Hrs)				
Properties of pure substance : p-v, p-T, T-S, h-S	3	CRT & Video presentation	Assignment-II	A text book of Engineering Thermodynamics : R K Rajput, 4 th edition. Laxmi

<p>diagram for steam, Triple point of water. Different types of steam.</p>				<p>publications. Thermodynamics Engineering. Approach, Y.A Cengel, M. A Boles, Tata McGraw Hill Companies. <u>https : //www.youtube.com/watch?v=pP2HuLPkrkY</u> <u>https : //www.youtube.com/watch?v=pJM9Fh9Fp-I</u></p>
<p>Introduction to steam table with respect to specific volume, pressure, temperature, enthalpy and entropy</p>	2	CRT	Assignment-II	<p>A text book of Engineering Thermodynamics : R K Rajput, 4th edition. Laxmi publications. Thermodynamics An Engineering. Approach, Y.A Cengel, M. A Boles, Tata McGraw Hill Companies.</p>
<p>Module VI (6 Hrs)</p>				
<p>IC Engines :Working of IC engines. Classification of IC engines.</p>	2	CRT & Videopresentation	Assignment-III	<p>A text book of Engineering Thermodynamics : R K Rajput, 4th edition. Laxmi publications. Thermodynamics Engineering. Approach, Y.A Cengel, M. A Boles, Tata McGraw Hill Companies. <u>https : //www.youtube.com/watch?v=emSXIjwGfQU</u> <u>https : //www.youtube.com/watch?v=Pu7g3uIG6Zo</u> <u>https : //www.youtube.com/watch?v=fD7GOrF7laY</u> <u>https : //www.youtube.com/watch?</u></p>

				<u>v=rhzgeNAXvfs</u>
2 strokes & 4 strokes engine, Petrol & diesel engines. Engine nomenclature.	4	PRA	Assignment-III	A text book of Engineering Thermodynamics : R K Rajput,4 th edition. Laxmi publications. Thermodynamics Engineering. Approach, Y.A Cengel, M. A Boles, Tata McGraw Hill Companies.
Module VII (6 Hrs)				
Gas Power Cycles : Carnot cycle, Air standard cycles- Otto, Diesel and Dual Combustion cycle.	4	CRT	Assignment-III	A text book of Engineering Thermodynamics : R K Rajput,4 th edition. Laxmi publications. Thermodynamics An Engineering. Approach, Y.A Cengel, M. A Boles, Tata McGraw Hill Companies.
Introduction to Gas Turbine Cycles : Open & Closed Cycle	2	Video	Assignment-III	<u>https : //www.youtube.com/watch?v=m4kvSLxAaI</u> <u>https : //www.youtube.com/watch?v=eTJkz99Jjx8</u> <u>https : //www.youtube.com/watch?v=zcWkEKNvqCA</u>
Total (hrs)				45

Introduction to Communication Engineering

Course Title	Code	Type of Course	T-P-PJ	Prerequisite
Introduction to Communication Engineering	ENFC0104	Theory	3-0-0	Nil

Objective

- The objective of this subject is to impart the fundamentals of modern digital & analog communication systems.

Course Outcome

- Upon successful completion of this subject students should be able to : understand important concepts in communication engineering and an insight into modern communication standards.

Evaluation Systems

	Component	% of Marks	Method of Assessment
Internal Examination	Internal Theory	30	Written examination
	Assignment	5	Report or Presentation + Learning Record
	Attendance	5	Based on class attended
External Examination	External Theory	60	Written examination
Total		100	

Course Outline

Module: I (06 Hours)

Land Line Communication :

Evolution of telecommunications, simple telephone communication, basics of switching system, switching system parameters, signaling tones, electronic space division switching centralized and distributed SPC

Module : II (06 Hours)

Optical Communication:

Fiber-Optic Cable, Optical Principles, Optical Communication System, Fiber Optical Cables.

Module: III (07 Hours)

Elements of a Television System : Picture Transmission, Sound Transmission, Picture Reception, Sound Reception, Synchronization, Receiver Controls, Color Television.

Signal Transmission and Channel Bandwidth : Amplitude Modulation, Channel Bandwidth, Vestigial Sideband, Transmission, Transmission Efficiency Complete Channel Bandwidth, Reception of Vestigial Sideband Signals, Frequency Modulation, FM Channel Bandwidth, Channel Bandwidth for Colour Transmission, Allocation of Frequency Bands for Television Signal Transmission, Television Standards.

Module: IV (06 Hours)

Mobile Communication: Overview of Cellular Systems and Evolution of 2G/3G/4G/5G, Cellular Concepts – Cellular Systems, Hexagonal Cell Geometry, Frequency reuse, Co-channel and Adjacent channel Interference, Cell Splitting, Handoff, Blocking, GSM& CDMA Standards. WLAN, Bluetooth, Infrared Wireless, Wi-fi, Wi-Max.

Module: V (06 Hours)

Radar Communication : RADAR, Applications, Types, Frequency Bands, Basic Radar, RADAR range equation, Pulsed RADAR, CW RADAR, MTI RADAR, Tracking RADAR, Global Positioning System.

Module: VI (06 Hours)

Satellite Communication: Basic Satellite Systems, Indian Scenario, Satellite Orbits, Satellite Communication Systems, satellite link design,

Module: VII (08 Hours)

Internet Communication:

Data Communication Architecture, Link To Link Layers, End-To-End Layers, Switching Techniques for Data Transmission, LAN, MAN, ISDN, BISDN.

Text Books:

1. Telecommunication Switching Systems and Networks, Thiagarajan Vishwanathan PHI Publisher .
2. Fiber-Optic Communication Systems, 3ed Paperback – 2007 by Govind P. Agrawal.
3. Monochrome and colour television by R.R.Gulati
4. Satellite Communication by T. Pratt, C. Bostian and J. Allnutt. 2nd Edition, Joihn Wiley Co.
5. Radar engineering by G. S. N. Raju

Session Plan

Topic Coverage and Internal Test	No. of Sessions (in hrs.)	Activity (lecture, tutorial, lab practice, field studies/field-trip, Workshop etc.)	Assignment (Project, assignment, field study, seminar, etc.)	Suggested Reading (Book, Video, Online source, etc.)
Module-I [06 hrs. Lecture]				
Evolution of telecommunications, simple telephone communication,	1	Lecture		Text Book-1
Basics of switching system,	1	Lecture		Text Book-1
switching system parameters,	1	Lecture		Text Book-1
signaling tones,	1	Lecture		Text Book-1
electronic space division switching	1	Lecture		Text Book-1
centralized and distributed SPC	1	Lecture		Text Book-1
Module-II [06 hrs. Lecture]				
Fiber-Optic Cable	1	Lecture		Text Book-2
Optical Principles	1	Lecture		Text Book-2
Optical Communication System	2	Lecture		Text Book-2
Fiber Optical Cables.	2	Lecture		Text Book-2
Module-III [07 hrs. Lecture]				
Elements of a Television System : Picture Transmission, Sound Transmission, Picture Reception	1	Lecture		Text Book-3
Sound Reception, Synchronization, Receiver Controls , Colour Television.	1	Lecture		Text Book-3

Signal Transmission and Channel Bandwidth : Amplitude Modulation , Channel Bandwidth	1	Lecture		Text Book-3
Vestigial Sideband ,Transmission , Transmission Efficiency	1	Lecture		Text Book-3
Complete Channel Bandwidth , Reception of Vestigial Sideband Signals , Frequency Modulation	1	Lecture		Text Book-3
FM Channel Bandwidth, Channel Bandwidth for Colour Transmission	1	Lecture		Text Book-3
Allocation of Frequency Bands for Television Signal Transmission, Television Standards.	1	Lecture		Text Book-3
Module-IV [06 hrs. Lecture]				
Overview of Cellular Systems and Evolution of 2G/3G/4G/5G	1	Lecture		Text Book-4
Cellular Concepts – Cellular Systems, Hexagonal Cell Geometry	1	Lecture		Text Book-4
Frequency reuse, Co-channel and Adjacent channel Interference	1	Lecture		Text Book-4
Cell Splitting, Handoff, Blocking, GSM & CDMA	1	Lecture		Text Book-4
Standards. WLAN, Bluetooth	1	Lecture		Text Book-4
Infrared Wireless, Wi-fi, Wi-Max	1	Lecture		Text Book-4
Module-V [06 hrs. Lecture]				
RADAR, Applications, Types, Frequency Bands	1	Lecture		Text Book-5
Basic Radar , RADAR range equation,	1	Lecture		Text Book-5
Pulsed RADAR,	1	Lecture		Text Book-5
CW RADAR,	1	Lecture		Text Book-5
MTI RADAR, Tracking RADAR	1	Lecture		Text Book-5
Global Positioning System.	1	Lecture		Text Book-5
Module-VI [06 hrs. Lecture]				

Basic Satellite Systems	1	Lecture		Text Book-4
Indian Scenario	1	Lecture		Text Book-4
Satellite Orbits	1	Lecture		Text Book-4
Satellite Communication Systems	2	Lecture		Text Book-4
Satellite link design	1	Lecture		Text Book-4
Module-VII [08hrs. Lecture]				
Data Communication Architecture	1	Lecture		Text Book-1
Link To Link Layers	1	Lecture		Text Book-1
End-To-End Layers	1	Lecture		Text Book-1
Switching Techniques for Data Transmission	2	Lecture		Text Book-1
LAN, MAN	1	Lecture		Text Book-1
ISDN	1	Lecture		Text Book-1
BISDN.	1	Lecture		Text Book-1
Total (hrs.)				45 hr.

Introduction to Aerospace Engineering

Course Title	Code	Type of course	T-P-PJ	Prerequisite
Introduction to Aerospace Engineering	ENFC0105	Theory	3-0-0	Nil

Objective

- To familiarize with the Basic Concepts of Flying, Aircraft Structures, Systems, Instruments and Power Plants used in Airplanes.

Course Outcome

- To Identify the Component of Flight and Suitable Materials for Aircraft Structure.
- To Perform Basic Calculation on Mechanics using Newton Law for Lift, Drag and Moment.

Evaluation Systems

	Component	% of Marks	Method of Assessment
Internal Examination	Internal Theory	30	Written examination
	Assignment	5	Report or Presentation + Learning Record
	Attendance	5	Based on class attended
External Examination	External Theory	60	Written examination
Total		100	

Course Outline

Module: I (08 Hrs)

History of Flight:

Early flying vehicles by Wright brothers, hot air balloons, Classification of flight vehicles, biplanes and monoplanes, developments in aerodynamics airplanes and Helicopters, Components of an airplane and their functions.

Module: II (06 Hrs)

Basics of Aeronautics: Physical properties and structure of the atmosphere, temperature, pressure and altitude relationships.

Module: III (08 Hrs)

Newton's law of motions applied to aeronautics - evolution of lift, drag and moment. aerofoils, mach number, subsonic, transonic, supersonic, hypersonic flows.

Module: IV (06 Hrs)

Airplane Structures and Materials :General types of construction, monocoque and semi-monocoque constructions, typical wing and fuselage structure.

Module: V (06 Hrs)

Airplane Structures and Materials:Materials used in aircraft metallic and non-metallic materials, use of aluminium alloy, titanium, stainless steel and composite materials.

Module: VI (06 Hrs)

Systems and Instruments:Conventional control, Powered controls, Basic instruments for flying, typical systems for control actuation.

Module: VII (08 Hrs)

Power Plants : Basic ideas about piston, turboprop and jet engines - use of propeller and jets for thrust production - comparative merits, principles of operation of rocket, types of rockets and typical applications, exploration into space.

References

Text Books :

J.D. Anderson, Introduction to Flight, McGraw Hill

A.C. Kermode, Mechanics of Flight, Himalayan Book

Reference Books :

E.H.J. Pallet, Aircraft Instruments & Principles, Pitman & Co

Online Source : NPTEL, You tube

Introduction to Computer Networks

Course Title	Code	Type of course	T-P-PJ	Prerequisite
Introduction to Computer Networks	FCEN0120	Theory	3-0-0	Nil

Objective

- This course introduces the architecture, functions, and components of the Internet and computer networks, the principles and structure of IP addressing and sub netting, the fundamentals of Ethernet, the architecture, components and operations of routers, routing protocols and switches in a network.
- Topics include TCP/IP, Ethernet, IPv4, routers, switches.

Course Outcome

- Upon successful completion of this course students will be able to define layers of the OSI model and identify the protocols, and services associated with each layer, identify the purpose, features, and functions of current common network hardware and the OSI layer with which each is associated
- Explain the operation principles of current common network hardware devices, describe current common protocols in terms of their function, routing, addressing schemes, interoperability, and naming conventions, justify information security issues in computer net works.

Evaluation Systems

	Component	% of Marks	Method of Assessment
Internal Examination	Internal Theory	30	Written examination
	Assignment	5	Report or Presentation + Learning Record
	Attendance	5	Based on class attended
External Examination	External Theory	60	Written examination
Total		100	

Course outline

Module I Computer Networking Fundamentals

(8Hrs.)

Networking fundamentals, Internet, Access Networks, Physical Media, Switching techniques, Layered Architecture, Introduction to the Seven layers of the OSI model, concept of the OSI model, TCP/IP model and comparison with OSI model, the Application Layer, the Presentation Layer, the Session Layer, the Transport Layer, the Network Layer, the Data Link Layer & the Physical layer.

Module II (Part-1) Security Protocols - Application Layer (5 Hrs.)

Introduction to Protocol concepts, Important Protocols, File Transfer Protocol, Socket Secure OCKS), Secure Shell (SSH), Remote Terminal Control Protocol (Telnet), HTTP.

Module III (Part -2) Security Protocols - Application Layer (2) (4 Hrs.)

Transport Layer Security/Secure Sockets Layer (TLS/SSL), Extensible Messaging & Presence Protocol (XMPP), Wireless Application Protocol (WAP) & Internet Relay Chat (IRC), SMTP.

Module IV (Part-1)Transport Layer (4 Hrs.)

Introduction to Transport Layer, TCP/IP, User Datagram Protocol (UDP), Real-time Transport Protocol (RTP)

Module V (Part-2) Transport Layer (4 Hrs)

Datagram Congestion Control Protocol (DCCP), Stream Control Transmission Protocol (SCTP), Resource reservation Protocol (RSVP)&Explicit Congestion Notification (ECN)

Module VI Network Layer (8Hrs.)

Introduction to Network Layer, Internet Protocol Version 4 (IPv4), Internet Protocol Version 6 (IPv6), internet Protocol Security (IPSEC), Internet Control Message Protocol (ICMP) & Internet Group Management Protocol (IGMP)

Module VII: Data Link Layer (8Hrs.)

Introduction to Data Link Layer, Error correction and detection, CRC, the Address Resolution Protocol (ARP), Tunneling Protocol (Tunnels) &the Point to Point Protocol (PPP), HDLC.

E-content: LMS Content

Reference Books/Text Books:

1. Information Systems Security: Security Management, Metrics, Frameworks and Best Practices by Nina Godbole
2. Network Security Bible by Eric Cole.
3. Computer Networking by Kurose, Ross

Online Source:

1. <https://www.lifewire.com/layers-of-the-osi-model-illustrated-818017>
2. https://www.webopedia.com/quick_ref/OSI_Layers.asp
3. https://www.tutorialspoint.com/network_security/network_security_application_layer.htm
4. https://www.tutorialspoint.com/data_communication_computer_network/transport_layer_introduction.htm
5. <https://www.studytonight.com/computer-networks/osi-model-network-layer>
6. https://www.tutorialspoint.com/data_communication_computer_network/data_link_layer_introduction.htm

Session Plan

<i>Topic coverage and Internal Test</i>	<i>No. of Sessions (in hrs.)</i>	<i>Activity (lecture, tutorial, lab practice, field studies/field-trip, Workshop etc.)</i>	<i>Assignment (project, assignment, field study, seminar, etc.)</i>	<i>Suggested Reading (Book, Video, Online source, etc.)</i>
Module-1 Computer Networking Fundamentals (Total = 8hrs)				
Networking fundamentals, Internet,	2	Lecture + PPT	Assignment	Book,Online Sources,LMS
Access Networks, Physical Media	1	Lecture + PPT	Assignment	Book,Online Sources,LMS
Switching techniques, Layered Architecture,	1	Lecture + PPT	Assignment	Book,Online Sources,LMS
Introduction to the Seven layers of the OSI model, concept of the OSI model, TCP/IP model and comparison with OSI model,	2	Lecture + PPT	Assignment	Book,Online Sources,LMS
<ul style="list-style-type: none"> the Application Layer, the Presentation Layer, the Session Layer, 	1	Lecture + PPT	Assignment	Book,Online Sources,LMS
<ul style="list-style-type: none"> the Transport Layer, the Network Layer, the Data Link Layer & the Physical layer. 	1	Lecture + PPT	Assignment	Book,Online Sources,LMS
Module-2 (Part -1) Security Protocols - Application Layer (2) (Total = 5hrs)				
Introduction to Protocol concepts, Important Protocols	2	Lecture + PPT	Assignment	Book,Online Sources,LMS
,File Transfer Protocol, Socket Secure (SOCKS), Secure Shell (SSH), Remote Terminal Control Protocol (Telnet). HTTP	3	Lecture + PPT	Assignment	Book,Online Sources,LMS

Module-3 (Part -2) Security Protocols - Application Layer (2) (Total = 4 hrs)				
Transport Layer Security/Secure Sockets Layer (TLS/SSL),	2	Lecture + PPT	Assignment	Book,Online Sources,LMS
Extensible Messaging & Presence Protocol (XMPP), Wireless Application Protocol (WAP) & Internet Relay Chat (IRC), SMTP	2	Lecture + PPT	Assignment	Book,Online Sources,LMS
Module-4 (Part-1) Transport Layer (Total = 4 hrs)				
Introduction to Transport Layer, TCP/IP, User Datagram Protocol (UDP), Real-time Transport Protocol (RTP)	4	Lecture + PPT	Assignment	Book,Online Sources,LMS
Module-5 (Part-2) Transport Layer (Total = 4 hrs)				
Datagram Congestion Control Protocol (DCCP)	1	Lecture + PPT	Assignment	Book,Online Sources,LMS
Stream Control Transmission Protocol (SCTP),	1	Lecture + PPT	Assignment	Book,Online Sources,LMS
Resource reservation Protocol (RSVP)&Explicit Congestion Notification (ECN)	2	Lecture + PPT	Assignment	Book,Online Sources,LMS
Module-6 Network Layer (Total = 8hrs)				
Introduction to Network Layer, Internet Protocol Version 4 (IPv4), Internet Protocol Version 6 (IPv6),	4	Lecture + PPT	Assignment	Book,Online Sources,LMS
Internet Protocol Security (IPSEC), Internet Control Message Protocol (ICMP) & Internet Group Management Protocol (IGMP)	4	Lecture + PPT	Assignment	Book,Online Sources,LMS

Module-7 Data Link Layer (Total = 8hrs)				
Introduction to Data Link Layer, Error correction and Detection, CRC the Address Resolution Protocol (ARP), the Open Shortest Path First (OSPF), the Neighbor Discovery Protocol (NDP).	5	Lecture + PPT	Assignment	Book,Online Sources,LMS
The Tunneling Protocol (Tunnels) & the Point to Point Protocol (PPP), HDLC	3	Lecture + PPT	Assignment	Book,Online Sources,LMS
<i>Total (hrs)</i>	Total = 41 Hours (Theory)			

Computer Fundamental and Organization

Course Title	Code	Type of course	T-P-PJ	Prerequisite
Computer Fundamental and Organization	FCEN 0118	Theory	3-0-0	Nil

Objective

- To explore the organization of computer system and its working.
- To understand the basics of computer networks.
- To use office packages like MS Office.

Course Outcome

- After completing the course students will able to
- Explain different components of computer system and their functions.
- Know the basics about computer networks.
- Use word processing, spreadsheet, and power point applications.

Evaluation Systems

	Component	% of Marks	Method of Assessment
Internal Examination	Internal Theory	30	Written examination
	Assignment	5	Report or Presentation + Learning Record
	Attendance	5	Based on class attended
External Examination	External Theory	60	Written examination
Total		100	

Course outline

Module: I (7 hrs)

General Features of a Computer: General features of a computer, Generation of computers, Personal computer, workstation, mainframe computer and super computers. Computer applications – data processing, information processing, commercial, office automation, industry and engineering, healthcare, education, graphics and multimedia.

Module: II (6 hrs)

Computer Organization: Computer organization, central processing unit, computer memory – primary memory and secondary memory. Secondary storage devices – Magnetic and optical media. Input and output units. OMR, OCR, MICR, scanner, mouse, modem.

Module: III (5 hrs)

Computer Hardware and Software Computer hardware and software. Machine language and high level language. Application software, computer program, operating system. Computer virus, antivirus and computer security. Elements of MS DOS and Windows OS.

Module IV: (5 hrs)

Computer Arithmetic and Number System :Computer arithmetic, Binary, octal and hexadecimal number systems.

Module V: (6 hrs)

Logic Gates:Algorithm and flowcharts, illustrations, elements of a database and its applications
Basic Gates (**De Morgan's** theorems, duality theorem, NOR, NAND, XOR, XNOR gates), Boolean expressions and logic diagrams, Types of Boolean expressions.

Module: VI: (5 hrs)

MS Office: Word processing and electronic spread sheet. An overview of MSWORD, MSEXCEL and MSPOWER POINT.

Module VII : (5 hrs)

Introduction to Networking: Network of computers. Types of networks, LAN, Intranet and Internet. Internet applications. World Wide Web, E-mail, browsing and searching, search engines, multimedia applications.

Reference

E-content : LMS

Reference Books:

Alexis Leon and Mathews Leon (1999) : Fundamentals of information Technology, Leon

Techworld Pub.

Jain, S K (1999) : Information Technology “O” level made simple, BPB Pub

Jain V K (2000) “O” Level Personal Computer software, BPB Pub.

Rajaraman, V (1999) : Fundamentals of Computers, Prentice Hall India

Hamacher, Computer Organization McGrawhill

Alexis Leon : Computers for everyone. Vikas, UBS

Anil Madaan : Illustrated Computer Encyclopedia. Dreamland Pub

Sinha. Computer Fundamentals BPB Pub.

Online Source : Microsoft academy, Edx

Session Plan

Topic coverage and Internal Test	No. of Sessions (in hrs.)	Activity (lecture, tutorial, lab practice, field studies/field-trip, Workshop etc.)	Assignment (project, assignment, field study, seminar, etc.)	Suggested Reading (Book, Video, Online source, etc.)
Module I Lecture=7 Hrs.				
General features of a computer, Generation of computers, Personal computer, workstation mainframe computer and super computers	3	lecture	assignment	Book, Online Source, SLM
Mainframe computer and super computers	2	lecture	assignment	Book, Online Source, SLM
Computer applications – data processing, information processing, commercial, office automation, industry and engineering, healthcare, education, graphics and multimedia.	2	lecture	assignment	Book, Online Source, SLM
Module II Lecture=6 Hrs.				
Computer organization, central processing unit, computer memory – primary memory and secondary memory.	3	lecture	assignment	Book, Online Source, SLM
Secondary storage devices – Magnetic and optical media. Input and output units. OMR, OCR, MICR, scanner, mouse, modem.	3	lecture	assignment	Book, Online Source, SLM
Module III Lecture=5 Hrs.				

Computer hardware and software. Machine language and high level language.	2	lecture	assignment	Book, Online Source, SLM
Application software, computer program, operating system. Computer virus, antivirus and computer security. Elements of MS DOS and Windows OS.	3	lecture	seminar	Book, Online Source, SLM
Module IV Lecture=5 Hrs.				
Computer arithmetic, Binary, octal and hexadecimal number systems.	5	lecture	assignment	Book, Online Source, SLM
Module V Lecture=6 Hrs.				
Algorithm and flowcharts, illustrations, elements of a database and its applications.	3	lecture	assignment	Book, Online Source, SLM
Basic Gates (De Morgan's theorems, duality theorem, NOR, NAND, XOR, XNOR gates), Boolean expressions and logic diagrams, Types of Boolean expressions.	3	lecture	assignment	Book, Online Source, SLM
Module VI Lecture=5 Hrs.				
Word processing and electronic spread sheet. An overview of MS WORD, MS EXCEL and MS POWER POINT	5	lecture	assignment	Book, Online Source, SLM
Module VII Lecture=5 Hrs.				
Network of computers. Types of networks, LAN, Intranet and Internet.	2	lecture	assignment	Book, Online Source, SLM

Internet applications. World Wide Web, E-mail, browsing and searching, search engines, multimedia applications.	3	lecture	Assignment	Book, Online Source, SLM
Total (hrs)	39			

Operating System Building Blocks

Course Title	Code	Type of course	T-P-PJ	Prerequisite
Operating System Building Blocks	FCEN 0119	Theory	3-0-0	Nil

Objective

- The operating system is the most important program that runs on a computer. Every general-purpose computer must have an operating system to run other programs.
- Operating systems perform basic tasks, such as recognizing input from the keyboard, sending output to the display screen, keeping track of files and directories on the disk, and controlling peripheral devices such as disk drives and printers.
- This course covers the concept of operating system and its applications.

Course Outcome

- After learning the fundamental concepts in Operating system including how OS has evolved over the years and different components of OS, students will continue to more significant functions of OS like Process management, storage and memory management etc.
- This will provide the necessary information for students to extract maximum benefits out of the OS while developing programs, working with applications etc.

Evaluation Systems

	Component	% of Marks	Method of Assessment
Internal Examination	Internal Theory	30	Written examination
	Assignment	5	Report or Presentation + Learning Record
	Attendance	5	Based on class attended
External Examination	External Theory	60	Written examination
Total		100	

Course outline

Module I: (5 Hrs.)

Introduction to Operating System: Objectives and Functions of OS, Evolution of OS, OS Structures, OS Components, OS Services, System calls, System programs, Virtual Machines.

Module II: (8 Hrs.)**Process Management – Processes and Threads**

Processes: Process concept, Process scheduling, Co-operating processes, Operations on processes, Inter process communication, Communication in client-server systems. Threads : Introduction to Threads, Single and Multi-threaded processes and its benefits, User and Kernel threads, Multithreading models, threading issues. CPU Scheduling : Basic concepts, Scheduling criteria, Scheduling Algorithms, Multiple Processor Scheduling, Real-time Scheduling, Algorithm Evaluation, Process Scheduling Models.

Module III: (6 Hrs.)

Process Management – Synchronization : Process Synchronization : Mutual Exclusion, Critical – section problem, Synchronization hardware, Semaphores, Classic problems of synchronization, Critical Regions, Monitors, OSS Synchronization, Atomic Transactions.

Module IV: (4 Hrs)

Deadlock Handling Deadlocks: System Model, Deadlock characterization, Methods for handling Deadlocks, Deadlock prevention, Deadlock Avoidance, Deadlock, Detection, Recovery from Deadlock.

Module V: (8 Hrs.)

Memory Management: Memory Management: Logical and physical Address Space, Swapping, Contiguous Memory Allocation, Paging, Segmentation with Paging. Virtual Management : Demand paging, Process creation, Page Replacement Algorithms, Allocation of Frames, Thrashing, Operating System Examples, Page size and other considerations, Demand segmentation.

Module VI: (4 Hrs.)

Device and File Management File-System Interface : File concept, Access Methods, Directory structure, File- system Mounting, File sharing, Protection and consistency semantics. File-System Implementation: File-System structure, File-System Implementations, Directory Implementation, Allocation Methods, Free-space Management, Efficiency and Performance, Recovery. Disk Management Disk Structure, Disk Scheduling, Disk Management, Swap-Space Management, Disk Attachment, stable-storage Implementation.

Module VII : (4 Hrs.)

Protection and Security Protection : Goals of Protection, Domain of Protection, Access Matrix, Implementation of Access Matrix, Revocation of Access Rights, Capability- Based Systems, Language – Based Protection. Security : Security Problem, User Authentication, One – Time Password, Program Threats, System Threats, Cryptography, Computer – Security Classifications.

E-content: LMS Content

Text Books:

1. Operating System by Silberschatz / Galvin / Gagne, 6th Edition, WSE (WILEY Publication)
2. Operating System by Abraham Silberschatz and peter Baer Galvin, 8th Edition, Pearson Education 1989 (Chapter 1,3.1,3.2,3.3,3.4,3.6,4,5,6 (Except 6.8,6.9), 7, 8,9,10,11,13, (Except 13.6) 19 (Except 19.6),20(Except 20.8, 20.9), 22,23).

Reference Books:

1. Operating System Concepts and design by Milan Milonkovic, II Edition, McGraw Hill 1992.
2. Operation System Concepts by Tanenbaum, 2nd Edition, Pearson Education.
3. Operating System by William Stallings, 4th Edition, Pearson Education.
4. Operating System by H.M. Deitel , 2nd Edition Pearson Education.
5. Operating Systems by Nutt, 3/e Pearson Education 2004.

Online Source:

[http : //www.sci.brooklyn.cuny.edu/~jniu/teaching/csc33200/files/0915-OperatingSystemsOverview.pdf](http://www.sci.brooklyn.cuny.edu/~jniu/teaching/csc33200/files/0915-OperatingSystemsOverview.pdf)
[http : //codex.cs.yale.edu/avi/os-book/OS8/os8c/slide-dir/PDF-dir/ch1.pdf](http://codex.cs.yale.edu/avi/os-book/OS8/os8c/slide-dir/PDF-dir/ch1.pdf)
[http : //www.ddegjust.ac.in/studymaterial/mca-3/ms-08.pdf](http://www.ddegjust.ac.in/studymaterial/mca-3/ms-08.pdf)
<http://www2.latech.edu/~box/os/ch06a.pdf>
[http : //www.cs.ucsb.edu/~rich/class/cs170/notes/IntroThreads](http://www.cs.ucsb.edu/~rich/class/cs170/notes/IntroThreads)
[http : //codex.cs.yale.edu/avi/os-book/OS8/os8c/slide-dir/PDF-dir/ch5.pdf](http://codex.cs.yale.edu/avi/os-book/OS8/os8c/slide-dir/PDF-dir/ch5.pdf)
[https : //www.kernel.org/doc/gorman/html/understand/understand014.html](https://www.kernel.org/doc/gorman/html/understand/understand014.html)
[https : //www.cs.uic.edu/~jbell/CourseNotes/OperatingSystems/14_Protection.html](https://www.cs.uic.edu/~jbell/CourseNotes/OperatingSystems/14_Protection.html)
[http : //www.slideshare.net/Colin058/network-security-threats-and-solutions-1018888](http://www.slideshare.net/Colin058/network-security-threats-and-solutions-1018888)
[http : //www.openbsd.org/papers/crypt-service.pdf](http://www.openbsd.org/papers/crypt-service.pdf)

Session Plan

Topic coverage and Internal Test	No. of Sessions (in hrs.)	Activity (lecture, tutorial, lab practice, field studies/field-trip, Workshop etc.)	Assignment (project, assignment, field study, seminar, etc.)	Suggested Reading (Book, Video, Online source, etc.)
Module - I (5 Hrs.)				
Introduction to Operating System : Objectives and Functions of OS, Evolution of OS	3	Lecture	Assignment	Book, Online Source

OS Structures, OS Components, OS Services	1	Lecture	Assignment	Book, Online Source
System Calls	1	Lecture	Assignment	Book, Online Source
Module - II (8 Hrs.)				
Process Management – Processes and Threads : Processes : Process concept, Process scheduling, Co-operating processes, Operations on processes	2	Lecture	Assignment	Book, Online Source
Inter process communication, Communication in client-server systems.	2	Lecture	Assignment	Book, Online Source
Threads : Introduction to Threads, Single and Multi-threaded processes and its benefits, User and Kernel threads, Multithreading models, Threading issues.	1	Lecture	Assignment	Book, Online Source
CPU Scheduling : Basic concepts, Scheduling criteria, Scheduling Algorithms, Multiple Processor Scheduling, Real-time Scheduling, Algorithm Evaluation, Process Scheduling Models.	3	Lecture	Assignment	Book, Online Source
Module - III (6 Hrs.)				
Process Management – Synchronization Mutual Exclusion,	3	Lecture	Assignment	Book, Online Source

Critical – section problem, Synchronization hardware, Semaphores				
Classic problems of synchronization, Critical Regions.	3	Lecture	Assignment	Book, Online Source
Module - IV (4 Hrs.)				
Deadlock Handling : System Model, Deadlock characterization, Methods for handling Deadlocks, Deadlock prevention, Deadlock Avoidance.	2	Lecture	Assignment	Book, Online Source
Deadlock Detection, Recovery from Deadlock.	2	Lecture	Assignment	Book, Online Source
Module - V (8 Hrs.)				
Memory Management : Logical and physical Address Space, Swapping.	3	Lecture	Assignment	Book, Online Source
Contiguous Memory Allocation	2	Lecture	Assignment	Book, Online Source
Paging, Segmentation with Paging.	3	Lecture	Assignment	Book, Online Source
Module - VI (4 Hrs.)				
Device and File Management : File-System Interface: File concept, Access Methods, Directory structure, File- system Mounting, File sharing, Protection and consistency semantics.	1	Lecture	Assignment	Book, Online Source
File-System Implementation: File-System structure, File-System	1	Lecture	Assignment	Book, Online Source

Implementations, Directory Implementation, Allocation Methods, Free-space Management, Efficiency and Performance, Recovery.				
Disk Management: Disk Structure, Disk Scheduling, Disk Management, Swap-Space Management, Disk Attachment, stable-storage Implementation.	2	Lecture	Assignment	Book, Online Source
Module-VII (4 Hrs.)				
Protection and Security: Protection: Goals of Protection, Domain of Protection, Access Matrix, Implementation of Access Matrix, Revocation of Access Rights, Capability-Based Systems, Language – Based Protection.	2	Lecture	Assignment	Book, Online Source
Security : Security Problem, User Authentication, One – Time Password, Program Threats, System Threats, Cryptography, Computer – Security Classifications	2	Lecture	Assignment	Book, Online Source
Total (hrs)	39 Hrs.			

Introduction to Biotechnology

Course Title	Code	Type of course	T-P-PJ	Prerequisite
Introduction To Biotechnology	FCEN0115	Theory	3-0-0	Nil

Objective

- To introduce students basic knowledge about biotechnology

Course Outcome

- To impart a sound knowledge on the principles of Biotechnology involving the different application oriented topics required for all engineering branches.

Evaluation Systems

	Component	% of Marks	Method of Assessment
Internal Examination	Internal Theory	30	Written examination
	Assignment	5	Report or Presentation + Learning Record
	Attendance	5	Based on class attended
External Examination	External Theory	60	Written examination
Total		100	

Course outline

Module: I

Biochemistry: Component of the cell, structure and biochemical functions,

Module: II

Biomolecules-Carbohydrates, lipids, proteins, Nucleic acids, Structure and classification of enzymes

Module: III

Cell Biology Eukaryotic, Prokaryotic cells, Cell cycle – Mitosis and Meiosis,

Module: IV

Cell fractionation and flow cytometry.

Module: V

Introduction to nucleic acids: Nucleic acids as genetic material, Structure and physicochemical properties of elements in DNA and RNA, Biological significance of differences in DNA and RNA.

Module: VI

Immunology: Cells of immune system, Development, maturation, activation and differentiation of Tcells and Bcells, Phagocytosis process

Module VII

Biotechnology Applications: Industrial production, Drug discovery and development

Text Books:

1. Lehninger A.L., Nelson D.L. and Cox M.M. Principles of Biochemistry. CBS publishers and distributors.
2. Murray R.K., Granner D.K., Mayes P.A. and Rodwell V.W. Harpers Biochemistry. Appleton and Lange ,Stanford ,Conneticut.

Reference Books:

1. Lodish, Harvey etal., “ Molecular Cell Biology,” 6th Edition. W.H.Freeman, 2008
2. Alberts, Bruce, “Molecular Biology of Cell”, 5th Edition, Garland Science, 2008.
3. Satyanarayana, U. “Biotechnology” Books & Allied (P) Ltd., 2005.
4. Friefelder, David. “Molecular Biology.” Narosa Publications, 199

Session Plan

Topic coverage and Internal Test	No. of Sessions (in hrs.)	Activity (lecture, tutorial, lab practice, field studies/field-trip, Workshop etc.)	Assignment (project, assignment, field study, seminar, etc.)	Suggested Reading (Book, Video, Online source, etc.)
Module I		lecture, tutorial	assignment	Book, Video, Notes
Component of the cell	1			
Cell structure	1			
biochemical functions	1			
Module II				
Carbohydrates	3			
lipids	3			
Proteins	3			

Nucleic Acids	3			
Structure of Enzymes	3			
Module III				
Eukaryotic, Prokaryotic cells	5	lecture, tutorial	assignment	Book, Video, Notes
Cell Cycle	5			
Nucleic acids as genetic material				
Module IV				
Cells of immune system	3	lecture, tutorial	assignment	Book, Video, Notes
activation and differentiation of Tcells and Bcells	3			
Drug discovery and development	2			
Module IV				
Cell fractionation and flow cytometry.	2	lecture, tutorial	assignment	Book, Video, Notes
Module V				
Nucleic acids as genetic material	1	lecture, tutorial	assignment	Book, Video, Notes
Structure and physicochemical properties of elements in DNA and RNA	2			
Biological significance of differences in DNA and RNA.	1			
Module VI				
Cells of immune system, Development, ,	1	lecture, tutorial	assignment	Book, Video, Notes
maturation, activation and differentiation of Tcells and Bcells	2			

Phagocytosis process	1			
Module VII		lecture, tutorial	assignment	Book, Video, Notes
Industrial production	1			
Drug discovery and development	2			
Total (hrs)	45			

Introduction to Biophysics

Course Title	Code	Type of course	T-P-PJ	Prerequisite
Introduction To Biophysics	FCEN0116	Theory	3-0-0	Nil

Objective

- Learn the structures of biological molecules
- To understand the concept of structural analysis
- Learn the techniques for analysis and determination of structure of biomolecules.

Course Outcome

- To introduce the theories and concepts of biophysics of biomolecules which are considered important in biotechnology applications

Evaluation Systems

	Component	% of Marks	Method of Assessment
Internal Examination	Internal Theory	30	Written examination
	Assignment	5	Report or Presentation + Learning Record
	Attendance	5	Based on class attended
External Examination	External Theory	60	Written examination
Total		100	

Course outline

Module: I

Structures of Biological macromolecules: Levels of structures in proteins, nucleic acids and polysaccharides - primary, secondary, tertiary and quaternary structures

Module: II

Conformational analysis of proteins: Polypeptide chain geometries, internal rotation angles, Ramachandran plot, potential energy calculations, forces that determine protein structure – hydrogen bonding

Module: III

Hydrophobic interactions, ionic interactions, disulphide bonds – prediction of protein structure.

Module: IV

Conformational analysis of Nucleic acid: General characteristics of nucleic acid structure – geometric Glycosidic bond – rotational isomers, ribose puckering–backbone rotation angles and steric hindrances – forces stabilizing ordered forms – base pairing and base stacking.

Module V

Techniques for the study of Biological structures, Electron Microscopy, Ultracentrifuge, Viscometry

Module VI

Molecular –sieve chromatography, electrophoresis, NMR and EPR. X-Ray crystallography

Module VII

X-ray fiber diffraction, light scattering, Neutron scattering

Text Books:

Biophysical Chemistry, Cantor and Schimmel, part I and II, W.H. Freeman and co 1997.

Reference Books:

1. Physical Biochemistry : David Friefelder, 5th Ed, PHI
2. Physical Biochemistry : Kensal E van Holde. PHI

Session Plan

Topic coverage and Internal Test	No. of Sessions (in hrs.)	Activity (lecture, tutorial, lab practice, field studies/field-trip, Workshop etc.)	Assignment (project, assignment, field study, seminar, etc.)	Suggested Reading (Book, Video, Online source, etc.)
Module I				
Levels of structures in proteins	2	lecture, tutorial	assignment	Book, Video, Notes
nucleic acids and polysaccharides	2			
primary, secondary, tertiary and quaternary structures	2			
Module II				
Polypeptide chain geometries,	2	lecture, tutorial	assignment	Book, Video, Notes
internal rotation angles, Ramachandran plot,	2			
potential energy calculations	2			

forces that determine protein structure – hydrogen bonding	2			
Module III		lecture, tutorial	assignment	Book, Video, Notes
Hydrophobic interactions,	2			
ionic interactions, disulphide bonds	2			
prediction of protein structure.	2			
Module IV		lecture, tutorial	assignment	Book, Video, Notes
General characteristics of nucleic acid structure – geometric	2			
Glycosidic bond – rotational isomers	2			
ribose puckering– backbone rotation angles and steric hindrances	2			
forces stabilizing ordered forms – base pairing and base stacking.	2			
Module V		lecture, tutorial	assignment	Book, Video, Notes
Techniques for the study of Biological structures	2			
Electron Microscopy, Ultracentrifuge	2			
Viscometry	1			
Module VI		lecture, tutorial	assignment	Book, Video, Notes
Molecular–sieve chromatography	2			
Electrophoresis	2			
NMR and EPR.	2			
X-Ray crystallography	1			
Module VII		lecture, tutorial	assignment	Book, Video,

X-ray fiber diffraction	2			Notes
light scattering	2			
Neutron scattering	1			
Total (hrs)	45			

Biosafety, Bioethics, IPR & Patents

Subject Name	Code	Type of course	T-P-PJ	Prerequisite
Biosafety, Bioethics, IPR & Patents	FCEN0117	Theory	2-0-0	Nil

Objective

- To introduce the biosafety regulations and ethical concepts in biotechnology
- To emphasize on IPR issues and need for knowledge in patents in biotechnology

Course Outcome

- This course creates awareness on the Biosafety, bioethics, Intellectual property rights and patenting of biotechnological processes.

Evaluation Systems

	Component	% of Marks	Method of Assessment
Internal Examination	Internal Theory	30	Written examination
	Assignment	5	Report or Presentation + Learning Record
	Attendance	5	Based on class attended
External Examination	External Theory	60	Written examination
Total		100	

Course outline

Module: I

Bioethics: Bioethics – Necessity of Bioethics, different paradigms of Bioethics – National & International. Ethical issues against the molecular technologies.

Module: II

Biosafety: Biosafety– Introduction to biosafety and health hazards concerning biotechnology.

Module: III

Good Laboratory Practices :Introduction to the concept of containment level and Good Laboratory Practices (GLP) and Good Manufacturing Practices (GMP).

Module IV

Introduction to Patent: Objectives of the patent system - Basic principles and general requirements of patent law biotechnological inventions.

Module V

Patent Laws:Introduction to Indian Patent Law. World Trade Organization and its related intellectual property provisions.

Module VI

Intellectual/Industrial property and its legal protection in research, design and development. Patenting in Biotechnology, economic, ethical and depository considerations.

Module VII

Intellectual Property Rights:Intellectual property rights-TRIP- GATT-International conventions patents and methods of application of patents Legal implications-Biodiversity and farmer rights.

Text Books:

1. Singh K, Intellectual Property rights on Biotechnology, BCIL, New Delhi
2. Regulatory Framework for GMOs in India (2006) Ministry of Environment and Forest, Government of India, New Delhi

Reference Books:

1. Beier, F.K., Crespi, R.S. and Straus, T. Biotechnology and Patent protection-Oxford and IBH Publishing Co. New Delhi.
2. Sasson A, Biotechnologies and Development, UNESCO Publications.

Session Plan

Topic coverage and Internal Test	No. of Sessions (in hrs.)	Activity (lecture, tutorial, lab practice, field studies/field-trip, Workshop etc.)	Assignment (project, assignment, field study, seminar, etc.)	Suggested Reading (Book, Video, Online source, etc.)
Module I		lecture, tutorial	assignment	Book, Video, Notes
Bioethics – Necessity of Bioethics,	1			
different paradigms of Bioethics – National & International	2			
Ethical issues against the molecular technologies	1			
Module II		lecture, tutorial	assignment	Book, Video, Notes
Biosafety– Introduction to biosafety	1			

health hazards concerning biotechnology.	2			
Module III		lecture, tutorial	assignment	Book, Video, Notes
Introduction to the concept of containment level	1			
Good Laboratory Practices (GLP) and Good Manufacturing Practices (GMP).	2			
Module IV		lecture, tutorial	assignment	Book, Video, Notes
Objectives of the patent system	2			
Basic principles and general requirements of patent law biotechnological inventions.	2			
Module V		lecture, tutorial	assignment	Book, Video, Notes
Introduction to Indian Patent Law	2			
World Trade Organization and its related intellectual property provisions	2			
Module VI		lecture, tutorial	assignment	Book, Video, Notes
Intellectual/Industrial property and its legal protection in research, design and development.	2			
Patenting in Biotechnology, economic, ethical and depository considerations	2			
Module VII		lecture, tutorial	assignment	Book, Video, Notes
Intellectual property rights-TRIP	1			
GATT-International conventions patents and methods of application of patents	2			
Legal implications-Biodiversity and farmer rights.	1			
Total (hrs)	30			

Earth System Science

Course Title	Code	Type of course	T-P-PJ	Prerequisite
Earth System Science	FCEN0111	Theory	3-0-0	Nil

Objective:

- To make the students have a clear knowledge on :
- Space Science
- Earth Dynamics
- Geological Oceanography
- Geological bodies and structure
- Hydrogeology
- Glaciology
- Earth's Atmosphere
- Biosphere
- Natural Resources

Course Outcome:

- Students will be able to understand the earth's interior, its composition, various dynamic processes, oceanography, hydrogeology, glaciology, structural geology earth's atmosphere, biosphere and the natural resources.
- A clear understanding of the basics of geology as a prerequisite for mining engineering.

Evaluation System

	Component	% of Marks	Method of Assessment
Internal Examination	Internal Theory	30	Written examination
	Assignment	5	Report or Presentation + Learning Record
	Attendance	5	Based on class attended
External Examination	External Theory	60	Written examination
Total		100	

Course outline:

Module: I

Space Science: Solar System, Age of the Earth, Origin of Solar system. Meteors and Meteorites.
Earth Dynamics: Interior of the Earth, Composition of the Earth, Seismic waves, Seismograph, Plate Tectonics, Basics of Earthquake Engineering, Landslides, Volcanoes.

Module: II

Geological Oceanography: Sea waves, Tides, Ocean currents, Geological work of seas and oceans, Tsunami and its causes, Warning system and mitigation

Hydrogeology: Water table, Aquifer, Groundwater fluctuations and groundwater composition, Hydrologic cycle.

Module: III

Glaciology: Glacier types, Different type of glaciers, Landforms formed by glacier.

Geological bodies and their structures: Rock, mineral, batholiths, dyke, sill, fold, fault, joint, unconformity.

Module: IV

Earth's Atmosphere: Structure and composition of atmosphere, Atmospheric circulation, Geological work of wind, Greenhouse effect and global warming, Carbon dioxide sequestration.

Module: V

Steps to maintain clean and pollution free atmosphere with governing laws, precautionary measures against disasters.

Module: VI

Biosphere: Origin of life, Evolution of life through ages, Geological time scale, biodiversity and its conservation.

Module VII

Natural Resources: Renewable and non-renewable resources, Mineral and fossil fuel resources and their Geological setting, mining of minerals and conservation, effect of mining on surface environment.

Reference Book

1. W Kenneth Hamblin; Eric H Christiansen "Earth's dynamic systems" Publisher: Upper Saddle River, N.J. : Prentice Hall, Pearson Education
2. Jon P Davidson; Walter E Reed; Paul M Davis "Exploring earth: An introduction to physical geology" Upper Saddle River, NJ : Prentice Hall

Text Book:

1. Michael C Jacobson "Earth System Science: from biogeochemical cycles to global changes" London [England] ; San Diego, California : Academic Press

Session Plan:

Topic coverage and Internal Test	No. of Sessions (in hrs.)	Activity (lecture, tutorial, lab practice, field studies/field-trip, Workshop etc.)	Assignment (project, assignment, field study, seminar, etc.)	Suggested Reading (Book, Video, Online source, etc.)
Solar System, Age of the Earth	1	Lecture	assignment	book
Origin of Solar system. Meteors and Meteorites	1	lecture	assignment	book
Interior of the Earth, Composition of the Earth,	1	lecture	assignment	book
Seismic waves, Seismograph, Plate Tectonics,	1	Lecture	assignment	book
Basics of Earthquake Engineering,	1	lecture	assignment	book
Landslides, Volcanoes.	1	lecture	assignment	book
Sea waves, Tides, Ocean currents	2	lecture	assignment	book
Geological work of seas and oceans	1	lecture	assignment	book
Tsunami and its causes, Warning system and mitigation.	1	lecture	assignment	book
Water table, Aquifer,	1	lecture	assignment	book
Groundwater fluctuations and groundwater composition	1	lecture	assignment	book
Hydrologic cycle.	1	lecture	assignment	book
Glacier types, Different type of glaciers,	1	lecture	assignment	book
Landforms formed by glacier.	1	lecture	assignment	book
Rock, mineral	1	lecture	assignment	book
batoliths, dyke, sill,	1	lecture	assignment	book

fold, fault,	1	lecture	assignment	book
Structure and composition of atmosphere,	1	lecture	assignment	book
Atmospheric circulation	1	lecture	assignment	book
Geological work of wind,	1	lecture	assignment	book
Greenhouse effect and global warming	1	lecture	assignment	book
Carbon dioxide sequestration.	1	lecture	assignment	book
Steps to maintain clean and pollution free atmosphere with governing laws,	1	lecture	assignment	book
Precautionary measures against disasters.	1	lecture	assignment	book
Origin of life	1	lecture	assignment	book
Evolution of life through ages,	1	lecture	assignment	book
Geological time scale,	1	lecture	assignment	book
Biodiversity and its conservation.	1	lecture	assignment	book
Renewable and non-renewable resources,	1	lecture	assignment	book
Mineral and fossil fuel resources and their geological setting,	2	lecture	assignment	book
mining of minerals and conservation,	2	lecture	assignment	book
effect of mining on surface environment	1	lecture	assignment	book
Total (hrs)	35			

Introduction to Mining

Course Title	Code	Type of course	T-P-PJ	Prerequisite
Introduction to Mining	FCEN0112	Theory	3-0-0	Nil

Objective:

<ul style="list-style-type: none"> ● Mines ● Types of mining methods ● Mineral deposits ● Types of mineral deposits ● Mine life cycle ● Overview of surface mining ● Overview of underground mining ● Transport system in mines ● Ventilation in mines ● Illumination in mines ● Support system in mines

Course Outcome

<ul style="list-style-type: none"> ● Students will be able to understand about mines, different types of mining methods and mineral deposits. ● A clear understanding of the basics of mining engineering.
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Evaluation System

	Component	% of Marks	Method of Assessment
Internal Examination	Internal Theory	30	Written examination
	Assignment	5	Report or Presentation + Learning Record
	Attendance	5	Based on class attended
External Examination	External Theory	60	Written examination
Total		100	

Course outline

Module: I

Mining: Definition and economic importance; Mine – definition, different types and classification;
 Mine life cycle,

Module: II

Mineral deposit-different types and their classification, Modes of entry to a mine- shaft, incline, decline, adit and box-cut.

Module: III

Overview of surface mining: Types of surface mines, unit operations, basic bench geometry,

Module: IV

Applicability&limitations, advantages and disadvantage

Module: V

Overview of underground mining: Different coal mining methods and their applicability & limitations

Module VI

Different metal mining methods and their applicability & limitations;

Module VII

Basic concepts of transportation, ventilation, illumination and support in underground mines.

Text Book:

1. D J Deshmukh “Elements of mining technology” Publisher: Ramdaspath, Nagpur : Vidyasewa Prakashan,

Reference Book.

1. Howard L Hartman; Jan M Mutmansky “Introductory mining engineering” Publisher: New York : John Wiley & Sons, 2002

Session Plan

Topic coverage and Internal Test	No. of Sessions (in hrs.)	Activity (lecture, tutorial, lab practice, field studies/field-trip, Workshop etc.)	Assignment (project, assignment, field study, seminar, etc.)	Suggested Reading (Book, Video, Online source, etc.)
Definition and economic importance of mining	1	lecture	assignment	book
Mine – definition, different types and classification	2	lecture	Assignment, field study	book

Mine life cycle	1	lecture	assignment	book
Mineral deposit – different types and their classification	2	lecture	Assignment, field study	book
Mineral resources of India	2	lecture	assignment	book
Modes of entry to a mine – shaft	1	lecture	Assignment, field study	book
	1	lecture	assignment	book
incline, decline, adit and box-cut.	1	lecture	assignment	book
Overview of surface mining : definition	1	lecture	assignment	book
Types of surface mines,	1	lecture	assignment	book
Unit operation	1	lecture	assignment	book
basic bench geometry	2	lecture	Assignment, field study	book
applicability & limitations	1	lecture	assignment	book
advantages & disadvantage	1	lecture	assignment	book
Overview of underground mining : definition	1	lecture	assignment	book
Different coal mining methods and their applicability & limitations	2	lecture	Assignment, field study	book
Different metal mining methods and their applicability & limitations	2	lecture	assignment	book
Basic concepts of transportation	1	lecture	Assignment, field study	book
ventilation	1	lecture	assignment	book
illumination and support in underground mines	2	lecture	assignment	book
Total	27Hrs.			

Mine Development

Course Title	Code	Type of course	T-P-PJ	Prerequisite
Mine Development	FCEN0113	Theory	3 0 0	Nil

Objective:

<ul style="list-style-type: none"> ● To make the students have knowledge on : ● Opening-up of Deposits ● Vertical and Inclined Shafts ● Shaft Sinking Operations ● Insets ● Mechanized Sinking ● Shaft Boring ● Special Attributes ● Main Haulage Drifts and Tunnels ● High Speed Drifting/Tunneling ● Recent Developments ● Layouts
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Course Outcome:

<ul style="list-style-type: none"> ● Students will be able to understand the choice of mode of entry their applicability, Number and disposition. ● Students will be able to understand vertical and Inclined Shafts ● Students will be able to understand methods and equipment of shaft boring. ● Students will be able to understand main Haulage Drifts and Tunnels. ● Students will be able to understand layouts of pit-top and pit-bottom, coal Handling Plant, Bunkers and Railway Sidings

Evaluation System

	Component	% of Marks	Method of Assessment
Internal Examination	Internal Theory	30	Written examination
	Assignment	5	Report or Presentation + Learning Record
	Attendance	5	Based on class attended
External Examination	External Theory	60	Written examination
Total		100	

Course outline

Module: I

Opening-up of Deposits: Choice of mode of entry- adit, shaft, decline and combined mode, their applicability, number and disposition.

Vertical and Inclined Shafts: Location, shape, size, and organization of shaft sinking, construction of shaft collar, shaft fittings.

Module: II

Shaft Sinking Operations: Ground breaking and muck disposal- tools and equipment, lining; ventilation, lighting and dewatering; sinking in difficult and water-bearing ground.

Module III

Insets: Design, excavation and lining.

Mechanized Sinking: Simultaneous sinking and lining; slip - form method of lining; high speed sinking.

Module IV

Shaft Boring: Methods and equipment.

Special Attributes: Widening and deepening of inclined and vertical shafts; staple shafts, raised shafts.

Module V

Main Haulage Drifts and Tunnels : Purpose, shape, size and location; excavation ground breaking, muck disposal, ventilation and supporting.

Module VI

High Speed Drifting/Tunneling : Application of mechanized methods; road headers and tunnel boring machines.

Module VII

Recent Developments in shaft sinking and drifting/tunnelling. Layouts of pit-top and pit-bottom, Coal Handling Plant, Bunkers and Railway Sidings

Text Book

1. D J Deshmukh "Elements of mining technology" Publisher: Ramdaspath, Nagpur : Vidyasewa Prakashan,
2. R Agor "A text book of surveying and leveling" Author:., Publisher: Delhi : Khanna Publication

Reference Book

1. B C Punmia; Arun Kumar Jain; A K Jain "Surveying. Vol.I" , Author:., Publisher: New Delhi Laxmi Publications

Alak De "Plane surveying" Publisher: S. Chand & Co

Session Plan

Topic coverage and Internal Test	No. of Sessions (in hrs.)	Activity (lecture, tutorial, lab practice, field studies/field-trip, Workshop etc.)	Assignment (project, assignment, field study, seminar, etc.)	Suggested Reading (Book, Video, Online source, etc.)
Choice of mode of entry-adit, shaft, decline and combined mode, their applicability, number and disposition.	3	lecture	Assignment, field study	book
Location, shape, size, and organization of shaft sinking, construction of shaft collar, shaft fittings.	4	lecture	assignment	book
Ground breaking and muck disposal- tools and equipment, lining; ventilation, lighting and dewatering; sinking in difficult and water-bearing ground.	4	lecture	assignment	book
Insets : Design, excavation and lining.	2	lecture	assignment	book
Simultaneous sinking and lining; slip - form method of lining; high speed sinking. Shaft Boring : Methods and equipment.	4	lecture	assignment	book
Main Haulage Drifts and Tunnels : Purpose, shape, size and location; excavation ground breaking, muck disposal, ventilation and supporting	4	lecture	assignment	book
Application of mechanized methods; road headers and tunnel boring machines.	3	lecture	Assignment, field studies	book

Recent Developments in shaft sinking and drifting/tunneling. Layouts of pit-top and pit-bottom, Coal Handling Plant, Bunkers and Railway Sidings	4	lecture	assignment	book
Total Hrs	28			

Mine Surveying - I

Course Title	Code	Type of course	T-P-PJ	Prerequisite
Mine Surveying - I	FCEN0114	Theory	3- 0- 0	Nil

Objective

- To make the students have knowledge on :
- Surveying
- Angular Measurement
- Leveling
- Total Station
- Plane Table Surveying
- Contours

Course Outcome

- Students will be able to understand the classification and principles of surveying
- Students will be able to understand linear measurement.
- Students will be able to understand angular measurement
- Students will be able to understand leveling instruments types, Leveling staves, Underground leveling

Evaluation System

	Component	% of Marks	Method of Assessment
Internal Examination	Internal Theory	30	Written examination
	Assignment	5	Report or Presentation + Learning Record
	Attendance	5	Based on class attended
External Examination	External Theory	60	Written examination
Total		100	

Course outline

Module: I

Surveying: Definition, objective, classification and principles of surveying.

Module: II

Linear Measurement: Instruments for measuring distances; ranging and taping survey lines; Chain surveying – principle, field work, off-sets, booking and plotting, obstacles in taping.

Module: III

Angular Measurement: Bearing of lines; Rectangular coordinate system; Essentials of the micro-optic

Theodolite; Measurement of horizontal and vertical angles; Temporary and permanent adjustments;

Module: IV

Theodolite traversing; Computation of co-ordinates; Adjustment of traverse; Temporary and permanent adjustments.

Module: V

Leveling : Definition & terminology; Leveling instruments types - tilting, auto set and digital levels; Leveling staves; Different types of leveling - differential, profile, crosssectional and reciprocal leveling; Booking and reduction methods; Underground leveling; Temporary and permanent adjustments of levels.

Module: VI

Total Station: Principle of electronic measurement of distance and angles; construction and working with Total Station; Errors; Application and recent developments in Total Station.

Module VII

Plane Table Surveying: Methods Contours: Concepts; Characteristics of contour; Contour Interval; Methods of contouring and uses of contours.

Session Plan

Topic coverage and Internal Test	No. of Sessions (in hrs.)	Activity (lecture, tutorial, lab practice, field studies/field-trip, Workshop etc.)	Assignment (project, assignment, field study, seminar, etc.)	Suggested Reading (Book, Video, Online source, etc.)
Surveying : Definition, objective, classification and principles of surveying.	3	Lecture	Assignment, field studies	book
Linear Measurement: Instruments for measuring distances; ranging and taping survey lines; Chain surveying – principle, field work, off-sets, booking and plotting, obstacles in taping.	4	Lecture	Assignment, field studies	book

Angular Measurement : Bearing of lines; Rectangular coordinate system; Essentials of the micro-optic theodolite; Measurement of horizontal and vertical angles; Temporary and permanent adjustments; Theodolite traversing; Computation of co-ordinates; Adjustment of traverse; Temporary and permanent adjustments.	5	Lecture	Assignment, field studies	book
Leveling : Definition & terminology; Leveling instruments types - tilting, auto set and digital levels; Leveling staves; Different types of leveling - differential, profile, crosssectional and reciprocal leveling; Booking and reduction methods; Underground leveling; Temporary and permanent adjustments of levels.	6	Lecture	Assignment, field studies	book
Total Station : Principle of electronic measurement of distance and angles; construction and working with Total Station; Errors; Application and recent developments in Total Station.	5	Lecture	Assignment, field studies	book
Plane Table Surveying : Methods Contours : Concepts; Characteristics of contour; Contour Interval; Methods of Contouring and uses of contours.	4	Lecture	Assignment, field studies	book
Total Hrs	27			

Workshop Practice

Course Title	Code	Type of course	T-P-PJ	Prerequisite
Workshop Practice	ENFC0201	Practice	0-2-0	Nil

Objective

- To provide the students hands-on-experience on manufacturing processes like fitting, carpentry, plumbing, casting, turning, joining and machining.

Course Outcome

- Students will be able to choose manufacturing technique for a given product and can perform simple operations.

Evaluation Systems

Internal Examination	Component	% of Marks	Method of Assessment
	Internal Practice	50 (40+10)	Lab work + Learning Record
External Examination	External Practice	50	Lab work
Total		100	

Course Outline

Experiment 1 : Workshop Safety Practice, Use of Personal Protective Equipment.

Fitting:

Experiment 2: Marking & Sizing of a 5mm thick Rectangular Plate with given dimensions using Scriber, Caliper, Steel Rule, Hack Saw & Holding Vice.

Experiment 3 : Preparing an Open V Fitting Joint.

Plumbing:

Experiment 4 : Use of Pipe Vice, Wrench, Tap and Die to make External Threads in ½”PVC Pipe for Basic Pipe Fittings and to do a Leak Test.

Experiment 5 : Fabrication of a Rectangular Loop using basic Pipe Fittings.

Experiment 6 : Fitting of Flow Measurement Water Meter.

Casting:

Experiment 7 : Sand Mold Preparation with Pattern for Casting Aluminum .

Experiment 8 : Casting of Aluminum Spur Gear.

Welding:

Experiment 9: Safety to Connect a Welding Transformer, Tools and SMAW Arcing.

Experiment 10: Oxy Acetylene 3 Types of Flames & Torch Brazing.

Experiment 11: Preparation of a Study Stool of Square Section. (4 student in a group)

Turning:

Experiment 12: Aligning a 20mm Cylindrical Job in Conventional Lathe, Use of Dial Gauge.

Experiment 13: Facing and Plain Turning of 20mm M.S Stock.

Electrical & Electronic:

Experiment 14: Domestic & Staircase Wiring Circuit Practice.

Experiment 15: PCB: Designing and Making of Simple Circuits.

Experiment 16: Measurement Power Consumption by Incandescent, CFL and LED Lamps.

Experiment 17: Use of Transducer and Sensors, Strain Gauge, Photovoltaic Cell.

Reference**Text Books:**

1. Elements of Workshop Technology, S.K. HazraChaudhary, A.K. HazraChaudhary, N. Roy, Vol. 1 & 2, 2007, 14th Edition, Media Promoters and Publishers Private Limited, India.
2. Workshop Technology, Volume 1 & 2, Chapman, W A J, Arnold, E, 2005, 4th Edition, CBS Publishers, India.

Reference Books:

1. Electrical Wiring & Estimating, S.L. Uppal, 2003, 5th Edition, Khanna Publishers.

.Session Plan

Topic coverage and Internal Test	No. of Sessions (in hrs.)	Activity (lecture, tutorial, lab practice, field studies/field-trip, Workshop etc.)	Assignment (project, assignment, field study, seminar, etc.)	Suggested Reading (Book, Video, Online source, etc.)
Demonstration of Various Safety Practice, Measuring Tools and Equipments used in Workshop.	3	Job Working in groups	Group Assignment and Evaluation.	HazraChaudhary, S K, HazraChaudhary and Chapman, W A J, Arnold, E, Workshop Technology

Preparing an Open V Fitting Joint	3	Job Working in groups	Group Assignment and Evaluation.	HazraChaudhary, Chapman, W A J, Arnold, E, Workshop Technology S K, HazraChaudhary
Use of Pipe Vice, Wrench, Tap and Die to make external threads in ½”PVC pipe for basic pipe fittings and to do a leak test	3	Job Working in groups	Group Assignment and Evaluation	HazraChaudhary, S K, HazraChaudhary and Chapman, W A J, Arnold, E, Workshop Technology
Fabrication of a Rectangular Loop using Basic Pipe Fittings	3	Job Working in groups	Group Assignment and Evaluation.	HazraChaudhary, S K, HazraChaudhary
Fitting of Flow Measurement Water Meter	3	Job Working in groups	Group Assignment and Evaluation.	HazraChaudhary, S K, HazraChaudhary
Sand Mold Preparation with Pattern for Casting Aluminum	3	Job Working in groups	Group Assignment and Evaluation.	HazraChaudhary, S K, HazraChaudhary
Casting of Aluminum Spur Gear	3	Job Working in groups	Group Assignment and Evaluation.	HazraChaudhary, S K, HazraChaudhary
Safety to Connect a Welding Transfer, Tools and SMAW Arcing	3	Job Working in groups	Group Assignment and Evaluation.	HazraChaudhary, S K, HazraChaudhary
Oxy Acetylene 3 Types of Flames & Torch Brazing	3	Job Working in groups	Group Assignment and Evaluation.	HazraChaudhary, S K, HazraChaudhary
Preparation of a Study Stool of Square Section	3	Job Working in groups	Group Assignment and Evaluation.	HazraChaudhary, S K, HazraChaudhary

Aligning a 20mm Cylindrical Job in Conventional Lathe, use of Dial Gauge	3	Job Working in groups	Group Assignment and Evaluation.	HazraChaudhary, S K, HazraChaudhary
Facing and Plain Turning of 20mm M.S Stock.	3	Job Working in groups	Group Assignment and Evaluation.	HazraChaudhary, S K, HazraChaudhary
Domestic & Staircase Wiring Circuit Practice	3	Job Working in groups	Group Assignment and Evaluation.	HazraChaudhary, S K, HazraChaudhary
PCB : Designing and Making of Simple Circuits	3	Job Working in groups	Group Assignment and Evaluation.	HazraChaudhary, S K, HazraChaudhary
Measurement Power Consumption by Incandescent, CFL and LED lamps	3	Job Working in groups	Group Assignment and Evaluation.	HazraChaudhary, S K, HazraChaudhary and Chapman, W A J, Arnold, E, Workshop Technology
Use of Transducer and Sensors, Strain Gauge, Photovoltaic Cell	3	Job Working in groups	Group Assignment and Evaluation.	HazraChaudhary, S K, HazraChaudhary
Total (hrs)	48			

Geometric Modeling Lab

Course Title	Code	Type of course	T-P-PJ	Prerequisite
Geometric Modeling Lab	ENFC0202	Practice	0-2-0	Nil

Objective

- To impart knowledge to students on conceptual design, 3D modeling, surface modeling and drafting through hands-on-practice mode using CATIA.
- To impart requisite knowledge and skills to the students on developing 3D assembly drawings and exploded views using CATIA.

Course Outcome

- Students will be able to study, understand and interpret engineering drawings used in industry
- Students will be able to use CATIA for creation of 3D models, assembly drawings and exploded view

Evaluation Systems

Internal Examination	Component	% of Marks	Method of Assessment
	Internal Practice	50 (40+10)	Lab work + Learning Record
External Examination	External Practice	50	Lab work
Total		100	

Course outline

Module: I (20 Hrs)

Part Modeling: Creation of Simple Solids, Parametric Modeling, Booleans and Functional Modeling, Rendering

Module: II (20 Hrs)

Assembly Modeling: Simple Assembly, Constraints, Digital Mockup

Module: III (20 Hrs) :

Drafting & Surface Modeling: Creation of Layout, Conversion of Part drawing to projection views, detailed drawing. Creation of Surfaces, Simple Surface Models, Converting Surface Models to Part Drawing.

(**Note:** All of the topics will be through learn by doing and laboratory mode.
Platform is CATIA)

MECHANICAL/CIVIL/ ELECTRICAL BRANCH STUDENTS ARE REQUIRED
TO DO PROJECTS RELATED TO THEIR OWN BRANCH

Text Books:

Geometrical Modelling, M.E. Morteson

Reference Books:

CAD CAM, M.P. Groover

Online Source:

Session Plan

(Total 12 experiments out of 17 to be conducted)

Sl. No.	Topic coverage and Internal Test	No. of Sessions (in hrs.)	Activity (lecture, tutorial, lab practice, field studies/field-trip, Workshop etc.)	Assignment (project, assignment, field study, seminar, etc.)	Suggested Reading (Book, Video, Online source, etc.)
1	Assembly of Quick Acting Hold Down Clamp	3	Lab practice		
2	Modeling parts of Quick Acting Hold Down Clamp Assembly	6	Lab practice		
3	Assembly of Pneumatic FRL	3	Lab practice		
4	Modeling parts of Pneumatic FRL Assembly	6	Lab practice		
5	Assembly of Roller Guide	3	Lab practice		
6	Modeling Parts of Roller Guide Assembly	6	Lab practice		
7	Assembly of Electrical Tower	3	Lab practice		
8	Modeling parts of Electrical Tower Assembly	6	Lab practice		
9	Assembly of Hitch Mount	3	Lab practice		
10	Modeling parts of Hitch mount Assembly	6	Lab practice		
11	Assembly of Trombon	3	Lab practice		

12	Modeling parts of Trombon Assembly	6	Lab practice		
13	Drafting all the parts of two Assemblies	6	Lab practice		
14	Production of Detailed Drawing of two Assemblies	6	Lab practice		
15	Surface Modeling of Automobile Tail Lamp	6	Lab practice		
16	Surface Modeling of Automobile Bonnet	6	Lab practice		
17	Conversion of Surface Model of Tail Lamp to Part Model	3	Lab practice		
Total (hrs)		60			

Introduction to Robotics

Course Title	Code	Type of course	T-P-PJ	Prerequisite
Introduction to Robotics	ENFC0203	Practice	0-2-0	Geometric Drawing

Objectives

- To Provide An Overview To Students On Various Types of Industrial Robots and Their Configurations.
- To Educate The Students on Use Of DELMIA To Carryout Simulation Exercises of Various Types of Robotic Arms Suiting to Specific Applications.

Course Outcome

- Students Will Have Knowledge and Skill To Program Industrial Robots For Performing Various Tasks.
- Students Will Be Able To Undertake Simulation Exercises Of Various Types Of Robotic Arms As A Pre-Requisite Leading To A Safe, Cost Effective, Reliable And Optimum Design.

Evaluation Systems

Internal Examination	Component	% of Marks	Method of Assessment
	Internal Practice	50 (40+10)	Lab work + Learning Record
External Examination	External Practice	50	Lab work
Total		100	

List of Experiments (45 Hours)

DELMIA: Simulated Models of Various Types Industrial Robots &Its Architecture.

DELMIA: Simulation of Activities Like: Pick and Place, Coordinated Movement, Spot Welding and Arc Welding.

DELMIA: Designing Own Robotic Arm with Insight to Robot Kinematics.

- i) A Prismatic Robotic Arm.
- ii) A Revolute Joint Robotic Arm.
- iii) Articulated Robotic Arm
- iv) Spherical Robotic Arm

Robot Programming: Use of Brabofor Pick and Place Actions.

An Understanding of Different Sensors, Their Operation and Application. Demonstration of Use of Sensors for At Least 3 Applications of Robot.

Commanding A Robot To Achieve Tasks On The Basis Of Sensor Information, A Description Of Motors, And How Their Velocity Is Set, And Other Robotic Actuators.

Reference

Text Books :

M.P. Groover, Industrial Robotics, Second Edition, TMH Publishers.

S.R. Deb and S. Deb, Robotics Technology and Flexible Automation, Second Edition, TMH Publishers.

Reference Books :

Y Koren, Robotics for Engineers, TMH Publishers.

Online Source:

Session Plan

Sl. No	Topic coverage and Internal Test	No. of Sessions (in hr)	Activity	Assignment	Suggested Reading (Book, Video, Online source, etc.)
1	Demonstration of various robotic arms available in DELMIA	3	Lab Demonstration	Collection of tutorials related various Robotic Arms	DELMIA help file
2	Robotic architecture. Demonstration of prismatic, revolute and SCARA	6	Lab Demonstration	Development of Robotic Arm in DELMIA & Demonstration of Application.	DELMIA help file
3	Robotic architecture. Demonstration of articulated robotic arm and Spherical robotic arm	3	Lab Demonstration	Development of Robotic Arm in DELMIA & Demonstration of Application.	DELMIA help file

4	Demonstration of application in spot welding and arc welding	3	Lab Demonstration	Development of Robotic Arm in DELMIA & Demonstration of application.	DELMIA help file
5	Demonstration of application in assembly line operation.	3	Lab Demonstration	Development of robotic arm in DELMIA & Demonstration of application.	DELMIA help file
6	Robotic Programming practice to do pick and place action.	3	Lab practice	Development of programs to do other actions like writing on the white board, Erasing the same with wiper. At least 3 such Activities	Brabo Manual
7	Demonstration of assignment Exercises	3	Lab practice	Recording of all assignments	BraboManual
8	Demonstration of application of sensors, At least 3 sensor based applications	3	Lab practice	Identifying different types of sensors that can be used in robot arm application	
9	Demonstration of use of sensors	3	Lab practice		
10	Demonstration of sensors to actuate motors and its speed control	3	Lab Practice		
11	Demonstration of sensors to actuate motors and its speed control	6	Lab Practice	A Mini project of designing to making a movement to robotic arm	

12	A mini Project Demonstration	6			
	Total (hours)	45			

3D Modelling

Course Title	Code	Type of course	T-P-PJ	Prerequisite
3D Modelling	ENFC0204	Practice	0-2-0	Nil

Objective

- The course covers modeling conceptual design, 3D modeling, Views and documentation of building drawing

Course Outcome

- 3D Solid Model and drawing
- 3D Building Model

Evaluation Systems

Internal Examination	Component	% of Marks	Method of Assessment
	Internal Practice	50 (40+10)	Lab work + Learning Record
External Examination	External Practice	50	Lab work
Total		100	

Course outline

Module I (12 Hrs)

Elements of planning building, fundamentals of Building Information Modelling (BIM). Generation of 2D (plan, section and elevation) and 3D modelling with detailed specification and dimensioning of the following using AutoCAD, Revit Architecture and CATIA :

Practice Session 1 : Generation of 3D modelling with detailed specification and dimensioning of a (G+20) multi-storeyed building with same floor plans using Revit Architecture and CATIA.

Practice Session 2 : Generation of elevation for with detailed specification and dimensioning of a multi-storeyed building with same floor plans using AutoCAD for (practice session 1).

Practice Session 3 : Generation of section for with detailed specification and dimensioning of a multi-storeyed building with same floor plans using AutoCAD, Revit Architecture and CATIA (practice session 1).

Module II (36 Hrs)

Practice Session 4 : Generation of 3D modelling with detailed specification and dimensioning of a (G+20) multi-storeyed building with varying floor plans using Revit Architecture and CATIA.

Practice Session 5 : Generation of elevation for with detailed specification and dimensioning of a multi-storeyed building with varying floor plans using AutoCAD (practice session 4).

Practice Session 6 : Generation of section for with detailed specification and dimensioning of a multi-storeyed building with varying floor plans using AutoCAD, Revit Architecture and CATIA (practice session 4).

Practice Session 7 : Generation of 3D modelling with detailed specification and dimensioning of a (G+5) shopping complex using Revit Architecture and CATIA.

Practice Session 8 : Generation of elevation for with detailed specification and dimensioning of a (G+5) shopping complex using AutoCAD (practice session 7).

Practice Session 9 : Generation of section for with detailed specification and dimensioning of a (G+5) shopping complex using AutoCAD, Revit Architecture and CATIA (practice session 7).

Practice Session 10 : Generation of 3D modelling with detailed specification and dimensioning of a (G+4) hospital building using Revit Architecture and CATIA.

Practice Session 11 : Generation of elevation for with detailed specification and dimensioning of a (G+4) hospital building using AutoCAD (practice session 10).

Practice Session 12 : Generation of section for with detailed specification and dimensioning of a (G+4) hospital building using AutoCAD, Revit Architecture and CATIA (practice session 10).

Module III (12Hrs)

Practice Session 13 : Generation of 3D modelling with detailed specification and dimensioning of a (G+4) hostel building using Revit Architecture and CATIA.

Practice Session 14 : Generation of elevation for with detailed specification and dimensioning of a (G+4) hostel building using AutoCAD (practice session 13).

Practice Session 15 : Generation of section for with detailed specification and dimensioning of a (G+4) hostel building using AutoCAD, Revit Architecture and CATIA (practice session 13).

Reference

Drawing book A-series.

Drawing book B-series

Session Plan

Topic coverage and Internal Test	No. of Sessions (in hrs.)	Activity (lecture, tutorial, lab practice, field studies/field-trip, Workshop etc.)	Assignment (Project, assignment, field study, seminar, etc.)	Suggested Reading (Book, Video, Online source, etc.)
Module I				
Generation of 3D modelling with detailed				

specification and dimensioning of a (G+20) multi-storeyed building with same floor plans using Revit Architecture and CATIA.	4	practice	assignment	
Generation of elevation for with detailed specification and dimensioning of a multi-storeyed building with same floor plans using AutoCAD for (practice session 1).	4	practice	assignment	
Generation of section for with detailed specification and dimensioning of a multi-storeyed building with same floor plans using AutoCAD, Revit Architecture and CATIA (practice session 1).	4	practice	assignment	
Sub-Total (hrs)	12			
Module II				
Generation of 3D modelling with detailed specification and dimensioning of a (G+20) multi-storeyed building with varying floor plans using Revit Architecture and	4	practice	assignment	

CATIA.				
Generation of elevation for with detailed specification and dimensioning of a multi-storeyed building with varying floor plans using AutoCAD (practice session 4).	4	practice	assignment	
Generation of section for with detailed specification and dimensioning of a multi-storeyed building with varying floor plans using AutoCAD, Revit Architecture and CATIA (practice session 4).	4	practice	assignment	
Generation of 3D modelling with detailed specification and dimensioning of a (G+5) shopping complex using Revit Architecture and CATIA.	4	practice	assignment	
Generation of elevation for with detailed specification and dimensioning of a (G+5) shopping complex using AutoCAD (practice session 7).	4	practice	assignment	
Generation of section for with detailed specification and dimensioning of a (G+5)	4	practice	assignment	

shopping complex using AutoCAD, Revit Architecture and CATIA (practice session 7).				
Generation of 3D modelling with detailed specification and dimensioning of a (G+4) hospital building using Revit Architecture and CATIA.	4	practice	assignment	
Generation of elevation for with detailed specification and dimensioning of a (G+4) hospital building using AutoCAD (practice session 10).	4	practice	assignment	
Generation of section for with detailed specification and dimensioning of a (G+4) hospital building using AutoCAD, Revit Architecture and CATIA (practice session 10).	4	practice	assignment	
Sub-Total (hrs)	36			
Module III				
Generation of 3D modelling with detailed specification and dimensioning of a (G+4) hostel building using Revit Architecture and CATIA.	4	practice	assignment	
Generation of elevation for with detailed specification and dimensioning of a (G+4) hostel building using	4	practice	assignment	

AutoCAD (practice session 13).				
Generation of section for with detailed specification and dimensioning of a (G+4) hostel building using AutoCAD, Revit Architecture and CATIA (practice session 13).	4	practice	assignment	
Sub-Total (hrs)	12			
Total (hrs)	60			

Electrical Workshop Practice

Course Title	Code	Type of course	T-P-PJ	Prerequisite
Electrical Workshop Practice	ENFC0205	Practice	0-2-0	Nil

Objective

- To develop skills for troubleshooting of electrical wiring and appliances at household level

Course Outcome

- Enhances the skill of operating electrical instruments, hand tools and power tools.
- Comprehend the safety measures required to be taken while using the tools.
- Solving Electrical Problems at domestic level.

Evaluation Systems

Internal Examination	Component	% of Marks	Method of Assessment
	Internal Practice	50 (40+10)	Lab work + Learning Record
External Examination	External Practice	50	Lab work
Total		100	

Course outline

Lists of Experiments

1. To study safety precautions for electrical engineering, draw the electrical symbol and general electrical house wiring.
2. To study the various types of accessories and tools. Working of fuse and circuit breaker.
3. To setup a series, parallel and staircase wiring using the given lamps.
4. To study Earth-wire connection and Earth-wire measurement in electrical wiring.
5. To set-up residential house wiring using switches, socket, fuse, junction box, energy meter etc.
6. Study of Multimeter, voltmeter, ammeter, wattmeter (both AC&DC)
7. Connection & fault analysis in Domestic appliances (Fan, electric iron)
8. Connection & fault analysis in Domestic appliances (Air Condition)
9. Connection & fault analysis in Domestic appliances (fluorescent tube)
10. Study of Industrial wiring in the workshop and study of bimetallic relay.
11. Study of a 11/4 KV transformer substation
12. Concept of efficiency (Star rating) of electrical appliances

Session Plan

Topic coverage and Internal Test	No. of Sessions (in hrs.)	Activity (lecture, tutorial, lab practice, field studies/field-trip, Workshop etc.)	Assignment (project, assignment, field study, seminar, etc.)	Suggested Reading (Book, Video, Online source, etc.)
To study safety precautions for electrical engineering, draw the electrical symbol and general electrical house wiring.	4	Lab Practice	Experiment Result & Viva	
To study the various types of accessories and tools. Working of fuse and circuit breaker.	4	Lab Practice	Experiment Result & Viva	
To setup a series, parallel and staircase wiring using the given lamps.	4	Lab Practice	Experiment Result & Viva	
To study Earth-wire connection and Earth-wire measurement in electrical wiring.	4	Lab Practice	Experiment Result & Viva	
To set-up residential house wiring using switches, socket, fuse, junction box, energy meter etc.	8	Lab Practice	Experiment Result & Viva	
Study of Multimeter, voltmeter, ammeter, wattmeter (both AC&DC)	4	Lab Practice	Experiment Result & Viva	
Connection & fault analysis in Domestic appliances (Fan, electric iron)	4	Lab Practice	Experiment Result & Viva	
Connection & fault analysis in Domestic appliances (Air Condition)	4	Lab Practice	Experiment Result & Viva	
Connection & fault analysis in Domestic appliances (fluorescent tube)	4	Lab Practice	Experiment Result & Viva	
Study of Industrial wiring in the workshop and study of bimetallic relay.	4	Field Studies	Viva	
Study of a 11/4 KV transformer substation	4	Field Studies	Viva	
Concept of Star rating of electrical appliances	4	Lab Practice	Experiment Result & Viva	
Total : 52 Hours				

Mine Surveying –I Lab

Course Title	Code	Type of course	T-P-PJ	Prerequisite
Mine Surveying - Lab	FCEN0214	Practice	0-2-0	Nil

Objective:

- To make the students have practical knowledge on :
- Linear measuring instruments & carrying out Chain Surveying
- Carrying out Compass Traversing
- Vernier theodolite
- Tilting level & carrying out Fly Leveling
- Auto level & carrying out Profile Leveling

Course Outcome:

- Enhances the skill of operating electrical instruments, hand tools and power tools.
- Comprehend the safety measures required to be taken while using the tools.
- Solving Electrical Problems at domestic level.

Evaluation System

Internal Examination	Component	% of Marks	Method of Assessment
	Internal Practice	50 (40+10)	Lab work + Learning Record
External Examination	External Practice	50	Lab work
Total		100	

Course outline

Module I

Study and sketch the linear measuring instruments & carrying out Chain Surveying Prismatic Compass and carrying out Compass Traversing; Vernier theodolite & angle measurement by Repetition Method; Angle measurement by Reiteration Method using Micro-optic theodolite; Study and sketch of a Tilting level & carrying out Fly Leveling; Study and sketch of Auto level & carrying out Profile Leveling; Study and sketch of 1" Theodolite and angle measurement; Plane Table Surveying by Radiation Method and Contouring; Study and sketch of Total Station and measurement of angles, distance and determination of coordinates and RL using Total Station; Preparation of grid and plotting the field data.

Session Plan

Topic coverage and Internal Test	No. of Sessions (in hrs.)	Activity (lecture, tutorial, lab practice, field studies/field-trip, Workshop etc.)	Assignment (project, assignment, field study, seminar, etc.)	Suggested Reading (Book, Video, Online source, etc.)
Study and sketch the linear measuring instruments & carrying out Chain Surveying	3	lab practice	assignment, field study	book
Prismatic Compass and carrying out Compass Traversing	3	lab practice	assignment, field study	book
Vernier theodolite & angle measurement by Repetition Method; Angle measurement by Reiteration Method using Micro-optic theodolite;	6	lab practice	assignment, field study	book
Study and sketch of a Tilting level & carrying out Fly Leveling; Study and sketch of Auto level & carrying out Profile Leveling;	6	lab practice	assignment, field study	book
Study and sketch of 1" Theodolite and angle measurement; Plane Table Surveying by Radiation Method and Contouring	6	lab practice	assignment, field study	book
Study and sketch of Total Station and measurement of angles, distance and determination of coordinates and RL using Total Station; Preparation of grid and plotting the field data.	6	lab practice	assignment, field study	book
Total Hrs	30			

Aerodynamics Laboratory

Course Title	Code	Type of course	T-P-PJ	Prerequisite
Aerodynamics Laboratory	ENFC0208	Practice	0-2-0	Nil

Objective

<ul style="list-style-type: none"> To Predict Different Aerodynamic Propulsion in Aero Applications
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Course Outcome

<ul style="list-style-type: none"> Ability to Use the Fundamental Dynamics Principles in Aircraft Applications.
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Evaluation Systems

Internal Examination	Component	% of Marks	Method of Assessment
	Internal Practice	50 (40+10)	Lab work + Learning Record
External Examination	External Practice	50	Lab work
Total		100	

1. List of Experiments

1. Application of Bernoulli's Equation – venturimeter and orifice meter.
2. Frictional loss in laminar flow through pipes.
3. Frictional loss in turbulent flow through pipes.
4. Calibration of a subsonic Wind tunnel.
5. Determination of lift for the given airfoil section.
6. Pressure distribution over a smooth circular cylinder.
7. Pressure distribution over a rough circular cylinder.
8. Pressure distribution over a symmetric aerofoil.
9. Pressure distribution over a cambered aerofoil.
10. Flow visualization studies in subsonic flows.
11. Calculation of drag over smooth cylinder
12. Calculation of drag over rough cylinder

List of Equipment for a Batch of 30 Students

S.N	Name of Equipment	Quantit	Experiment No.
1	Venturimeter	1	1
2	Orificemeter	1	1
3	Pipe friction apparatus	1	2, 3
4	Subsonic Wind tunnel	1	4, 5, 6, 7, 8, 9, 10, 11, 12
5	Models (aerofoil, rough and smooth cylinder, flat plate)	1	5, 6, 7, 8, 9

Engineering Metrology and Measurements

Course Title	Code	Type of course	T-P-PJ	Prerequisite
Engineering Metrology and Measurements	ENFC0401	Theory + Practice	1-2-0	Nil

Course Objective

- To Make Students Familiar with the Measuring Systems, and the Standard of Measurements. Learns about Basic Measurement Devices.
- Understanding the Basic Measurement Systems in the Real Time Engineering Applications.
- Enables Students to Work in Quality Control and Quality Assurances Divisions Industries.

Course Outcomes

- Selecting Suitable Measuring Instruments for Basic and Typical Applications in the Industries.
- Analyze Measurement Requirement.
- Can Choose Transducer & Sensors for Products.

Evaluation System

Internal Examination	Component	% of Marks	Method of Assessment
	Internal Theory	20	Written examination
	Internal Practice	30(20+10)	Lab work + Learning Record
External Examination	External Theory	30	Written examination
	External Practice	20	Lab work
Total		100	

Course Outline

Module: I (6 Hours)

Introduction to Metrology; Importance and Need for Measurements and Metrology; Need for Inspection; Precision & Accuracy; Errors in Measurement.

Practice : (Laboratory Mode- Learn by Doing)

Calibration of Measuring Instruments Using Slip Gauge Blocks.

Module: II (9 Hours)

Limit System; Limits Fits & Tolerances; Allowances; Hole Basis & Shaft Basis Systems; Interchangeability; Gauge Design. (Class room Teaching and videos)

Practice : (Laboratory Mode- Learn by Doing)

1. Introduction to Metrology Laboratory (Steel Rule, Tape, Right Angle, Protractor, Surface Plate).
2. Gauges- Filler, Radius, Thread, Wire, Snap & GO-NOGO.

Module: III (9 Hours)

Standards of Measurement; Dial Indicators; Vernier Apparatus; Micrometers; Comparators (Mechanical, Electrical, Pneumatic).

Practice : (Laboratory Mode- learn by Doing)

3. Vernier Caliper- Inside, Outside, Depth Measurement & Height Gauge.
4. Micrometers, Outside, Inside Micrometer & Depth Micrometer.
5. Three Points Bore Micrometer

Module: IV (10 Hours)

Measurement of Angles & Tapers using Bevel Protractor; Angle Gauges; Sine Bars; Flatness Spirit Level & Surface Plate.

Practice: (Laboratory Mode- learn by Doing)

6. Sine Bar/Bevel Protractor-Measurement of Angles.
7. Flatness Test Using Sprit Level.
8. Use of Dial Indicators-in-lathe.

Module: V (9 Hours)

Gear Tooth Metrology; Inspection & Alignment Tests. Transducers; Variable Resistance Transducer; LVDT; Comparative Transducer; Piezoelectric Transducer; Photo Voltaic Cells; Devices for Pressure Measurement- Dead Weight Tester; Bourdon Tube Pressure Gauge; Diaphragm and Bellow Gauges.(Topics will be covered by explaining and fallowed by practice mode)

Practice: (Laboratory Mode- Learn by Doing)

9. Gear Tooth Metrology, Inspection & Alignment Tests.

Module: VI (10 Hours)

Low Pressure Measurements; Force Measuring Using Proving Rings; Torque Measuring Using Dynamometers; Strain Measurements; Profile Projector; Tool Maker's Microscope; Optical Flats; Laser Interferometers; Autocollimators.

Practice: (Laboratory Mode- Learn by Doing)

10. Optical Flat Use & Surface Plate Test Using Spirit Level & Dial Gauge.
11. Measurement of Template Using Profile Projector.

Module: VII (12 Hours)

Assessment of Surface Roughness; Machining Symbols for Surface Finish; Measuring Instruments; Tally-Surf; Screw Thread Measurement- Terminology; Precision Instruments Based on Laser Principles- Laser Interferometer Application; Coordinate Measuring Machine (CMM).

Practice: (Laboratory Mode- Learn by Doing)

12. Surface Finish by Taylor's Apparatus –LVDT.
13. Measurement of Tool angle in Tool Maker's Microscope.
14. Repeat Laboratory-1 or Test.
(50% of the topics will be covered by “Learn by Doing” principle and few video presentations)

Reference:**Text books :**

1. Gupta, I C, A Text Book of ENGINEERING METROLOGY.2016. 8th Edition, Reprint, Dhanpat Rai Publication, New Dehi-110002
2. Narayana, K L, Engineering Metrology.2014. Third Edition, Scitech Publication(India) Privet Limited

Reference Books:

3. Mahajan, M, A Text Book of Metrology. 2010. DhanpatRai& Co (P) Ltd,ISBN 13 : 978-817700051

Session Plan

Topic coverage and Internal Test	No. of Sessions (in hrs.)	Activity (lecture, tutorial, lab practice, field studies/field-trip, Workshop etc.)	Assignment (Project, assignment, field study, seminar, etc.)	Suggested Reading (Book, Video, Online source, etc.)
Module I				
Introduction to metrology Importance and need for measurements and metrology	1	lecture	Assignment	https : //www.youtube.com/watch?v=xcvNl1HHY9o https : //www.youtube.com/watch?v=qXhOWXShH1w Mahajan, M, A Text Book of Metrology. 2010. DhanpatRai& Co (P) Ltd,ISBN 13 : 978-817700051
Need for Inspection	1	lecture	Assignment	https : //www.youtube.com/watch?v=YYrnjEo90fs Mahajan, M, A Text Book of Metrology. 2010. DhanpatRai& Co (P) Ltd,ISBN 13 : 978-817700051

Precision & Accuracy	1	lecture	Assignment	https : //www.youtube.com/watch?v=b38hFWvEjwI Mahajan, M, A Text Book of Metrology. 2010. DhanpatRai& Co (P) Ltd,ISBN 13 : 978-817700051
Errors in Measurement	1	lecture	Assignment	https : //www.youtube.com/watch?v=cGdbQeRSYTc Mahajan, M, A Text Book of Metrology. 2010. DhanpatRai& Co (P) Ltd,ISBN 13 : 978-817700051
Practice				
1.Calibration of measuring Instruments using slip gauge blocks	2	practice		
Module II				
Limit System, Limits Fits & Tolerances	2	lecture	Assignment	https : //www.youtube.com/watch?v=zxyERl8KnnM&list=PL0uwpDY0Y8Q2aoPhDuEZLI1PVuKKUGb90 https : //www.youtube.com/watch?v=zxyERl8KnnM&list=PL0uwpDY0Y8Q2aoPhDuEZLI1PVuKKUGb90&index=1 Mahajan, M, A Text Book of Metrology. 2010. DhanpatRai& Co (P) Ltd,ISBN 13 : 978-817700051
Allowances, Hole Basis & Shaft Basis Systems, Interchangeability	1	lecture	Assignment	https : //www.youtube.com/watch?v=AP_T7hf5Wv0&list=PL0uwpDY0Y8Q2aoPhDuEZLI1PVuKKUGb90&index=4 Mahajan, M, A Text Book of Metrology. 2010. DhanpatRai& Co (P) Ltd,ISBN 13 : 978-817700051

Design of Gauges- GO, NOGO	2	lecture	Assignment	https : //www.youtube.com/watch?v=uNOZ TmhsH1w https : //www.youtube.com/watch?v=mZH Hdim3hOY Mahajan, M, A Text Book of Metrology. 2010. DhanpatRai& Co (P) Ltd,ISBN 13 : 978-817700051
Practice				
2.Introduction to Metrology Laboratory(1hr) + Steel Rule, Tape, Right Angle Protractor, Surface Plate	2	Practice	field study	
3.Gauges- Filler ,Radius, Thread, Wire, Snap, GO- NOGO	2	Practice	field study	
Module III				
Standards of Measurement	1	lecture	Assignment	Mahajan, M, A Text Book of Metrology. 2010. DhanpatRai& Co (P) Ltd,ISBN 13 : 978-817700051
Dial Indicators, Vernier caliper &Micrometer	1	lecture	Assignment	https : //www.youtube.com/watch?v=FqSJh Y_lctc https : //www.youtube.com/watch?v=vkPlz malvN4 https : //www.youtube.com/watch?v=StBc5 6ZifMs Mahajan, M, A Text Book of Metrology. 2010. DhanpatRai& Co (P) Ltd,ISBN 13 : 978-817700051

Comparators Mechanical, Electrical, Pneumatic	1	lecture	Assignment	Mahajan, M, A Text Book of Metrology. 2010. Dhanpat Rai & Co (P) Ltd, ISBN 13 : 978-817700051
Practice				
Vernier Caliper- inside, outside, depth measurement, Height Gauge	2	Practice	Field Study	
5. Micrometers, Outside & Inside Micrometer, Depth Micrometer	2	Practice	Field Study	
6. Three point Bore Micrometer	2	Practice	Field Study	
Module IV				
Angular Measurements Measurement of Angles & Tapers using Bevel Protractor, Angle Gauges, Sine Bars	3	lecture	Assignment	https : //www.youtube.com/watch?v=oJFUI_FHlio https : //www.youtube.com/watch?v=F7uCEeipdCw https : //www.youtube.com/watch?v=u-PLC3uKICM
Spirit Level, Surface Plate	1	lecture	Assignment	https : //www.youtube.com/watch?v=H-F2C5F78aw
Practice				
7. Sine Bar/Bevel Protractor- Measurement of Angles	2	Practice		

8.Flatness test using Sprit Level	2	Practice		
9.Use of Dial Indicators-in –Lathe.	2	Practice		
Module V				
Gear Tooth Metrology	2	lecture	Assignment	https : //www.youtube.com/watch?v=fb278 VIHICU
Inspection &Alignment Tests	1	lecture	Assignment	https : //www.youtube.com/watch?v=utZVv 7QvRt8
Transducers, Variable Resistance Transducer, LVDT, comparative transducer, piezoelectric transducer, photo voltaic cells.	2	lecture	Assignment	https : //youtu.be/vuVFbKxsds
Devices for pressure measurement- dead weight tester, bourdon tube pressure gauge, diaphragm and bellow gauges.	1	lecture	Assignment	
Practice				
ar Tooth Metrology, Inspection & Alignment tests	3	Practice		
Module VI				
Low Pressure Measurements	1	lecture	Assignment	
Force Measuring Using Proving	2	lecture	Assignment	

Rings. Torque Measuring Using Dynamometers, Strain Measurements				
Profile Projector, Tool Maker's Microscope, Optical Flats, application.	1	lecture	Assignment	https : //www.youtube.com/watch?v=HGO9GXaeZFc https : //www.youtube.com/watch?v=hqsVXA5S2xM https : //www.youtube.com/watch?v=5JE7BV-XkSk
Laser Interferometers	1	lecture	Assignment	https : //www.youtube.com/watch?v=UA1qG7Fjc2A
Autocollimators	1	lecture	Assignment	https : //www.youtube.com/watch?v=XHEywuzl9sA
Practice				
tical Flat Use & Surface Plate test using Spirit Level & Dial Gauge	2	Pratice	Field study	
12.Measurement of template using Profile Projector	2	Practice	Field Study	
Module VII				
Assessment of Surface Roughness, Machining Symbols for	1	lecture	Assignment	https : //www.youtube.com/watch?v=omhoWIs2d-M

Surface Finish, Measuring Instruments, Tally- Surf,				https : //www.youtube.com/watch?v=VyeP ASErr5Q
Screw Thread Measurement- Terminology, Determination of Effective Diameter Using Two, three Wire Method	2	lecture	Assignment	https : //www.youtube.com/watch?v=N4pjg JMmk3A https : //www.youtube.com/watch?v=LjQf6 ISFISg
Coordinate measuring machine (CMM)	1	lecture	Assignment	https : //www.youtube.com/watch?v=844Ui RBVx1Y
Practice				
11.Surface Finish by Taylor's Apparatus	2	Practice	field study	
13.Measurement of Tool angle in Tool Maker's Microscope	2	Practice	Field Study	
14.Repeat Laboratory-1	2	Practice	field study	
15. Repeat Laboratory-2	2	Practice	field study	
Total Hours	65			

Basic Fluid Mechanics

Course Title	Code	Type of course	T-P-PJ	Prerequisite
Basic Fluid Mechanics	ENFC0402	Theory + Practice	2-1-0	Nil

Objective

- To make students understand flow characteristics and different types of flow and application of dimensional analysis, different flow and velocity measuring device.

Course Outcome

- Understand flow characteristics and different types of flow
- Understand kinematics and dynamics of flow
- Understand about application of dimensional analysis

Evaluation Systems

Internal Examination	Component	% of Marks	Method of Assessment
	Internal Theory	20	Written examination
	Internal Practice	30(20+10)	Lab work + Learning Record
External Examination	External Theory	30	Written examination
	External Practice	20	Lab work
Total		100	

Course outline

Module I Fluid kinematics (9 Hours)

Types of flow, Continuity equation (in one, two & three dimension), velocity and acceleration, streamline, streakline, path line, velocity potential function and stream function, types of motion (Linear Translation and all deformations, rotation and vorticity, vortex flow).

Experiments:

1. Demonstration of different types of flow
2. Pressure Measurement

Module II Fluid Dynamics (7 Hours)

Rate of Flow Or Discharge, Euler's equation of motion along a stream line for ideal flow - Principle of conservation of energy Integration of Euler's equation along a stream line - Bernoulli's equation (**Derivation not to be included for external Examination**) - Practical applications of Bernoulli's Principle - Kinematics of free jets.

Experiments:

3. Bernoulli's experiment
4. Characteristics of free jet

Module III Principle of conservation of momentum (5 Hours)

Impulse momentum equation. Application of momentum principle for force on pipe bends and reducers. Angular momentum principle and its applications (Numerical problems on angular momentum principle not included. Only fundamental concepts.)

Experiments :

5. Impact of jet

Module IV Laminar Flow and Turbulent Flow : (6 Hours)

Reynolds's Experiment, Laws of Laminar and Turbulent Friction, HagenPoiseulle Equation for laminar flow through pipe (**Derivation not to be included for external Examination**), Darcy-Weisbach Equation for Turbulent flow through pipe (**Derivation not to be included for external Examination**)

Experiments :

6. Pipe friction
7. Reynolds's no calculation and identification of laminar and turbulent flow

Module V Flow through Pipes (8 Hours)

Loss of Energy-Friction loss & Minor losses, HGL&TEL, Pipes in series and Parallel, Equivalent Length of pipe, Power transmission through pipes and nozzle, Hydro dynamically smooth & rough boundaries, Moody's Diagram.

Experiments :

8. HGL& TEL through simulation
9. Hardy Cross Method

Module VI Dimensional Analysis and Similitude : (5 Hours)

Fundamental and derived units, Dimensional formulae for various geometric, kinematic and dynamic parameters. Rayleigh and Buckingham' methods for arriving group of dimensionless parameters. Similarity laws - Reynolds, Froude, Mach Laws. Geometric, Kinematic and Dynamic similarities. Distorted Models.

Module VII Flow Measurement(18 Hours)

Flow through small orifice, Mouthpiece, Time of Emptying tanks. Velocity Measurement using Pitot tube, Prandtl tube, Flow measurement in pipes-Flow Meters-orifice Plate-Flow Nozzle Meter, Venturi Meter, Flow rate Measurement in channel- Weir and Notches.

Experiments :

10. Flow Measurement through V-Notch
11. Flow Measurement through Venturi Meter
12. Flow Measurement through Small Orifice
13. Flow Measurement through Orifice Meter
14. Flow Measurement through Rota meter
15. Flow Measurement through Pitot Tube

LIST OF THE EXPERIMENT THROUGH SIMULATION : -

1. Bernoulli's Equation
2. Venturi Meter
3. Orifice Meter
4. Reynolds's Experiment
5. Impact Of Jet
6. Discharge through Weir.
7. Mouth Piece

All this Experiment can be done using the link given below

<http://eerc03-iiith.virtual-labs.ac.in/index.php?section=Introduction>

http://vlab.co.in/ba_labs_all.php?id=7

E-content:

Text Books:

1. Fluid mechanics : A.K.JAIN, Khanna publishers

Reference Books:

1. Hydraulics and Fluid mechanics : P.N.MODI & S.M.SETH
2. Fluid Mechanics and Hydraulic Machines by R. K. Bansal,

Online Source:

Video Links : -

Bernoulli Equation : <https://www.youtube.com/watch?v=brN9citH0RA>

<https://www.youtube.com/watch?v=bC8v6hlXnSk> <https://www.youtube.com/watch?v=UJ3-Zm1wbIQ>

<https://www.youtube.com/watch?v=oUd4WxjoHKY> <http://www.efm.leeds.ac.uk/CIVE/FluidsLevel1/Unit03/T4.html>

<http://www.efm.leeds.ac.uk/CIVE/FluidsLevel1/Unit03/T4.html>

Flow Measurement : Venturi Meter Fabrication : <https://www.youtube.com/watch?v=Zpux9MvvDmw>

Venturi Effect : <https://www.youtube.com/watch?v=H3TcLoapJBo>

<https://www.youtube.com/watch?v=H3TcLoapJBo>

<http://www.wermac.org/specials/venturiflowmeter.html> **Flow over Weirs** : <https://www.youtube.com/watch?v=oXYHe-DGyVE>

<https://www.youtube.com/watch?v=oXYHe-DGyVE> **Flume demo** : <https://www.youtube.com/watch?v=awsnbnljy78>

<https://www.youtube.com/watch?v=awsnbnljy78> **Weirs** : https://www.youtube.com/watch?v=Ax38XN_XqCU

https://www.youtube.com/watch?v=Ax38XN_XqCU

V-Notch : <https://www.youtube.com/watch?v=2dZtIn7CUos>

Reynolds Experiment :

<https://www.youtube.com/watch?v=1wNmtle6qkE>

https://www.youtube.com/watch?v=0ThQ_nD97hY

Laminar Flow in a Pipe

[youtube=<http://www.youtube.com/watch?v=KqqOb30jWs&NR=1>]

Turbulent Flow in a Pipe

[youtube=<http://www.youtube.com/watch?v=NplrDarMDF8&NR=1>]

Session Plan

Topic coverage and Internal Test	No. of Sessions (in hrs.)	Activity (lecture, tutorial, lab practice, field studies/field-trip, Workshop etc.)	Assignment (Project, assignment, field study, seminar, etc.)	Suggested Reading (Book, Video, Online source, etc.)
MODULE-1 FLUID KINEMATICS				
Types of flow, Continuity equation (in one, two & three dimension) video on types of flow	2	Lecture		
velocity and acceleration, streamline, streakline, path line	1	Lecture		
Velocity potential function and stream function, types of motion (Linear Translation and all deformations) rotation and vorticity, vortex flow.	2	Lecture		Video
Demonstration of different types of flow	2	Practice		
Pressure Measurement	2	Practice		
MODULE-2 FLUID DYNAMICS				
Rate of Flow Or Discharge, Euler's equation of motion along a stream line for ideal flow - Principle of conservation of energy Integration of Euler's equation along a stream line - Bernoulli's equation	1+2	Lecture+ Practice		
Practical applications of Bernoulli's Principle - Kinematics of free jets. Bernoulli's Principle	2+2	Lecture+ Practice		Video

MODULE-3 PRINCIPLE OF CONSERVATION OF MOMENTUM				
Impulse momentum equation. Application of momentum principle for force on pipe bends and reducers	2+2	Lecture+ Practice		
Angular momentum principle and its applications (Numerical problems on angular momentum principle not included. Only fundamental concepts.)	1	Lecture		
MODULE-4 LAMINAR FLOW & TURBULENT FLOW				
Reynolds's Experiment, Laws of Laminar and Turbulent Friction	1+2	Practice		Video
Hagen Poiseulle Equation for laminar flow through pipe, Darcy-Weisbach Equation for Turbulent flow through pipe	1+2	Lecture+ Practice		
MODULE-5 FLOW THROUGH PIPES				
Loss of Energy-Friction loss & Minor losses, HGL&TEL	1+2	Lecture+ Practice		
Pipes in series and Parallel, Equivalent Length of pipe	1+2	Lecture+ Practice		
Power transmission through pipes and nozzle	1	Lecture		
Hydrodynamically smooth & rough boundaries, Moody's Diagram.	1	Lecture		

MODULE-6 DIMENSIONAL ANALYSIS				
Fundamental and derived units, Dimensional formulae for various geometric, kinematic and dynamic parameters.	1	Lecture		
Rayleigh and Buckingham' methods for arriving group of dimensionless parameters.	2	Lecture		
Similarity laws - Reynolds, Froude, Mach Laws.Geometric, Kinematic and Dynamic similarities.Distorted Models.	2	Lecture		
MODULE-7 FLOW MEASUREMENT IN PIPES AND CHANNELS				
Flow through small orifice,MouthPiece,Time of Emptying tanks.	2+4	Lecture+ Practice		
Velocity Measurement using pitottube ,Prandtl tube	2+2	Lecture+ Practice		
Flow measurement in pipes-Flow Meters-orifice Plate-Flow Nozzle Meter,Venturimeter	2+4	Lecture+ Practice		
Flow rate Measurement in channel- Weir and Notches.	2+2	Lecture+ Practice		
Total (hrs.)	60			

Basic Surveying

Subject Name	Code	Type of course	T-P-PJ	Prerequisite
Basic Surveying	ENFC0403	Theory & Practice	2-1-0	Nil

Objective

- To make students able to understand the measurement techniques, equipment used in land surveying using Dumpy level, Theodolite and Total station.

Course Outcome

- Apply math, science, and technology in surveying activities.
- Measure horizontal distances across clear landscape and across obstacles.
- Prepare contour maps using Theodolite and Total station for projects (Road, Railway and water shade)

Evaluation Systems

Internal Examination	Component	% of Marks	Method of Assessment
	Internal Theory	20	Written examination
	Internal Practice	30(20+10)	Lab work + Learning Record
External Examination	External Theory	30	Written examination
	External Practice	20	Lab work
Total		100	

Module-I (2HRS)

Historical survey practice : Introduction to surveying : Classification, Basic Principle, List of Instruments used in surveying.

Module-II (8HRS)

Leveling: Use of dumpy level and leveling staff. Temporary and Permanent adjustment of dumpy level, Curvature and refraction error, types of leveling, reciprocal leveling, leveling difficulties and common errors.

Experiments:

1. Calculation of RL using HI and Rise and fall method.
2. Longitudinal and cross sectional Leveling
3. Check Leveling

Module-III (11HRS)

Theodolite: Use of theodolite, description, uses and adjustments – temporary and permanent, measurement of horizontal and vertical angles.

Experiments :

4. Theodolite traversing, checks and closing errors, balancing a traverse, adjustment of bearings, computation of area of closed traverse.
5. Measurement of Inaccessible points.

Module--IV (13Hrs)

Total station: Introduction to Total station, Functions, working principles of total station applications, Use of all parts and all options inside the machines.

Experiments:

6. Basic operation, setting up the instrument
7. Measurement of angle and Measurement of Distance
8. Setting up instrument station, Co-ordinate system
9. Traverse adjustment (With help of software)
10. Area calculation using Total station

Module--V (6Hrs)

Contouring: Characteristics, methods and types of contouring.

Experiments:

11. Preparation of contour map using total station and surfer software.

Module--VI (10HRS)

Curves: Types of curves, Properties– simple, compound, reverse and transition curve.

Experiments:

12. Setting out of different curves (simple, compound, reverse and transition) using Total Station.

Module -VI (10HRS)

Setting out of work using Total station.

Experiments:

13. Setting out of Building
14. Setting out of culvert.

Text Books:

1. Surveying Vol I & II, III B C Purnima, Laxmi Publication.
2. Surveying, volume 1&2 BY S.K.Duggal, TMH publisher.

Reference Books:

1. Surveying & Levelling by T.P Kanitkar & V S Kulkarni

Online Source :

<https://www.youtube.com/watch?v=-JgCfs0oiu0>)

<https://www.youtube.com/watch?v=grvdEYmjSPc>)

[https://www.youtube.com/watch?v=A-kf1oX_xJ0&t=796s,](https://www.youtube.com/watch?v=A-kf1oX_xJ0&t=796s)

<https://www.youtube.com/watch?v=XsxJD79MR0s>)

<https://www.youtube.com/watch?v=eRiSShpqm3U>

[**https://www.youtube.com/watch?v=hISmKTEfgXc**](https://www.youtube.com/watch?v=hISmKTEfgXc)

[**https://www.youtube.com/watch?v=zZL9MNsmSWo**](https://www.youtube.com/watch?v=zZL9MNsmSWo)

<https://www.youtube.com/watch?v=aqN8uDJoXFA&t=2s>

[**https://www.youtube.com/watch?v=50jrYYKKUCA**](https://www.youtube.com/watch?v=50jrYYKKUCA)

<https://www.youtube.com/watch?v=Yy-8e3sCr0U>)

[https://www.youtube.com/watch?v=pVgDyh_YBcI,](https://www.youtube.com/watch?v=pVgDyh_YBcI)

[https://www.youtube.com/watch?v=rCLKEYD0_KA,](https://www.youtube.com/watch?v=rCLKEYD0_KA)

<https://www.youtube.com/watch?v=PZ7oUmD5DnU>

Online Source :

<https://www.youtube.com/watch?v=-JgCfsooiu0>)
<https://www.youtube.com/watch?v=grvdEYmjSPc>)
https://www.youtube.com/watch?v=A-kf1oX_xJ0&t=796s.
<https://www.youtube.com/watch?v=XsxJD79MR0s>)
<https://www.youtube.com/watch?v=eRiSShpqm3U>
<https://www.youtube.com/watch?v=hISmKTEfgXc>
<https://www.youtube.com/watch?v=zZL9MNsmSWo>
<https://www.youtube.com/watch?v=aqN8uDJoXFA&t=2s>
<https://www.youtube.com/watch?v=50jrYYKKUCA>
<https://www.youtube.com/watch?v=Yy-8e3sCr0U>)
https://www.youtube.com/watch?v=pVgDyh_YBcI.
https://www.youtube.com/watch?v=rCLKEYD0_KA.
<https://www.youtube.com/watch?v=PZ7oUmD5DnU>

Lesson Plan

Module I

Topic coverage and Internal Test	No. of Sessions (in hrs.)	Activity (lecture, tutorial, lab practice, field studies/field-trip, Workshop etc.)	Assignment (Project, assignment, field study, seminar, etc.)	Suggested Reading (Book, Video, Online source, etc.)
Historical survey practice : Introduction to surveying : Classification, Basic Principle, List of Instruments used in surveying.	2	Lecture	Assignment	https://www.youtube.com/watch?v=-JgCfsooiu0)
Total (hrs.)	2			

Module-II

Topic coverage and Internal Test	No. of Sessions (in hrs.)	Activity (lecture, tutorial, lab practice, field studies/field-trip, Workshop etc.)	Assignment (Project, assignment, field study, seminar, etc.)	Suggested Reading (Book, Video, Online source, etc.)

Levelling : Use of dumpy level and levelling staff. Temporary and Permanent adjustment of dumpy level, Calculation of RL by HI and rise and fall method. Curvature and refraction error, types of levelling, reciprocal levelling, levelling difficulties and common errors.	2	lecture	Assignment	https : //www.youtube.com/watch?v=grvdEYmjSPc
Experiments : Calculation of RL using HI and Rise and fall method.	2	practice, field studies	field study	https : //www.youtube.com/watch?v=grvdEYmjSPc
Longitudinal and cross sectional levelling Check Levelling	4	practice, field studies	field study	https : //www.youtube.com/watch?v=grvdEYmjSPc
Total (hrs.)	8			

Module III

Topic coverage and Internal Test	No. of Sessions (in hrs.)	Activity (lecture, tutorial, lab practice, field studies/field-trip, Workshop etc.)	Assignment (Project, assignment, field study, seminar, etc.)	Suggested Reading (Book, Video, Online source, etc.)
Theodolite : Use of theodolite, description, uses and adjustments – temporary and permanent, measurement of horizontal and vertical angles.	2	(lecture, lab practice, field studies)	Assignment	https : //www.youtube.com/watch?v=A-kf1oX_xJ0&t=796s . https : //www.youtube.com/watch?v=XsxJD79MR0s)

<p>Theodolite traversing, checks and closing errors, balancing a traverse, adjustment of bearings, computation of area of closed traverse. Experiments : Theodolite traversing, checks and closing errors, balancing a traverse, adjustment of bearings, computation of area of closed traverse.</p>	3+2	Lecture ,lab practice, field studies)	Field study	https : //www.youtube.com/watch?v=A-kf1oX_xJ0&t=796s , https : //www.youtube.com/watch?v=XsxJD79MR0s)
<p>Measurement of Inaccessible points using theodolite. Experiments : Measurement of Inaccessible points.</p>	2+2	(lab practice, field studies)	Field study	https : //www.youtube.com/watch?v=eRiSShpqm3U)
Total (hrs.)	11			

Module IV

Topic coverage and Internal Test	No. of Sessions (in hrs.)	Activity (lecture, tutorial, lab practice, field studies/field-trip, Workshop etc.)	Assignment (Project, assignment, field study, seminar, etc.)	Suggested Reading (Book, Video, Online source, etc.)
Total station : Introduction to Total station, Functions, working principles of total station applications, Use of all parts and all options inside the machines. Electronic data recording & total station operation	3	Lecture	Assignment	<u>(https : //www.youtube.com/watch? v=hISmKTEfgXc)</u>
Experiments : 6. Basic operation, setting up the instrument 7. Measurement of angle and Measurement of Distance 8. Setting up instrument station, Co-ordinate system 9. Traverse adjustment (With help of software) 10. Area calculation using Total station	10	practice, field studies	field study	<u>https : //www.youtube.com/watch? v=hISmKTEfgXc</u> <u>https : //www.youtube.com/watch? v=zZL9MNsmSWo</u> <u>https : //www.youtube.com/watch? v=zZL9MNsmSWo</u>
Total (hrs.)	13			

Module V

Topic coverage and Internal Test	No. of Sessions (in hrs.)	Activity (lecture, tutorial, lab practice, field studies/field-trip, Workshop etc.)	Assignment (Project, assignment, field study, seminar, etc.)	Suggested Reading (Book, Video, Online source, etc.)
Contouring : Characteristics, methods and types of contouring	1	lecture	assignment	<u>https : //www.youtube.com/watch?v=50jrYYKKUCA</u>
Preparation of contour map using total station and surfer software Experiments : 11. Preparation of contour map using total station and surfer software.	5	lecture, lab practice, field studies	assignment, field study	<u>https : //www.youtube.com/watch?v=50jrYYKKUCA</u>
Total (hrs.)	6			

Module V

Topic coverage and Internal Test	No. of Sessions (in hrs.)	Activity (lecture, tutorial, lab practice, field studies/field-trip, Workshop etc.)	Assignment (Project, assignment, field study, seminar, etc.)	Suggested Reading (Book, Video, Online source, etc.)

Curves : Types of curves, Properties–simple, compound, reverse and transition curve. Experiments : 12. Setting out of different curves (simple, compound, reverse and transition) using Total Station.	10	lecture, tutorial, field studies	assignment, field study	https : //www.youtube.com/watch?v=aqN8uDJoXFA&t=2s https : //www.youtube.com/watch?v=hISmKTEfgXc
Total (hrs.)	10			

Module VI

Topic coverage and Internal Test	No. of Sessions (in hrs.)	Activity (lecture, tutorial, lab practice, field studies/field-trip, Workshop etc.)	Assignment (Project, assignment, field study, seminar, etc.)	Suggested Reading (Book, Video, Online source, etc.)
Setting out of work using Total station. Experiments : 13. Setting out of Building 14. Setting out of culvert.	10	lecture, tutorial, field studies	assignment, field study	https : //www.youtube.com/watch?v=XPbWIp56zxY
Total (hrs.)	10			

Basic Electrical Engineering

Course Title	Code	Type of course	T-P-PJ	Prerequisite
Basic Electrical Engineering	ENFC0404	Theory & Practice	2-1-0	Nil

Objective

- Impart a basic knowledge of electrical quantities such as current, voltage, power, energy and frequency in the analysis of basic D.C. and A.C.
- Develop selection skill to identify the type of generators or motors required for particular application and highlight the importance of transformers in transmission and distribution of electric power.

Course Outcome

- Understand concept of electrical circuit and magnetic circuit configurations
- Understand fundamentals of single and three phase A.C circuits,
- Understand wiring schedule for residential, office and industrial loads, concept of earthing and will be acquainted with Distribution Transformer and LT lines to understand the fundamentals of distribution system.

Evaluation Systems

Internal Examination	Component	% of Marks	Method of Assessment
	Internal Theory	20	Written examination
	Internal Practice	30(20+10)	Lab work + Learning Record
External Examination	External Theory	30	Written examination
	External Practice	20	Lab work
Total		100	

Module I

Introduction to Electrical Engineering : Essence of electricity, Electric field; electric current, potential and potential difference, E.M.F, electric power, ohm's law, basic circuit components, Ideal and Practical Sources, Source Conversion, Induced EMF, Energy Stored in Inductor & Capacitor.

Practice:

1. Understanding working principle of DC potential (Lead-Acid battery). Specific gravity of electrolyte. Charging process of battery. Modern DC cells.
2. Plotting the V-I Characteristics of Incandescent lamp.

Module II

DC Networks : Laws and Theorems applicable to DC networks (KCL & KVL, Node voltage & Mesh current analysis, Delta-Star & Star-Delta conversion, Superposition principle, Thevenin's & Norton theorem), Transients in R-L and R-C circuits with DC excitation, Simple problems.

Practice:

3. Verification of Thevenin's theorem, Superposition and Nodal analysis (by experimental setup)
4. Verification of KCL and KVL in series and parallel circuits.
Observing current rise/fall due to transience in DC circuits in Oscilloscope.

Module III

Introduction to Electromagnetism : Magnetic Circuits, B-H curve, Permeability, Reluctance, Solution of simple magnetic circuits, Hysteresis and Eddy current loss. Methods of preventing such losses. Solenoids and field coils. Application of solenoids in different circuits in Automobiles in electrical protection Working principle of MCBs. Use of field coils in machines and instruments. Galvanometer.

Module IV**Practice:**

5. Study of operation of solenoids.
6. Study of operation of MCBs
7. Study of operation of field coils in machines.
8. Observation of generation of magnetic flux for different input current in a coil and plotting BH Curve.

Practice: Applications of electromagnetism.

9. Observing working of a coil, a Galvanometer.
10. Measurement of iron loss in a core from BH curve by using CRO
11. Observing Induction of Electro Motive Force in a DC generator with D.C Shunt Generator.

Module V

Single-Phase AC Circuits : Single-phase EMF Generation, Waveform and Phasor Representation, Average and Effective value of sinusoids, Peak factor & Form factor, Complex Impedance and Power using j-operator, Power factor.

Practice:

12. Connection & Measurement of power consumption of a fluorescent lamp/LED.
13. Calculation of current, voltage, power & power factor of series RLC circuit excited by 1- \emptyset A.C Supply.

Module VI

Three-Phase AC Circuits: Comparison between single-phase and three-phase systems, Three-phase EMF Generation, Line and Phase quantities in star and delta networks, Power and its measurement in three-phase balanced circuits.

Practice:

15. Measurement of power and power factor in a 3- \emptyset AC circuit by two wattmeter
16. Single-Phase Transformers : Construction and principle of operation, EMF Equation, Transformation ratio, Practical and Ideal transformers
Calculation of No-Load losses of a 1- \emptyset Transformer.

Module VII

Only Practice

17. Domestic Wiring; Switch Boards, Distribution boxes
18. Workshop wiring : Study of the wiring of electrical machine lab.
19. Concept of Earthing.

Reference

Text Books:

1. D C Kulshrestha, “Basic Electrical Engineering”, Tata Mc-Graw Hill Education
2. P K Sathpathy “Basic Electrical Engineering” Oxford

Reference Books :

1. Hughes, “Electrical & Electronic Technology”, Ninth Edition (Revised by J Hiley, K Brown, and I Smith), Pearson Education,

Session Plan

Topic coverage and Internal Test	No. of Sessions (in hrs.)	Activity (lecture, tutorial, lab practice, field studies/field-trip, Workshop etc.)	Assignment (project, assignment, field study, seminar, etc.)	Suggested Reading (Book, Video, Online source, etc.)
Introduction to Electrical Engineering : Essence of electricity, Electric field; electric current, potential and potential difference.	1	Lecture	Assignment	Book
Emf, electric power, ohm’s law	1	Lecture	Assignment	Video
basic circuit components, Ideal and Practical Sources	1	Lecture	Assignment	Book
Source Conversion	1	Lecture	Assignment	Book
Induced EMF	1	Lecture	Assignment	Book
Energy Stored in Inductor & Capacitor	1	Lecture	Assignment	Book
DC Networks : Laws and Theorems applicable to DC networks (KCL & KVL)	4	Practice	Experiments	Book
Node voltage	1	Lecture	Assignment	Book
Mesh current analysis	1	Lecture	Assignment	Book
Delta-Star & Star-Delta conversion	1	Lecture	Assignment	Book
Superposition principle	2	Practice	Experiments	Book

Thevenin's & Norton theorem	4	Practice	Experiments	Book
Transients in R-L and R-C circuits with DC excitation	2	Lecture	Assignment	Book
Simple problems	1	Tutorial	Assignment	Book
Magnetic Circuits : Introduction to Electromagnetism, B-H curve	1	Lecture	Assignment	Book
Permeability, Reluctance, Solution of simple magnetic circuits	1	Lecture	Assignment	Book
Hysteresis and Eddy current loss	1	Lecture	Assignment	Book
D.C. Machines : Construction	2	Practice	Experiments	Book
Classification and Principle of operation of DC machines, EMF equation of DC generator	1	Lecture	Assignment	Video
Speed Equation of DC Motor	4	Practice	Experiments	Book
Single-Phase AC Circuits : Single-phase EMF Generation, Waveform and Phasor Representation	2+1	Lecture (using videos) and Practice	Experiments	Video
Average and Effective value of sinusoids, Peak factor & Form factor	2	Lecture	Assignment	Video
Complex Impedance and Power using j-operator, Power factor.	2	Lecture	Assignment	Video
Three-Phase AC Circuits : Comparison between single phase and three-phase systems, Three-phase EMF Generation	2	Lecture	Assignment	Video
Line and Phase quantities in star and delta networks, Power and its measurement in three-phase balanced circuits.	1	Lecture	Assignment	Book
Single-Phase Transformers : Construction and principle of operation.	1+2	Lecture and Practice	Experiments	Book
EMF Equation, Transformation ratio	2	Lecture	Assignment	Book
Practical and Ideal transformers	1+2	Practice	Experiments	Book
Induction Motors :	2+2	Lecture and	Experiments	Book

Introduction to Three-phase and Single-phase Induction Motors, Concept of Slip		Practice		
Concept of Slip, Slip-Torque characteristics	1	Lecture	Assignment	Book
Measuring Instruments : Introduction, PMMC Ammeters and Voltmeters with extension of range	2	Lecture	Assignment	Book
Moving-Iron Ammeters and Voltmeters	1	Lecture	Assignment	Book
Dynamometer type Wattmeter, Energy meter	4	Practice	Experiments	Book
Domestic Wiring; Switch Boards, Distribution boxes	2	Practice	Experiments	
Workshop wiring : Study of the wiring of electrical machine lab.	2	Practice	Experiments	
Concept of Earthing.	2	Practice	Experiments	
Total- 68 Hours (Theory- 35 hours, Practice- 33hours)				

Electrical Machines

Course Title	Code	Type of course	T-P-PJ	Prerequisite
Electrical Machines	ENFC0405	Theory & Practice	2-1-0	Nil

Objective

- To introduce the students about principles of electromagnetism applied to AC & DC Machines and its importance.

Course Outcome

- Able to distinguish the constructional similarity and dissimilarity between various machines.
- Able to test and certify the machines as per BIS
- Able to select appropriate transformer and electrical machines
- Able to develop selection skill to identify the type of generators or motors required for particular application.

Evaluation Systems

Internal Examination	Component	% of Marks	Method of Assessment
	Internal Theory	20	Written examination
	Internal Practice	30(20+10)	Lab work + Learning Record
External Examination	External Theory	30	Written examination
	External Practice	20	Lab work
Total		100	

Course outline

Module: I

D.C. Machines: Construction, Classification and Principle of operation of DC machines, EMF equation of DC generator, Dc Motor Characteristics, Speed Equation of DC Motor. Characteristic for Speed Armature Current, Torque Armature Current and Speed Torque of (i) Separately Excited DC Motor, (ii) DC Shunt Motor, (iii) DC Series Motor, and (iv) DC Compound Motor, Comparison between Different types of DC Motors and their Application. (Lecture & practice)

Practice:

1. Determination of OCC (Open Circuit Characteristics) of D.C Shunt Generator.
2. Starting & Speed Control of D.C Shunt motor by (i) Field flux control method & (ii) armature voltage control method.

Module: II

Single-Phase Transformers: Construction and principle of operation, EMF Equation, Transformation ratio, Practical and Ideal transformers, Transformer losses, Brief idea on Transformer Phasor diagram and transformer rating

Practice:

3. Calculation of No-Load losses of a 1-Ø Transformer.

Module: III

Three Phase Transformers: Three-phase transformer connections- Star-star, Two Single-Phase Transformers connected in Open Delta (V-Connection) and their rating, T-Connection (Scott Connection) of Two Single-Phase Transformers to convert Three-Phase balanced supply to Two-Phase balanced supply. Delta-delta, Star-delta, Delta-star, Zig-zag connections. Scott connection, Open delta connection. Auto Transformers

Module IV**Three Phase Induction Machines**

Constructional Features of Squirrel Cage Rotor type and Slip Ring/Wound Rotor type of Induction Motors, Principle of Operation, and Slip Speed.

Practice:

4. Determination of Efficiency, Plotting of Torque-Slip Characteristics of Three Phase Induction motor by Brake Test.

Module: V

Three Phase Synchronous Generators: Synchronous Generator Construction (both Cylindrical Rotor and Salient Pole type), The Speed of Rotation of a Synchronous Generator, Induced voltage in A.C. Machines

Module: VI

Three Phase Synchronous Motors : Basic Principles of Motor operation, Construction, Starting Synchronous Motors, induction motor and Synchronous Motors, Synchronous Motor Ratings, Applications of synchronous motors(Class room teaching)

Module: VII

Single Phase Induction Motors: Starting of Single Phase Induction Motors, Speed Control of Single Phase Induction Motors, Circuit Model. Other types of Motors : Reluctance Motors.(Class room teaching)

Practice:

5. Determination of parameter of a single phase induction motor and study of

(a)Capacitor start induction motor

(b)Capacitor start and capacitor run induction motor

Text Books:

1. Electrical Machines – D P Kothari and I J Nagrath – Tata McGraw Hill.

Reference Books:

1. Electrical Machinery – P S Bimbhra – Khanna Publishers.

2. Electrical Machines - P. K. Mukherjee, S. Chakravarti, Dhanpat Rai & Sons

Session Plan

Topic coverage and Internal Test	No. of Sessions (in hrs.)	Activity (lecture, tutorial, lab practice, field studies/field-trip, Workshop etc.)	Assignment (project, assignment, field study, seminar, etc.)	Suggested Reading (Book, Video, Online source, etc.)
D.C. Machines : Construction	2	Lecture	Assignment	Book
Classification and Principle of operation of DC machines, EMF equation of DC generator	3	Lecture	Assignment	Video
Speed Equation of DC Motor	2	Practice	Experiments	Book
Characteristic for Speed Armature Current, Torque Armature Current	2	Lecture	Assignment	Book
Comparison between Different types of DC Motors and their Application.	1	Lecture	Assignment	Book
Speed Torque of (i) Separately Excited DC Motor, (ii) DC Shunt Motor, (iii) DC Series Motor, and (iv) DC Compound Motor	2	Lecture	Assignment	Book
Determination of OCC (Open Circuit Characteristics) of D.C Shunt Generator.	2	Practice	Experiments	Book
Starting & Speed Control of D.C Shunt motor by (i) Field flux control method & (ii) armature voltage control method.	2	Practice	Experiments	Book
Single-Phase Transformers : Construction and principle of operation, EMF Equation, Transformation ratio, Practical and Ideal transformers, Transformer losses, Brief idea on Transformer Phasor diagram and transformer rating	2	Lecture	Assignment	Book
Calculation of No-Load losses of a 1- \emptyset Transformer.	3	Practice	Experiments	Book
Three Phase Transformers : Three-phase transformer connections- Star-star	1+2	Lecture (using videos) and Practice	Experiments	Video

Two Single-Phase Transformers connected in Open Delta (V-Connection) and their rating,	2	Lecture	Assignment	Video
T-Connection (Scott Connection) of Two Single-Phase Transformers to convert Three-Phase balanced supply to Two-Phase balanced supply.	2	Lecture	Assignment	Video
Delta-delta, Star-delta, Delta-star, Zig-zag connections.	2	Lecture	Assignment	Video
Scott connection, Open delta connection.	5	Practice	Experiments	Book
Auto Transformers.	1	Lecture	Experiments	Book
THREE PHASE INDUCTION MACHINES : Constructional Features of Squirrel Cage Rotor type and Slip Ring/Wound Rotor type of Induction Motors,	2	Lecture	Assignment	Book
Principle of Operation, Slip Speed	1	Lecture	Assignment	Video
THREE PHASE SYNCHRONOUS GENERATORS : Synchronous Generator Construction (both Cylindrical Rotor and Salient Pole type),	2+2	Lecture Practice	+ Experiments	Book
The Speed of Rotation of a Synchronous Generator, Induced voltage in A.C. Machines	3	Lecture	Assignment	Book
THREE PHASE SYNCHRONOUS MOTORS Basic Principles of Motor operation, Construction	2+1	Lecture Practice	& Assignment	Book
Starting Synchronous Motors, induction motor and Synchronous Motors, Synchronous Motor Ratings, Applications of synchronous motors(Class room teaching)	2	Lecture	Assignment	Book
SINGLE PHASE INDUCTION MOTORS : Starting of Single Phase Induction Motors, Speed Control of Single Phase Induction Motors, Circuit Model. Other types of Motors : Reluctance Motors.	3+6	Lecture Practice	and Experiments	Book

Determination of parameter of a single phase induction motor and study of (a)Capacitor start induction motor (b) Capacitor start and capacitor run induction motor				
Total : 57 Hours (Theory- 35 hours, Practice- 25 hours)				

Introduction to Automation

Course Title	Code	Type of course	T-P-PJ	Prerequisite
Introduction to Automation	ENFC0406	Theory & Practice	2-1-0	Nil

Objective

- To provide knowledge levels needed for PLC programming and operating.
- To train the students to develop a relay based control circuit.

Course Outcome

- Gain knowledge on Programmable Logic Controllers
- Understand different types of Devices to which PLC input and output modules are connected
- Provide the knowledge about understand various types of PLC registers

Evaluation Systems

Internal Examination	Component	% of Marks	Method of Assessment
	Internal Theory	20	Written examination
	Internal Practice	30(20+10)	Lab work + Learning Record
External Examination	External Theory	30	Written examination
	External Practice	20	Lab work
Total		100	

Module -: I (5 Hours)

Introduction to Automation

What is Automation, Brief history of Automation, Automation Uses, Automation - PLC Basics, Mechanical relays versus PLC, PLC Architecture, Functions of various blocks, and working principle of PLC?

Module: II (8 Hours)

PLC Hardware & Terminology

Various Types of Addressing Used within a PLC, PLC Programming input instructions

Practice:

Study of hardware of PLC.

Module: III (9Hours)

Programming PLC's

Differences between Types of Programming, construction of PLC ladder diagrams, Controlling Program Flow in a Ladder Logic Program.

Practice:

Basic programming using ladder logic program

Module: IV (11 Hours)

Timers and Counters

What is timers & Counters, Use of timers and counters within a ladder logic program, Basic concepts of function blocks.

Practice:

Study of latching and unlatching of motor.

Module: V (7 Hours)

PLC Communication

What are the common types of data communications and their characteristics and use of Ethernet TCP/IP protocol.

Practice:

Sequential operation.

Module: VI (5 Hours)

Introduction to SCADA

Introduction and SCADA Basics. Importance of SCADA in Industrial Automation.

Module: VII (15 Hours)

Basic operation of SCADA

Basic operations related to SCADA. How to work on windows property.

Practice:

Basic window property concepts of SCADA.

Session Plan

Topic coverage and Internal Test	No. of Sessions (in hrs.)	Activity (lecture, tutorial, lab practice, field studies/field-trip, Workshop etc.)	Assignment (project, assignment, field study, seminar, etc.)	Suggested Reading (Book, Video, Online source, etc.)
MODULE I (Introduction To Automation) (Theory- 5 hours)				
What is Automation, Brief history of Automation	1	Lecture	Assignment	Text Book 1
Automation Uses, Automation - PLC Basics	1	Lecture	Assignment	Text Book 1
Mechanical relays versus PLC, PLC Architecture	1	Lecture	Assignment	Text Book 1
Functions of various blocks, working principle of PLC.	2	Lecture	Assignment	Text Book 1
MODULE II (PLC Hardware & Terminology) (Theory- 04 hours, Practice - 04 hours)				
Various Types of Addressing Used within a PLC	2	Lecture	Assignment	Text Book 1
PLC Programming input instructions	2	Lecture	Assignment	Text Book 1
Study of hardware of PLC.	4	Practice	Result of Experiments and Viva	Text Book 1
MODULE III (Programming PLC's) (Theory- 4 hours, Practice –05 hours)				
Differences between Types of Programming	2	Lecture	Assignment	Text Book 1
Construction of PLC ladder diagrams. Controlling Program Flow in a Ladder Logic Program.	2	Lecture	Assignment	Text Book 1
Basic programming using ladder logic program	5	Practice	Result of Experiments and Viva	Text Book 1

MODULE IV(Timers and Counters) (Theory- 06 hours, Practice –05 hours)				
What is timers & Counters,	4	Lecture	Assignment	Text Book 1
Use of timers and counters within a ladder logic program, Basic concepts of function blocks.	2	Lecture	Assignment	Text Book 1
Study of latching and unlatching of motor.	5	Practice	Result of Experiments and Viva	Text Book 1
MODULE V(PLC Communication) (Theory- 02 hours, Practice –05 hours)				
What are the common types of data communications and their characteristic sand use of Ethernet TCP/IP protocol.	2	Lecture	Assignment	Text Book 1
Sequential operation	5	Practice	Result of Experiments and Viva	Text Book 1
MODULE VI(Introduction To SCADA) (Theory- 5 hours)				
Introduction and SCADA Basics	3	Lecture	Assignment	Text Book 1
How to work on windows property	2	Lecture		Text Book 1
MODULE VII(Basic operation of SCADA) Theory- 04 hours, Practice –11 hours)				
Basic operations related to SCADA	2	Lecture	Assignment	Text Book 1
How to work on windows property	2	Lecture	Assignment	Text Book 1
Basic window property concepts of SCADA.	11	Practice	Result of Experiments and Viva	Text Book 1
Total- 60 Hours (Theory- 30 hours Practice-30 hours)				

Introduction to Web Technology

Course Title	Code	Type of course	T-P-PJ	Prerequisite
Introduction to Web Technology	ENFC0407	Theory & Practice	2-1-0	Nil

Objective

- This course is intended to teach the basics involved in publishing content on the World Wide Web. This includes the fundamentals of how the Internet and the Web function, a basic understanding of graphic production with a specific stress on creating graphics for the Web and general grounding introduction to more advanced topics such as programming scripting. This will also explore expose students to the basic tools and applications used in Web publishing.

Course Outcome

- Students may also create web pages using XHTML and Cascading Style Sheets. Build dynamic web pages using JavaScript (Client side programming).
- Create XML documents and Schemas. Build interactive web applications using AJAX.

Evaluation Systems

Internal Examination	Component	% of Marks	Method of Assessment
	Internal Theory	20	Written examination
	Internal Practice	30(20+10)	Lab work + Learning Record
External Examination	External Theory	30	Written examination
	External Practice	20	Lab work
Total		100	

Module : I (5 hrs)

What is Web? What is WWW, Web site - Static and Dynamic web site, Web application - Client-server, Web development Technologies- Html, CSS, Js, XML, Servlet & JSP, PHP and Ajax.

Module : II (7 hrs)

Introduction to Html, Html structure, Html Editors, Html element/tag & attributes, Designing simple page - Html tag, Head tag, Body tag; More Html tags - Anchor tag, Image tag, Table tag, List tag, Frame tag, Div. tag, Html forms - Input type, Text area, Select, Button.

Module : III (5 hrs)

Introduction to CSS, Syntax, Selectors, Embedding CSS to Html, Formatting fonts, Text & background color, Borders & boxing

Module : IV (6 hrs)

Introduction to JS, Embedding JS into Html, Variables, Data types, Operators, Conditional statements, Looping statements, Strings, Arrays, Math Object, Date Object, Functions, Objects, Event Handling.

Module : V (3 hrs)

Introduction to XML, Difference b/w Html & XML, XML editors

Module : VI (3 hrs)

XML Elements & Attributes XML DTD, XML Schema

Module : VII (4 hrs)

XML Schema, XML DOM

E-content : LMS Content

Reference Books :

1. HTML, XHTML & CSS Bible, Brian Pfaffenberger, Steven M.Schafer, Charles White, Bill Karow- Wiley Publishing Inc, 2010 .
2. HTML Black Book by Steven Holzner 2011
3. Web Design with HTML, CSS, JavaScript and jQuery Set by Jon Duckett.
4. Beginning Java Script with DOM scripting and Ajax By Christian Heilmann- Apress Publisher, 2010.
5. Learning PHP & My SQL, Michele Davis, Jon Philips- O’Reilly Publisher, 2009.
6. PHP Cook book By : David Sklar, Adam Trachtenberg- O’Reilly Publisher, 2008

Introduction to Web Technology Lab List of Programs :

1. Create a simple web page using HTML
2. Create and HTML page with a table and a set of ordered and unordered list.
3. Use CSS in the above web page
4. Design a web page for a company XYZ
5. Develop a static web page that shows basic animation
6. Develop a web page for an audio company
7. Develop a dynamic web page
8. Develop a dynamic web page using DHTML and CSS
9. Consider a company ABC which is into selling movie CDs. Develop a web page for the company.
10. Create a web site in which you can navigate from one page to another
11. Create a dynamic web page for a college
12. Organize a set of data using XML

Session Plan

Topic coverage and Internal Test	No. of Sessions (in hrs.)	Activity (lecture, tutorial, lab practice, field studies/field-trip, Workshop	Assignment (project, assignment, field study, seminar, etc.)	Suggested Reading (Book, Video, Online source, etc.)

		etc.)		
Module-I (Total Theory = 5 Hours)				
What is Web?, What is WWW, Web site - Static and Dynamic web site,	2	Class Room Teaching+ PPT	Assignment	Book,Online Sources,SLM
Web application - Client-server, Web development Technologies- Html, CSS, Js, XML, Servlet & JSP, PHP and Ajax.	3	Class Room Teaching+ PPT	Assignment	Book,Online Sources,SLM
Module II (Total Theory = 7 Hour /Practical= 8 Hour)				
Introduction to Html, Html structure, Html, Editors, Html element/tag & attributes, Designing simple page - Html tag, Head tag, Body tag; More Html tags - Anchor tag, Image tag, Table tag, List tag	3+4	Class Room Teaching+ PPT+Practical	Assignment	Book,Online Sources,SLM
Frame tag, Div tag ; Html forms - Input type, Text area, Select , Button.	3+4	Class Room Teaching+ PPT+Practical	Assignment	Book,Online Sources,SLM
Module III (Total Theory = 5 Hours / Practical= 7 Hours)				
Introduction to CSS, Syntax, Selectors	2+3	Class Room Teaching+ PPT+Practical	Assignment	Book,Online Sources,SLM
Embedding CSS to Html, Formatting fonts, Text & background colour, Borders & boxing.	3+4	Class Room Teaching+ PPT+Practical	Assignment	Book,Online Sources,SLM
Module-IV (Total Theory= 6 hour / Practical = 7 Hour)				
Introduction to JS, Embedding JS into Html, Variables, Data types	2	Class Room Teaching+ PPT+Practical	Assignment	Book,Online Sources,SLM

Operators, Conditional statements, Looping statements, Strings, Arrays, Math Object, Date Object, Functions, Objects	2+5	Class Room Teaching+ PPT+Practical	Assignment	Book,Online Sources,SLM
Event Handling	2+2	Class Room Teaching+ PPT	Assignment	Book,Online Sources,SLM
Module-V (Total Theory= 3 Hour/ Practical = 1 Hour)				
Introduction to XML, Difference b/w Html & XML	3+1	Lecture	Assignment	Book,Online Sources,SLM
Module-VI (Total Theory= 3 Hour/ Practical = 1 Hour)				
XML editors, XML Elements. XML Schema	3+1	Class Room Teaching+ PPT+Practical	Assignment	Book,Online Sources,SLM
Module-VII (Total Theory = 4 Hour/ Practical = 0 Hour)				
XML Schema, XML DOM	4	Class Room Teaching + PPT + Practical	Assignment	Book, Online Sources, SLM
Total (hrs)	Total = 57 Hours (Theory 33 Hours + Practical 24 Hours)			

Information Security-I

Course Title	Code	Type of course	T-P-PJ	Prerequisite
Information Security-I	FCEN 0408	Theory & Lab	2-1-0	Nil

Objective

- Get a clear understanding of Types of Threats, Vulnerabilities, Risks and various terminologies in Information Security.
- Understand C I A of Security and Ease of Use Triangle in Information Security
- Understand Access Controls and Physical security measures to safeguard the Assets
- Understand System And Server Security And Internet Security
- Understand Cyber Law and its need

Course Outcome

- Students will understand the importance of CIA Traid (Confidentiality, Integrity and Availability) and advantage of Security
- The student will be able to safeguard their Assets

Evaluation Systems

Internal Examination	Component	% of Marks	Method of Assessment
	Internal Theory	20	Written examination
	Internal Practice	30(20+10)	Lab work + Learning Record
External Examination	External Theory	30	Written examination
	External Practice	20	Lab work
Total		100	

Module: I INTRODUCTION (7 Hours)

Security Definition, Why Security, Security and its need, Current Trends and Statistics, Basic Terminology, The C I A of Security the Relation : Security functionality and Ease of Use Triangle

Module : II USER IDENTITY AND ACCESS MANAGEMENT (4 Hours)

User identity and Access Management : Authentication, Account Authorization, Validation, Access Control and Privilege management.

Module : III HASHING AND CRYPTOGRAPHY (6 Hours)

Hashing and Cryptography- Encryption and Decryption

Module : IV SYSTEM AND SERVER SECURITY (9 Hours)

System Security, Desktop & Server Security, Firewalls, Password cracking Techniques, Key-logger, viruses and worms, Malwares & Spy wares, Windows Registry

Module : V INTERNET SECURITY (5 Hours)

Internet Security : LAN Security, Email Security, Hacking attacks, preventive measures

Module : VI RISK ASSESSMENT (6 Hours)

Vulnerability Assessment, Penetration Testing, Risk Assessment, Threat, Vulnerability

Module : VII CYBER LAWS (3 Hours)

Cyber Laws – India Context

E-content : LMS Content

Text Books :

Information Systems Security : Security Management, Metrics, Frameworks And Best Practices - Nina Godbole, ISC2 Press, 2010

Mark Stamp's Information Security : Principles and Practice (WIND) Paperback – 2009 by Deven N. Shah, Wiley (2009)

Information Security Risk Analysis - Thomas R. Peltier, Third Edition, Pub : Auerbach, 2012

Information Security : The Complete Reference by Mark Rhodes-Ousley, McGraw Hill Education; Second edition (1 May 2013)

Cyber Security by Nina Godbole, Sunit Belapure, Wiley, 2011

Online Sources :

http://www.cengage.com/resource_uploads/downloads/1111138214_259146.pdf

http://www.eecs.yorku.ca/course_archive/2013-4/F/4482/CSE4482_01_Introduction_2013_posted.pdf

<http://iso-27001-2013.blogspot.in/2015/05/information-security-professionals.html>

<https://www.sans.org/reading-room/whitepapers/services/identity-access-management-solution-1640>

<http://searchsecurity.techtarget.com/definition/access-control>

<http://searchsecurity.techtarget.com/definition/access-control>

<http://www.slideshare.net/ColMukteshwarPrasad/cyber-law-crime-m>

ftp://mail.im.tku.edu.tw/Prof_Liang/IRM/10%20An%20Introduction%20to%20Factor%20Analysis%20of%20Information%20Risk.pdf

http://www.wciapool.org/pdf/Tab_5_10_Immutable_Laws_of_Security.pdf

<https://www.sans.org/reading-room/whitepapers/basics/vulnerability-assessment-421>

Session Plan

Topic coverage and Internal Test	No. of Sessions (in hrs.)	Activity (lecture, tutorial, lab practice, field studies/field-trip, Workshop etc.)	Assignment (project, assignment, field study, seminar, etc.)	Suggested Reading (Book, Video, Online source, etc.)
MODULE 1 : Introduction (Theory- 7 hours, Practice- 8 hours)				
Security Definition, Why Security, Security and its need	2	Lecture	Assignment	Book, Online source,SLM
Current Trends and Statistics, Basic Terminology	2	Lecture	Assignment	Book, Online source,SLM
The C I A of Security the Relation : Security functionality and Ease of Use Triangle	3	Lecture	Assignment	Book, Online source,SLM
System Security Configuration in Windows 7 I & II	2	Practice	Experiments	Online source,Video
DOS attacks and its prevention	2	Practice	Experiments	Online source,Video
Password Based Authentication Process	2	Practice	Experiments	Online source,Video
Service Management of Windows 7 for prevention of attacks.	2	Practice	Experiments	Online source,Video
MODULE II USER IDENTITY AND ACCESS MANAGEMENT (Theory- 4 hours)				
User identity and Access Management : Authentication, Account Authorization	2	Lecture	Assignment	Book, Online source

Validation, Access Control and Privilege management.	2	Lecture	Assignment	Book, Online source
MODULE III HASHING AND CRYPTOGRAPHY(Theory- 6 hours, Practice- 3 hours)				
Hashing	2 + 1	Lecture + Practice	Experiment	Book, Online source
Cryptography- Encryption and Decryption	4	Lecture	Assignment	Book, Online source
Event logger analysis	2	Practice	Experiment	Book, Online source
Module IV SYSTEM AND SERVER SECURITY (Theory- 9 hours, Practice- 7 hours)				
System Security, Desktop & Server Security	2	Lecture	Assignment	Book,Online ,SLM
Firewalls	2+2	Lecture + Practice	Experiment	Book,Online ,SLM
Password cracking Techniques	2+2	Lecture + Practice	Experiment	Book,Online ,SLM
Key-logger	1+2	Lecture + Practice	Experiment	Book,Online ,SLM
viruses and worms, Malwares & Spy wares	1	Lecture	Assignment	Book,Online ,SLM
Windows Registry	1+1	Lecture + Practice	Experiment	Book,Online ,SLM
Module V INTERNET SECURITY (Theory- 5 hours, Practice- 0 hours)				
LAN Security	2	Lecture	Assignment	Book,Online,SLM
Hacking attacks, preventive measures	2	Lecture	Assignment	Book,Online,SLM
Security on E-mail	1	Lecture	Assignment	Book,Online,SLM
Module VI INTERNET SECURITY (Theory- 6 hours, Practice-2 hours)				
Vulnerability Assessment	2 +2	Lecture + Practice	Experiment	Book,Online ,SLM
Penetration Testing	2	Lecture	Assignment	Book,Online,SLM

Risk Assessment	1	Lecture	Assignment	Book,Online,SLM
Threat, Vulnerability	1	Lecture	Assignment	Book,Online,SLM
Module VII Cyber Law (Theory- 3 hours)				
Cyber Laws – Indian Context.	2	Lecture	Assignment	Book,Online,SLM
Importance of Cyber Law	1	Lecture	Assignment	Book,Online,SLM
Total (hrs) : 60 Hours (Theory- 40 hours, Practice- 20 hours)				

Programming in C

Course Title	Code	Type of course	T-P-PJ	Prerequisite
Programming in C	ENFC0409	Theory & Practice	2-1-0	Nil

Objective

- To provide basic knowledge of programming tools and techniques.
- To familiarize the programming environment and syntax of C programming.
- To understand the working of basic programming constructs.

Course Outcome

- The students will able to apply programming skills to problem solving.
- The student will able to write 150 to 200 line programs without any error.

Evaluation Systems

Internal Examination	Component	% of Marks	Method of Assessment
	Internal Theory	20	Written Examination
	Internal Practice	30 (20+10)	Lab Work + Learning Record
External Examination	External Theory	30	Written Examination
	External Practice	20	Lab Work
Total		100	

Course outline

Module I :Problem Solving Techniques (10Hours)

Problem solving techniques : Algorithm, flow chart; Structure of C program, Character set, Identifiers, Keywords, Data Types, Constants and Variables, Input-output statements, relational and logical operators, increment and decrement operators, conditional operator, bit-wise operators, assignment operators, expressions, type conversions, conditional expressions, precedence and order of evaluation.

Module II : Control Structures (7Hours)

Statements and blocks, if and switch statements, loops : -while, do-while and for statements, break, continue, goto.

Module III : Array(7Hours)

Arrays-concepts, declaration, definition, accessing elements, two-dimensional and multi-dimensional arrays, applications of arrays.

Module IV : Functions(15 Hours)

Designing structured programs Functions, parameter passing, user defined functions, recursive functions, storage classes- extern, auto, register, static, scope rules.

Module V : Pointern (15 Hours)

Pointers- concepts, initialization of pointer variables, pointers and function arguments, address arithmetic, Character pointers and functions, pointers to pointers, pointers and multidimensional arrays, dynamic memory management functions, command line arguments.

Module VI : Structures(11Hours)

Derived types-structures-declaration, definition and initialization of structures, accessing structures, nested structures, arrays of structures, structures and functions, pointers to structures, self referential structures, unions,

Module VII : Files (10Hours)

Typedef, bit fields, C program examples. Input and output–concept of a file, text files and binary files, streams, standard I/O, Formatted I/O, file I/O operations.

Text Books :

1. E. Balaguruswamy “Programming in C”, Tata McGraw Hill 3rd Edition
2. Y. Kanetkar, “Let us C”, BPB Publications-9th edition.

Reference Books :

1. H. Scheldt, “C The Complete Reference”, Tata McGraw Hill
2. B.W. Kernighan & D.M. Ritchie, "C Programming Language", PHI.
3. Gotterfried, Schaum Series-“C Programming”.

Session Plan

Topic coverage and Internal Test	No. of Sessions (in hrs.)	Activity (lecture, tutorial, lab practice, field studies/field-trip, Workshop etc.)	Assignment (project, assignment, field study, seminar, etc.)	Suggested Reading (Book, Video, Online source, etc.)
Module I 5 hrs lectures + 3 hrs practice				
Problem solving techniques : Algorithm Problem solving techniques : flow chart	1	lecture	assignment	Book
Structure of C program Character set, Identifiers Keywords, Data Types, Constants and Variables, Input-output statements	1+1	lecture, quiz	assignment	Book

Relational and logical operators, increment and decrement operators	1	lecture	assignment	Book
Conditional operator, bit-wise operators, assignment operators	1+2	lecture, practice	assignment	Book
Expressions, type conversions Conditional expressions, precedence and order of evaluation	1	lecture		Book
Module II 4 hrs lectures + 5 hrs practice				
Statements and blocks, if and switch statements	2+1	lecture, practice	assignment	Book
loops : -while, do-while	1+2	lecture, practice	assignment	Book
for statements, break, continue, goto	1+2	lecture, practice	assignment	Book
Module III 5 hrs lectures + 5 hrs practice				
Arrays-concepts Declaration, definition, accessing elements, programs	1+2	lecture, practice, quiz	assignment	Book
two-dimensional arrays multi-dimensional arrays	2+2	lecture, practice	assignment	Book
applications of arrays	2+1	lecture, practice	assignment	Book
Module IV 5 hrs lectures + 4 hrs practice				
Designing structured programs : -Functions	1	lecture, practice	assignment	Book
parameter passing, user defined functions	2+2	lecture, practice	assignment	Book
recursive functions	1+1	lecture,	assignment	Book

		practice		
storage classes-extern, auto, register, static, scope rules	1+1	lecture, practice	assignment	Book
Module V 5 hrs lectures + 4 hrs practice				
pointers-concepts, initialization of pointer variables	1	lecture	assignment	Book
pointers and function arguments, address arithmetic, Character pointers and functions	2+2	lecture, practice	assignment	Book
pointers to pointers, pointers and multidimensional arrays	1+1	lecture, practice	assignment	Book
dynamic memory management functions, command line arguments	1+1	lecture, practice	assignment	Book
Module VI 6 hrs lectures + 5 hrs practice				
Derived types-structures-declaration, definition and initialization of structures, accessing structures	2+2	lecture, practice	assignment	Book
nested structures, arrays of structures	2+1	lecture, practice	assignment	Book
pointers to structures, self referential structures	1+1	lecture, practice	assignment	Book
unions	1+1	lecture, practice	assignment	Book
Module VII 4 hrs lectures + 6 hrs practice				
Typedef, bit fields Input and output–concept of a	2+2	lecture, practice	assignment	Book

file, text files and binary files, streams				
standard I/O, Formatted I/O	1+2	lecture, practice	assignment	Book
file I/O operations	1+2	lecture, practice	assignment	Book
Total (hrs)	34+32			

Desktop Operating System (Windows 10)

Course Title	Code	Type of course	T-P-PJ	Prerequisite
Desktop Operating System (Windows 10)	ENFC0410	Theory & Practice	2-1-0	FCEN0119 Operating System Building Blocks

Objective

- To install and configure Windows 10 enterprise.
- Configure networks, security settings in Windows 10 enterprise.

Course Outcome

- Student will able to install windows 10 enterprise.
- Student will able to configure devices, security settings, firewall in Windows 10 enterprise.

Evaluation Systems

Internal Examination	Component	% of Marks	Method of Assessment
	Internal Theory	20	Written examination
	Internal Practice	30(20+10)	Lab work + Learning Record
External Examination	External Theory	30	Written examination
	External Practice	20	Lab work
Total		100	

Module : I Installing, upgrading and managing Windows (4 Hrs.)

Gathering hardware devices, preparing to install windows, upgrading and migrating, Clean and Image based installation, Configuring Application Compatibility

Module : II Windows Features ,device drivers and disk managemnt (4 Hrs.)

Administrating windows features, Disk management, and installing and configuring device drivers.

Module : III File Access, Printers with Windows (4 Hrs.)

Introduction to Authentication and Authorization, Managing file access, Shared Folders, File compression, file archiving, managing printers

Module : IV Network connectivity with Windows (4 Hrs.)

Connecting windows client with server, configuring ipv4 & ipv6 connectivity, Implementing APIPA, Introduction to Name resolution, troubleshooting network issues, Overview of wireless network, configuring wireless network.

Module : V Securing, Optimizing and maintaining windows Client (5 Hrs.)

Overview of local security management, local security policy settings, EFS and Bitlocker, Application restrictions, UAC, Windows Firewall, Windows Defender.

Module : VI Configuring Browser and Mobile Computing in Windows (3 Hrs)

Administrating IE8, Configure Mobile computer and device settings

Module : VII Configuring Remote Access in windows (4 Hrs.)

Remote desktop, remote assistance, direct access, branch cache.

LAB EXERCISES : ANY TEN LABS

Navigating and Customizing the User Interface

Navigating the Windows 10 User Interface

Configuring Start

Configuring the Desktop

Installing Windows 10

Upgrading Windows 7 to Windows 10

Migrating User Settings

3 .Configuring Windows 10

Using the Settings App

Using Control Panel

Using Windows Power Shell

Using GPOs

Synchronizing Settings with One Drive

Connecting a Microsoft Account

Synchronizing Settings between Devices

Configuring Network Connectivity

Verifying and Testing IPv4 Settings

Configuring Automatic IPv4 Settings

Configuring and Testing Name Resolution

Managing Storage

Adding a Disk

Creating a Simple Volume

Compressing a Folder

Enabling Disk Quotas

Creating a Storage Space

Configuring and Managing Permissions and Shares

Creating, Managing, and Sharing a Folder

Using Conditions to Control Access and Effective Permissions

Installing and Managing a Printer

Managing and Using a Printer

Configuring Windows 10 Web Browsers

Configuring and Using Microsoft Edge

Configuring and Using Internet Explorer

Data Security

Using EFS

Using Bit Locker

Device Security

Creating Security Policies

Testing Security Policies

Configuring UAC Prompts

Configuring and Testing AppLocker

Network Security
 Creating and Testing Inbound Rules
 Creating and Testing Outbound Rules
 Creating and Testing Connection Security Rules
 Configuring Windows Defender
 Troubleshooting and Recovery
 Managing Device Drivers
 Using File History to Recover Files
 Using Previous Versions to Recover Files
 Recovering a Device with a Restore Point
 Using the Advanced Start-up Options to Recover a Device

Reference

E-content : www.krackin.com

Text Books :

1. Milan Milenkovic, “Operating Systems”, TATA McGraw Hill, 2009
2. Andrew Bettany, Andrew Warren, “Installing and Configuring Windows 10” , Microsoft Press, 2016D. Irtegov, “Operating Systems Fundamentals”, Charles River Media, 2002
1. Microsoft Official Academic Course, “Installing and Configuring Windows 10 Lab Manual”, Microsoft Press, 2017

Online Source : Microsoft academy, [http : //technet.microsoft.com](http://technet.microsoft.com)

Session Plan

Topic coverage and Internal Test	No. of Sessions (in hrs.)	Activity (lecture, tutorial, lab practice, field studies/field-trip, Workshop etc.)	Assignment (project, assignment, field study, seminar, etc.)	Suggested Reading (Book, Video, Online source, etc.)
Module : I Lecture=4 Lab Practice=2				
Installing, upgrading and managing Windows 10 : Gathering hardware devices, preparing to install windows.Up grading and migrating, Clean and Image based installation.Configuring Application Compatibility,	4+2	Lecture, lab practice	experiment	Book, Online source
Module : II Lecture=4 Lab Practice=4				

Configuring Application Compatibility, administrating windows features, Disk management, and installing and configuring device drivers.	4+4	Lecture, lab practice	experiment	Book, Online source
Module : III Lecture=4 Lab Practice=3				
Introduction to Authentication and Authorization, Managing file access, Shared Folders, File compression, file archiving, managing printers	2+1	Lecture, lab practice	Experiment	Book, Online source
File compression, file archiving, managing printers.	2+2	Lecture, lab practice	Experiment	Book, Online source
Module : IV Lecture=4 Lab Practice=2				
Connecting windows client with server, configuring ipv4 & ipv6 connectivity, Implementing APIPA.	2+1	Lecture, lab practice	Experiment	Book, Online source
Introduction to Name resolution, troubleshooting network issues, Overview of wireless network, configuring wireless network.	2+1	Lecture, lab practice	Experiment	Book, Online source
Module : V Lecture=5 Lab Practice=3				
Securing, Optimizing and maintaining windows 10 Client : Overview of local security management	1	Lecture		Book, Online source
local security policy settings.	1+1	Lecture, lab practice	Experiment	Book, Online source
EFS and Bit locker, Application restrictions. UAC,.	2+1	Lecture, lab practice	Experiment	Book, Online source

Windows Firewall. Windows Defender	1+1	Lecture, lab practice	Experiment	Book, Online source
Module : VI Lecture=3 Lab Practice=2				
Configuring Mobile Computing and Remote Access in windows 10 : Configure Mobile computer and device settings.	3+2	Lecture, lab practice	Experiment	Book, Online source
Module : VII Lecture=3 Lab Practice=2				
Remote desktop, remote assistance, direct access, branch cache.	3+2	Lecture, lab practice	Experiment	Book, Online source
Total (hrs)	46			

Principles of Biochemistry

Course Title	Code	Type of course	T-P-PJ	Prerequisite
Principles Of Biochemistry	FCEN0408	Theory & Practice	3-2-0	Nil

Objective

- To study the structure and properties of carbohydrates.
- Discuss the structure, properties and reactions of proteins and amino acids
- Discuss the structure, properties of fats and lipids
- To study the composition, structure and functions of nucleic acids

Course Outcome

- Aims at providing an elementary knowledge of bio molecules and its application

Evaluation Systems

Internal Examination	Component	% of Marks	Method of Assessment
	Internal Theory	20	Written examination
	Internal Practice	30(20+10)	Lab work + Learning Record
External Examination	External Theory	30	Written examination
	External Practice	20	Lab work
Total		<i>100</i>	

Course outline

Module : I

Biochemical Organization

Scope of clinical biochemistry, component of the cell, structure and biochemical functions, membrane structure and functions, transport through biological cell membrane

Module : II

Bioenergetics

Concept of free energy, determination of change in free energy from equilibrium constant and reduction potential, bioenergetics and biological oxidation – general concept of oxidation and reduction

Module : III

Electron transport chain, oxidative phosphorylation, uncouplers and theories of biological oxidation and oxidative phosphorylation.

Module : IV

Carbohydrates :

Classification, properties. Starch, glycogen, dextrin, inulin, cellulose, metabolism of carbohydrates, gluconeogenesis, glycogenolysis, glycolysis, citric acid cycle and its biological significance, role of sugar in nucleotide biosynthesis and pentose phosphate pathway.

Module : V

Lipids :

Classification, properties, sterols, essential fatty acids, eicosanoids, phospholipids, sphingolipids, metabolism of lipids, oxidation of fatty acids, α, β - oxidation and biosynthesis of ketone bodies, cholesterol, porphyrin biosynthesis, metabolism of bile pigments.

Module : VI

Amino acids and nucleic acids :

Classification, properties, biosynthesis of amino acids and proteins, essential amino acids, metabolism of amino acids and proteins, Nitrogen balance, genetic code, nucleic acids, and structure of DNA and RNA, purine biosynthesis and pyrimidine biosynthesis.

Module : VII

Macromolecules, Vitamins, Hormones, Enzymes

Physical and chemical properties, structure of haemoglobin, immunoglobulins and nucleoprotein, classification and their properties, occurrence, functions, requirements, deficiency manifestations and role of vitamins as coenzyme, chemical nature and properties, hormones, Nomenclature, enzyme kinetics, Michaelis-Menten equation, classification and their properties, mechanism of action, enzyme inhibition, coenzyme significance and enzymes of clinical importance.

LIST OF EXPERIMENTS (Any 8)

1. pH measurements and preparation of buffers.
2. Qualitative tests for Carbohydrates.
3. Estimation of sugars.
4. Estimation of proteins by Lowry's method / Biuret method.
5. Estimation of cholesterol by Zak's method.
6. Determination of saponification number of lipids.
7. Estimation of Amino acids.
8. Separation of amino acids - Thin layer chromatography.
9. Separation of sugars - Paper chromatography
10. Biochemical estimation of DNA /RNA using Spectrophotometer

Text Books :

1. Biochemistry by Jeremy M. Berg, John L. Tymoczko, Lubert Stryer, Fifth edition, W.H. Freeman and Company, 1514 pages.
2. Thomas M. Devlin. Textbook of Biochemistry with clinical correlations. Wiley Liss Publishers

Reference Books :

1. Burtis & Ashwood W.B. Tietz Textbook of Clinical chemistry. Saunders Company
2. Lubert Stryer W.H. Biochemistry. Freeman and company, New york.
3. Donald Voet & Judith G. Voet. Biochemistry. John Wiley and Sons, Inc.

Session Plan

Topic coverage and Internal Test	No. of Sessions (in hrs.)	Activity (lecture, tutorial, lab practice, field studies/field-trip, Workshop etc.)	Assignment (project, assignment, field study, seminar, etc.)	Suggested Reading (Book, Video, Online source, etc.)
Module I		lecture, tutorial, lab practice	assignment	Book, Video, Online source
Scope of clinical biochemistry	2			
component of the cell,	1			
membrane structure and functions, transport through biological cell membrane	2			
structure and biochemical functions	1			
Module II		lecture, tutorial, lab practice	assignment	Book, Video, Online source
Concept of free energy,	1			
determination of change in free energy from equilibrium constant and reduction potential,	2			
bioenergetics and biological oxidation	2			
general concept of oxidation and reduction	2			
Module III		lecture, tutorial, lab practice	assignment	Book, Video, Online source
Electron transport chain,	1			
oxidative phosphorylation, uncouplers	1			
theories of biological oxidation	1			
oxidative phosphorylation.	2			
Module IV		lecture,	assignment	Book, Video,

classification, properties. starch, glycogen, dextrin, inulin, cellulose	2	tutorial, lab practice		Online source
metabolism of carbohydrates, gluconeogenesis, glycogenolysis,	1			
glycolysis. citric acid cycle and its biological significance	1			
role of sugar in nucleotide biosynthesis and pentose phosphate pathway	2			
Module V		lecture, tutorial, lab practice	assignment	Book, Video, Online source
Classification, properties. sterols, essential fatty acids, eicosanoids	1			
phospholipids, sphingolipids	1			
metabolism of lipids, oxidation of fatty acids	2			
α, β - oxidation and biosynthesis of ketone bodies	1			
cholesterol, porphyrin biosynthesis	1			
metabolism of bile pigments.	1			
Module VI		lecture, tutorial, lab practice	assignment	Book, Video, Online source
Classification, properties, biosynthesis of amino acids and proteins,	2			
essential amino acids, metabolism of amino acids and proteins,	2			
Nitrogen balance, genetic code, nucleic acids, and structure of DNA and RNA,	1			
purine biosynthesis and pyrimidine biosynthesis.	2			

Module VII		lecture, tutorial, lab practice	assignment	Book, Video, Online source
Physical and chemical properties, structure of haemoglobin, immunoglobulins and nucleoprotein	2			
classification and their properties, occurrence, functions, importance	2			
requirements, deficiency manifestations and role of vitamins as coenzyme, chemical nature and properties,	1			
hormones, Nomenclature, enzyme kinetics,	1			
Michelles-Menten equation, classification and their properties,	2			
mechanism of action, enzyme inhibition, coenzyme significance and enzymes of clinical	1			
Total (hrs)	45+20			

Cell Biology

Course Title	Code	Type of course	T-P-PJ	Prerequisite
Cell Biology	FCEN0409	Theory & Practice	3-2-0	Nil

Objective

- To study cell structure and functions of organelle functions
- Exposure on transportations through cell membrane
- To focus on different receptors and model of signaling
- To introduce the concept of cell signaling

Course Outcome

- The course is aimed to make the student understand the basic concept of cell structure, membrane, cellular functions of different types of cell, modes of cellular signaling and signal amplification

Evaluation Systems

Internal Examination	Component	% of Marks	Method of Assessment
	Internal Theory	20	Written examination
	Internal Practice	30(20+10)	Lab work + Learning Record
External Examination	External Theory	30	Written examination
	External Practice	20	Lab work
Total		<i>100</i>	

Course outline

Module : I

Cell Structure and function

Origin and evolution of cells, molecular composition of cells, central role of enzymes, metabolic energy, biosynthesis of cell constituents, cell membrane

Module : II

Nucleus, Endoplasmic reticulum, Golgi apparatus and Lysosomes, Bioenergetics and Metabolism – Mitochondria, chloroplasts, Peroxisomes.

Module : III

Cell Division

Cell cycle – Mitosis, Meiosis, Molecules controlling cell cycle

Module : IV

Extra cellular matrix, role of matrix in cell enthore : Gap junctions, Tight junctions, Plasmodesmata.

Module : V**Transport across cell membrane**

Passive and Active Transport, Permeases, Ion channels, ATP pumps. Na^+ / K^+ / Ca^{2+} pumps uniport, symport antiporter system. Ligand gated / voltage gated channels, Agonists and Antagonists.

Module : VI**Signal Transductions**

Receptors – extracellular signaling, Cell surface / cytosolic receptors and examples, Different classes of receptors autocrine / paracrine / endocrine models, Secondary messengers molecules.

Module : VII

The Development and causes of cancer, tumour viruses, oncogenes, prevention and treatment

LIST OF EXPERIMENTS (Any 8)

1. Microscopic study of cell and cell organelles
2. Cell fractionation
3. Fixation, Dehydration, embedding and sectioning of tissues
4. Histology of extracellular matrix
5. Quantitative analysis of lipid classes by TLC
6. Isolation of microtubules
7. Isolation of actin and Myosin filaments
8. Isolation of Mitochondria
9. Nuclear staining
10. Stages of cell cycle.

Text Books :

1. The Cell : A molecular approach by Geoffrey M. Cooper. ASM Press, Pages : 673

Reference Books :

1. Molecular Biology of the Cell Edition 4, Roberts, Keith Alberts, Bruce Johnson, Alexander Raff, Martin Walter, Peter Lewis, Julian, Garland
2. Molecular Cell Biology, Lodish, Harvey Krieger, Monty Kaiser, Chris A. Berk, Arnold, W H Freeman & Co

Session Plan

Topic coverage and Internal Test	No. of Sessions (in hrs.)	Activity (lecture, tutorial, lab practice, field studies/field-trip, Workshop etc.)	Assignment (project, assignment, field study, seminar, etc.)	Suggested Reading (Book, Video, Online source, etc.)
Module I		lecture, tutorial, lab practice,	assignment	Book, Video, Notes
Origin and evolution of cells	2			
molecular composition of cells, cell membrane	1			
central role of enzymes, metabolic energy, biosynthesis of cell constituents	2			
Module II		lecture, tutorial, lab practice,	assignment	Book, Video, Notes
Nucleus, Endoplasmic reticulum	2			
Golgi apparatus and Lysosomes	2			
Bioenergetics and Metabolism	2			
Mitochondria chloroplasts	1			
Peroxisomes	1			
Module III		lecture, tutorial, lab practice,	assignment	Book, Video, Notes
Cell cycle – Mitosis	2			
Meiosis	2			
Molecules controlling cell cycle	1			
Module IV		lecture, tutorial, lab	assignment	Book, Video, Notes
Extra cellular matrix, role of matrix in cell enthore	2			

Gap junctions	1	practice,		
Tightjunctions, Plasmodesmata.	1			
Module V		lecture, tutorial, lab practice,	assignment	Book, Video, Notes
Passive and Active Transport,.	2			
Permeases, Ion channels,	2			
ATP pumps. Na ⁺ / K ⁺ / Ca ²⁺ T pumps uniport,	2			
Symport antiporter system	1			
Ligand gated / voltage gated channels	1			
Agonists and Antagonists	1			
Module VI		lecture, tutorial, lab practice,	assignment	Book, Video, Notes
Receptors – extracellular signaling	2			
Cell surface / cytosolic receptors and examples,	2			
Different classes of receptors antocrine / paracrine / endocrine models	1			
Secondary messengers molecules	2			
Module VII		lecture, tutorial, lab practice,	assignment	Book, Video, Notes
The Development and causes of cancer	2			
tumour viruses, oncogenes,	1			
prevention and treatment	2			
Total (hrs)	45+20			

Programming for Problem Solving- Java

Course Title	Code	Type of course	T-P-PJ	Prerequisite
Programming for Problem solving- Java	ENFC0412	Theory + Practice	1-2-0	Nil

Objective

- Learn problem solving using object-oriented concepts
- Implement object oriented programming using Java
- Analyze several alternative solutions to determine the best approach
- Create job opportunities in java application development area

Course Outcome

- Able to use object oriented concept to solve problems
- Write an error free program of minimum 200 lines of code.
- Acquire java coding skill which helps students in getting jobs in different IT firms

Evaluation Systems

	Component	% of Marks	Method of Assessment
Internal Examination	Internal Theory	20	Written examination
	Internal Practice	30(20+10)	Lab work + Learning Record
External Examination	External Theory	30	Written examination
	External Practice	20	Lab work
Total		100	

Projects :

1. Simple Currency Converter
2. Designing a Calculator
3. Generating the mark sheet of a student
4. Create a phone directory and search a number
5. Create a tic tac toe game
6. Developing a library maintenance system
7. Desktop applications
8. Exam System (Without Database)
9. Create Country MAP and Different banners

Course outline

Module: I (10Hrs) :

Problem Solving Techniques: Ask Questions, Look for things that are familiar, solve by analogy, Means-Ends Analysis, Divide and Conquer, The building block approach, Merging solutions, Mental Block : The Fear of Starting, Object Oriented Problem Solving, and Case Study.

Programming: Programming Language, Skeleton, Compilation, Interpretation, and Execution of Program.

Object-Oriented Programming : Object Oriented Concepts, Java Programming Environment, Feature of Java, Elements of Java Program : Identifier, Naming Conventions, Build-in Type, Variable, Operators, Control Statements, Loops, Typecasting, Arrays,

Module : II(15 Hrs)

Classes : Concept of Objects and Classes, Using Methods, Local Variables, Instance Variables, Constructor, Overloading Constructor, Overloading Methods, Garbage Collection, The Finalize Method, Static, Final and this Keyword.

Inheritance and Polymorphism: Basics, Access Modifier, The super Keyword, Method Overriding, Dynamic Method Dispatch, Abstract Classes, Inner Classes.

Module :III (10 Hrs) :

Packages : Packages, Access Protection, Importing Package

Interfaces : Interface, Implementing Interfaces.

Module :IV (10 Hrs) :

String Handling : String, String Buffer, String Builder.

Exception Handling : Fundamentals, Checked and Unchecked Exceptions, Using Try, Catch, Multiple Catches, Throw, Throws, Finally, Java's Built-In Exceptions, User-Defined Exception.

Module :V (10 Hrs) :

Multi-Threading : Java Thread Lifecycle Model, Thread Priorities, Synchronization, Creating Threads, Using Different Thread Methods, Wrapper Classes, Clone (java.lang), Collection API, Vectors (java.util).

Module-VI (10 Hrs) :

Java.IO : I/O Streams, Serialization

AWT : AWT Classes, Window Fundamental, Component, Container, Panel, Window, Frame, Canvas, Control Fundamentals, Layout Managers.

Module :VII (10 Hrs) :

Event Handling : Delegation Event Model, Event Classes, Event Listener Interfaces, and Adapter Classes, Handling Events by Extending AWT Components.

Text Books:

1. Mark Lassoﬀ, Java Programming for Beginners, Packt Publishing Limited, October 2017
2. Walter Savitch, “Java-An Introduction to Problem Solving & Programming”, 8th edition, Pearson, 2017
3. Herbert Schildt, “Java Complete Reference”, 10th edition, in McGraw-Hill Education, 2017

Reference Books:

1. Dr. Edward Lavieri, Peter Verhas, Mastering Java 9, Packt Publishing Limited, October 2017
2. Nell Dale, Chip Weems, “Programming and problem solving with Java”, in Jones and Bartlett, 2008
3. Bhave&. Patekar, “Programming with Java” in Pearson Education, 2008
4. H.M. Deitel& Paul J. Deitel, “Java How to Program” in PHI, 9th Edition, 2012

Online Source :

javatpoint.com,

[http : //www.corejavaguru.com](http://www.corejavaguru.com)

[https : //www.w3schools.in/java-tutorial/](https://www.w3schools.in/java-tutorial/)

Session Plan

Topic coverage and Internal Test	No. of Sessions (in hrs.)	Activity (lecture, tutorial, lab practice, field studies/field-trip, Workshop etc.)	Assignment (project, assignment, field study, seminar, etc.)	Suggested Reading (Book, Video, Online source, etc.)
Problem Solving Techniques : Ask Questions, Look for things that are familiar,	4	Lecture		Book

solve by analogy, Means-Ends Analysis, Divide and Conquer, The building block approach, Merging solutions, Mental Block : The Fear of Starting, Object Oriented Problem Solving, and Case Study				
Installation of JDK,Configure runtime environment and Visualizing Java programming Environment (architecture)	1+1	Practice		
What is Programming, Programming Language, Skeleton, Compilation, Interpretation, and Execution of Program	1	Lecture	Assignment	Book
Constructing skeleton of Java Program, Object Oriented Concepts, Java Programming Environment, Feature of Java	2+2	Lecture, Practice	Assignment	Book
Share and execute India Map & CUTM Banner Sharing and Execute Calculator program	2	Practice	Assignment	

Elements of Java Program : Identifier, Naming Conventions, Build-in Type, Variable, Operators, more example	2	Practice	Assignment	Book
Conditional statement, looping statement,	2	Practice	Assignment	Book
Sharing and Execute calculate grade of students	2	Practice		
Concept of Objects and Classes, Using Methods, Local Variables, Instance Variables, Constructor, Overloading Constructor With Examples	2+2	Lecture, Practice	Assignment	Book
Overloading Methods, Garbage Collection, The Finalize Method, Static, Final and this Keyword	2	Practice	Assignment	Book
Sharing and Execute area of shapes	1	Practice		
Inheritance and Polymorphism : Basics, Access Modifier, The super Keyword, Method Overriding, Dynamic Method Dispatch	1+2	Lecture, Practice	Assignment	Book
Abstract Classes, Inner Classes	1+2	Lecture, Practice	Assignment	Book

ToDo list where you can calculate the completed task vs. pending tasks.	1	Practice		
Packages, Access Protection, Importing Package, Interface, Implementing Interfaces	1+4	Lecture, Practice	Assignment	Book
StringHandling : String, StringBuffer, StringBuilder	1+2	Lecture, Practice	Assignment	Book
Create a phone directory and search for a number.	1	Practice		
Excepting Handling : Fundamentals, Checked and Unchecked Exceptions, Using Try, Catch, Multiple Catches, Throw, Throws, Finally, Java's Built-In Exceptions, User-Defined Exception	1+4	Lecture, Practice	Assignment	Book
Create a tic tac toe game	1	Practice		

java.io : I/O streams, Serialization	1+4	Lecture, Practice	Assignment	Book
Producer/Consumer Problem	1	Practice		
Multi-Threading : Java Thread Lifecycle Model, Thread Priorities, Synchronization, Creating Threads, using Different Thread Methods	1+2	Lecture, Practice	Assignment	Book
Wrapper Classes, Clone (java.lang), Collection API, Vectors (java.util)	1+2	Lecture, Practice	Assignment	Book
Developing a library maintenance system.	1	Practice		
Event Handling : Delegation Event Model, Event Classes, Event Listener Interfaces, and Adapter Classes, Handling Events by Extending AWT Components	1+2	Lecture, Practice	Assignment	Book
AWT : AWT Classes, Window Fundamental, Component, Container, Panel, Window, Frame, Canvas, Control Fundamentals, Layout Managers	2+6	Lecture, Practice	Assignment	Book
Total (Hrs)	75	(Theory -24 hrs + Practice -51 hrs =75)		

Database Management System

Course Title	Code	Type of course	T-P-PJ	Prerequisite
Database Management System	ENFC0414	Theory + Practice	1-2-0	Nil

Objective

- Introduce the fundamental concepts of database systems & their importance in practical life and the basic concepts necessary for designing, using and implementing database systems & applications
- Make the students understand the principles behind relational database management systems, including the database environment, the relational model, relational languages, develop simple SQL queries
- Create job opportunities in database design, development and administration.

Course Outcome

- Demonstrate the underlying concepts of database technology, identify the appropriate data model for the given problem
- Write SQL queries for performing database operations
- Design, implement and normalize a relational model for a given problem domain
- Obtain skills in designing, developing and administrating the relational database.

Evaluation Systems

Internal Examination	Component	% of Marks	Method of Assessment
	Internal Theory	20	Written examination
	Internal Practice	30(20+10)	Lab work + Learning Record
External Examination	External Theory	30	Written examination
	External Practice	20	Lab work
Total		100	

Module: I

General introduction to database systems; Database - DBMS distinction, approaches to building a database, data models, database management system, three-schema architecture of a database, challenges in building a DBMS, various components of a DBMS.

File Based Systems and Database Systems : File Based Approach, Database Systems, File-oriented Systems vs. Database Systems Database Approach : Database, Database Management System (DBMS), Components of DBMS Environment, Advantages and Disadvantages of DBMS Roles in Database Environment : Database Users, Database Administrators(DBA)

Module: II

Database System Architecture: Three Level Architecture, External Level, Conceptual Level, Internal Level, Schemas, Mappings, Instances, Data Independence, Data Abstraction
E/R Model - Conceptual data modeling - motivation, entities, entity types, various types of attributes, relationships, relationship types, E/R diagram notation, examples.

Module: III

Relational Data Model: Concept of relations, schema-instance distinction, keys, referential integrity and foreign keys, relational algebra operators : selection, projection, cross product, various types of joins, division, example queries, tuple relation calculus, domain relational calculus, converting the database specification in E/R notation to the relational schema.

Module: IV

Database installation procedure: Database table creation & insertion of values Database Languages : SQL - DDL, DML, TCL, DCL

SQL - Introduction, data definition in SQL, table, key and foreign key definitions, update behaviors. Querying in SQL - basic select-from-where block and its semantics, nested queries - correlated and uncorrelated, notion of aggregation, aggregation functions group by and having clauses, embedded SQL.

Data Definition Language : Creating a Database, Table Operations (Create, Alter, Drop, Truncate, Comment and Rename), Creating and Removing an Index

Data Manipulation Language : Using different DML commands (Insert, Delete, Update, and Select), Sorting Results (Order By), Aggregate Functions, Join, Grouping Results (Group By)

Data Control Language & Transaction Control Language : Using different DCL commands (Grant, Revoke) & using different TCL commands (Commit, Rollback and Savepoint).

Module: V

Dependencies and Normal forms - Importance of a good schema design, problems encountered with bad schema designs, motivation for normal forms, dependency theory - functional dependencies, Armstrong's axioms for FD's, closure of a set of FD's, minimal covers, definitions of 1NF, 2NF, 3NF and BCNF, decompositions and desirable properties of them, algorithms for 3NF and BCNF normalization, multi-valued dependencies and 4NF, join dependencies and definition of 5NF.

Module :VI

Data Storage and Indexes - file organizations, primary, secondary index structures, various index structures - hash-based, dynamic hashing techniques, multi-level indexes, B+ trees.

Terminologies of Relational Model : Relational Data Structure, Relational Keys, Representing Relational Database Schema Integrity Constrains and Views : Nulls, Entity Integrity, Referential Integrity, General Constraints, Views, Purpose of Views

Module: VII

Transaction processing and Error recovery - concepts of transaction processing, ACID properties, concurrency control, locking based protocols for CC, error recovery and logging, undo, redo, undo-redo logging and recovery methods.

PL/SQL : SQL vs PL/SQL, Practice different basic PL/SQL programs

Text Book:

1. Raghuram Ramakrishnan, Johames Gerkhe “ Data Base Management Systems, Mc Graw Hill
2. Gaurav Gupta, Sarika Gupta “ Data Base Management Systems” Khanna Book Publisher

Electronics and its Application

Course Title	Code	Type of course	T-P-PJ	Prerequisite
Electronics and Its Application	ENFC0415	Theory & Practice	2-1-0	Nil

Objective

- The objective of this course is to provide a good understanding on the components used in today's electronics circuits and systems.

Course Outcome

- Describe active and passive components and their application.
- Explain the Working principle of different types of sensor and their application.
- Design and simulate deferent electronic circuits using software tools(ORCAD/MULTISIM/MATLAB)

Evaluation Systems

Internal Examination	Component	% of Marks	Method of Assessment
	Internal Theory	20	Written Examination
	Internal Practice	30(20+10)	Lab Work + Learning Record
External Examination	External Theory	30	Written Examination
	External Practice	20	Lab Work
Total		100	

Course Outline

Module I: RECENT TRENDS IN ELECTRONIC APPLICATION

(9 Hours)

Theory

a. Smart Electronics : Few Case Studies

- Wearable Electronic Devices / Wearable Technology
- Home Automation
- Driverless Car / Self-driving Car
- Inside a Smart Phone

b. Electronics in Transdisciplinary Applications

- Automotive
- Space
- Underwater
- Medical
- Mining
- Manufacturing

- Industrial Automation
- Robotics
- Agriculture
- Entertainment

c. New Trends

- Green Electronics
- Organic Electronics
- Bio-Electronics
- Nano Electronics
- Polymer Electronics
- Molecular Electronics

Practice

1. Familiarization with different components inside a smart phone

Module II: ELECTRONIC MANUFACTURING

(11 Hours)

Theory

Electronic Manufacturing:

- a. Semiconductor devices
- b. Integrated Circuits (IC)
- c. System-on-Chip (SoC)
- d. System-in-Package (SiP)
- e. Network on Chip (NoC)
- f. Printed Circuit Board (PCB)
- g. Single layer PCB, Double layer PCB, Multi-Layer PCB
- h. Aluminum Backed PCB
- i. 3D Printed PCB

Practice

2. Familiarization with different ICs.
3. Familiarization with PCB design software.
4. Familiarization with 3-D printer.

Module III: COMPONENTS FOR ELECTRONIC CIRCUITS

(12 Hours)

Theory

a. Passive Components :

Resistor, potentiometer, capacitor, inductor, connectors, switches and relays.

b.Active Components :

PN junction diode, Zener diode, Photo diode, Light Emitting Diode (LED), Bipolar Junction Transistor (BJT) and Field Effect Transistor (FET)

Practice:

5. Familiarization with different Components - Resistor, Potentiometer, Capacitor, Inductor, Connectors, switches & Relays. Measurement of Resistance and Capacitance.
6. Application of PN junction diode, Zener Diode
7. Application of LED and photodiode
8. Application of BJT and FET

Module IV: SENSOR & ACTUATOR**(4 Hours)****Theory****a. Sensors : Types and Applications**

- Analog Sensors
- Digital Sensors
- Special Sensors

b. Actuators

- Types of Actuators
- Applications

Practice

9. Familiarization with all types of available sensors.

Module V:SENSOR APPLICATION**(8 Hours)****Theory**

- a. Sensors and Smart Sensors
- b. Reading Sensor Input
- c. Sensor Wiring
- d. Understanding sensors and its application
 - **Infrared Reflectance Sensor.**
 - **Resistance Temperature Detectors**
 - **Temperature Sensor (LM35, Thermistor)**
 - **Motion Sensor**
 - **Limit Switch/Sensor**
 - **Touch Sensor Circuit**

Practice:

10. Sensor Wiring
11. Application of any of the above sensors.

Module VI:VOLTAGE REGULATOR & AMPLIFIER**(8 Hours)****Theory**

Assembling and Testing (Hardware/Multisim) for Different Circuits (Any one from each category by different groups)

a.Voltage Regulator

- Linear Regulators (LM723,78XX,79XX)
- Switching Regulators (LM2676)
- SMPS
- Hybrid Regulators

b.Amplifier

- Voltage Amplifier
- Current Amplifier
- Power Amplifier

Practice

12. Design of a voltage divider circuit
13. Design of an amplifier

Module VII: SWITCH & OSCILLATOR

(8 Hours)

Theory

Assembling and Testing (Hardware/Multisim) for Different Circuits (Any one from each category by different groups)

Switch

- Relay
- Diode as a Switch
- Transistor as a Switch

Oscillator

- Harmonic Oscillator
- Voltage Controlled Oscillator

Practice

12. Design of a switch
13. Design of an oscillator circuit

Practice will be through hardware implementation and software simulation using Multisim / OrCad PSpice/ Matlab.

Reference : -

Text Books :

1. Ian Sinclair and John Dunton, "Practical Electronics Handbook", 6th Edition, Elsevier.
2. J. Hughes, "Practical Electronics : Components and Techniques", O'Reilly Media, 2015.
3. Basic Principle, Donald A. Neamen, "Semiconductor Physics and Devices", TMH publication

Reference Books :

1. Principles of electronics, V K Meheta, Rohit Meheta, S Chand publication

Session Plan

Topics	No. of Sessions (in hrs.)	Activity	Assignment	Suggested Reading
Module-I [7 hrs. Lecture + 2 hrs. Practice]				
Smart Electronics : Few Case Studies Wearable Electronic Devices Wearable Tech Home Automation Driverless Car / Self-driving Car	2	Lecture		Online source
Inside a Smart Phone [Familiarization with different components inside a smart phone]	2	Practice		Online source
Electronics in Transdisciplinary Applications : Automotive Space Underwater	1	Lecture		Online source
Medical Mining Manufacturing	1	Lecture		Online source
Industrial Automation Robotics Agriculture	1	Lecture		Online source
Green Electronics Organic Electronics Bio-Electronics	1	Lecture		Reference Book-1 + Online reference
Nano Electronics Polymer Electronics Molecular Electronics	1	Lecture		Reference Book-1 + Online reference
Module-II [5 hrs. Lecture+6 hrs. Practice]				
Electronic Manufacturing				
Semiconductor devices [Overview only]	1	Lecture		Text Book-3
Integrated Circuits (IC) [Familiarization with all	2	Practice		Text Book-3

available ICs in Lab]				
System on Chip (SoC), System on Package, Network on Chip [Overview and advantage]	1	Lecture		Text Book-3
Single layer PCB, Double layer PCB, Multi-Layer PCB, Aluminum Backed PCB [Overview of design software and application]	4	2hr. Lecture+ 2 hrs. Practice		Text Book-2 Chapter 15
3D Printed PCB	3	1hr. Lecture +2hrs. Practice		Text Book-2 Chapter 15
Module-III [4hrs. Lecture+8 hrs. Practice]				
Passive Components : Resistor, Potentiometer, capacitor, Inductor, Connectors, switches & Relays. [Definition, Function and Application]	4	2hrs. Lecture+ 2hrs. Practice		Text Book-2 Chapter 8 & 9, Text Book-1 Chapter 5
Active Components : PN junction diode, Zener diode, Photo diode, LED, BJT & FET [Function and application]	8	2hrs. Lecture+ 6 hrs. Practice		Text Book-2 Chapter 8 &9 , Text Book-1 Chapter 5
Module-IV [2hrs. Lecture+2 hrs. Practice]				
Sensors : - Types and Applications Analog Sensors Digital Sensors Special Sensors [Overview, Types and Applications]	3	1 hr. Lecture+ 2 hrs. Practice		Text Book-1 Chapter 8
Actuators : - Types of Actuators Applications	1	Lecture		Text Book-1 + online reference
Module-V [4hrs. Lecture+4 hrs. Practice]				
Sensors and Smart Sensors [overview]	1	Lecture		Text Book-1 + online reference
Reading Sensor Input, Sensor Wiring	3	1hr. Lecture + 2 hrs. Practice		Text Book-1 + online reference
• Infrared Reflectance Sensor	4	2hrs. Lecture +		Text Book-1 +

<ul style="list-style-type: none"> • Resistance Temperature Detectors • Temperature Sensor (LM35, Thermistor) • Motion Sensor • Limit Switch/Sensor • Touch Sensor Circuit <p>[Each group will practice any one of the above]</p>		2 hrs. Practice		online reference
Module-VI [4hrs. Lecture+4 hrs. Practice]				
Voltage Regulator Linear Regulators (LM723, 78XX, 79XX) Switching Regulators (LM2676) SMPS, Hybrid Regulators	4	2hrs. Lecture + 2hrs. Practice		Reference Book-1 + Online reference
Amplifier : Voltage Amplifier, Current Amplifier, Power Amplifier	4	2hrs. Lecture + 2hrs. Practice		Reference Book-1 + Online reference
Module-VII [4hrs. Lecture+4 hrs. Practice]				
Switch Relay, Diode as a Switch, Transistor as a Switch	4	2hrs. Lecture + 2hrs. Practice		Reference Book-1 + Online reference
Oscillator Harmonic Oscillator Voltage Controlled Oscillator	4	2hrs. Lecture + 2hrs. Practice		Reference Book-1 + Online reference
Total (hrs.)	60	29 hr. Lecture + 31 hrs. Practice		

Electronic Devices

Course Title	Code	Type of course	T-P-PJ	Prerequisite
Electronic Devices	ENFC0416	Theory + Practice	2-1-0	Nil

Objective

- The objective of this subject is to provide in-depth understanding on construction and characteristics of three major components of electronics-diode, BJT, FET.

Course Outcome

- Learn the construction and characteristics of different semiconductor devices.
- Design different rectifier, voltage regulator circuit and Filters.
- Design and analysis of different amplifier circuits.

Evaluation Systems

Internal Examination	Component	% of Marks	Method of Assessment
	Internal Theory	20	Written examination
	Internal Practice	30(20+10)	Lab work + Learning Record
External Examination	External Theory	30	Written examination
	External Practice	20	Lab work
Total		100	

Course Outline

Module I: INTRODUCTION

(4 Hours)

Theory

Various properties of conductor, semiconductor and insulator, n-type and p-type semiconductors. Formation of PN junction, depletion region, drift and diffusion.

Module II: SEMICONDUCTOR DIODE

(8 Hours)

Theory

Open-circuited, forward bias and reverse bias of p-n junction diode, Diode equation, Volt-ampere characteristics of p-n junction diode (forward and reverse bias), Temperature dependence of VI characteristic, Transition and Diffusion capacitances.

Practice

- Volt-Ampere characteristics of a Forward bias PN Diode.
- Volt-Ampere characteristics of a Reverse bias PN Diode.

Module III: SEMICONDUCTOR DIODE**(5 Hours)****Theory**

Breakdown mechanisms in semiconductor (Avalanche and Zener breakdown), Zener diode characteristics, LED and photo diode.

Practice

3. Volt-Ampere characteristics of a Zener Diode

Module IV: RECTIFIERS, FILTERS AND REGULATORS**(11 Hours)****Theory**

Half wave rectifier, full wave rectifier and ripple factor. Application of p-n diode as clipper and clamper. Simple circuit of a regulator using Zener diode, series and shunt voltage regulators.

Practice

4. Implementation of half wave rectifier. Tracing of waveforms, measurement of DC load voltage, AC load voltage and ripple factor values
5. Implementation of full wave rectifier. Tracing of waveforms, measurement of DC load voltage, AC load voltage and ripple factor values
6. Implementation of clipper circuits using PN-junction diode. Tracing of waveforms at the clipper circuits output.

Module V: TYPES OF FILTER**(10 Hours)****Theory**

Inductor filter, Capacitor filter, L- section filter, PI- section filter, Multiple L- section and Multiple PI-section filter.

Practice

7. Implementation of clamper circuits using PN-junction diode. Tracing of waveforms at the clamper circuits output.
8. Design and implementation of a capacitor Filter.
9. Design and implementation of Voltage Regulator using Zener diode

Module VI: BJT CONSTRUCTION AND CHARACTERISTICS**(12 Hours)****Theory**

Bipolar Junction Transistor (BJT), Types, Construction and it's working principle., Transistor as an amplifier, Detailed study of currents in a Transistor, VI characteristics of transistor in Common Base (CB), Common Emitter (CE) and Common collector (CC) configurations; Comparison of CE, CB and CC transistor configuration. Relation between Alpha, Beta & Gamma.

Practice

10. Plot and verify VI Characteristics of BJT in CB configuration.
11. Plot and verify VI Characteristics of BJT in CC configuration.
12. Plot and verify VI Characteristics of BJT in CE configuration.

Module VII: MOSFET CONSTRUCTION & CHARACTERISTICS (10 Hours)**Theory**

MOSFET –Types, Construction, working Principle, characteristics (Enhancement and depletion mode), Symbols of MOSFET, VI characteristics of CS, CD and CG configuration; Introduction to SCR and UJT; Thermal run away and thermal stability

Practice

13. Plot and verify VI Characteristics of FET in CS configuration.
14. Plot and verify VI Characteristics of FET in CD configuration.
15. Plot and verify VI Characteristics of FET in CG configuration.

Practice will be done through hardware implementation and software simulation using OrCAD PSpice/ Multisim/ LTspice.

Text Book

1. R.L. Boylestad and Louis Nashelsky, “Electronic Devices and Circuits”, Pearson/Prentice Hall, 11th Edition, 2013.

Reference Books

1. J. Millman, C. C. Halkias, and Satyabrata Jit, “Electronic Devices and Circuits” ,Tata McGraw Hill, 4th Edition, 2015.
2. Prof G S N Raju, “Electronic Devices and Circuits”, I K International Publishing House Pvt. Ltd, 2008.

Session Plan

Topics	No. of Sessions (in hrs.)	Activity	Assignment	Suggested Reading
Module I [4 hrs. Lecture]				
Various properties of Conductor, Semiconductor & Insulator, n and p – type semiconductors, Formation of PN junction	2	Lecture	Assignment-1.1	Text Book-1
Depletion region, Drift and diffusion	1	Lecture	Assignment-1.2	Text Book-1
Diode equation	1	Lecture	Assignment-1.3	Text Book-1

Module II [4 hrs. Lecture + 4 hrs. Practice]				
Volt-ampere characteristics of p-n diode (Forward and Reverse bias)	4	Practice		Text Book-1 and Lab Manual
Temperature dependence of VI characteristic, Transition and Diffusion capacitances,	2	Lecture	Assignment-2.1	Text Book-1
Breakdown Mechanisms in Semiconductor (Avalanche and Zener breakdown)	2	Lecture	Assignment-2.2	Text Book-1
Module III [3 hrs. Lecture + 2 hrs. Practice]				
Zener diode characteristics	2	Practice		Text Book-1 and Lab Manual
LED and photo diode	3	Lecture	Assignment-3.1	Text Book-1
Module IV [5 hrs. Lecture + 6 hrs. Practice]				
Half wave rectifier	1	Lecture	Assignment-4.1	Text Book-1
Implementation of half wave rectifier. Tracing of waveforms, measurement of DC load voltage, AC load voltage and ripple factor values	2	Practice		Lab Manual
Full wave rectifier	1	Lecture	Assignment-4.2	Text Book-1
Ripple factor	1	Lecture	Assignment-4.3	Text Book-1
Implementation of full wave rectifier. Tracing of waveforms, measurement of DC load voltage, AC load voltage and ripple factor values	2	Practice		Lab Manual
Application of p-n diode as clipper	2	Lecture	Assignment-4.4	Text Book-1
Implementation of clipper circuits using PN-junction diode. Tracing of waveforms at the clipper circuits output.	2	Practice		Lab Manual
Module V [4 hrs. Lecture + 6 hrs. Practice]				
Clamper	1	Lecture	Assignment-5.1	Text Book-1

Implementation of clamper circuits using PN-junction diode. Tracing of waveforms at the clamper circuits output.	2	Practice		Lab Manual
Types of filter, Inductor filter, Capacitor filter, L- section filter, PI- section filter, Multiple L- section and Multiple PI-section filter.	1	Lecture	Assignment-5.2	Text Book-1
Design and implementation of a capacitor Filter.	2	Practice		Lab Manual
Simple circuit of a regulator using Zener diode	1	Lecture	Assignment-5.3	Text Book-1
Design and implementation of Voltage Regulator using Zener diode	2	Practice		Lab Manual
Series and shunt voltage regulators	1	Lecture	Assignment-5.4	Text Book-1
Module-VI [6 hrs. Lecture + 6 hrs. Practice]				
Bipolar Junction Transistor, Types, Construction & it's working principle	2	Lecture	Assignment-6.1	Text Book-1
Transistor as an amplifier, Detailed study of currents in a Transistor	2	Lecture	Assignment-6.2	Text Book-1
VI Characteristics of transistor in Common Base (CB) configurations	2	Practice		Text Book-1
VI Characteristics of transistor Common collector (CC) configurations	2	Practice		Text Book-1
VI Characteristics of transistor Common Emitter (CE) configurations	2	Practice		Text Book-1
Comparison of CE, CB and CC transistor configuration. Relation between Alpha, Beta & Gamma	2	Lecture	Assignment-6.3	Text Book-1
Module VII [4 hrs. Lecture + 6 hrs. Practice]				
MOSFET –Types, construction, working principle	2	Lecture	Assignment-7.1	Text Book-1
Characteristics of MOSFET (enhancement and depletion mode). Symbols of MOSEET	1	Lecture	Assignment-7.2	Text Book-1

VI Characteristics of CS, configuration	2	Practice		Text Book-1
VI Characteristics of CD configuration	2	Practice		Text Book-1
VI Characteristics of CG configuration	2	Practice		Text Book-1
Introduction to SCR and UJT. Thermal run away and thermal stability	1	Lecture	Assignment-7.3	Text Book-1
Total (hrs.)	60	30hrs. Lecture + 30hrs. Practice		

Sensors and IOT

Course Title	Code	Type of Course	T-P-PJ	Prerequisite
Sensors and IOT	ENFC0417	Theory & Practice	2-1-0	NIL

Objective

- To teach how 'Internet of Things' works, how the Protocols Function, familiarization with different Sensors and their Working, how a Hardware Communicates with Internet and the way it Exchange Necessary Data Through Internet.

Course Outcome

- Students will gain knowledge on how 'Internet of Things' can be utilized and how different Sensors can help in making the System to Operate Effectively and Smartly.
- Students will develop skill in Designing Portable, Ease of Access, Smart, Effective and Efficient Systems to meet the need of Modern Society by using IOT and various Sensors.

Evaluation Systems

	Component	% of Marks	Method of Assessment
Internal Examination	Internal Theory	20	Written Examination
	Internal Practice	30(20+10)	Lab Work + Learning Record
External Examination	External Theory	30	Written Examination
	External Practice	20	Lab Work
Total		100	

Course Outline

Module I : SENSORS & IOT

(15 Hours)

Theory

What is Sensor? Types of Sensors, URM 37 Sensor (Ultrasonic Sensor), Electro-Mechanical Switches, IR, PIR, Laser, Accelerometers, MQ2, MQ3, Temperature and Humidity Sensors (DHT-11), Stress Sensors, LoadSensors, Force Sensors, Wi-Fi modules

What is IOT, What Device makes it to IOT, IOT Platforms, What IOT means for the Developer, Challenges of IOT

Practice

- Interfacing and Testing the Ultrasonic Module, Relay and Infra-Red Module
- Interfacing and Testing PIR, Laser LED, and Accelerometer
- Interface the LPG Sensor, Monoxide Sensor, Temperature and Humidity Sensor
- Interfacing and Testing Stress Sensor, Load Sensor, Force Sensor, Wi-Fi Modules

Module II: ARDUINO ENVIRONMENT, WEB CONNECTIVITY (12 Hours)

Theory

Introduction to Arduino, setting up the Arduino Development Environment, Options for Internet Connectivity with Arduino, Interacting with Basic Sensors, Interacting with Basic Actuators, Configuring your Arduino Board for the IOT

Practice

5. Installing the Arduino IDE
6. Learning the steps to Interface the Controller Board to the System through the Interface
7. Connecting the Arduino to the Internet
8. Interacting of various Sensors to the Internet through the Controller Board
9. Interfacing Actuators to the Controller Board and Control through the Internet

Module III: DATA EXTRACTION (5 Hours)

Theory

Grabbing the Content from a Web Page, Sending Data to the Web, Troubleshooting Basic Arduino Issues

Practice

10. Extracting Data from a Web Page
11. Sending Data to a Web Page

Module IV: INTERNET DATA MONITORING (10 Hours)

Theory

Introduction, Internet of Things Platforms for Arduino, Posting the Sensor Data Online, Retrieving your Online Data, Securing your Online Data, Monitoring Sensor Data from a Web based Dashboard, Monitoring several Arduino Boards at once, Troubleshooting Issues with Web Data Monitoring

Practice

12. Posting the data to the Internet through Internet on-line
13. Monitor the Sensor output from a remote computer through Internet
14. Parallel Monitoring multiple Controller Boards connected to the Internet

Module V:WEB SERVICES

(7 Hours)

Theory

Introduction, Discovering the Temboo Platform, Tweeting from an Arduino Board, Posting updates on Facebook, Automation with IFTTT, Sending Push Notifications

Practice

15. Posting an update to Facebook
16. Sending a Push notification through the Controller by Internet

Module VI: INTERACTING WITH WEB SERVICES

(15 Hours)

Theory

Sending Text Message Notifications, Storing data on Google Drive, Troubleshooting issues with Web Services

Practice

17. Sending a Text Notification through Internet
18. Control Light and Fan via Internet. (prototyped as LEDs)
19. Operate a DC Motor and Servo Motor to Simulate the opening and closing of door

Module VII:MACHINE-TO-MACHINE INTERACTIONS

(11 Hours)

Theory

Introduction, Types of IoT Interaction, Basic local M2M Interactions, Cloud M2M with IFTTT, M2M Alarm System, Automated Light Controller, Automated Sprinkler Controller, Troubleshooting basic M2M Issues

Practice

20. Operate the Smoke Detector from Internet
21. Extract the reading of Temperature, Humidity and Monitoring through Internet
22. Automating the Control of Light, Sprinkler
23. Operate the Robot through Internet which has facility of Communication to and fro through Web and the Sensor Data

Text Books :

1. Marco Schwartz,“Internet of Things with Arduino Cookbook”, Packt Publishing Ltd, 2016,ISBN 978-1-78528-658-2.
2. Arshdeep Bahga, Vijay Madisetti, “Internet of Things- A Hands on Approach”, Universities Press, 2015.

Reference :

1. Neil Cameron, “Arduino Applied: Comprehensive Projects for Everyday Electronics”, Apress Publication, 2019, ISBN-13(pbk):978-1-4842-3959-9, ISBN-13(electronic):978-1-4842-3960-5
2. Marco Schwartz, “Internet of Things with Arduino Yun: Projects to help you build a world of smarter things”, Packt Publishing Ltd, 2014, ISBN:978-1-78328-800-7

Online Resource

1. <https://www.arduino.cc/reference/en>. [Viewed on 14-06-2019]

Session Plan :

Topics	No. of Sessions (in hrs.)	Activity	Assignment	Suggested Reading
Module I [3 hrs. Lecture + 12 hrs. Practice]				
What is Sensor? Types of Sensors	1	Lecture	Assignment 1.1	Text Book(TB)-1, Reference Book(RB)-1
URM 37 Sensor (Ultrasonic Sensor), Electro-Mechanical Switches, IR	1	Lecture	Assignment 1.2	TB-1, RB-1
Interfacing and Testing the URM 37, Relay, IR Module	4	Practice		TB-1
PIR, Laser, Accelerometers, MQ2, MQ3, Temperature and Humidity Sensors (DHT-11)	1	Lecture	Assignment 1.3	TB-1, RB-1
Interfacing and Testing PIR, Laser, Accelerometer, MQ2, MQ3, DHT-11	4	Practice		RB-1
Stress Sensors, LoadSensors, Force Sensors, Wi-Fi Modules	1	Lecture	Assignment 1.4	TB-1, RB-1
Interfacing and Testing stress Sensor, Load Sensor, force Sensor, Wi-Fi modules	4	Practice		TB-1
Background, What is IOT, What device makes it to IOT, IOT platforms, What IOT means for the Developer.	1	Lecture	Assignment 1.5	TB-1,
Module II [2 hrs. Lecture + 10 hrs. Practice]				
Introduction, Setting up the Arduino Development Environment.	2	Practice		TB-1

Interacting of various Sensors to the Internet through the Controller Board.	4	Practice		TB-1
Interacting with basic actuators, Configuring your Arduino Board for the IoT.	4	Practice		
Module III [1 hrs. Lecture + 4 hrs. Practice]				
Grabbing the content from a Web page, sending data to the Web, Troubleshooting basic Arduino issues.	1	Lecture	Assignment 3.1	TB-2 RB-1,2
Extracting data from a Web page.	2	Practice		TB-2
Sending data to a Web page.	2	Practice		
Module IV [2 hrs. Lecture + 8 hrs. Practice]				
Introduction, Internet of Things platforms for Arduino	1	Lecture	Assignment 4.1	TB-2 RB-1,2
Posting the Sensor data online, retrieving your online data, and Securing your online data, Monitoring Sensor data from a Web-based dashboard.	4	Practice		TB-2 RB-1,2
Monitoring several Arduino Boards at once, Troubleshooting issues with Web data Monitoring.	1	Lecture	Assignment 4.2	TB-2 RB-1,2
Parallel Monitoring multiple Controller Boards connected to the Internet.	4	Practice		TB-2 RB-1,2
Module V [3 hrs. Lecture + 4 hrs. Practice]				
Introduction, Discovering the Temboo platform, Tweeting from an Arduino Board. Tweeting from an Arduino Board	2	Lecture	Assignment 5.1	TB-2
Posting updates on Facebook, Automation with IFTTT, Sending push notifications.	1	Lecture	Assignment 5.2	TB-2
Posting updates on Facebook, Sending push notifications	4	Practice		TB-2
Module VI [1 hrs. Lecture +14 hrs. Practice]				
Sending text message notifications, Storing data on Google Drive.	2	Practice		

Troubleshooting issues with Web services.	1	Lecture	Assignment 6.1	Text Book-1, Reference Book-1,2
Control Light & Fan from the Internet.	4	Practice		
Remote Controlled door (opening & closing) using servo Motor.	4	Practice		
Smoke detector and Remote Control room temperature from Internet.	2	Practice		
Extract the reading of Temperature, Humidity and Monitoring through Internet.	2	Practice		
Module VII [3 hrs. Lecture + 8 hrs. Practice]				
Introduction, Types of IoT interaction, Basic local M2M interactions.	1	Lecture	Assignment 7.1	Text Book-1, Reference Book-1,2
Cloud M2M with IFTTT, M2M alarm system, Troubleshooting basic M2M issues.	1	Lecture	Assignment 7.2	Text Book-1, Reference Book-1,2
Automated light Controller, Automated sprinkler Controller,	4	Practice		
Introduction, choosing a robotic platform, Building a mobile robot, Configuring your mobile robot, Basic robot Control, Using distance Sensors, Controlling your robot from anywhere, Troubleshooting basic robotic issues.	1	Lecture	Assignment 7.3	Text Book-1, Reference Book-1,2
Operate the robot through Internet which has facility of communication to and fro through Web and the Sensor data.	4	Practice		
Total (hrs.)	75	15 hrs. Lecture + 60 hrs. Practice		

Problem Solving and Programming

Course Title	Code	Type of course	T-P-PJ	Prerequisite
Problem Solving and Programming	ENFC0418	Theory +Practice	1-2-0	Nil

Objective:

- To introduce programming through Visual programming tool - SCRATCH
- To teach problem solving through Flow charting tool - RAPTOR
- To elucidate problem solving through python programming language
- To introduce function-oriented programming paradigm through PYTHON
- To train in development of solutions using modular concepts
- To teach practical Python solution patterns
- To enhance the problem analysis capability and problem solving techniques

Course Outcome:

- Develop a program controlled by a loop.
- Experiment with “costumes” to change the appearance of sprites
- Perform Input, Output Operations using scratch
- Perform computation using common mathematical formulas.
- Develop programs by passing messages between sprites.
- Build Mobile apps using App Inventor
- Select flowchart symbols for solving problems.
- Develop basic flowcharts for performing Input, Output and Computations
- Solve numerical problems using Raptor
- Analyze the different computational problems and give programmatic solutions.

Evaluation Systems

	Component	% of Marks	Method of Assessment
Internal Examination	Internal Theory	20	Written Examination
	Internal Practice	30 (20+10)	Lab Work + Learning Record
External Examination	External Theory	30	Written Examination
	External Practice	20	Lab Work
Total		100	

Course Outline

Module I : SCRATCH (10 Hours)

Introduction to programming concepts with scratch, Scratch environment, sprites looks and motion, Angles and directions, repetition and variation, changing costumes, adding background, Input/Output, variables and operators. Working with sounds and sprite communication and

creating stories, App Generation.

Module II : RAPTOR (10 Hours)

RAPTOR: Flow chart symbols, Input/Output, Assignment, operators, conditional if, repetition, function and sub charts.

Module III : Programming Languages (9 Hours)

Various types of Programming Languages(PL), Types of PL, Characteristics of PL, Syntax, Semantics, Pragmatics Analysis Procedure based languages : General features, Data types, Abstract Data Types (ADT), Structuring, Syntax, Semantics, RAM model of computation, Example : C language

Module IV : Object Oriented Concepts (10 Hours)

Object based languages: Concepts of objects, Class vs ADT, control structures, methods, General features-inheritance, polymorphism, derived classes & information hiding, Example : C++ and Java, Difference with C.

Module V : Programming Concepts (12 Hours)

Logic programming: Predicate calculus- Logical operators, Propositional forms, Rules of inference, Logical equivalence, Quantification, Wellformed formula, Disproofs; Prolog- Syntax, Lists, Operators and arithmetic, Control, i/o, data structures. Functional programming : Lisp- Control constructs, List processing, Files and i/o, Generic functions, Objects,Exceptions.

Module VI : PYTHON Basic concepts (12 Hours)

Python – Numbers, Strings, Variables, operators, expressions, statements, String operations, Math function calls, Input/Output statements, Conditional If, while and for loops, User defined Functions, parameters to functions, recursive functions, Turtle Graphics.

ModuleVII : PYTHON Data Structures (12 Hours)

Lists, Tuples, Dictionaries, Strings, Files and their libraries.Beautiful Idiomatic approach to solve Turtle Bar Chart, Event Driven programming. Key press events, Mouse events, timer events.

Online Resources

- 1.<https://www.cse.msu.edu/~stockman/ITEC/Scratch/BGC2011Scratch-Rev1.pdf>
<https://nostarch.com/scratchplayground> [Viewed on Dt- 13-06-2019]
- 2.<https://raptor.martincarlisle.com/>[Viewed on Dt- 13-06-2019]
3. <http://www.ict.ru.ac.za/Resources/cspw/thinkcspy3/thinkcspy3.pdf>[Viewed on Dt- 13-06-2019]
- 4.https://zhanxw.com/blog/wp-content/uploads/2013/03/BeautifulCode_2.pdf [Viewed on Dt- 13-06-2019]

Data Structures

Course Title	Code	Type of course	T-P-PJ	Prerequisite
Data Structures	ENFC0419	Theory +Practice	2-1-0	Nil

Objective

- Understand and implement linear, nonlinear datastructures
- Implement various searching and sorting techniques.

Course outcome

- Acquire the knowledge about linear, non-linear datastructures.
- Able to implement various searching and sorting techniques.

Evaluation Systems

Internal Examination	Component	% of Marks	Method of Assessment
	Internal Theory	20	Written examination
	Internal Practice	30(20+10)	Lab work + Learning Record
External Examination	External Theory	30	Written examination
	External Practice	20	Lab work
Total		100	

Course outline

Module I (10 Hrs)

Definition, Classification of data structures: primitive and non-primitive, Elementary data organization, Time and space complexity of an algorithm (Examples)

Module II

(10 hrs)

Stack Definition, Array representation of stack, Operations on stack: Infix, prefix and postfix notations, Conversion of an arithmetic expression from Infix to postfix, Applications of stacks.

Module III

(10 hrs)

Queue: Definition, Array representation of queue, Types of queue: Simple queue, Circular queue, Double ended queue (De-queue), Priority queue, Operations on all types of Queues

Module IV**(15 Hrs)**

Definition, Components of linked list, Representation of linked list, Advantages and disadvantages of linked list. Types of linked list: Singly linked list, doubly linked list, Circular linked list, Operations on singly linked list: creation, insertion, deletion, search and display.

Module V**(15 Hrs)**

Definition : Tree, Binary tree, Complete binary tree, Binary search tree, Tree terminology: Root, Node, Degree of a node and tree, Terminal nodes, Non-terminal nodes, Siblings, Level, Edge, Path, depth, Parent node, ancestors of a node. Binary tree: Array representation of tree, Creation of binary tree. Traversal of Binary Tree: Preorder, In-order and post-order, Binary search tree, AVL tree.

Module VI (14 Hrs)

Basic Sorting and Searching Techniques: Sequential search: Iterative and Recursive methods, Binary search: Iterative and Recursive methods, Comparison between sequential and binary search. Sort: General background and definition, Bubble sort, Selection sort, Insertion sort, Merge sort, Quick sort, Radix sort, heap sort.

Module VII(10 Hrs)

Graphs, Graph terminology, Application of Graphs, Depth First search, Breadth First search, Topological sort.

Text Books:

- . Tenenbaum, Data Structures Using C. Pearson Education, Seventh Impression, 2009
- .. Kamthane: Introduction to Data Structures in C. Pearson Education . Third Impression, 2009

Reference

1. Lipschutz: Schaum's outline series Data structures with C Tata McGraw-Hill Indian Edition 2011
2. Weiss, Data Structures and Algorithm Analysis in C, II Edition, Pearson Education, 2001.

Online Source:

1. [http://nptel.ac.in/courses/Webcourse-contents/IIT- %20Guwahati/data_str_algo/frameset.htm](http://nptel.ac.in/courses/Webcourse-contents/IIT-%20Guwahati/data_str_algo/frameset.htm)
2. <https://www.cs.utexas.edu/users/djimenez/utsa/cs1723/lecture2.html>

Switching Theory & Logic Design

Course Title	Code	Type of course	T-P-PJ	Prerequisite
Switching Theory & Logic Design	ENFC0420	Theory + Practice	2-1-0	Nil

Objective:

- The Objective of this Subject is to Provide Good Understanding on Digital Logic and Different Combinational and Sequential Circuits Design and their Implementations.

Course Outcome:

- Understand different number representation and conversion between different representations.
- Design various logic gate and simplify different Boolean equations.
- Design and analyze various combinational circuits.
- Understand the design of sequential circuits in terms of Algorithmic State Machines

Evaluation Systems:

Internal Examination	Component	% of Marks	Method of Assessment
	Internal Theory	20	Written Examination
	Internal Practice	30(20+10)	Lab Work + Learning Record
External Examination	External Theory	30	Written Examination
	External Practice	20	Lab Work
Total		100	

Course Outline

Module I: NUMBER SYSTEMS AND CODES (3 Hours)

Number Systems, Base Conversion Methods, Complements of Numbers, Codes- Binary Codes, Binary Coded Decimal Code and its Properties, Module Distance Codes, Alphanumeric Codes, Error Detecting and Correcting Codes.

Module II: BOOLEAN ALGEBRA AND LOGIC MINIMIZATION (9 Hours)

Basic Theorems and Properties, Switching Functions, Canonical and Standard Form, Algebraic Simplification of Digital Logic Gates, Properties of XOR Gates, Universal Gates, Multilevel NAND/NOR realizations

Module III: LOGIC MINIMIZATION AND COMBINATIONAL CIRCUIT DESIGN (13 Hours)

Introduction, The Minimization with theorem, The Karnaugh Map Method, Five and Six Variable Maps, Prime and Essential Implications, Don't Care Map Entries, Using the Maps for Simplifying, Tabular Method Partially Specified Expressions, Multi-output Minimization, Minimization and Combinational Design, Arithmetic Circuits, Comparator, Multiplexers, Code

Converters, Wired Logic, Tristate Bus System, Practical Aspects related to Combinational Logic Design, Hazards and Hazard Free Relations.

Module IV: SEQUENTIAL CIRCUIT DESIGN (9 Hours)

Introduction, Basic Architectural Distinctions Between Combinational and Sequential Circuits, The Binary Cell, Fundamentals of Sequential Machine Operation, The Flip-Flop, The D-Latch & Flip-Flop, The “Clocked T” Flip-Flop, The “ Clocked J-K” Flip-Flop, Design of a Clocked Flip-Flop, Conversion From One Type of Flip-Flop to Another, Timing and Triggering Consideration, Clock Skew

Module V: REGISTER AND COUNTER (10 Hours)

Introduction, State Diagram, Analysis of Synchronous Sequential Circuits, Approaches to the Design of Synchronous Sequential Finite State Machines, Design Aspects, State Reduction, Design Steps, Realization Using Flip-Flops Counters – Design of Single Mode Counter, Ripple Counter, Ring Counter, Shift Register, Shift Register Sequences, Ring Counter Using Shift Register.

Module VI: FINITE STATE MACHINE (8 Hours)

Finite State Machine-Capabilities and Limitations, Mealy and Moore Models-Minimization of Completely Specified and Incompletely Specified Sequential Machines, Partition Techniques, and Merger Chart Methods-Concept of Minimal Cover Table.

Module VII: ALGORITHMIC STATE MACHINES (8 Hours)

Salient Features of the ASM Chart-Simple Examples-System Design Using Data Path and Control Subsystems-Control Implementations-Examples of Weighing Machine and Binary Multiplier.

Text Book

1. M.Morris Mano., “Digital Design”, Pearson Education, 4th Edition.
2. Zvi Kohavi & Niraj K. Jha, “Switching and Finite Automata Theory”, 3rd Edition, Cambridge.

Reference Book

1. Kumar, A.A., Fundamentals of digital circuits. PHI Learning Pvt. Ltd,2014.
2. Jain, R.P. and Floyd, T.L., Digital fundamentals, Dorling Kindersley Pvt Ltd, 2009.
3. Donald, P.L., Albert, P.M., Goutam. Saha, Malvino, A.P. and Saha, G.K., Digital Principles & Applications. Tata McGraw-Hill, 2010.

Operating Systems

Course Title	Code	Type of course	T-P-PJ	Prerequisite
Operating Systems	ENFC0422	Theory + Practice	1-2-0	Nil

Course Objective

- Provide knowledge about the services rendered by operating systems
- Present details discussion on processes, threads and scheduling algorithms
- Discuss various file-system design and implementation issues
- Provide good insight on various memory management techniques
- Expose the students with different techniques of handling deadlocks
- Familiarize students with the basics of linux operating system and perform administrative tasks on Linux servers
- Provide skills in operating system abstraction, mechanism and implementation of operating system concepts

Course Outcome:

- Understand operating system structure and functions, services and system calls
- Differentiate between preemptive, non-preemptive and real time CPU scheduling
- Understand how to achieve mutual exclusion in uniprocessor systems
- IPC outcome
- Demonstrate the ability to implement various memory management techniques
- Illustrate various demand paging techniques.
- Understand file systems in various operating systems
- Analyse different disk scheduling algorithms
- Understand various schemes available for achieving system protection and system security
- Acquire skill in administrating Linux system

Evaluation Systems

	Component	% of Marks	Method of Assessment
Internal Examination	Internal Theory	20	Written examination
	Internal Practice	30(20+10)	Lab work + Learning Record
External Examination	External Theory	30	Written examination
	External Practice	20	Lab work
Total		100	

Course Outline

Module :I

Introduction:(8hrs)

Architecture, Goals & Structures of O.S, Basic functions, Interaction of O. S. & hardware architecture, System calls, Batch, multiprogramming. Multitasking, time sharing, parallel, distributed & real -time O.S.

Module: II

Process Management: (13hrs)

Process Concept, Process states, Process control, Threads, Uni- processor Scheduling: Types of scheduling : Preemptive, Non preemptive, Scheduling algorithms : FCFS, SJF, RR, Priority, Thread Scheduling, Real Time Scheduling. System calls like ps, fork, join, exec family, wait.

Module :III(12hrs)

Concurrency control :

Concurrency : Principles of Concurrency, Mutual Exclusion : S/W approaches, H/W Support, Semaphores, pipes, Message Passing, signals, Monitors, Classical Problems of Synchronization : Readers-Writers, Producer Consumer, and Dining Philosopher problem. Deadlock :Principles of deadlock, Deadlock Prevention, Deadlock Avoidance, Deadlock Detection, System calls like signal,kill.

Module :IV

Memory Management : (12hrs)

Memory Management requirements, Memory partitioning : Fixed and Variable Partitioning, Memory Allocation : Allocation Strategies (First Fit, Best Fit, and Worst Fit), Fragmentation, Swapping, and Paging. Segmentation, Demand paging

Module V

Virtual Memory :(8hrs)

Concepts, management of VM, Page Replacement Policies (FIFO, LRU, Optimal, Other Strategies), Thrashing.

Module :VI

I/O management & Disk scheduling : (8hrs)

I/O Devices, Organization of I/O functions, Operating System Design issues, I/O Buffering, Disk Scheduling (FCFS, SCAN, C-SCAN, SSTF), RAID, Disk Cache.

Module :VII

Inter Process Communication :(10hrs)

Basic Concepts of Concurrency, Cooperating process, Advantage of Cooperating process, Bounded- Buffer - Shared-Memory Solution, Inter- process Communication (IPC), Basic Concepts of Inter-process Communication and Synchronization.

Text Book:

Operating System Conceptsby Abraham Silberschatz , Peter B. Galvin , Wiley Publication

Big Data Analytics

Course Title	Code	Type of course	T-P-PJ	Prerequisite
Big Data Analytics	ENFC0423	Theory +Practice	1-2-0	Nil

Course Objective

- Learn understand and practice big data analytics approaches with the study of modern computing big data technologies and focus on industry application
- Conceptualize and summarize big data computing technologies machine learning, trivial data vs big data and scale of the approaches.
- Gain essential skills in data storage, process and data analysis

Course Outcome:

- Identify the characteristics of data set and compare trivial data and big data for various applications
- Recognize and implement different ways of selecting parameters and integrate with the mathematical and statistical tools
- Acquires skills in big data applications.

Evaluation Systems

	Component	% of Marks	Method of Assessment
Internal Examination	Internal Theory	20	Written examination
	Internal Practice	30(20+10)	Lab work + Learning Record
External Examination	External Theory	30	Written examination
	External Practice	20	Lab work
Total		100	

Course Outline

Module: I Introduction to Big Data(10 hrs)

Big Data-definition, Characteristics of Big Data (Volume, Variety, Velocity, Veracity, Validity), Importance of Big Data, Patterns for Big Data Development, Data in the Warehouse and Data in Hadoop.

Module: II Introduction to Hadoop (10 hrs)

Hadoop- definition, Understanding distributed systems and Hadoop, Comparing SQL databases and Hadoop, Understanding MapReduce, Counting words with Hadoop—running your first program, History of Hadoop, Starting Hadoop - The building blocks of Hadoop, NameNode, DataNode, Secondary NameNode, JobTracker and Task Tracker.

Module: IIIMapReduce(10 hrs)

A Weather Dataset, Analyzing the Data with Unix Tools, Analyzing the Data with Hadoop, Scaling Out, Hadoop Streaming, Hadoop Pipes, Developing a MapReduce Application - The Configuration API, Configuring the Development Environment, Running Locally on Test Data, Running on a Cluster, Tuning a Job, MapReduce Workflows.

Module: IVHDFS(13 hrs)

Components of Hadoop -Working with files in HDFS, Anatomy of a MapReduce program, Reading and writing the Hadoop Distributed File system -The Design of HDFS, HDFS Concepts, The Command-Line Interface, Hadoop Filesystem, The Java Interface, Data Flow, Parallel Copying with distcp, Hadoop Archives

Module: VMapReduce Programming(12 hrs)

Writing basic Map Reduce programs - Getting the patent data set, constructing the basic template of a Map Reduce program, Counting things, Adapting for Hadoop's API changes, Streaming in Hadoop, Improving performance with combiners.

Module : VI MapReduce Advanced Programming (10 hrs)

Advanced MapReduce - Chaining MapReduce jobs, joining data from different sources, creating a Bloom filter, Passing job-specific parameters to your tasks, probing for task-specific information, Partitioning into multiple output files, Inputting from and outputting to a database, keeping all output in sorted order.

Module: VIIGraph Representation in MapReduce(10 hrs)

Modeling data and solving problems with graphs, Shortest Path Algorithm, Friends-of-Friends Algorithm, PageRank Algorithm, Bloom Filter, Parallelized Bloom filter creation in MapReduce, Map-Reduce semi-join with Bloom filters.

Text Books:

1. Anil Maheswari, “ Big Data” TMH Publication
2. Thomas Erl, Wajid Khattak, Paul Buchler “ Big Data Fundamentals: Concepts, Drivers & Techniques Prentice Hall

Block Chain & Smart Contracts

Course Title	Code	Type of course	T-P-PJ	Prerequisite
Block Chain & Smart Contracts	EN FC0424	Theory +Practice	1-1-0	Nil

Course Objective

- This course aims to provide conceptual understanding of the function of Block chains as a method of securing distributed ledgers, how consensus on their contents is achieved, and the new applications that they enable
- It covers the technological underpinnings of block chain operations as distributed data structures and decision making systems, their functionality and different architecture types.
- Able to build the career in block chain application development

Course Outcome :

- Understand the structure of a blockchain and why/when it is better than a simple distributed database
- Analyze the incentive structure in a blockchain based system and critically assess its functions, benefits and vulnerabilities
- Evaluate the setting where a blockchain based structure may be applied, its potential and its limitations
- Analyze to what extent smart and self-executing contracts can benefit automation, governance, transparency and the Internet of Things (IOT)
- Attain awareness of the new challenges that exist in monetizing businesses around blockchains and smart contracts.
- Acquires skills in design and program smart contracts and decentralized applications

Evaluation Systems

Internal Examination	Component	% of Marks	Method of Assessment
Internal Examination	Internal Theory	20	Written examination
	Internal Practice	30(20+10)	Lab work + Learning Record
External Examination	External Theory	30	Written examination
	External Practice	20	Lab work
Total		100	

Course Outline

Module I

Introduction to Distributed system, Challenges in Centralized networks. Fundamentals of cryptography, Introduction to Hashing Algorithms, Family of SHA Algorithms and its applications. Course overview and logistics Bitcoin The big picture of the industry – size,

growth, structure, players. The key terms that are used. Bitcoin versus Cryptocurrencies versus Blockchain, Distributed Ledger Technology (DLT). Strategic analysis of the space – who are the major players (Block chain platforms, regulators, application providers, etc.) Bitcoin, HyperLedger, Ethereum, Litecoin, Zcash. Etc. The major application : currency, identity, chain of custody.

Module: II

Introduction to blockchain, Blockchain eco system, Introduction to consensus algorithms and its importance, Proof of work, Proof of stake. Mining, Rewards, Forking – hard and soft .Types of blockchain – Public, private, permissioned, permissionless.

Module: III

Smart contract – Writing a simple smart contract – deploying a contract. Applications of smart contracts – real time use cases in Banking & Insurance, Supplychain management.

Module: IV

Cryptocurrency, Introduction to tokens – Security Token, Utility token and payment tokens, ERC 20 and ERC 721. Case study on token usage in gaming and e-commerce industry. Creating our own virtual currency using smart contracts. Scaling Blockchain – reading and writing data. Differentiate nodes, sparse data and Merkle trees. Fixing on the fly – fixes to current implementations : Layer 2 solutions (Lightning and Ethereum state channels.) Bitcoin scaling debate (Segwit2x etc.). The realities of hard forks for scaling, and bugs.

Module: V

Case study on Blockchains – Ethereum, Hyperledger and EOS. Blockchain Dynamics, Public and private blockchains, Hard and soft forks, Sharding Side chains, Distributed Virtual Machines, Smart Contracts, Oracles

Module: VI

Basics of contract law. Smartcontracts and their potential Trust in Algorithms, the impact on society. How existing legal systems could be integrated? OpenZeplin, OpenLaw.

Module: VII

Assets (fiat currencies, property, equity, securities). Supply and demand. Inflation and deflation Valuations and bubbles. Cyrptoconomics – moving beyond its use in verifying the blockchain– motivating participants, creating investment funds, storing value Creating and using tokens and coins.

Text Book:

1. Melanie Swan “ Block Chain Blue Print for new economy” Keilly Publication
2. Tiana Laurence “ Block Chain for Dummies” Wiley Publication
3. Debajani Mohanty “ Block Chain” BPB Publication

Product Development

Course Title	Code	Type of course	T-P-PJ	Prerequisite
Product Development	ENFC0601	Practice + Project	0-2-1	Nil

Objectives

- To educate the students on various stages of development of design of a product beginning from intent-to-actual design.
- Educate the students on usage of design software like ENOVIA, SIMULIA.

Course Outcome

- Students will have knowledge and skills to undertake design projects through making design decisions and evolve design of a product using the theoretical knowledge and hands-on-experience provided on design software.

Evaluation Systems

	Component	% of Marks	Method of Assessment
Internal Examination	Internal Practice	50(40+10)	Lab Work + Learning Record
	Internal Project	50	Project Work
External Examination	External Practice	50	Lab Work
	External Project	50	Project Work + Report
Total		200	

Course Outline

Module : I (08 Hours)

Intent, Impact, Import & Use of Core Mechanical Principles for Concept Design, Engineering Design, Problems Engineering can Solve, How to Identify Opportunities for Design, Needs Assessment & Problem Definition.

Module : II (10 Hours)

Defining Requirements & Problem Definition, Analytical Process Hierarchical Analysis, Developing Possible Design Solutions, Making Design Decisions.

Module : III (08 Hours)

Introduction to CAD Process through 3D Experience Free Modeling, Modeling & Managing Subassemblies in the Robot

Module : IV PLM through ENOVIA(09 Hours)

Modeling a Lathe Machine.Introduction to PLM through ENOVIA, Steps Involved in Controlling the Product Updates in ENOVIA.

Module : V (20 Hours)

Introduction to FEA in Industry, Pre-Processing Using SIMULIA.

Module : VI (15 Hours)

Understanding the Mathematical Modeling for Product in Physical Behavior

Module :VII (15 Hours)

Introduction to Design of Experiments, How to Use SIMULIA to Make an Incremental Design Decision.Type of Engineering Analysis.

E-content: Peer Learning Experience by Dassault Systemes.

Text Books:

1. Chitale, A K, Product Design & Manufacturing, 2013, 6th Edition, PHI publication, India.
2. Ulrich, K T, Eppinger, S D, Product Design & Development, 2016, 5th edition, Tata McGraw-Hill Companies, Inc.

Reference Books:

1. Kumar, P, Product Design - Creativity, Concepts & Usability, 2011, 2nd Edition, PHI publication, India.

Session Plan

Topic coverage and Internal Test	No. of Sessions (in hours.)	Activity (lecture, tutorial, lab practice, field studies/field-trip, Workshop etc.)	Assignment (project, assignment, field study, seminar, etc.)	Suggested Reading (Book, Video, Online source, etc.)
Module-I				
Intent, Impact, Import, Use of core Mechanical Principles for concept Design, What is Engineering Design, Problems Engineering can solve, How to	08	Tutorial	Project	

identify opportunities for design, Needs Assessment & Problem Definition,				
Module-II				
Defining requirements & Problem Definition, Analytical Process Hierarchical Analysis, Developing a possible design Solutions, Making Design Decisions.	10	Tutorial	Project	
Module-III				
Introduction to CAD Process through 3D Experience free modeling, Modeling & managing subassemblies in the Robot,	08	Tutorial , Practice	Project	
Module-IV				
Modeling a Lathe Machine. Introduction to PLM through ENOVIA, Steps involved in controlling the product updates in ENOVIA.	09	Tutorial , Practice	Project	
Module-V				
Introduction to FEA in Industry, Pre-processing using SIMULIA, Understanding the Mathematical modeling for Product in physical behavior, Introduction to design of experiments, How to use SIMULIA to make a incremental design decision. Type of Engineering analysis. Projects such as Disc Brake analysis by DOE, Door trim Substrate by DOE, MBD of Suspension by DOE.	20	Practice, tutorial	Project	
Module-VI				
Consumer Sentimental Analysis, Behavior Loyalty Metric, Emotional Loyalty Metric, Understanding decision making dashboards in NetVibes,	15	Lecture, Practice	Project	
Interpreting the Real time social data, Creation of different metric for business condition in Net Vibes, Automate Business logic to respond.	15	Lecture, Practice	Project	
Total (hours)	85			

Artificial Intelligence Tools, Techniques and Application

Course Title	Code	Type of course	T-P-PJ	Prerequisite
Artificial intelligence Tools, Techniques and Application	ENFC0603	Practice + Project	0-2-1	Nil

Objective

- Introduce fundamental concepts in AI
- Demonstrate the capability to create simple AI applications using Natural Language Processing, Audio engineering & Speech, Computer Vision, pattern recognition and machine learning.
- Present various modeling and formulation techniques to solve problems using AI techniques.
- Introduce state-of-art AI tools and techniques to solve various problems faced by Engineers in design and analysis.

Course Outcome:

- Understand the importance of AI.
- Explain the concepts of Natural Language Processing.
- Understand concepts of Machine Learning algorithms and their limitations.
- Compare different Machine Learning Algorithms
- Summarize applications of Speech Recognition and Synthesis.
- Develop the applications of, Computer Vision and Image Processing.

Evaluation Systems

	Component	% of Marks	Method of Assessment
Internal Examination	Internal Practice	50(40+10)	Lab Work + Learning Record
	Internal Project	50	Project Work
External Examination	External Practice	50	Lab Work
	External Project	50	Project Work + Report
Total		200	

Course Outline

Module :I Introduction to Artificial Intelligence(10 hrs)

Basics of AI.Applications of AI. Advanced search, Constraint satisfaction problems, Knowledge representation & reasoning, Non-standard logics, Uncertain and probabilistic reasoning

Conceptual introduction to **Machine Learning: Introduction** to Neural Networks, Supervised, Unsupervised, and Semi-Supervised Learning, Deep Learning, Reinforcement Learning, LinearRegression.

Module :II Conceptual introduction to Natural Language Processing : (10 hrs)

Natural language Understanding, Sentiment Analysis, Segmentation and recognition.Conceptual introduction to **Speech Recognition &Synthesis: Speech Fundamentals**, Speech Analysis,Speech Modeling, Speech Recognition, Speech Synthesis, Text-to-Speech

Module : III Conceptual introduction to Image Processing & Computer Vision : (10 hrs)

Introduction to Image processing, Image Noise, Removal of Noise from Images, Color Enhancement, Segmentation, Edge Detection, Optical Character Recognition, Feature Detection & Recognition

Module :IV BOT Technologies and Virtual Assistants : (10 hrs)

Chatbots: Introduction to a Chatbot, Architecture of a Chatbot. NLP in the cloud, NL Interface, How to Build a Chatbot, Transformative user experience of chatbots, Designing elements of a chatbot, Best practices for chatbot development. NLP components.NLP wrapper to chatbots.Audiobots and Musicbots.

Virtual Assistants :Architecture of a Virtual Assistant.

Module :V Image Processing & Computer Vision : (10 hrs)

Image - Definition and Tagging.Classification of images.Tagging.Image formation, Deep Learning algorithms for Object detection & Recognition. Face recognition, Instance recognition, Feature detection and matching, Segmentation, Recognition Databases and test sets Applications -- Feature extraction, Shape identification. Fane detection,.

Applications :Automation, Agriculture[Crop and Soil Monitoring, Grading farm produce, Predictive Analytics], Retail and Retail Security[Amazon Go], Autonomous vehicles,

Module: VI Reinforcement Learning(10 hrs)

Introduction to Reinforcement Learning, Game Playing [Deep Blue in Chess, IBM Watson in Jeopardy, Google's DeepMind in AlphaGo], Agents and Environment, Action-Value Function, Deep ReinforcedLearning

Module :VII Smart Applications (10 hrs)

Smart Manufacturing, Smart Agriculture, Smart Healthcare, Smart Education, Smart Grids,

Smart Transportation and Autonomous Vehicles, Smart Homes, Smart Cities

Text Books:

2. Prateek Joshi, Artificial Intelligence with Python, 1st Edition, Packt Publishing Limited, January 2017.
3. Stuart J.Russell, Peter Norving, Artificial Intelligence, Pearson Publishing, 2015

Note: 14 hrs will be assigned for Project.

Cloud Computing and its Applications Using Linux OS

Course Title	Code	Type of course	T-P-PJ	Prerequisite
Cloud Computing and its Applications using Linux	ENFC0602	Practice + Project	0-2-1	Nil

Course Objective

- To learn how to use Cloud Services.
- To implement Virtualization
- Apply Map-Reduce concept to applications.
- To build Private Cloud.
- Broadly educate to know the impact of engineering on legal and societal issues involved.

Course Outcome

- Analyze the Cloud computing setup with it's vulnerabilities and applications using different architectures.
- Design different workflows according to requirements and apply map reduce programming model.
- Apply and design suitable Virtualization concept, Cloud Resource Management and design scheduling algorithms.
- Acquires the skills in accessing cloud Storage systems and Cloud security and develop cloud application

Evaluation Systems

Internal Examination	Component	% of Marks	Method of Assessment
	Internal Practice	50(40+10)	Lab Work + Learning Record
	Internal Project	50	Project Work
External Examination	External Practice	50	Lab Work
	External Project	50	Project Work + Report
Total		200	

Course Outline

Module: I Introduction to User Permissions

(10 Hours)

Users, Groups and Permissions, Using the bash Shell, Std. I/O and Pipes, Text Editor, Basic System Configuration Tools, Investigating and Managing Processes, Configuring the Bash Shell, Finding and Processing Files, Network Clients.

Module: II Basics Commands of OS

(15 Hours)

Basic Commands & OS Basics, browsing root and various directories, ext3 and ext4 file system, chmod, chgrp, bash, set, shell basics, less, more, tail, head, sort, cut, grep, awk, sed, tr, etc., vi, ps, kill, top, jobs, shell scripting – branching, looping, find, locate and advanced find, network related scripts, cron, tar, and additional tools

Module: III File System Management

(10 Hours)

Package Management, Kernel Services, and System Services, File system Management, User Administration, Network Configuration, Installation, and Troubleshooting, Minor Project for develop a file system, System Performance and Security, Web Service and website configuration,

Module: IV Commands of Linux

(10 Hours)

Rpm , yum, apt-get, lspci, lsmod, systemctl services, chkconfig, creating partition, format and mount, LVM useradd, userdel, groupadd, groupdel, passwd, chage, acl, raid, iscsi etc, Basic Installation and Configuration Breaking SU passwd, services check Electronic Mail Services, Account Management, Design and develop a network using packet tracer. Cloud Computing

Module: V Introduction to Cloud

(10 Hours)

Introduction to Cloud, Amazon EC2 and EBS, Amazon S3, RRS, Auto Scaling and load distribution in AWS, Route53, AWS VPC, IAM. Services and resources life cycle, AWS Architecture and Design, Cloud Migration and Implementation

Module: VI Introduction to Kali Linux(15 Hours)

Using Kali Linux - Footprinting and Reconnaissance - FP Terminology, What is FP, Why FP, Objectives of FP, Types of Threats, FP through Search Engines, Competitive Intelligence Gathering, Footprinting using google hacking WHOIS Lookup, DNS Information, Network FP, Traceroute, FP through Social Engineering, Pen Testing, FP Countermeasures. DN Analyzer Pro, Web Data Extractor.

Social Engineering : What is SE, Types of SE, Human-based, Computer-based and Mobile based SE, SE Countermeasures.

Module: VII Networking Concepts**(15 Hours)**

Scanning Networks : Identifying hosts, ports and services, Scanning Methodology, Checking Live Systems, Ping Sweep, Check for Open Ports, Scanning Techniques, scanning beyond IDS, Banner Grabbing, Scan for Vulnerability, Draw Network Diagrams, Prepare Proxies, Pen Testing. Sniffing: Wiretapping, Packet Sniffing, CAM Table, MAC Flooding Tool : macof -i eth0, Yersinia, DHCP Packet Format, Starvation Attack Tool. Rogue DHCP Server Attack ARP, ARP Spoofing Techniques, ARP Spoofing Attack, and Wireshark.

Online Resources

<https://www.aws.training/>

<https://www.aws.educate/>

Problem Solving Using Python

Course Title	Code	Type of course	T-P-PJ	Prerequisite
Problem Solving Using Python	ENFC0901	Theory +Practice	1-2-0	Nil

Objective:

- Learn core Python scripting elements such as variables and flow control structures.
- Understand the concepts of file I/O.
- Plot data using appropriate Python visualization libraries such as Numpy, Matplotlib and SciPy etc.
- To enhance the problem analysis capability and problem solving techniques using python

Course Outcome:

- Able to use object oriented concept to solve problems.
- To quickly and easily draw plot or visualize the information through visualization technique.
- Write an error free program of minimum 200 lines of code.
- Acquire python coding skill which helps students in getting jobs in different IT firms

Evaluation Systems

Internal Examination	Component	% of Marks	Method of Assessment
	Internal Theory	20	Written examination
	Internal Practice	30(20+10)	Lab work + Learning Record
External Examination	External Theory	30	Written examination
	External Practice	20	Lab work
Total		<i>100</i>	

Course Outline

Module I : Familiarization of Python (12 Hours)

Features and Installation, Setting up Path, Working with Python Basic Syntax, Variable and Data types, Basic operators, Numbers, Array, Tuples, Dictionary, Date and Time. **String Manipulation** :Accessing Strings, Basic Operations, String slices.

List :Accessing lists, Operations, Working with lists List (Functions).

Decision Making Statement :Boolean Expressions, if-else Statement, Nested if Else Statement, elif Statement, Switch Statement. **Iteration Statement** :The while Statement, for Statement, Nested Loops, Break and Continue statement.

Module II : Functions Operation (10 Hours)

Types of Function, Function Arguments, Passby reference vs value, Recursion Function. Files Operation : Create Text & Binary Files, Different modes of opening a file, Reading and Writing into Files, FilePositions.

Module III : NumPy (10 Hours)

Arrays, Array indexing, Data types, Array math operation, Sequences, Repetitions and Random number, Broadcasting, Polynomial, unique items and the counts.

Module IV : Functional Programming (12 Hours)

Lists, Tuples, Dictionaries, Strings, stacks, queues, lambda function, Standard library functions, multithreading.

Module V : SciPy (12 Hours)

Numpy VS SciPy, File input/output, Special Function, Linear Algebra, Operation, Interpolation, Optimization and fit, Statistics and random numbers, Numerical Integration, Fast Fourier transforms, Image manipulation.

Module VI : GUI Programming (08 Hours)

Example GUI Program, Environment Variables, Label, Message Widget, Text Area, Button, Radio Button, CheckBox, Listbox/ DropDown Box, Frames, Menu Widget, Menu Button Widget, Scrollbar, Forms, Sliders, Database access, Sending email.

Module VII: Data Visualization (11 Hours)

Visualization Libraries, Data frame : Data types, Attributes, methods (mean(), median(), std(), var(), cor(), min()/ max(), describe()), groupby method, Selecting Column, Filtering, Selecting row and column, Missing values, Data read from excel, CSV and txt file. **Plotting using Matplotlib** :Basic plot(), Histogram, Bar Plot, Box Plots, Area Plot, Scatter Plot, PieChart.

Text Books:

1. Fabrizio Romano, Learn Python Programming - Second Edition, Packt Publishing Limited, June 2018
2. Mark Lutz , Learning Python, O'Reilly 5th edition
3. Robert Johansson, Numerical Python, Apress 2nd edition
4. Kirthi Raman, Mastering Python Data Visualization, PACKT publishing 2015

Reference Books:

1. Wes McKinney , "Python for Data Analysis, O'Reilly 2nd edition 2017
5. SciPy and NumPy , Eli Bressert,O'Reilly 1st edition

Online Source:

1. Michael Dawson, Python Programming for the Absolute Beginner, Premier Press (ebook)
2. J.R. Johansson, Introduction to scientific computing with Python (<http://www-star.st-and.ac.uk/~pw31/CompAstro/IntroToPython.pdf>)

Object Oriented Programming Using Java

Course Title	Code	Type of course	T-P-PJ	Prerequisite
Object Oriented Programming using Java	ENFC0902	Theory + Practice + Project	1-1-1	Nil

Objective:

- To learn why Java is useful for the design of desktop and web applications.
- To learn how to implement object-oriented designs with Java.
- To identify Java language components and how they work together in applications.
- To design and program stand-alone Java applications.
- To learn how to design a graphical user interface (GUI) with Java Swing.
- To understand how to use Java APIs for program development.

Course Outcome:

- Able to understand the use of OOPs concepts.
 - Able to solve real world problems using OOP techniques.
 - Able to understand the use of abstraction.
 - Able to understand the use of Packages and Interface in java.
 - Able to develop and understand exception handling, multithreaded applications with synchronization.
- Able to **design** GUI based applications and **develop** applets for web applications.

Evaluation Systems

Internal Examination	Component	% of Marks	Method of Assessment
	Internal Theory	40 (30+5+5)	Written examination + Assignment + Attendance
	Internal Practice	50 (40+10)	Lab Work
	Internal Project	50	Project Work
External Examination	External Theory	60	Written examination
	External Practice	50	Lab Work
	External Project	50	Project Work + Report
Total		300	

Course Outline

Module: I Problem Solving Techniques & OOP(10 hrs)

Problem Solving Techniques: Ask Questions, Look for things that are familiar, solve by analogy, MeansEnds Analysis, Divide and Conquer, The building block approach, Merging solutions, Mental Block : The Fear of Starting, Object Oriented Problem Solving, and Case Study. Programming: Programming Language, Skeleton, Compilation, Interpretation, and Execution of Program.

Object-Oriented Programming: Object Oriented Concepts, Java Programming Environment,

Feature of Java, Elements of Java Program : Identifier, Naming Conventions, Build-in Type, Variable, Operators, Control Statements, Loops, Typecasting, Arrays,

Module : II Class & Characteristics of OOPs (12 hrs)

Classes : Concept of Objects and Classes, Using Methods, Local Variables, Instance Variables, Constructor, Overloading Constructor, Overloading Methods, Garbage Collection, The Finalize Method, Static, Final and this Keyword. Inheritance and Polymorphism : Basics, Access Modifier, The super Keyword, Method Overriding, Dynamic Method Dispatch, Abstract Classes, Inner Classes.

Module :III Package and Interface (12 hrs)

Packages : Packages, Access Protection, Importing Package Interfaces : Interface, Implementing Interfaces.

Module :IV String Handling and Exception Handling (10 hrs)

StringHandling : String, String Buffer, String Builder. Excepting Handling :Fundamentals, Checked and Unchecked Exceptions, Using Try, Catch, MultipleCatches, Throw, Throws, Finally, Java’s Built-In Exceptions, User-Defined Exception.

Module-V :Multi-Threading (10 hrs)

Multi-Threading : Java Thread Lifecycle Model, Thread Priorities, Synchronization, Creating Threads, Using Different Thread Methods, Wrapper Classes, Clone (java.lang), Collection API, Vectors(java.util).

Module-VI:Java.IO and AWT (10 hrs)

Java.IO : I/O Streams, Serialization AWT : AWT Classes, Window Fundamental, Component, Container, Panel, Window, Frame, Canvas, Control Fundamentals, Layout Managers.

Module: VIIEvent Handling(10 hrs)

Event Handling : Delegation Event Model, Event Classes, Event Listener Interfaces, and Adapter Classes, Handling Events by Extending AWT Components

Text Books:

1. Walter Savitch, “Java-An Introduction to Problem Solving& Programming”, 8th edition, in Pearson, 2017.
2. Herbert Schildt, “Java Complete Reference”, 10th edition, in McGraw-Hill Education, 2017.

Reference Books:

1. Bhavé & Patekar, “Programming with Java” in Pearson Education, 2008.
2. H.M. Deitel & Paul J. Deitel, “Java How to Program” in PHI, 9th Edition, 2012.

Online Source:

jvatpoint.com,

<http://www.corejavaguru.com>

<https://www.w3schools.in/java-tutorial/>

Web Technologies

Course Title	Code	Type of course	T-P-PJ	Prerequisite
Web Technologies	ENFC0903	Theory + Practice + Project	1-1-1	Nil

Objective:

- Understand client server architecture and able to use the skills for web project development
- Create job opportunities as a web developer.

Course Outcome:

- Develop a static, interactive and well-formed webpage using JavaScript, CSS3 and HTML5
- Use PHP7 to improve accessibility of a web document.
- Gain necessary skills for designing and developing web applications

Evaluation Systems

Internal Examination	Component	% of Marks	Method of Assessment
	Internal Theory	40 (30+5+5)	Written examination + Assignment + Attendance
	Internal Practice	50 (40+10)	Lab Work
	Internal Project	50	Project Work
External Examination	External Theory	60	Written examination
	External Practice	50	Lab Work
	External Project	50	Project Work + Report
Total		300	

Course Outcome

Module: I HTML5:(10 hrs)

Editors, Attributes, Head, Meta, Body, Style, Paragraphs, Headings, Bold, Line Breaks, Horizontal Rule, Upload, Textarea, Charset, URL Encoding, XHTML, Semantics, Migration, Syntax, Canvas, SVG, Audio, Video, API's, Geolocation, Drag/Drop, Local Storage, Web Workers, App Cache

Module:II CSS3 (10 hrs)

Introducing CSS3,What is CSS3?,The History of CSS, Browser Support, Selectors and Pseudo Classes, Attribute Selectors, The Target Pseudo-Class, UI Element States Pseudo- Classes, Negation Pseudo-Class, Structural Pseudo-Classes, Fonts and Text Effects, Fonts on the Web, Font Services, Gradients, Rounded Corners, Box Shadow, Transitions, Transforms, and Animations, Transitions and Transforms, Transitions.

Module:III Java Script, XML (12 hrs)

Basics, Functional programming, Object oriented programming, Client-side applications, Server-side applications, Design patterns and Idioms, Popularframeworks.
XML Basics, SAX, DOM, Xpath, Digester, XUL, SOAP, WSDL

Module:IV PHP (12 hrs)

Introduction to PHP,Installation of PHP and mySql,PHP configuration in IIS & Apache Web Server and features of PHP,Writing PHP,How PHP code is parsed,Embedding PHP and HTML,Executing PHP and viewing in Browser,Data types,Operators,PHP variables : static and global variables,Comments in PHP,Control Structures,Condition statements,If...Else Switch,? Operator,Loops,While,Break Statement,Continue,Do... While,For,For each,Exit, Die, Return,Arrays in PHP

Module: V Advanced PHP(10 hrs)

Working With Data Form Element, Input Elements, Validating The User Input, Passing Variables Between Pages, Passing Variables Through A Get,Passing Variables Through A Post, Passing Variables Through A Request,Functions,Handling Sessions And Cookies, Concept Of Session, Starting Session,Modifying Session Variables, Unregistering And Deleting Session Variable,Concept Of Cookies,Handling Of Cookies, Introduction Of MySQL, Types Of Tables In Mysql,Query In Mysql : Select, Insert, Update, Delete,Truncate,Alias,Order By,Database Connectivity Of Php With Mysql

Module: VI Mysqli(10 hrs)

Data Definition Statements, Data Manipulation Statements, Transactional and Locking Statements, Replication Statements, Prepared SQL Statement Syntax, Compound-Statement Syntax, Database Administration Statements, Utility Statements, Connection with PHP and Mysql using PDOs

Module: VII CMS (10 hrs)

BootStrap, Joomla, Wordpress, Drupal with project implementation

Text Books

1. HTML 5 Black Book (Covers CSS3, JavaScript, XML, XHTML, AJAX, PHP, jQuery) 2Ed By DT Editorial Services.
2. [Web Technologies: HTML, JAVASCRIPT, PHP, JAVA, JSP, ASP.NET, XML and Ajax, Black Book: HTML...](#) by Kogent Learning Solutions Inc.
3. MySQL(TM): The Complete Reference,Vikram Vaswani
4. PHP: The Complete Reference,Steven Holzner
5. Beginning HTML5 and CSS 3, Copyright © 2012 by Richard Clark, Oli Studholme, Christopher Murphy and Divya Manian.

Software Engineering using Agile

Course Title	Code	Type of course	T-P-PJ	Prerequisite
Software Engineering using Agile	ENFC0904	Theory + Practice + Project	1-1-1	Nil

Objective

- Explain the phases of Software Development.
- Teach the customer requirement gathering techniques.
- Familiarize with Agile software development methods.
- Demonstrate the testing techniques.
- Teach Software Design techniques
- Learn the skill principles and practices associated with agile development methods

Course Outcome:

- List the steps involved in software development.
 - Interpret the myths of software.
 - Analyze various software process models
 - Explain agile software development model
 - Identify the functional and non-functional requirements for software development
 - Analyse user requirements for a software
- Apply agile software development model (L3)
 Identify different requirement modeling strategies (L2)
 Design UML Diagrams for the given problem (L6)

Evaluation Systems

	Component	% of Marks	Method of Assessment
Internal Examination	Internal Theory	40 (30+5+5)	Written examination + Assignment + Attendance
	Internal Practice	50 (40+10)	Lab Work
	Internal Project	50	Project Work
External Examination	External Theory	60	Written examination
	External Practice	50	Lab Work
	External Project	50	Project Work + Report
Total		300	

Course Outline

Module: I Software Engineering Process: (10 hrs)

The Nature of Software, The Unique Nature of WebApps, Software Engineering, The Software Process, Software Engineering Practice, Software Myths, How It All Starts. A Generic Process Model, Process Assessment and Improvement, Prescriptive Process Models, Specialized Process Models, The Unified Process, Personal and Team Process Models, Process Technology.

Module: II Agility(10 hrs)

What Is Agility?, Agility and the Cost of Change, What Is an Agile Process?, Extreme Programming (XP), Other Agile Process Models, A Tool Set for the Agile Process, Software Engineering Knowledge , Core Principles, Principles That Guide Each Framework Activity, Requirements Engineering, Establishing the Groundwork, Eliciting Requirements, Developing Use Cases, Building the Requirements Model, Negotiating Requirements, Validating Requirements.

Module: III UML Models (12 hrs)

Requirements Analysis, Scenario-Based Modeling, UML Models That Supplement the Use Case, Data Modeling Concepts, Class-Based Modeling, Requirements Modeling Strategies, Flow-Oriented Modeling, Creating a Behavioral Model, Patterns for Requirements Modeling, Requirements Modeling for WebApps.

Module: IV Software Design (12 hrs)

Design within the Context of Software Engineering, The Design Process, Design Concepts, The Design Model, Software Architecture, Architectural Genres, Architectural Styles, Assessing Alternative Architectural Designs, Architectural Mapping Using Data Flow.

Module: VSoftware Design

What Is a Component?, Designing Class-Based Components, Conducting Component-Level Design, Component-Level Design for WebApps, Designing Traditional Components, Component-Based Development.

Module: VI Software Interface (10 hrs)

The Golden Rules, User Interface Analysis and Design, Interface Analysis, Interface Design Steps, WebApp Interface Design, Design Evaluation, A Strategic Approach to Software Testing, Strategic Issues, Test Strategies for Conventional Software, Test Strategies for Object-Oriented Software, Test Strategies for WebApps, Validation Testing, System Testing.

Module: VII Software Testing (10 hrs)

The Art of Debugging, Software Testing Fundamentals, Internal and External Views of Testing, White-Box Testing, Basis Path Testing

Internet of Things

Course Title	Code	Type of course	T-P-PJ	Prerequisite
Internet of Things	ENFC1407	Workshop	0-2-0	Nil

Objective

- Introduce the fundamental concepts of IoT and physical computing
- Expose the student to a variety of embedded boards and IoT Platforms
- Create a basic understanding of the communication protocols in IoT communications.

Course Outcome:

- Explain IOT architecture.
- Interpret the design principles that govern connected devices
- Summarize the roles of various organizations for IOT
- Explain the basics of microcontrollers
- Outline the architecture of Arduino
- Acquire skills to develop applications using Arduino

Evaluation Systems

	Component	% of Marks	Method of Assessment
Internal Examination	Internal Practice	100	Workshop
	Total	100	

Course Outline

Module: I

The Internet of Things : An Overview; The Flavour of the Internet of Things; The “Internet” of “Things”; The Technology of the Internet of Things; Enchanted Objects; Who is Making the Internet of Things?; Design Principles for Connected Devices; Calm and Ambient Technology; Privacy; Keeping Secrets; Whose Data Is It Anyway?; Web Thinking for Connected Devices; Small Pieces, Loosely Joined; First-Class Citizens On The Internet; Graceful Degradation ; Affordances

Module: II

Embedded Computing Basics; Microcontrollers; System-on-Chips; Choosing Your Platform; Arduino; Developing on the Arduino; Some Notes on the Hardware; Openness;

Module: III

Raspberry Pi ; Cases and Extension Boards; Developing on the Raspberry Pi; Some Notes on the Hardware; Openness; Other notable platforms; Mobile phones and tablets; Plug Computing ; Always-on Internet of Things

Module: IV

Internet Principles; Internet Communications : An Overview IP; TCP; The IP Protocol Suite (TCP/IP); UDP ; IP Addresses; DNS ; Static IP Address Assignment ; Dynamic IP

Module: V

Address Assignment; IPv6 ; MAC Addresses ; TCP and UDP Ports An Example : HTTP Ports ; Other Common Ports; Application Layer Protocols- HTTP; HTTPS : Encrypted HTTP ; Other Application Layer Protocols

Module: VI

Getting Started with an API; Mashing Up APIs; Scraping; Legalities; Writing a New API; Clockodillo; Security; Implementing the API; Using Curl to Test; Going Further;

Module: VII

Real-Time Reactions; Polling; Comet; Other Protocols ; MQ Telemetry Transport; Extensible Messaging and Presence Protocol; Constrained Application Protocol

Build Your Own Computer

Course Title	Code	Type of course	T-P-PJ	Prerequisite
Build your Own Computer	ENFC1402	Workshop	0-2-0	Nil

Objective:

- Develop ability to understand the internals of Computer and peripherals
- To have an overall idea about networking concepts and devices
- To have an overall idea about secure computing

Course Outcome:

- Build your computing device
- Troubleshoot various faults in a computer system and network
- Construct small LAN for resource sharing

Evaluation Systems

	Component	% of Marks	Method of Assessment
Internal Examination	Internal Practice	100	Workshop
	Total	100	

Course Outline

Module: I

Firmware upgrades/flash BIOS, BIOS component information, BIOS configurations, Built-in diagnostics, Monitoring. Sizes of cabinet, Expansion slots, RAM slots, CPU sockets, Chipsets, CMOS battery, Power connections and types, Fan connectors, Front/top panel connectors, Bus speeds, Resetbutton.

Module :II

Types of RAM, Single channel vs. dual channel vs. triple channel, RAM compatibility. Sound cards, Video cards, Network cards, USB cards, Firewire cards, Thunderbolt cards, Storage cards, Modem cards, Wireless/cellular cards, TV tuner cards, Video capture cards, Risercards.

Module :III

Display types, Refresh/frame rates, Resolution, Native resolution, Brightness/lumens, Analog vs. digital, Privacy/antiglare filters, Multiple displays, Aspect ratios. Display cable and connector types.

Module :IV

Drives, Magnetic hard disk drives, Hot swappable drives, Solid state/flash drives, RAID types, Tape drive, Media capacity.

Module :V

Socket types – Intel and AMD, Characteristics, Cooling – Heat sink, fans, thermal paste.
Connector type, characteristics and their voltages

Module :VI

Input and Output devices, network cable and connectors, crimping of network cable. Hardware and network troubleshooting. Assembling and disassembling of computer and laptop

Module :VII

Installation of DOS and Non-DOS operating system – Automatic and Manual Configurations

Cloud Computing Application

Course Title	Code	Type of course	T-P-PJ	Prerequisite
Cloud Computing Application	ENFC1403	Workshop	0-2-0	Nil

Objective

- Learn fundamentals of cloud computing
- Learn to build distributed applications and microservices with AWS Step Functions
- Learn step-by-step to setup up AWS platform

Course Outcome

- Setup AWS Account and AWS infrastructure
- Deploying serverless micro services
- Implementing scalability and implementing high availability

Evaluation Systems

	Component	% of Marks	Method of Assessment
Internal Examination	Internal Practice	100	Workshop
	Total	100	

Course outline

Module: I (8 Hrs)

UNDERSTANDING CLOUD BASICS

Defining cloud computing, Introducing public, private, and hybrid clouds, Introducing cloud service models – IaaS, PaaS, and SaaS, Introducing multi-tenancy models, Compare cloud value proposition with conventional models. Understand Global Infrastructure – Region, Availability Zones, Edge Locations; Setting up AWS account, Getting Familiarity with AWS Management Console; Understanding cloud-based workloads

Module: II (10 Hrs)

DESIGNING CLOUD APPLICATIONS

Introducing cloud-based multitier architecture, Designing for multi-tenancy, Understanding cloud applications design principles, Understanding emerging cloud-based application architectures, Estimating your cloud computing costs, A typical e-commerce web application

Module: III (8 Hrs)

INTRODUCING AWS COMPONENTS

AWS components, managing costs on AWS cloud, Application development environments
Setting up the AWS infrastructure

Module: IV (8 Hrs)

DESIGNING FOR AND IMPLEMENTING SCALABILITY

Defining scalability objectives, Designing scalable application architectures, Leveraging AWS infrastructure services for scalability, Evolving architecture against increasing loads, Event handling at scale, setting up Auto Scaling

Module: V (8 Hrs)

DESIGNING FOR AND IMPLEMENTING HIGH AVAILABILITY

Defining availability objectives, Nature of failures, Setting up high availability

Module: VI (8 Hrs)

DESIGNING FOR AND IMPLEMENTING SECURITY

Defining security objectives, Understanding the security responsibilities, Best practices in implementing AWS security, Setting up security

Module: VII (10 Hrs)

DEPLOYING TO PRODUCTION AND GOING LIVE

Managing infrastructure, deployments, and support at scale, Creating and managing AWS environments using CloudFormation, Using CloudWatch for monitoring, Using AWS solutions for backup and archiving, Planning for production go-live activities, Setting up for production

E-content :www.awseducate.com

https://aws.amazon.com/getting-started/use-cases/?awsf.getting-started-content=*default

Text Books :

Aurobindo Sarkar, Amit Shah, Learning AWS - Second Edition, Packt Publishing Limited, February 2018, ISBN 9781787281066

Reference Books:

Vipul Tankariya, AWS Certified SysOps Administrator - Associate Guide, Packt Publishing Limited August 2018, ISBN 9781788990776

John Stamper, Sean Senior, Kevin E. Kelly, Biff Gaut, Tim Bixler, Hisham Baz, Joe Baron, AWS Certified Solutions Architect Official Study Guide, John Wiley & Sons, October 2016, ISBN : 9781119138556

Online Source :

<https://aws.amazon.com/>

<https://www.awseducate.com/faqs?app=3>

Session Plan

Topic coverage and Internal Test	No. of Sessions (in hrs.)	Activity (lecture, tutorial, lab practice, field studies/field-trip, Workshop etc.)	Assignment (project, assignment, field study, seminar, etc.)	Suggested Reading (Book, Video, Online source, etc.)

Defining cloud computing, Introducing public, private, and hybrid clouds	2	Lecture	Assignment	Text Book -1
Introducing cloud Service models – IaaS, PaaS, and SaaS, Introducing multi-tenancy models	2	Lecture	Assignment	T.B-1
Understanding cloud-based workloads, Setting up AWS account	2	Lab Practice	Experiment	T.B-1
Introducing cloud-based multitier architecture, Designing for multi-tenancy	2	Lab Practice	Experiment	T.B-1
Understanding cloud applications design principles, Understanding emerging cloud-based application architectures	2	Lab Practice	Experiment	T.B-1
Estimating your cloud computing costs, A typical e-commerce web application	2	Lab Practice	Experiment	T.B-1
AWS components, Managing costs on AWS cloud	2	Lab Practice	Experiment	T.B-1
Application development environments	2	Lab Practice	Experiment	T.B-1
Setting up the AWS infrastructure	2	Lab Practice	Experiment	T.B-1
Defining scalability objectives, Designing scalable application architectures	4	Lab Practice	Experiment	T.B-1
Leveraging AWS infrastructure services for scalability	4	Lab Practice	Experiment	T.B-1
Evolving architecture against increasing loads	2	Lab Practice	Experiment	T.B-1
Event handling at scale , Setting up Auto Scaling	4	Lab Practice	Experiment	T.B-1
Defining availability objectives, Nature of failures, Setting up high availability	6	Presentation, Lab Practice	Assignment, Experiment	T.B-1

Defining security objectives, Understanding the security responsibilities	3	Lab Practice	Experiment	T.B-1
Best practices in implementing AWS security, Setting up security	4	Lab Practice	Experiment	T.B-1
Managing infrastructure, deployments, and support at scale	3	Lab Practice	Experiment	T.B-1
Creating and managing AWS environments using CloudFormation	3	Lab Practice	Experiment	T.B-1
Using CloudWatch for monitoring	2	Lab Practice	Experiment	T.B-1
Using AWS solutions for backup and archiving	2	Lab Practice	Experiment	T.B-1
Planning for production go-live activities, Setting up for production	3	Lab Practice	Experiment	T.B-1
Total (hrs)	60			

Centurion University of Technology and Management Odisha

Choice Based Credit System

Course Structure & Syllabus

BASKET - IV



CENTURION UNIVERSITY OF TECHNOLOGY AND MANAGEMENT

School of Engineering & Technology

2018

**Course Structure
Basket-IV
Civil Engineering**

Course Code	Course Title	Type of course	(Credit)	Prerequisite	C O 1	C O 2	C O 3	C O 4	C O 5	C O 6	C O 7	P S O 1	P S O 2	P S O 3
CECC 0103	Hydraulics & Hydraulic Machines	Theory	2	Basic fluid mechanics	H	H	H	H	M	L	M	H	H	L
CECC 0102	Disaster Preparedness & Planning Management	Theory	2	Nil	H	L	M	H	L	M	H	H	H	L
CECC 0201	Estimation & Quantity Surveying	Practice	2	Nil	H	H	H	H	M	L	M	H	H	M
CECC 0202	Pre-Fabricated Structures	Practice	2	Nil	H	H	M	L	H	M	M	H	H	L
CECC 0412	Concrete Technology	Theory + Practice	2	Nil	H	H	H	H	H	H	M	H	H	L
CECC 0401	Soil Mechanics	Theory + Practice	3	Nil	H	H	H	L	M	H	H	H	H	L
CECC 0402	Foundation Engineering	Theory + Practice	3	Soil Mechanics	H	H	H	L	H	H	H	H	H	L
CECC 0403	Transportation Engineering	Theory + Practice	4	Nil	H	M	L	L	H	H	H	H	H	L
CECC 0415	Water supply & Waste water Management	Theory + Practice	3	Nil	H	M	H	H	L	M	M	H	H	L
CECC 0416	Hydrology & Water Resources Engineering	Theory + Practice	3	Nil	H	H	H	M	L	L	H	H	H	L
CECC 0414	Quality Control and	Theory +	3	Nil	H	M	M	H	H	L	M	H	H	L

	Risk Management in Construction	Practice												
CECC 0407	Computer Aided Design of Steel Structure	Theory + Practice	3	Nil	H	M	L	L	H	H	H	H	H	M
CECC 0408	Computer Aided Design of Concrete Structures	Theory + Practice	3	Nil	H	H	H	L	H	M	H	H	H	M
CECC 0413	GIS and Digital Cartography	Theory + Practice	4	Nil	H	M	M	M	H	H	H	H	H	M
CECC 0411	Strength of Material	Theory + Practice	3	Engineering Mechanics	H	H	H	L	H	M	L	H	H	L
CECC 0501	Functional planning and DPR	Theory + Project	3	Nil	H	H	H	M	H	L	L	H	H	L

Hydraulics & Hydraulic Machine

Course Title	Code	Type of course	T-P-PJ	Prerequisite
Hydraulics & Hydraulic machines	CECC0103	Theory	2-0-0	Basic Fluid Mechanics

Objective

- To teach the common manifestations of boundary layer concepts and its effect upon any immersed and moving object and providing students the necessary background in real open channel flow

Course Outcome

- The students will gain knowledge of basic fluid properties in real flow engineering contexts of uniform and non-uniform flow in open channels of best economic section and channels flowing at uniform depth with transition and under the hydraulic jump and open channel Hydraulics with basics of Hydraulic machines such as pumps and turbines.
- Students shall develop skill on operation procedure of hydraulic machines and pumps.

Evaluation Systems

	Component	% of Marks	Method of Assessment
Internal Examination	Internal Theory	30	Written Examination
	Assignment	5	Report or Presentation + Learning Record
	Attendance	5	Based on class Attended
External Examination	External Theory	60	Written Examination
Total		100	

Course outline

Module I: BOUNDARY LAYER THEORY (6 Hrs.)

Basic Concepts of Boundary Layer; Development of Boundary Layers on a flat plate; Laminar & Turbulent Boundary Layers; Velocity Distribution with in Boundary Layer; Thickness of Boundary Layer; Viscous Drag; Displacement Thickness; Momentum thickness and Energy Thickness; Integral Momentum Equation; Drag Coefficients .

Module II: FLOW PAST IMMERSED BODIES , (4 hours)

; Drag and Lift on bodies ; Various types of Drag; Drag Coefficient; Variation of drag with Reynolds number for flow around cylinder; sphere; Flow around rotating cylinder; Magnus Effect; Stagnation Points; Lift and Drag on Rotating Cylinder.

Module III: PRINCIPLES OF OPEN CHANNEL FLOW (4hrs.)

Introduction & Classification of Open Channel Flow; difference between pipe and open channel flow; definition of terms; Wetted Perimeter; Hydraulic Mean Depth; Hydraulic Radius; Prismatic Channel; Velocity and Pressure Distribution in Open Channels; Basic Equations; Chezy's Equation; Manning's Equation; Uniform Flow; Normal Depth; Concept of Most Efficient Sections; Most Efficient Rectangular and Trapezoidal Sections.

Module IV: ENERGY PRINCIPLES (All discussions w.r.t. to Rectangular and Trapezoidal channels) (4 hrs)

Continuity and Energy equations in Open Channel Flows; Specific Energy; Specific Energy Diagram; Critical Flow; Froude Number; Critical Depth; Subcritical and Supercritical Flows Specific Energy.

Module V: RAPIDLY VARIED FLOW (All discussions w.r.t. to Rectangular channels) (4 hrs)

Momentum Principle in Open Channels; Specific Force; Conjugate Depths; Hydraulic Jump ; Gradually Varied Flow in Open Channels (All discussions w.r.t. to Rectangular channels); Introduction to Varied Flow; Gradually Varied Flow and rapidly Varied Flow; Governing Equation for GVF.

Module VI: HYDRAULIC MACHINES (PUMPS) (4Hrs)

Functions and general working principles of Turbines; Types of pumps; Centrifugal and Reciprocating pumps; relative Advantages; Selection of type of pump; centrifugal Pumps; component Parts of a Centrifugal Pump working principles; priming work done by impeller Classification of centrifugal pumps; Minimum starting speed of centrifugal Pumps Reciprocating Pumps; Component parts and working of reciprocating pumps; Slip and cavitation in pumps.

Module VII: HYDRAULIC MACHINES (TURBINES) (4Hrs)

(Numerical problems on velocity triangles; computations of work done and efficiencies of turbines not to be included in the university examination)

Basics of hydropower plants; Classification of Turbines; Impulse and Reaction Turbines; Selection of type of turbine; Working principle of Impulse turbines; Pelton wheel; component parts; Work done by Pelton wheel; Definitions of heads and efficiencies; Gross head & Net head; Mechanical; volumetric & overall efficiencies; Reaction turbines; Working principles of reaction

turbines; Francis and Kaplan turbine; Efficiency of turbines; mechanical; hydraulic and overall efficiency; (Numerical problems on Kaplan & Propeller turbines not to be part of external examination)

Reference Text Books:

1. Jain A. K., 2004, Fluid Mechanics including hydraulic machines, Khanna Publishers, New Delhi
2. Subramanya K., Open Channel Hydraulics, McGraw Hill Education; 3 edition (1 December 2008), pp- 576 pages
3. Rajput R. K., 1996, A Textbook of Fluid Mechanics, S. Chand Publishing, pp-1051
4. Bansal R. K., A text book of fluid mechanics and hydraulic machines, Laxmi Publishers New Delhi, PP 0-1102

Session plan:

PEDAGOGY

<i>Topic coverage and Internal Test</i>	<i>No. of Sessions (in hrs.)</i>	<i>Activity</i>	<i>Assignment (Assignment /Project)</i>	<i>Suggested Reading (Book, Video, Online source, etc.)</i>
Module I				
MODULE I- Basic Concepts of Boundary Layer, Development of Boundary Layers on a flat plate - Laminar & Turbulent Boundary Layers, Velocity Distribution with in Boundary Layer - Thickness of Boundary Layer, Viscous Drag - Displacement Thickness, Momentum thickness and Energy Thickness. Integral Momentum Equation - Drag Coefficients for different velocity distributions in Laminar and Turbulent Boundary Layers. Boundary Layer Separation - Effect of Adverse Pressure Gradient - Control of Boundary Layer Separation(basics only).	6	Theory (PPT mode), class room practice	1	TB ₄ , Chapter 13 http://www.youtube.com/watch?v=cUTkqZeiMow
Module II: (Basic Concept only) Flow past immersed bodies - Pressure distribution around bodies - Circular Disc, Plate held normal to flow, Cylinder and Sphere. Drag and Lift on bodies - Various types of Drag - Drag Coefficient - Variation of drag with Reynolds number for flow around cylinder, sphere, disc and plate held normal to flow. Circulation - Circulation around an inclined Plate - Flow about a Rotating Cylinder - Magnus Effect- Stagnation Points - Lift and Drag on Rotating Cylinder.	4	Theory (PPT mode), class room practice	2	TB ₄ , Chapter 14

<p>MODULE- III: Introduction & Classification of Open Channel Flow, difference between pipe and open channel flow, definition of terms - Wetted Perimeter -Hydraulic Mean Depth - Hydraulic Radius - Prismatic Channel - Velocity and Pressure Distribution in Open Channels- Basic Equations- Chezy's Equation - Manning's Equation- Manning's Coefficient for different Bed Roughness. Uniform Flow -Normal Depth - Concept of Most Efficient Sections - Most Efficient Triangular, Rectangular and Trapezoidal Sections</p>	4	Theory (PPT mode), class room practice	3	TB2, Chapter-8
<p>Module IV:Continuity and Energy equations in Open Channel Flows - Specific Energy - Specific Energy Diagram - Critical Flow - Froude Number - Critical Depth - Subcritical and Supercritical Flows - Canal Transitions - change in Bed width and Bed level - Minimum Specific Energy - Relationship between Critical Depth and Minimum Specific Energy.</p>	4	Theory PPT mode, Class room Practice	4	
<p>MODULE- V: Momentum Principle in Open Channels - Specific Force - Conjugate Depths - Hydraulic Jump - Gradually Varied Flow in Open Channels (All discussions w.r.t. to Rectangular channels), Introduction to Varied Flow - Gradually Varied Flow and rapidly Varied Flow - Governing Equation for GVF-Classification of GVF Profiles - Critical, Mild and Steep Slopes - M1, M2, M3, S1, S2 and S3 only (basics only).</p>	4	Theory PPT mode, Class room Practice	5	TB4, Chapter 16 https://sites.google.com/a/vt.edu/moglen/home/animations-open-channel-flow
<p>MODULE- VI: Introduction to Turbo machinery, Functions and general working principles of Turbines, Types of pumps - Centrifugal and Reciprocating pumps - Relative Advantages, Selection of type of pump, Centrifugal Pumps, component Parts of a Centrifugal Pump working principles - Priming. Work done by impeller – Classification of centrifugal pumps - Minimum starting speed of centrifugal Pumps - Multi stage pumps, Specific Speed of Centrifugal Pumps - Reciprocating Pumps, Component parts and working of</p>	4	Theory PPT mode, Class room Practice	6	TB4, Chapter 19 and chapter 20

reciprocating pumps - Different types. Theoretical Discharge – Coefficient of Discharge and Slip				
MODULE- VII: (Basics only): Basics of HPP, Classification of Turbines - Impulse and Reaction Turbines - Selection of type of turbine, Working principle of Impulse turbines - Pelton wheel - component parts, Work done by Pelton wheel - Definitions of heads and efficiencies, Reaction turbines - Working principles- Francis turbine - Component parts - mechanical, hydraulic and overall efficiency, Types of Draft tubes, surge tank – water hammer, cavitation in draft tubes, working principles of Kaplan turbine.	4	Theory PPT mode, Class room Practice	7	TB4, Chapter 18
Total (hrs.)	30	THEOR Y		

Disaster Preparedness & Planning Management

Course Title	Code	Type of course	T-P-PJ	Prerequisite
Disaster preparedness & Planning Management	CECC0102	Theory	2-0-0	Nil

Objective

- To teach the Challenges and Impacts posed by Disasters

Course Outcome

- Having successfully completed this course to make the students capable to know various natural hazards that can pose risk to property, lives, and livestock and understanding of the social responsibility towards preparedness for mitigating the damages.

Evaluation Systems

	Component	% of Marks	Method of Assessment
Internal Examination	Internal Theory	30	Written Examination
	Assignment	5	Report or Presentation + Learning Record
	Attendance	5	Based On Class Attended
External Examination	External Theory	60	Written Examination
Total		100	

Course Outline

Module-I: Introduction (3Hrs)

Concepts and definitions: disaster; hazard; vulnerability; risks severity; frequency and details, capacity; impact; prevention and mitigation

Module-II: Disaster(4Hrs)

Classification: Natural disasters floods; draught; cyclones; volcanoes; earthquakes; tsunami; landslides; coastal erosion; soil erosion; forest fires and manmade disasters

Module-III: Industrial Pollution

(4Hrs)

Artificial flooding in urban areas; nuclear radiation; chemical spills; transportation accidents; terrorist strikes; hazard and vulnerability profile of India; mountain ;coastal areas and ecological fragility

Module -IV: Disaster Impacts (5Hrs)

Disaster impacts (environmental, physical, social, ecological, economic, political, etc.); health, psycho-social issues; demographic aspects (gender, age, special needs); hazard locations; global and national disaster trends; climate change and urban disasters

Module-V: Disaster risk Reduction (6Hrs)

(DRR) Disaster management cycle its phases; prevention, mitigation; preparedness, relief and recovery; structural and non-structural measures; risk analysis; vulnerability and capacity assessment; early warning systems; Post disaster environmental response water; sanitation; food safety; waste management; disease control; security and communications

Module-VI: Roles and Responsible of Government (3Hrs)

community; local institutions; NGOs and other stakeholders; Policies and legislation for disaster risk reduction; DRR programmes in India and the activities of National Disaster Management Authority

Module-VII: Environment and Development of Disaster (5Hrs)

Factors affecting vulnerability such as impact of developmental projects and environmental modifications including of dams; land use changes; urbanization etc. sustainable and environmental friendly recovery reconstruction and development methods

Reference

E-content: NPTEL

Text Books:

1. Pradeep Sahni, 2004, Disaster Risk Reduction in South Asia, Prentice Hall.
2. Singh B.K., 2008, Handbook of Disaster Management: Techniques & Guidelines, Rajat
3. Publication.
4. Ghosh G.K., 2006, Disaster Management, APH Publishing Corporation

Online Source: NPTEL

Session Plan

Topic coverage and Internal Test	No. of Sessions (in hrs.) Theory +Practice	Activity (lecture, tutorial, lab practice, field studies/field -trip, Workshop etc.)	Assignment (Project, Assignment, field study, seminar, etc.)	Suggested Reading (Book, Video, Online source, etc.)

Module I				
Concepts and definitions: disaster, hazard	1	Lecture	1.1	Text Book(TB) Chapter(CH)
Vulnerability, risks severity, frequency and details	1	Lecture	1.2	TB ₁ CH ₂
Capacity, impact, prevention, mitigation	1	Lecture	1.3	TB ₁ CH ₂
Sub-Total (hrs)	3			
Module II				
Classification; natural disasters floods	1	Lecture	2.1	TB ₂ CH ₃
Draught, cyclones, volcanoes, earthquakes,	1	Lecture	2.2	TB ₁ CH ₃
Tsunami, landslides, coastal erosion, soil erosion	1	Lecture	2.3	
forest fires etc. manmade disasters	1	Lecture+ Practice	2.4	
Sub-Total (hrs)	4			
Module III				
Artificial flooding in urban areas Nuclear radiation, chemical spills,	1		3.1	TB ₁ CH ₄ ,TB ₂ CH ₄
Transportation accidents, terrorist strikes	1		3.2	TB ₂ CH ₅
Hazard and vulnerability profile of India	1		3.3	TB ₂ CH ₅
Mountain and coastal areas, ecological fragility	1		3.4	TB ₂ CH ₅
Sub-Total (hrs)	4			
Module IV				
Disaster impacts (environmental, physical, social, ecological, economic, political, etc.)	1	Lecture	4.1	TB ₂ CH ₆
Health, psycho-social issues demographic aspects (gender, age, special needs)	2	Lecture	4.2	TB ₂ CH ₆
Hazard locations; global and national disaster trends	1	Lecture	4.3	TB ₂ CH ₆

climate change and urban disasters	1	Lecture	4.4	TB ₂ CH7
Sub-Total (hrs)	5			
Module V				
Disaster management cycle its phases; prevention, mitigation, preparedness, relief and recovery	1	Lecture	5.1	TB ₂ CH8
Structural and non-structural measures	1	Lecture	5.2	TB ₂ CH8
Risk analysis, vulnerability and capacity assessment	1	Lecture	5.3	TB ₂ CH8
Early warning systems, Post disaster environmental response	1	Lecture	5.3	TB ₂ CH9
Water, sanitation, food safety, waste management	1	Lecture	5.4	TB ₂ CH9
Disease control, security, communications	1	Lecture	5.5	TB ₂ CH10
Sub-Total (hrs)	6			
Module VI				
Community, local institutions, NGOs and other stakeholders;	1	Lecture	6.1	TB ₃ CH9
Policies and legislation for disaster risk reduction	1	Lecture	6.2	TB ₃ CH9
DRR programmes in India and the activities of National Disaster Management Authority	1	Lecture	6.3	TB ₃ CH11
Sub-Total (hrs)	3			
Module VII				
Factors affecting vulnerability	1	Lecture	7.1	TB ₄ CH8
Impact of developmental projects and environmental modifications	1	Lecture	7.2	TB ₂ CH8
Including of dams, landuse changes, urbanization	1	Lecture	7.3	TB ₂ CH9
Sustainable and environmental friendly recovery	1	Lecture	7.4	TB ₂ CH10

Reconstruction and development methods.	1	Lecture	7.5	TB ₂ CH10
Sub-Total (hrs)	5			
Total (hrs)	30	THEORY		

Estimation & Quantity Surveying

Course Title	Code	Type of course	T-P-PJ	Prerequisite
Estimation & Quantity Surveying	CECC0201	Practice	0-2-0	Nil

Objective

- To make familiar with calculation of quantities for different item of works & provide knowledge about estimation of buildings through Estimator-2.0 software

Course Outcome

- Gain knowledge about how to schedule & estimate different construction works both manually and using software

Evaluation Systems

Internal Examination	Component	% of Marks	Method of Assessment
	Internal Practice	50 (40+10)	Lab work + Learning Record
External Examination	External Practice	50	Lab work
Total		100	

COURSE OUTLINE

Module - I: BUILDING (16hrs)

Estimations and Quantity Surveying: Reading of Plans, Sections and detailed Drawings Related to buildings; preparation of Quantities and Units.

Practice Sessions:

- Study of construction drawings and preparation of WBS.
- Detailed estimates for a Shopping Complex using Estimator-2.0 software.
- Detailed estimates for a hostel Building using Estimator-2.0 software.
- Detailed estimates for a hospital using Estimator-2.0 software.

Module -II : CULVERT (10hrs)

Estimations and Quantity Surveying: Reading of Plans, Sections and detailed Drawings Related to irrigation structures; preparation of Quantities and Units.

5. Detailed estimates (Manual) for a Slab culvert with right angled/ Splayed wing wall.
6. Detailed estimates (Manual) for a box culvert.
7. Detailed estimates (Manual) for a Hume pipe Culvert.

Module –III:ROAD (6hrs)

Estimations and Quantity Surveying: Reading of Plans, Sections and detailed Drawings Related to Roads structures; preparation of Quantities and Units.

8. Detailed estimates (Manual) for a road.

Module -IV :SLOPED ROOF (6hrs)

Estimations and Quantity Surveying: Reading of Plans, Sections and detailed Drawings Related to Sloping roof/Roof truss structures; preparation of Quantities and Units.

9. Detailed estimate (Manual) for a timber roof truss.
10. Detailed estimate (Manual) for a roof cover of GI sheets.

Module –V:QUANTITY SURVEY (06hrs)

Estimations and Quantity Surveying; Preparation of Quantity of materials per unit rate of work; Estimating labour.

11. Quantity of materials required for different items of works in buildings (Manual).
12. Quantity of different types of labor required for different items of works (Manual).

Module-VI: RATE ANALYSIS OF BUILDING (10hrs)

Specifications; Rate Analysis as per State Govt. and CPWD Standards

13. Development of Excel Sheet for Rates, Specifications and Cost Estimates.
14. Rate Analysis and Cost Estimates for a Shopping Complex using Estimator-2.0 software.
15. Rate Analysis and Cost Estimates for a hostel Building and a hospital, using Estimator-2.0 software.

Module-VII:RATE ANALYSIS OF CULVERT & ROAD (6hrs)

Specifications; Rate Analysis as per State Govt. and CPWD Standards

16. Rate Analysis and Cost Estimates for a Slab culvert with right angled wing wall using Estimator-2.0 software.
17. Rate Analysis and Cost Estimates for an arch culvert using Estimator-2.0 software.
18. Rate Analysis and Cost Estimates for a road using Estimator-2.0 software.

Text Books:

1. Estimating and Costing in Civil Engineering- By B.N.Dutta

Reference Books:

1. Estimating, Costing, Specification & Valuation in Civil Engineering-By M.Chakraborti

Session Plan

Topic coverage and Internal Test	No. of Sessions (in hrs.)	Activity (lecture, tutorial, lab practice, field studies/field-trip, Workshop etc.)	(project, Assignment, field study, seminar, etc.)	Suggested Reading (Book, Video, Online source, etc.)
Module I				
Estimations and Quantity Surveying; Reading of Plans, Sections and detailed Drawings Related to buildings, irrigation structures and Roads; preparation of Quantities and Units. Study of construction drawings and preparation of WBS.	2	lecture	1	RB ₁ ;chapter I & II
Detailed estimates for a Shopping Complex using Estimator-2.0 software.	6	Practice	2	http://estimator.in/tutorial/index.htm https://www.youtube.com/watch?v=d-EP7dm4X2s&list=PLuX_PtBw-QK1-c-B5D8SiJfOttjxmHf6 Seen on 11 th Jun, 2019
Detailed estimates for hostel Building using Estimator-2.0 software.	4	Practice		
Detailed estimates for a hospital using Estimator-2.0 software.	4	Practice		
Sub-total (hrs)	16			
Module II				
Detailed estimates (Manual) for a Slab culvert with right angled/Splayed wing wall.	6	Practice	3	TB ₁ ;chapter no-8 page-373 to 414
Detailed estimates (Manual) for a box	2	Practice		

culvert.				
Detailed estimates (Manual) for a Hume pipe Culvert.	2	Practice		
Sub-total (hrs)	Practice 10			
Module III				
Detailed estimates (Manual) for a road.	6	Practice	4	TB ₁ ; chapter no-7, page-328 to 372
Sub-total (hrs)	Practice 06			
Module IV				
Detailed estimate (Manual) for a timber roof truss	4	Practice	5	RB ₁ ; chapter VII, Page-275-299
Detailed estimate (Manual) for a roof cover of GI sheets	2	Practice		
Sub-total (hrs)	Practice 06			
Module V				
Quantity of materials required for different items of works in buildings (Manual).	04	Practice	6	RB ₁ ;chapter XIII, Page-473-528
Quantity of different types of labour required for different items of works (Manual).	02	Practice		
Sub-total (hrs)	Practice 06			

Module VI				
Specifications; Rate Analysis as per State Govt. and CPWD Standards. Development of Excel Sheet for Rates, Specifications and Cost	2	Practice	7	TB ₁ ;chapter no-13
Rate Analysis and Cost Estimates for a Shopping Complex using Estimator-2.0 software.	4	Practice		https://www.youtube.com/watch?v=NQIHnHWTRQc&list=PLuX_PtBw-QK1-c-B5D8SiJfOttjxmHf6&index=10
Rate Analysis and Cost Estimates for a hostel Building and a hospital, using Estimator-2.0 software.	4	Practice		Seen on 12 th Jun, 2019
Sub-total (hrs)	Practice 10			
Module VII				
Rate Analysis and Cost Estimates for a Slab culvert with right angled wing wall using Estimator-2.0 software.	2	Practice	8	https://www.youtube.com/watch?v=NW8ODPKgtFw&list=PLuX_PtBw-QK1-c-B5D8SiJfOttjxmHf6&index=15
Rate Analysis and Cost Estimates for a arch culvert using Estimator-2.0 software.	2	Practice		Seen on 12 th Jun, 2019
Rate Analysis and Cost Estimates for a road using Estimator-2.0 software.	2	Practice		
Sub-total (hrs)	PRACTICE 06			
Total (hrs)	60	PRACTICE		

Pre-Fabricated Structures

Course Title	Course Code	Type of Course	T-P-PJ	Pre-Requisite
Pre-Fabricated Structures	CECC0202	Practice	0-2-0	Nil

Objective

- To teach the student with emerging technology of prefabrication in construction industry including various processes involved there upon

Course Outcome

- After completion of the courses the students will gain knowledge of the processes of planning, production, storage, transportation and site installation of various prefabricated units pertaining to a civil engineering construction project
- Students will develop innovative ideas about prefabricated structures

Evaluation Systems

Internal Examination	Component	% of Marks	Method of Assessment
	Internal Practice	50 (40+10)	Lab work + Learning Record
External Examination	External Practice	50	Lab work
Total		100	

Course Outline

Module I: INTRODUCTION

(8hrs)

Practice

- Basic knowledge of PEB
- Generation of elevation and section for a utility using AutoCAD, Revit and CATIA .

Module II: TRUSS

(8hrs)

Practice

- Design of the truss through STAAD PRO
- Report on materials mix and Pre tensioning

Module III: PANEL AND BEAM

(8hrs)

- 5: Estimation of panel and beam lengths and number.
- 6: Estimation of the structure through ESTIMATOR 2.0.

Module IV: SLAB & INTRODUCTION OF MS-PROJECCT (10hrs)

- 7: Project scheduling through MS Project
- 8: Casting of slab panels as per the requirement of the proposed structure.

Module V: SITE CLEARANCE (12hrs)

- 9: Casting of beam panels as per the requirement of the proposed structure.
- 10: Site clearance and marking.
- 10: Fixing of slab panels

Module VI: FABRICATION (6hrs)

- 11: Fabrication &Finishing of roof panels
- 12: Erection of roof panels& beams

Module VII: CONSTRUCTION EQUIPMENT (8 hrs)

- 13: Fining of work
- 14: Equipment safety and operation & Report on Maintenance work

References

IS.15916.2011code book.

Online Resources

- 1. NPTEL

Session Plan

Topics	No. of Sessions (in hrs)	Activity	Assignment	Suggested Reading
Module I[6 Hours Practice]				
INTRODUCTION Basic knowledge of PEB	2	Practice	1.1-1.2	Online Source
Generation of elevation and section for a utility using AutoCAD, Revit and CATIA	6	Practice		Online Source
Module II[8 Hours Practice]				
TRUSS Design of the truss through STAAD PRO	4	Practice	2.1-2.2	Online Source
Report on materials mix and Pre tensioning	4	Practice		Online Source

Module III[8 Hours Practice]				
PANEL AND BEAM				
Estimation of panel and beam lengths and nos.	4	Practice	3.1-3.2	Online Source
Estimation of the structure through ESTIMATOR 2.0.	4	Practice		Online Source
Module IV[10 Hours Practice]				
SLAB & INTRODUCTION OF MS-PROJECT				
Project scheduling through MS Project	4	Practice	4.1-4.2	Online Source
Casting of slab panels as per the requirement of the proposed structure.	6	Practice	Field study	Online Source
Module V[12 Hours Practice]				
SITE CLEARANCE				
Casting of beam panels as per the requirement of the proposed structure.	4	Practice	Field Study	Online Source
Site clearance and marking.	2	Practice	Field Study	Online Source
Fixing of slab panels	6	Practice	Field Study	Online Source
Module VI[12 Hours Practice]				
FABRICATION				
Fabrication of roof panels	4	Practice	Field Study	
Erection of roof panels	2	Practice	Field Study	
Sub total	8			
Module VII[8 hours practice]				
Finishing work	4	Practice	Field Study	
CONSTRUCTION EQUIPMENT				
Equipment safety and operation	2	Practice	Field Study	
Report on Maintenance work	2	Practice	Field Study	
Total(Hours)	(64 Hours)			

	Practice)			
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Concrete Technology

Course Title	Code	Type of course	T-P-PJ	Prerequisite
Concrete Technology	CECC0412	Theory+ Practice	1-1-0	Nil

Objective

- To teach the student about different property of concrete and its use in different work.

Course Outcome

- Students will able to apply core concepts of Concrete technology to solve engineering problems.

Evaluation Systems

Internal Examination	Component	% of Marks	Method of Assessment
	Internal Theory	20	Written Examination
	Internal Practice	30(20+10)	Lab work + Learning Record
External Examination	External Theory	30	Written Examination
	External Practice	20	Lab Work
Total		100	

COURSE OUTLINE

Module I :Properties of Cement (6Hrs)

Cement-Different types Chemical composition and Properties Tests on cement-IS Specifications; Portland cement chemical composition Hydration; Setting of cement Structure of hydrate cement Test on physical properties for Different grades of cement

Practice 1

- XRF analysis of cement
- Specific gravity of cement (comparison study)

Practice 2

- Compressive strength of cement(comparison study)
- Soundness test of cement (comparison study)
- Setting time(comparison study)

Module II: Aggregates(5Hrs)

Classification; Mechanical properties and tests as per BIS Grading requirements Classification of aggregate Particle shape & texture strength & other mechanical properties of aggregate Specific gravity; Bulk density; porosity; adsorption& moisture content of aggregate Bulking of sand

Practice 3

- Specific gravity of coarse aggregate

7. Specific gravity of fine aggregate
8. Zoning of aggregates
9. Water absorption of coarse aggregate

Module III :PROPERTIES OF CONCRETE (4Hrs)

Workability- Factors affecting workability; Measurement of workability by different tests Setting times of concrete; Effect of time and temperature on workability Segregation & bleeding Mixing and vibration of concrete

Practice 4 Workability test of Fresh Concrete by

10. Slump cone method
11. Compaction factor method
12. Flow table method
13. Preparation of cube mould for durability test

Module IV : CHEMICAL AND MINERAL ADMIXTURES(6 Hrs)

Accelerators; Retarders; Plasticizers- Super plasticizers; Water proofers ;Mineral Admixtures like Fly; Ash, Silica Fume; Ground Granulated Blast Furnace Slag and Metakaoline Their effects on concrete properties

Practice 14. Preparation of Design Mix of concrete

Practice 15.: Prepare the design mix using Retarder and Accelerator

Module V :SPECIAL CONCRETE(10Hrs)

Special Concretes: Introduction to light weight concrete ;Cellular concrete no-fines concrete high density concrete fiber reinforced concrete

Practice 16: Preparation of Fiber reinforced concrete

Practice 17:Preparation of Light weight concrete mix and reactive Powder concrete

Practice 18: Preparation of concrete with plastic aggregates

Practice 19: Design of concrete using construction demolition waste

Module VI :PROPERTIES OF HARDENED CONCRETE (11Hrs)

Properties of Hardened concrete Determination of Compressive and Flexural strength by Destructive tests and non-destructive tests.

Practice 20: Splitting tensile strength of cylinder and Flexural strength of beam

Practice 21: Compressive strength of cube and cylinder specimen

Practice 22: Stress-strain curve for concrete Determination of Young's Modulus.

Practice 23:

- (a) Non-destructive tests by Rebound hammer.
- (b) Destructive tests by core cutter.

Module VII :Durability of Concrete (3 Hrs)

Factors affecting durability; Tests for durability of concrete

Practice 24:

- (a) Carbonation test for concrete.
- (b) Resistance to chemical attack (Sulphate attack, chloride attack)

Text Books:

1. M.S Shety, S. CHAND Publication

Reference Books:

1. Indian standards for tests on concrete materials and mix design.

Session Plan

Topic coverage and Internal Test	No. of Sessions (in hrs.) Theory +Practice	Activity (lecture, tutorial, lab practice, field studies/field -trip, Workshop etc.)	A (Project, A, field study, seminar, etc.)	Suggested Reading (Book, Video, Online source, etc.)
Module I [2hrs.Lecture+4hrs.Practice]				
Cement-Different types Chemical composition and Properties -Tests on cement-IS Specifications- Portland cement – chemical composition	1+0=1	Lecture	1.1	Text Book(TB) Chapter(CH)- 1&2
Hydration, Setting of cements Structure of hydrate cement. Test on physical properties for Different grades of cement	1+0=1	Lecture	1.2	TB CH-2
XRF analysis of cement Specific gravity of cement (comparison study)	0+2=2	Practice		TB CH-2
Compressive strength of cement(comparison study) Soundness test of cement (comparison study)	0+2=2	Practice		TB CH-2

Module II [3 hrs.Lecture+2 hrs. Practice]				
Aggregates-Classification-Mechanical properties and tests as per BIS Grading requirements-	1+0=1	Lecture	2.1	TB CH-3
Classification of aggregate Particle shape & texture strength & other mechanical properties of aggregate	1+0=1	Lecture	2.2	
Specific gravity, Bulk density, porosity, adsorption & moisture content of aggregate Bulking of sand	1+0=1	Lecture	2.3	
(a) Specific gravity of coarse aggregate (b) Specific gravity of fine aggregate (c) Zoning of aggregates (d) Water absorption of coarse aggregate	0+2=2	Practice		
Module III [2 hrs.Lecture+2 hrs. Practice]				
Workability Factors affecting workability Measurement of workability by different tests	1+0=1	Lecture	3.1	TB CH-5
Setting times of concrete Segregation & bleeding Mixing and vibration of concrete	1+0=1	Lecture	3.2	
(a) Slump cone method (b) Compaction factor method (c) Flow table method (d) Preparation of cube mould for durability test	0+2=2	Practice		

Module IV[2 hrs.Lecture+4hrs.Practice]				
Accelerators-Retarders Plasticisers Super plasticizers- Water proofers Mineral Admixtures like Fly, Ash, Silica Fume	1+0=1	Lecture	4.1	TB CH-7
Ground Granulated Blast Furnace Slag and Metakaoline Their effects on concrete properties	1+0=1	Lecture	4.2	
Preparation of Design Mix of concrete	0+2=2	Practice		
Prepare the design mix using Retarder and Accelerator	0+2=2	Practice		
Module V [2 hrs.Lecture+8 hrs. Practice]				
Special Concretes Introduction to light weight concrete Cellular concrete	1+0=1	Lecture	5.1	TB CH-12
No fines concrete high density concrete	1+0=1	Lecture	5.2	
Preparation of Fiber reinforced concrete	0+2=2	Practice		
Preparation of Light weight concrete mix and Powder concrete	0+2=2	Practice		
Preparation of concrete with plastic aggregates	0+2=2	Practice		
Design of concrete using construction demolition waste	0+2=2	Practice		
Module VI [3 hrs.Lecture+8 hrs.Practice]				
Properties of hardened concrete Determination of Compressive and Flexural strength as per BIS	1+0=1	Lecture	6.1	

Properties of Hardened concrete Determination of Compressive and Flexural strength	1+0=1	Lecture	6.2	TB CH-10
Destructive tests and non-destructive tests.	1+0=1	Lecture	6.3	
Splitting tensile strength of cylinder and Flexural strength of beam	2+0=2	Practice		
Compressive strength of cube and cylinder specimen	2+0=2	Practice		
Stress-strain curve for concrete Determination of Young's Modulus	2+0=2	Practice		
(a) Non-destructive tests by Rebound hammer. (b) Non-destructive tests by core cutter	2+0=2	Practice		
Module VII [1 hrs.Lecture+2 hrs.Practice]				
Factors affecting durability. Tests for durability of concrete	1+0=1	Lecture	7	TB CH-9
(a) Carbonation test for concrete. (b) Resistance to chemical attack (Suphate attack, chloride attack)	0+2=2	practice		TB CH-8
Total (hrs)	30+30=60	30hrs.Lecture+30 hrs.Practice		

Course Title	Code	Type of course	T-P-PJ	Prerequisite
Soil Mechanics	CECC0401	Theory + Practice	2-1-0	Nil

Objective

- To teach the basic theoretical aspects of soil mechanics and implementation of geotechnical topics in the real-world situations

Course Outcome

- Students will gain knowledge on soil mechanics and the concepts involve in it
- Students will develop skill on laboratory experiments, empirical methods and software aids involve in soil mechanics

Evaluation Systems

Internal Examination	Component	% of Marks	Method of Assessment
	Internal Theory	20	Written Examination
	Internal Practice	30(20+10)	Lab work + Learning Record
External Examination	External Theory	30	Written Examination
	External Practice	20	Lab Work
Total Marks		100	

Course Outline

Module I: Soil Properties and Relationships (09 Hours)

Theory

Soil formation; Soil structure and clay mineralogy; Adsorbed water; Mass- volume relationship and Relative density

Practice

1. To determine specific gravity of soil solids and free swell index test of soil
2. To determine the dry density of the soil by core cutter methods
3. To determine the dry density of the soil by sand replacement methods

Module II: CLASSIFICATION AND INDEX PROPERTIES OF SOILS (09 Hours)

Theory

Grain size analysis; Sieve and hydrometer methods; Consistency limits and indices and Activity of clays

Practice

4. Wet sieving and dry sieving test of soil
5. To determine the liquid limit of a soil specimen
6. To determine the plastic limit and shrinkage limit of a soil specimen

Module III: Compaction and Consolidation (09 Hours)

Theory

Compaction: Mechanism of compaction; Factors affecting compaction; Effects of compaction on soil properties; Field compaction equipment and Compaction control

Practice

7. To determine the compaction characteristics of a soil specimen by Standard Proctor's Test and Modified Proctor's Test

Theory

Consolidation: Stress history of clay; $e-p$ and $e-\log p$ curves; Magnitude and rate of 1-D consolidation and Terzaghi's theory

Practice

8. To determine the consolidation characteristics of a soil specimen

Module IV: Permeability and Seepage through Soils (10 Hours)

Theory

Permeability: Soil water; Capillary rise; Flow of water through soils; Darcy's law; Factors affecting permeability; Coefficient of permeability and Permeability of layered systems

Practice

9. To determine coefficient of permeability of a soil specimen by constant head permeability test
10. To determine coefficient of permeability of a soil specimen and falling head permeability test

Theory

Seepage through soils: Total, neutral and effective stresses; Quick sand condition; Seepage through soils; Flow nets: Characteristics and Uses

Module V: SHEAR STRENGTH OF SOILS (12 Hours)

Theory

Introduction; Mohr - Coulomb Failure theories; Types of laboratory strength tests; Strength tests based on drainage conditions and Shear strength of cohesive soils

(Mathematical derivations to be limited to classroom activity. They should not be a part of external evaluation)

Practice

11. To determine the shear strength of the soil by direct shear test
12. To determine the unconfined shear strength of a soil
13. To determine the shear strength of the soil by triaxial test
14. To determine the shear strength of the soil by vane shear test

Module VI: STRESS DISTRIBUTION IN SOIL (04 hours)

Theory

Normal and shear stresses on a plane; Boussinesq's solution for a point load, line load, strip load, uniformly loaded circular and rectangular areas; Isobar and pressure bulb concept; Stress distribution on horizontal and vertical planes and Contact pressure

(Mathematical derivations to be limited to classroom activity. They should not be a part of external evaluation)

Module VII: STABILITY OF SLOPES (07 hours)

Theory

Types of slopes; Failure types; Causes of slope failure; Factors contributing to instability of soil slope; Slope stability analysis: Analysis of finite and infinite slopes; Bishop's solution and Soil stabilization measures (Mathematical derivations to be limited to classroom activity. They should not be a part of External Evaluation)

Practice

15. Analysis of finite and infinite slopes (Using Geo5/ Geo studio / Simple slope software)

Text Book

1. B.C.Punmia, "Soil Mechanics and Foundation", New Delhi: Laxmi publications, 2018.

Reference Books

1. C. Venkataramiah, "Geotechnical Engineering", New age International Pvt .Ltd., 2010.
2. Purushotham Raj, "Geotechnical Engineering", New Delhi: Tata McGraw Hill Publishers, 2018.
3. ManojDutta& S K Gulati, "Geotechnical Engineering", New Delhi: Tata McGraw-Hill Publishers, 2010.
4. K.R. Arora, "Soil Mechanics and Foundation Engineering" New Delhi: Standard Publishers and Distributors, 2018.
5. GopalRanjan&A S R Rao, "Applied Soil Mechanics" New age International Pvt .Ltd,2018

Online Source:

<http://www.nptel.ac.in/courses/105101084/>[Viewed on Dt-12.06.2019]

<http://www.nptel.ac.in/courses/105103097/>[Viewed on Dt-12.06.2019]

Session Plan

Topic coverage and Internal Test	No. of Sessions (in hrs.)	Activity	Assignment	Suggested Reading
Module I [3 Hours Lecture + 6 Hours Practice]				
SOIL PROPERTIES AND RELATIONSHIPS Introduction to geotechnical engineering; Origin and formation of soil	1	Lecture	1.1	Textbook (TB) Chapter (CH)-1
Preliminary definitions and relationships	2	Lecture	1.2 - 1.7	TB CH-2,3
Determination of specific gravity, swelling index of different types of soil	2	Practice		
Determination of dry density of soil by Core cutter method	2	Practice		
Determination of dry density of soil by Sand replacement method	2	Practice		
Module II [3 Hours Lecture + 6 Hours Practice]				
CLASSIFICATION AND INDEX PROPERTIES OF SOILS Grain size analysis; Consistency limits and indices	3	Lecture	2.1 -2.7	TB CH-3,4,5
Wet sieving test , Dry sieving test	2	Practice		
Liquid limit test	2	Practice		

Plastic limit and shrinkage limit test	2	Practice		
Module III [5 Hours Lecture + 4 Hours Practice]				
COMPACTION AND CONSOLIDATION Compaction: Factors affecting compaction and compaction control; Mechanism of compaction	2	Lecture		TB CH-17
Standard Proctor Test and Modified Proctor Test	2	Practice		
Consolidation theory	3+2	Lecture + Practice	3.1 – 3.7	TB CH-15,16
Module IV [6 Hours Lecture + 4 Hours Practice]				
PERMEABILITY AND SEEPAGE THROUGH SOILS Basic concepts of soil permeability & Darcy's law	3	Lecture	4.1 - 4.7	TB CH-7
Determination of coefficient of permeability (By Constant Head Permeability Method and Falling Head Permeability Method)	2+2	Practice		
Seepage through soils	3	Lecture	4.8- 4.9	TB Ch-6 ,9
Module V [4 Hours Lecture + 8 Hours Practice]				
SHEAR STRENGTH OF SOILS Shear strength of different types of soils & failure	4	Lecture	5.1 -5.7	TB CH-18

theories				
To determine the shear strength of the soil by direct shear test	2	Practice		
To determine the unconfined shear strength of a soil	2	Practice		
To determine the shear strength of the soil by triaxial test	2	Practice		
To determine the shear strength of the soil by vane shear test	2	Practice		
Module VI [4 Hours Lecture]				
STRESS DISTRIBUTION IN SOIL Normal and shear stresses on a plane; Boussinesq's solution for a point load, line load, strip load, uniformly loaded circular and rectangular areas; Isobar and pressure bulb concept; Stress distribution on horizontal and vertical planes and Contact pressure	4	Lecture	6.1 -6.7	TB CH-13,14
Module VII[5 Hours Lecture + 7 Hours Practice]				
STABILITY OF SLOPES Types of slopes; Failure types; Causes of slope failure; Factors contributing to instability of soil slope	3	Lecture		TB CH-23
Analysis of finite and infinite slopes	2 +2	Lecture + Practice	7.1 -7.7	
Total (Hours)	60	(30 Hours Theory + 30 Hours		

		Practice)	
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Foundation Engineering

Course Title	Code	Type of course	T-P-PJ	Prerequisite
Foundation Engineering	CECC0402	Theory + Practice	2-1-0	Soil Mechanics

Objective

- To teach the basic theoretical aspects and implementation of following topics in the real-world situations: Foundations and Retaining structures

Course Outcome

- Students will gain knowledge on retaining structures and various types of foundations on different structures and soil
- Students will develop skill to design various retaining structures and foundations in different conditions

Evaluation Systems

Internal Examination	Component	% of Marks	Method of Assessment
	Internal Theory	20	Written Examination
	Internal Practice	30 (20+10)	Lab Work + Learning Record
External Examination	External Theory	30	Written Examination
	External Practice	20	Lab Work
Total		100	

Course outline

Module I: Shallow Foundation (06 hours)

Theory

Introduction; Different types of shallow foundations; Calculation of bearing capacity of soil and Calculation of settlements of foundations

Practice

- Bearing capacity of soil can be checked using Geomechanica Software/ Bearing Capacity Software.

Module II: Mat Foundation Design (10 hours)

Practice

2. Generation of structural design documents including necessary plans and section of raft/mat foundation using STAAD. Foundation software
3. Calculation of geotechnical data of soil like ultimate soil bearing capacity, depth of footing, water table depth, unit weights, etc. using STAAD. Foundation software
4. Service load design of mat foundation using STAAD. Foundation software
5. Mesh generation, analysis properties and mat slab analysis/design options of raft/mat foundation using STAAD. Foundation software
6. Checks and reinforcement design of raft/mat foundation using STAAD. Foundation software

Module III: Deep Foundation (11 hours)

Theory

DEEP FOUNDATION: Introduction, Different types of deep foundations, Design methodology for piles, Calculation of pile capacity, Analysis of pile group, Settlement of pile group, Concept of negative skin friction, Piles subjected to lateral loads, Pile load test;

Practice

7. Checking of pile settlement using Group Pile Settlement Software

Module IV: Pile Foundation Design (08 hours)

Practice

8. Calculation of geotechnical data of soil like soil bearing capacity, depth of footing, water table depth, unit weights, etc. of pile foundation in STAAD. Foundation software
9. Service load design of pile foundation using STAAD. Foundation software
10. Structural analysis, checks and reinforcement design of pile foundation using STAAD. Foundation software
11. Design of pile cap using STAAD. Foundation software

Module V: Design of Well Foundation (05 hours)

Theory

DESIGN OF WELL FOUNDATION: Introduction and construction of well foundation;

Practice

12. Design of well foundation using STAAD. Foundation software

Module VI: DESIGN OF EARTH RETAINING STRUCTURES (08 hours)

Theory

DESIGN OF RETAINING STRUCTURES: Introduction, Different types of retaining structures, Stability analysis of rigid walls;

Practice

13. Design of cantilever sheet piles using STAAD.Foundation software
14. Design of anchor sheet piles using STAAD.Foundation software

Module VII: Earth Pressure and Foundation in Difficult Grounds (12 hours)

Theory

EARTH PRESSURE: Introduction , Types of Earth pressure, Rankine's active and passive earth pressure, Smooth vertical wall with horizontal backfill, Extension to Soil, Coulombs wedge theory; (Mathematical derivations to be limited to classroom activity, it should not be a part of external evaluation);

Practice

15. Calculation of Rankine's active and passive earth pressure(Using Earth Pressure Coefficient Software)

FOUNDATIONS IN DIFFICULT GROUNDS: Introduction, Techniques of ground improvement, Foundations in swelling soil, Foundations in collapsible soil, Use of soil reinforcement;

Text Book

- 1.B.C. Punmia. 2018. "Soil Mechanics and Foundation" New Delhi: Laxmi publications.

Reference Books

1. C. Venkataramiah.2010."Geotechnical Engineering" New age International Pvt .Ltd.
2. Purushotham Raj.2018. "Geotechnical Engineering" New Delhi: Tata McGraw Hill Publishers.
3. ManojDutta& S K Gulati.2010. "Geotechnical Engineering" New Delhi: Tata McGraw-Hill Publishers.
4. K.R. Arora.2018. "Soil Mechanics and Foundation Engineering" New Delhi: Standard Publishers and Distributors.
5. GopalRanjan& A S R Rao.2018. "Applied Soil Mechanics" New age International Pvt .Ltd.

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<http://www.nptel.ac.in/courses/105103097/> [Viewed on Dt-12.06.2019]

Session Plan

Topic coverage and Internal Test	No. of Sessions (in hrs.)	Activity	Assignment	Suggested Reading
Module-I:SHALLOW FOUNDATION (06 hours) SHALLOW FOUNDATION: Introduction, Different types of shallow foundations	1	Lecture		TB- 1 Ch-25
Calculation of bearing capacity of soil (Bearing capacity can be checked using Geomecanica Software/ Bearing Capacity Software)	2 +2	Lecture + Practice	1.1	TB- 1 Ch-25
Calculation of settlements of foundation	1	Lecture	1.2	TB- 1 Ch-25
Module II : MAT FOUNDATION DESIGN (10 hours) Generation of structural design documents including necessary plans and section of raft/mat foundation using STAAD.Foundation software	2	Practice		
Calculation of geotechnical data of soil like ultimate soil bearing capacity, depth of footing, water table depth, unit weights, etc. using STAAD.Foundation software	2	Practice		
Service load design of mat foundation using STAAD.Foundation software	2	Practice		
Mesh generation, analysis properties and mat slab analysis/design options of raft/mat foundation using STAAD.Foundation software	2	Practice		
Checks and reinforcement design of raft/mat foundation using STAAD.Foundation software	2	Practice		

Module III :DEEP FOUNDATION (11 hours) DEEP FOUNDATION: Introduction, Different types of deep foundations	1	Lecture		TB- 1 Ch-26
Design methodology for piles, Calculation of pile capacity	2	Lecture	3.1	TB- 1 Ch-26
Analysis of pile group, Settlement of pile group, (Checking of pile settlement using Group Pile Settlement Software)	3 +2	Lecture + Practice	3.2	TB- 1 Ch-26
Concept of negative skin friction, Piles subjected to lateral loads	2	Lecture	3.3	TB- 1 Ch-26
Pile load test	1	Lecture	Field Visit	TB- 1 Ch-26
Module IV :PILE FOUNDATION DESIGN(08 hours) Calculation of geotechnical data of soil like soil bearing capacity, depth of footing, water table depth, unit weights, etc. of pile foundation in STAAD.Foundation software	2	Practice		
Service load design of pile foundation using STAAD.Foundation software	2	Practice		
Structural analysis, checks and reinforcement design of pile foundation using STAAD.Foundation software	2	Practice		
Design of pile cap using STAAD.Foundation software	2	Practice		
Module V: DESIGN OF WELL FOUNDATION (05 hours) DESIGN OF WELL FOUNDATION: Introduction and construction of well foundation	3	Lecture		TB- 1 Ch-27
Design of well foundation using STAAD.Foundation software	2	Practice		
Module VI : DESIGN OF EARTH RETAINING STRUCTURES (08 hours) DESIGN OF RETAINING STRUCTURES:	1	Lecture		TB- 1 Ch-20,21

Introduction, Different types of retaining structures				
Stability analysis of rigid walls	3	Lecture	6.1	TB- 1 Ch-20,21
Design of cantilever sheet piles using STAAD.Foundation software	2	Practice		
Design of anchor sheet piles using STAAD.Foundation software	2	Practice		
Module VII : EARTH PRESSURE AND FOUNDATION IN DIFFICULT GROUNDS (12 hours) EARTH PRESSURE: Introduction, Types of Earth pressure	1	Lecture		TB- 1 Ch-24
Rankine's active and passive earth pressure	2	Lecture	7.1	TB- 1 Ch-24
Smooth vertical wall with horizontal backfill, Extension to Soil, Coulombs wedge theory	3	Lecture		TB- 1 Ch-24
Calculation of Rankine's active and passive earth pressure (Using Earth Pressure Coefficient Software)	2	Practice		
FOUNDATIONS IN DIFFICULT GROUNDS: Introduction, Techniques of ground improvement	1	Lecture		
Foundations in swelling soil	1	Lecture		
Foundations in collapsible soil	1	Lecture		
Use of soil reinforcement	1	Lecture		
Total (Hours)	60	(Theory 30 Hours + Practice 30Hours)		

Transportation Engineering

Course Title	Code	Type of course	T-P-PJ	Prerequisite
Transportation Engineering	CECC0403	Theory + Practice	2-2-0	Nil

Objective

- To introduce transportation engineering principles with emphasis on designing principal element of highways along with the safe and efficient operation of highways.

Course Outcome

- Students will gain knowledge on planning, material selection for construction, Economics and finance and designing of elements on highway.
- Acquire the skill of designing the geometric elements of highway using AUTOCAD CIVIL 3D software.

Evaluation Systems

Internal Examination	Component	% of Marks	Method of Assessment
	Internal Theory	20	Written Examination
	Internal Practice	30 (20+10)	Lab work + Learning Record
External Examination	External Theory	30	Written Examination
	External Practice	20	Lab Work
Total		100	

Course outline

Module I: Geometric Design (10 Hours)

Theory

Introduction, Horizontal Alignment, Vertical Alignment, Superelevation, Camber.

Practice Sessions:

- Design of Horizontal Alignment using CIVIL 3D software.
- Design of Vertical Alignment. using CIVIL 3D software.
- Design of Super elevation. using CIVIL 3D software.
- Create profile. using CIVIL 3D software.

Module II: Expressway (10 Hours)

Theory

Introduction, Components, I-Girder, Box culvert, VUP(Vehicle underpasses), PUP (Pedestrian underpasses), ROB(Rail over bridge); Road construction equipments; Machines used; Cement Concrete Roads: Joints in cement concrete pavements; Arrangement of joints;joint filler and sealer; wet mix macadam plant and its components; WBM roads; slipform pavers,; Elevated Roads;Flexible and Rigid pavements

Practice Sessions:

- Design of flexible pavements.
- Design of rigid pavements.

Module III : TRAFFIC ENGINEERING

(20Hrs)

Theory

Introduction to Traffic Engineering; Various Traffic Studies and their application (Field study); Traffic Signals; Traffic Signs and Road Marking; Traffic Operations-Accident Prevention and Safety Methods; Rotary intersection; ITS (Intelligent transportation system); ITS in various countries.

Practice Sessions:

7. Junction Design using civil 3d software.
8. Vehicle volume counts (field study)

Module IV: RAILWAY ENGINEERING

(12Hrs)

Theory

Permanent way components; Cross Section of Permanent Way; ETB (Electric trolley buses); LRT (Light Rail Transit); Maglev (Magnetic Levitation system); Multi-modal Transport systems; Cable cars; Monorails; RORO (Roll-on-Roll-off).

Module V: Airport Engineering

(12Hrs)

Theory

Airport layout; Various Components and their functions; Airport site selection; Geometric elements of run way and taxiway; Basic concepts in runway design; Holding aprons; Fighter jets.

Module VI: Highway Materials

(20Hrs)

Theory

Aggregate properties; Types of bitumen; Cutback bitumen; Bitumen emulsion; Tar; Types of tar; Bituminous mix design.

Practice Sessions:

9. Angeles abrasion test.
10. Aggregate Impact value test
11. Penetration Test of Bitumen
12. Ductility value test of Bitumen
13. Softening point test of Bitumen
14. Flash and Fire point test of Bitumen
15. Marshall Stability Test of Bitumen
16. Flakiness index and elongation index test of Aggregate.

Module VII: PAVEMENT FAILURE AND MAINTENANCE

(6Hrs)

Theory

Flexible pavement failure; Rigid pavement failure; Types of maintenance; Maintenance of bituminous surfaces; special repairs in flexible pavements; types of overlay.

Text-Books:

1. S.k.khanna and C.E.G JUSTO, Highway engineering.
2. L.R Kadiyali, Traffic engineering and N B Lal, Principles and practice of highway engineering, Khanna Publications, 2005
3. Railway engineering, S.C.Saxena
4. Airport Engineering, Rangawala

Online Resources:

1. Expressways-https://en.wikipedia.org/wiki/Expressways_in_India
2. Expressway methodology and its components-
<https://www.slideshare.net/ATULSHUKLA48/eastern-peripheral-expressway-training-report>
3. WMM Plant and its components-https://www.youtube.com/watch?v=2dd_C0OuMMA
4. WBM Roads construction-<http://civil-online2010.blogspot.com/2013/06/wbm-road-construction.html>
5. Rotary intersection- https://www.youtube.com/watch?v=FOk_4HuZhjo
6. Railway permanent way components-https://www.youtube.com/watch?v=w_4V8kwkdNU
7. ETB- <https://www.youtube.com/watch?v=6vAGEaKFuyY>
8. LRT- <https://www.youtube.com/watch?v=pc5x5cvlHmw>
9. Maglev-<https://www.youtube.com/watch?v=PTo-krTSZBA>
10. Cable cars- <https://www.youtube.com/watch?v=B186qiXlpZ4>
11. RORO-<https://www.youtube.com/watch?v=WuMXR-LCnds>
12. Airport layout and its components- <https://www.youtube.com/watch?v=Lzp2eHJgvz8>
13. Fighter jets- <https://www.youtube.com/watch?v=CfmF5E1ECYM>

Session Plan

Topic coverage and Internal Test	No. of Sessions (in hrs.)	Activity (lecture, tutorial, lab practice, field studies/field-trip, Workshop etc.)	Assignment (Project, Assignment, field study, seminar, etc.)	Suggested Reading (Book, Video, Online source, etc.)
Module-I[2hrs. Lecture + 8hrs. Practice]				
Introduction	2	Lecture	1.1	Textbook(TB-1), Chapter(Ch-3,4)
Design of horizontal	2	practice	Software, civil	

alignment			3d	
Design of vertical alignment	2	practice	Software, civil 3d	
Design of Superelevation	2	practice	Software, civil 3d	
Create Profile	2	Practice	Software, civil 3d	
Sub-Total (Hrs)	10			
Module II[4 hrs. Lecture + 6hrs Practice]				
Expressways – Introduction,components	1	Lecture	2.1	Online source,Ref-1
Road construction equipments	1	Lecture	2.2	TB-1, Ch-8
Cement concrete roads- Introduction,joints	1	Lecture	2.3	TB-1, Ch-8
Overlays- Flexible and Rigid,WMM,WBM	1	Lecture	2.4	TB-1, Ch-7,8, Ref- 3,4
Flexible and rigid pavements design	6	practice		TB-1, Ch-7,8
Sub-total (Hrs)	10			
Module III[4 hrs. Lecture + 16hrs. Practice]				
Traffic engineering introduction	1	lecture	3.1	TB-1. Ch-5
Various traffic studies	10	practice	Field study	TB-1. Ch-5
Traffic signals	1	Lecture	3.2	TB-1. Ch-5
Traffic signs and road marking	1	Lecture	3.3	TB-1. Ch-5
Traffic accidents, safety methods	1	Lecture	3.4	TB-1. Ch-5
Design of intersection, rotary intersection	6	practice	3.5	TB-1. Ch- 5,Video-Ref-5
Module IV[12 hrs. Lecture + 0 hrs. Practice]				
Railway Engineering, introduction	2	lecture	4.1	TB-3, Ch-1
Permanent way components, cross-section of permanent way	2	lecture	4.2	Video,Ref-6
ETB	2	lecture	4.3	Video, Ref-7
LRT	1	lecture	4.4	Video, Ref-8
Maglev	2	lecture	4.5	Video, Ref-9
Multi-modal transport	3	lecture	4.6	Video, Ref-10,11

systems, cable cars, RORO				
Module V[12 hrs. Lecture + 0 hrs. Practice]				
Airport engineering, introduction	2	lecture	5.1	TB-4, Ch-1
Airport layout and various components and functions	3	lecture	5.2	Video, Ref-12
Airport site selection	1	lecture	5.3	TB-4, Ch-3,4
Geometric elements of runway and taxiway	4	lecture	5.4	TB-4, Ch-3,4
Fighter jets	2	lecture	5.1	Video, Ref-13
Module VI[2 hrs. Lecture + 18 hrs. Practice]				
Aggregate properties, types of bitumen, tar, cutback bitumen	1	lecture	6.1	TB-1, Ch-6
Bituminous mix design	1	lecture	6.2	TB-1, Ch-6
LOS Angeles abrasion test	2	practice	6.3	TB-1, Ch-6
Impact value test of aggregate	2	Practice	6.4	TB-1, Ch-6
Penetration test of bitumen	2	Practice	6.5	TB-1, Ch-6
Ductility value test of Bitumen	2	Practice	6.6	TB-1, Ch-6
Softening point test of bitumen	2	Practice	6.7	TB-1, Ch-6
Flash and fire point test of bitumen	2	Practice	6.8	TB-1, Ch-6
Marshall stability test of bitumen	6	Practice	6.9	TB-1, Ch-6
Module VII[4hrs. Lecture +0 hrs. Practice]				
Flexible pavement failure types	1	Lecture	7.1	TB-1,Ch-10
Rigid Pavement Failure types	1	Lecture	7.2	TB-1,Ch-10
Types of maintenance details	2	Lecture	7.3	TB-1,Ch-10
Maintenance of bituminous surfaces,specialrepairs,overlay	2	Lecture	7.4	TB-1,Ch-10
Total (Hrs)	90	(42hours theory and 48 hours practice)		

Water Supply and Waste Water Management

Course Title	Code	Type of course	T-P-PJ	Prerequisite
Water Supply and waste water Engineering	CECC0415	Theory + Practice	2-1-0	Nil

Objective

- To enable the students understand about the drinking water quality through experiments.
- To make student understand the sources of drinking water.
- To train students to know the principles of water treatment and to design the treatment units.
- To train students to know the principles of waste water treatment and to design the treatment units.
- To make them understand the quality of sewage generated from different plants.

Course Outcome

- To understand the principles of water treatment units and the design of the treatment units.
- To understand the principles of waste water treatment and the design of treatment units.
- To understand the distribution network of the drinking water and the treated waste water.
- To understand to treat the waste water and reuse to make an eco-friendly environment

Evaluation Systems

Internal Examination	Component	% of Marks	Method of Assessment
	Internal Theory	20	Written Examination
	Internal Practice	30 (20+10)	Lab work + Learning Record
External Examination	External Theory	30	Written Examination
	External Practice	20	Lab Work
Total		100	

Course outline

Module -I: Demand (08Hrs)

Planning and Execution of modern water supply schemes in Urban and Rural India; Sources; Surface Water and Underground water; Per capita demand; Domestic & Non-Domestic demand; Variation in demands; Design period for different components of a Water Supply System

Practice Sessions:

1. Design period for different components of a Water Supply System using excel

Module -II: Demand and supply of water (10Hrs)

Population Forecast; Collection; Pumping and Conveyance of water; Calculation of loss of head due to friction and minor losses; Pump and Motors.

Practice Sessions:

2. Calculation of loss of head due to friction and minor loss using excel.
3. Power calculations of pump and motor.

Module –III: Water Quality (12Hrs)

Quality of potable water; IS Standard, Miscellaneous Treatments; Removal of colour; Odour ;taste; Iron; Manganese; Fluoride; Dissolved Salts; Arsenic; Radioactivity and Domestic Water treatment.

Practice Sessions:

4. Determination of colour, Odour, pH in water.
5. Determination of Chloride, Fluoride in water.

Module -IV: Water distribution System (10Hrs)

Purification of water; Screening, aeration; Sedimentation; coagulation; flocculation; Filtration; Disinfection; Softening; Distribution System; Design of Size of Pipes in simple distribution system; Valves and Fittings. **(All the topics will be through field visit/ practicemode)**

Module –V: Practice Sessions (14 Hrs)

6. Design of sump and Pump well.
7. Design of approach channel.
8. Design of bar screen chamber.
9. Design of sedimentation tank (with flocculation chamber).
10. Design of rapid gravity filter.
11. Design of Size of Pipes in simple distribution system.
12. Design of pipe network

Module -VI: Waste Water Treatment and Design (11Hrs)

Systems of sanitation; Planning and Execution of Urban & Rural Sewage system; Collection; conveyance and system of Reuse; Quantity of sewage; Hydraulic design and construction of sewers; Appurtenances**(Sewer design will be through HEC software)**

Practice Sessions:

13. Computation of quantity of sewage.
14. Design of sewer using HEC Software
15. Design of primary settling tank

Module -VII: Water Treatment (10 Hrs)

Quality and Characteristics of sewage; Preliminary; Primary; Secondary (Biological);Advanced (Tertiary) Treatment; Disposal and utilization.**(All the topics will be through video presentation)**

E-content:

Text Books:

1. Rangwala: Water Supply and Sanitary Engineering, Charotar Publishing House
2. S.K. Garg: Environmental Engineering Vol.I& II, Khanna Publishers

Reference Books:

1. Waste Water Engineering Treatment and Reuse by MetCalf and Eddy

Online Source:

<https://www.youtube.com/watch?v=20Xk2XfDhuY>

<https://www.youtube.com/watch?v=uME-5LP4KJo>

<https://www.youtube.com/watch?v=orm1MIgBGjM>

<https://www.youtube.com/watch?v=AG7U26V1gPQ>

<https://www.youtube.com/watch?v=FDNzhEAqxgc>

Session Plan

Topic coverage and Internal Test	No. of Sessions (in hrs.)	Activity (lecture, tutorial, lab practice, field studies/field-trip, Workshop etc.)	Assignment (project, Assignment, field study, seminar, etc.)	Suggested Reading (Book, Video, Online source, etc.)
Module I[4hrs.Lecture +4hrs.Practice]				
Planning and Execution of modern water supply schemes in Urban and Rural India, Sources-Surface Water and Underground water.	2	lecture	1.1	Text Book(TB ₁) Chapter(CH)-1
Per capita demand, Domestic & Non-Domestic demand, Variation in demands, Design period for different components of a Water Supply System.	2	lecture	1.2	TB ₁ ,CH-2
Design period for different components of a Water Supply System using excel.	4	practice	1.3	TB ₁ ,CH-2
Module II[6hrs.Lecture +4hrs.Practice]				
Population Forecast	3	lecture	2.1	TB ₁ ,CH-38
Collection, Pumping and Conveyance of water, Calculation of loss of head				

due to friction and minor losses, Pump and Motors.	3	lecture	2.2	TB ₁ ,CH-4
Practice sessions: 1. Calculation of loss of head due to friction and minor loss using excel. 2. Power calculations of pump and motor.	4	practice	2.3	Online source
Module III[7hrs.Lecture +5hrs.Practice]				
Quality of potable water. IS Standard ,Miscellaneous Treatments	3	lecture	3.1	TB ₁ ,CH-5
Removal of colour, Odour, taste, Iron, Manganese, Fluoride, Dissolved Salts, Arsenic, Radioactivity, Domestic Water treatment.	4+5	lecture + practice	3.2	TB ₁ ,CH-11
Module IV[4hrs.Lecture +6hrs.Practice]				
Purification of water, Screening, aeration, Sedimentation, coagulation, flocculation, Filtration, Disinfection, Softening.	2+3	lecture + field studies	4.1	TB ₁ ,CH-6,7,8,9&10
Distribution System, Design of Size of Pipes in simple distribution system, Valves and Fittings.	2+3	lecture + field studies	4.2	TB ₁ ,CH-12&14
Module V[0hrs.Lecture +14hrs.Practice]				
4. Design of sump and Pump well. 5. Design of approach channel. 6. Design of bar screen chamber. 7. Design of sedimentation tank (with flocculation chamber). 8. Design of rapid gravity filter. 9. Design of Size of	14	practice	5	TB ₁ ,CH-17

Pipes in simple distribution system. 10. Design of pipe network				
Module VI[5hrs.Lecture +6hrs.Practice]				
Systems of sanitation, Planning and Execution of Urban & Rural Sewage system,	1	lecture	6.1	TB ₁ ,CH-17
Collection, conveyance and system of Reuse, Quantity of sewage,	2	lecture	6.2	TB ₁ ,CH-18
Hydraulic design and construction of sewers, Appurtenances	2	lecture	6.3	TB ₁ ,CH-18
11. Computation of quantity of sewage. 12. Design of sewer using HEC Software 13. Design of primary settling tank.	6	practice	6.4	TB ₁ ,CH-21&22
Module VII[8hrs.Lecture +2hrs.Practice]				
Quality and Characteristics of sewage.	2	lecture	7.1	TB ₁ ,CH-26
Preliminary, Primary, Secondary (Biological), Advanced (Tertiary) Treatment, Disposal and utilization.	4	lecture	7.2	TB ₁ ,CH-27&28
Principle of Treatment of Industrial Waste Water.	2+2	lecture + field studies	7.3	TB ₁ ,CH-32
Total (hrs)	75	THEORY-42,PRACTICE-33		

Hydrology & Water Resources Engineering

Course Title	Code	Type of course	T-P-P	Prerequisite
Hydrology & Water resources Engineering	CECC0416	Theory+ practice	2-1-0	Nil

Objective

- To develop technical skills in students to make them familiar with hydrology, hydro-meteorology, surface and subsurface water, design water resources structures, surface and subsurface water management, integrated water resources planning, Irrigation processes, flood control, and basic of hydropower generation.

Course Outcome

- To have knowledge of irrigation implementation on hydrology, water power and water quality along with acquaintance of planning, design, construction and application of irrigation/hydraulic structures in management of surface and subsurface water.

Evaluation Systems

Internal Examination	Component	% of Marks	Method of Assessment
	Internal Theory	20	Written Examination
	Internal Practice	30 (20+10)	Lab work + Learning Record
External Examination	External Theory	30	Written Examination
	External Practice	20	Lab Work
Total		100	

Course outline

Module –I: Precipitation (5Hrs)

Introduction - hydrologic cycle; water-budget equation; world water balance; applications in engineering, sources of data; forms of precipitation; characteristics of precipitation in India; measurement of precipitation; rain gauge network; mean precipitation over an area; depth area-duration relationships; maximum intensity/depth-duration-frequency relationship

Module –II: Abstraction (5Hrs)

Abstractions from precipitation - evaporation process; evaporimeters; analytical methods of evaporation estimation; reservoir evaporation and methods for its reduction; evapotranspiration; potential evapotranspiration over India; actual evapotranspiration; interception; storage; infiltration; infiltration capacity; measurement of infiltration; infiltration indices

Module -III: Runoff (6Hrs)

Runoff volume; SCS-CN method of estimating runoff volume; flow duration curve; flow-mass curve; hydrograph; factors affecting runoff hydrograph; components of hydrograph; base flow separation; effective rainfall; unit hydrograph and its uses (assumptions and construction procedure only)

Module -IV: Ground Water and Well Hydrology (6Hrs)

Forms of subsurface water; aquifers; types and its properties; geologic formations of aquifers; well hydraulics: steady state flow in wells; equilibrium equations for confined and unconfined aquifers; aquifer tests

Module-V: Water Withdrawals and Uses (4hrs)

Water for energy production; water for agriculture; water for hydroelectric generation; flood control. Analysis of surface water supply; Water requirement of crops-Crops and crop seasons in India; cropping pattern; duty and delta; Quality of irrigation water; Soil-water relationships; consumptive use; irrigation requirement; frequency of irrigation; Methods of applying water to the fields: surface; sub-surface; sprinkler and trickle / drip irrigation

Module-VI: Distribution Systems (4Hrs)

Canal systems; alignment of canals; canal losses; estimation of design discharge. Design of channels- rigid boundary channels; alluvial channels; Kennedy's and Lacey's theory of regime channels. Basics of CD works; Water logging: causes; effects and remedial measures; lining of canals; types of lining. Drainage of irrigated lands: necessity, methods.

Module -VII: PART A IRRIGATION STRUCTURES(8Hrs)

(All the topics will be through field visit, practice mode only)

- I. Regulators - Functions of cross regulators; head regulators; canal falls; aqueducts; metering flumes and canal outlets.
- II. Diversion head works- Principles and design of weirs on permeable and impermeable foundation; Khosla's theory- expressions for uplift pressure at key points ; Various corrections and their calculations for simple cases
- III. Storage works: Types of dams, design, principles of rigid gravity, stability analysis.
- IV. Spillways: Spillway types, energy dissipation.
- V. River training: Objectives of river training, methods of river training.

Practice-PART B (22 Hrs)

- 1) Design of irrigation canal using Kennedy's theory.
- 2) Design of irrigation canal using Lacey's theory.
- 3) Design of lined canal.

- 4) Fixing of L-section of the canal.
- 5) Design of tank surplus weir.
- 6) Design of vertical drop weir.
- 7) Design of Notch fall.
- 8) Design of head regulators.
- 9) Design of cross regulators.
- 10) Stability analysis of gravity dam.

Text Books:

- Engineering Hydrology – By K. Subramanya
- Irrigation Engineering and Hydraulic Structure- By S.K.Garg

Reference Books:

1. Engineering Hydrology – By Sharma and Sharma

Topic coverage and Internal Test				
	No. of Sessions (in hrs.)	Activity (lecture, tutorial, lab practice, field studies/field-trip, Workshop etc.)	Assignment (project, Assignment, field study, seminar, etc.)	Suggested Reading (Book, Video, Online source, etc.)
MODULE- I : Precipitation (5 Hrs) Introduction - hydrologic cycle, water-budget equation, world water balance, applications in engineering, sources of data. forms of precipitation, characteristics of precipitation in India, measurement of precipitation, rain gauge network, mean precipitation over an area, depth area- duration relationships, maximum intensity/depth-duration-frequency relationship,	5Hrs	CRT /Class room practice	1.1	Text Book(TB) Chapter(CH) TB ₁ CH-1&2,TB ₂ CH-7
Practice: (2hours) 1. Construction of double mass curve using EXCEL.			2hrs	
Abstraction: A Abstractions from precipitation - evaporation process, evaporimeters,	5hrs	Theory + class room	1.2	TB ₁ CH-3,TB ₂ CH-7

analytical methods of evaporation estimation, reservoir evaporation and methods for its reduction, evapotranspiration, potential evapotranspiration over India, actual evapotranspiration, interception, storage, infiltration, infiltration capacity, measurement of infiltration, infiltration indices.		practice		
Practice 4hrs 1. Determination on infiltration capacity using double ring infiltrometer.	4hrs	Practice		
Runoff: Runoff volume, SCS-CN method of estimating runoff volume, flow duration curve, flow-mass curve, hydrograph, factors affecting runoff hydrograph, components of hydrograph, base flow separation, effective rainfall, unit hydrograph and its uses (assumptions and construction procedure only)	6hrs	CRT /Class room practice	1.3	TB ₁ CH-5&6, TB2C H-7
2. Hydrograph analysis using EXCEL. 3. Preparation of stage discharge curve.	2hrs			
Site visit for CD works (aqueduct, Syphons, Outlet and Level crossing, Branch canals and lining of canals)	4hrs			
Ground water and well hydrology: Forms of subsurface water, aquifers, types and its properties, geologic formations of aquifers, well hydraulics: steady state flow in wells, equilibrium equations for confined and unconfined aquifers, aquifer tests. Radial flow into a well under confined and unconfined conditions Yield of a well.	6	CRT /Class room practice	1.4	TB ₁ CH-9, TB2CH-16
5. Design of irrigation canal using Kennedy's theory. 6. Design of irrigation canal using Lacey's theory.	4hrs			

Water withdrawals and uses (4hrs) Water for energy production, water for agriculture, water for hydroelectric generation; flood control. Analysis of surface water supply, Water requirement of crops-Crops and crop seasons in India, cropping pattern, duty and delta, Quality of irrigation water; Soil-water relationships, consumptive use, irrigation requirement, frequency of irrigation; Methods of applying water to the fields: surface, sub-surface, sprinkler and trickle / drip irrigation.	4hrs	CRT /Class room practice	1.5	TB2CH-1&2
Practice 4hours: 7. Design of lined canal 8. Fixing of L-section of the canal	2hrs			
Distribution systems: Canal systems, alignment of canals, canal losses, estimation of design discharge. Design of channels- rigid boundary channels, alluvial channels, Kennedy's and Lacey's theory of regime channels. Basics of CD works, Water logging: causes, effects and remedial measures. lining of canals, types of lining. Drainage of irrigated lands: necessity, methods.	4Hrs	Lecture	1.6	TB2CH-4&5
9.Design of tank surplus weir. 10.Design of vertical drop weir.	4Hrs	Practice		
Diversion head works- Principles and design of weirs on permeable and impermeable foundation, Khosla's theory- expressions for uplift pressure at key points - Various corrections and their calculations for simple cases.	4Hrs	Practice+Field Visit		
Practice 11. Design of Notch fall. 12. Design of a spur	2Hrs			
Storage works: Types of dams, design, principles of rigid gravity, stability analysis. Spillways: Spillway types, energy dissipation. River training: Objectives of river training, methods of river training construction				TB2CH-9

Practice 13. Design of head regulators. 14. Design of cross regulators. 15. Stability analysis of gravity dam.	4 hrs	practice		
Total	60hrs	(THEORY-30+PRACTICE-30)		

PowerPoint presentations :

Module I: gis.ess.washington.edu/grg/courses/ess326/5-Hydrology.ppt

Module I: abe-research.illinois.edu/courses/tsm352/lectures/Hydrology_Lecture01.pptx

Module I & II: https://www.zapmeta.ws/ws?q=water%20ppt%20presentation&asid=ws_gc_b5_2&mt=b&nw=g&de=c&ap=1o1

https://www.zapmeta.ws/ws?q=water%20ppt%20presentation&asid=ws_gc_b5_2&mt=b&nw=g&de=c&ap=1o1

Module I and Module II: <https://www.slideshare.net/SuryennMon/civil-vhydrology-and-irrigation-engineering-10-cv55notes>

Module III: <https://www.youtube.com/watch?v=28uGiIwwfro>

Module III: <https://www.youtube.com/watch?v=LNUoYhZ44EE>

Quality Control and Risk Management in Construction

Course Title	Code	Type of course	Credits	Prerequisite
Quality Control and Risk Management in Construction	CECC0414	Theory+ Practice	2-1-0	Nil

Objective

- To make the student realize the necessity of quality control and quality assurance in construction industry.
- To impart the procedures involved in maintaining quality in construction industry and various standards and practices prescribed therefor.
- To enlighten the student with the tools of total quality management process.
- To give hands on practice to the students in preparing quality assessment schedules and inspection check lists.
- To make the student to take up laboratory and field tests for quality assurance for civil engineering structures.

Course Outcome

- Generate quality control schedule for different projects in construction industry.
- Prepare quality control inspection check lists for selected civil engineering structures.
- Carryout the field and laboratory tests for quality assessment in construction industry.

Evaluation Systems

Internal Examination	Component	% of Marks	Method of Assessment
	Internal Theory	20	Written examination
	Internal Practice	30(20+10)	Lab work + Learning Record
External Examination	External Theory	30	Written examination
	External Practice	20	Lab work
Total		100	

Course outline

Module: I Principles of Quality Assessment & Quality Control (QA & QC) (Theory) (8 Hrs)

[Both Internal & External Assessment University Written Test and Sessional Tests.]

Introduction: Quality Control and Quality Assessment - Construction Quality - Purpose & Scope Definition & Evolution of Quality. Factors influencing Construction Quality QualityCircle.Establishing QC Requirements - Setting up a Quality Management System - Total Quality Management - Deming's PDSA Quality Cycle, Juran's Quality Triangle & Triple Role models.Concept of Quality ISO Standards.QualityAudit.Construction Quality Assurance System (CONQUAS).Principles of Quality Control and Quality Assessment. Quality Management System, Quality Control Inspection Process.

Quality Assurance & Control: Objective, Regularity Agent - Owner, Contract and Construction Oriented Objectives & Methods. Techniques and Needs of QA / QC.

Module: II Method Statement and Quality Inspection Schedule (Theory & Class Room Practice)

[Internal & External Assessment.] (8 Hrs)

Method Statement - Importance and Purpose - Contents of Method Statement.

Practice Session on preparation of Method Statement for given Structure (Buildings, Irrigation Structures and Highway Projects).

Quality Inspection Schedule and importance - General Phases of Inspection Schedule for different Construction Projects - Conventional Residential Building, Multi- storied Buildings, Highway Projects - Concrete Roads, Bituminous Pavements, Elevated and, Ground and Underground Water Tanks,

Practice Session on developing Quality Inspection Schedule for given Structure (Buildings, Irrigation Structures and Highway Projects).

Module:III Quality Assessment (QA) Inspection Check Lists (Theory & Class Room Practice) [Internal & External Assessment.] (8 Hrs)

Study of Quality Inspection Check Lists for various construction activities and their importance - Contents to be included - Some Standard Check Lists. Check list for Design Standards and design processes.

Module:IV (12Hrs)

Practice Session on selection of Quality Inspection check lists for given Structure (Buildings, Irrigation Structures and Highway Projects) as per identified Schedule.

Practice Session on selection of Quality Inspection check lists for given Structure (Buildings, Irrigation Structures and Highway Projects) as per identified Schedule.

Module: V Post Construction QA (Field Practice) [Internal & External Practice Assessment. No written university examination.](8 Hrs)

Study of field tests for Quality Assurance. Study of QC standards for various construction equipment including Concrete batch mixing / Bitumen batch mixing equipment.

Practice Session on Rebound Hammer Test, Ultrasonic Pulse Velocity Test and Core Sampling.

Module: VI Risk Involved in Construction Industry (Class Room & Field Practice) [Internal & External Practice Assessment. No written university examination.] (8 Hrs)

Introduction - Definition and Importance of Risk Management studies - Uncertainty Matrix - Importance of Risk Management - Risk Classification and Risk Management Process - Risk causation theories - Risk Identification Process - Preliminary Check List, Risk Events Consequences Scenario - Risk Mapping and Risk Classification - Risk Analysis.

Module: VII Safety Procedures in Construction Industry (Class Room & Field Practice) [Internal & External Practice Assessment. No written university examination.](8 Hrs)

Evaluation of Safety Project - Accident causation Theories, Foundations of a Major Injury - Unsafe Conditions and Unsafe Acts. Health and Safety Act and Regulations - Building & Other Construction Workers - Regulation of Employment and Condition of Services Act, 1996, Central Rules 1998.

Safety & Health Management System: Appraisal of construction safety management guidelines in Construction Sector - Safety Policy & Organization. Fire Prevention for different types of buildings Safety precautions in Construction activities, Construction equipment usage.

Reference

1. Quality Control in Construction Industry
2. SDGC Contractor QC Plan Template
3. Common Mistakes in Construction Phase
4. Quality Control Process
5. Concrete Distress
6. Construction QC Inspection Report
7. Durability & Deterioration of Concrete
8. Health Assessment of RC Structures
9. Quality Inspection & Control
10. IS Code- irc.gov.in.sp.011.1984

11. QA & QC Manual Dept of WS & Sanitation – Punjab

Session Plan

Topic coverage and Internal Test	No. of Sessions (in hrs.)	Activity (lecture, tutorial, lab practice, field studies/field-trip, Workshop etc.)	Assignment (project, Assignment, field study, seminar, etc.)	Suggested Reading (Book, Video, Online source, etc.)
Module I				
<p>Introduction: Quality Control and Quality Assessment - Construction Quality - Purpose & Scope Definition & Evolution of Quality. Factors influencing Construction Quality Circle.</p>	2	lecture	1.1	Handouts
<p>Establishing QC Requirements - Setting up a Quality Management System - Total Quality Management - Deming's PDSA Quality Cycle, Juran's Quality Triangle & Triple Role models. Concept of Quality ISO Standards. Quality Audit.</p>	2	lecture	1.2	Handouts
<p>Quality Audit. Construction Quality Assurance System (CONQUAS). Principles of Quality Control and Quality Assessment.</p>	2	lecture	1.3	Handouts

Quality Management System, Quality Control Inspection Process.				
Quality Assurance & Control: Objective, Regularity Agent - Owner, Contract and Construction Oriented Objectives & Methods. Techniques and Needs of QA / QC.	2	lecture	1.4	Handouts
Sub-total (hrs)	08			
Module II				
Practice Session 1 on Quality Control Testing Procedure & Quality Control Schedule preparation	2	practice	2.1	Handouts
Practice Session 2 on Generation of sample Quality Control inspection Check list for Design Standards and design processes	2	practice	2.2	Handouts
Practice Session 3 on Generation of sample Quality Control Inspection schedule Check list for form work for a Building / Irrigation Structure.	2	practice	2.3	Handouts
Practice Session 4 on Generation of sample	2	practice	2.4	Handouts

Quality Control Inspection schedule Check list for concreting in a Residential building / Irrigation Structure/ Highway Projects.				
Sub-total (hrs)	08			
Module III				
Study of Quality Inspection Check Lists for various construction activities and their importance - Contents to be included - Some Standard Check Lists. Check list for Design Standards and design processes.	2	practice	3.1	Handouts
Practice Session on selection of Quality Inspection check lists for given Structure (Buildings, Irrigation Structures and Highway Projects) as per identified Schedule.	3	practice, field studies	field study	Handouts
Practice Session on selection of Quality Inspection check lists for given Structure (Buildings, Irrigation Structures and Highway Projects) as per identified Schedule.	3	practice, field studies	field study	Handouts
Sub-total (hrs)	08			
Module IV				
Importance of Quality Assessment for Materials used in construction Industry and their	1	lecture	4.1	Handouts

procurement.				
Study of laboratory tests for Quality Assurance. Quality Assessment Testing Procedure (Laboratory Tests) - IS Codes for Testing of Materials and Concrete.	4	practice	4.2	Handouts& IS Codes
Quality Assessment Schedule preparation for Laboratory Tests. Check Lists for Quality Control Testing Procedure & Practice.	2	practice	4.3	Handouts& IS Codes
Practice Session on Material Testing and Testing of Concrete for Quality Assessment.	5	practice	4.4	Handouts& IS Codes
Sub-total (hrs)	12			
Module V				
Study of field tests for Quality Assurance. Study of QC standards for various construction equipment including Concrete batch mixing / Bitumen batch mixing equipment Practice Sessions on laboratory tests, field tests and Field Visits	4	practice, field studies	field study	Handouts& IS Codes
Practice Session on Rebound Hammer Test, Ultrasonic Pulse Velocity Test and Core Sampling.	4	practice, field studies	field study	Handouts& IS Codes
Sub-total (hrs)	08			

Module VI				
Introduction - Definition and Importance of Risk Management studies - Uncertainty Matrix - Importance of Risk Management -	4	lecture	6.1	Handouts& IS Codes
Risk Classification and Risk Management Process - Risk causation theories - Risk Identification Process - Preliminary Check List, Risk Events Consequences Scenario - Risk Mapping and Risk Classification - Risk Analysis.	4	lecture	6.2	Handouts& IS Codes
Sub-total (hrs)	08			
Module VII				
Evaluation of Safety Project - Accident causation Theories, Foundations of a Major Injury - Unsafe Conditions and Unsafe Acts. Health and Safety Act and Regulations - Building & Other Construction Workers - Regulation of Employment and Condition of Services Act, 1996, Central Rules 1998.	2	lecture	7.1	Handouts& IS Codes
Safety & Health Management System: Appraisal of construction safety management guidelines in Construction Sector - Safety Policy & Organization. Fire Prevention for different types of buildings	2	practice, field studies	field study	Handouts& IS Codes

Safety precautions in Construction activities, Construction equipment usage. Safety Practices for material handling, Safety Practices for Equipment Operation - Material safety Data Sheets				
Study of Safety Provisions for selected organizations - National Power Corporation of India Limited, Atomic Energy Regulation Board, NTPC, Godrej & Boyce. Visit to a project site visit for observing and noting the safety provisions adopted.	2	practice, field studies	field study	Handouts& IS Codes
Sub-total (hrs)	08			
Total (hrs)	60			

Computer Aided Design of Steel Structures

Course Title	Course Code	Type of Course	T-P-PJ	Pre-Requisite
Computer aided design of Steel structures	CECC0407	Theory+ Practice	2-1-0	Nil

Objective

- To teach the basic fundamental behavior of different section of steel structure used in construction by using software

Course Outcome

- After completion of the courses the students will gain knowledge of Steel design calculation with relevant Indian Standards
- Students will develop skill of converting clients requirement to structural drawing by using STAAD.Pro

Evaluation Systems

Internal Examination	Component	% of Marks	Method of Assessment
	Internal Theory	20	Written Examination
	Internal Practice	30 (20+10)	Lab Work + Learning Record
External Examination	External Theory	30	Written Examination
	External Practice	20	Lab Work
Total marks		100	

Course Outline

Module I: PLASTIC ANALYSIS (7Hours)

Theory

Plastic section modulus; load factor; shape factor; plastic moment of resistance; upper bound theorem and lower bound theorem

Practice

Tensile test of Mild steel specimen to know elastic and plastic failure region in UTM

Module II: FAILURE MECHANISM OF BEAMS AND PORTAL FRAMES (10Hrs)

Theory

Plastic analysis of fixed beam; continuous beam and simple rectangular portals

Practice

1. Failure mechanism of simply supported and cantilever beams with concentrated loads or uniformly distributed load
2. Failure mechanism of portal frames and simple truss with concentrated loads or uniformly distributed load

Module III: DESIGN OF BRACED AND UN-BRACED INDUSTRIAL BUILDING USING STAAD. Pro (13Hrs)

Theory

Different types of Industrial Floors; Different types of bolts and welds; their design strength calculation; design of tension members; design of beams and design of purlin

Practice

3. Design of bolts and welding
4. Design of beam- column and column–slab by welded and bolted joints
5. Design of tension members

Module IV: DESIGN OF COLUMN (8Hrs)

Theory

Design of Short and long Columns; design of laced and battened column

Practice

6. Design of short and long column
7. Design of lacing and battening column

Module V: DESIGN OF PLATE AND GANTRY GIRDERS (8Hrs)

Theory

Introduction; weight and economical depth; design of plate girders; splices; stiffeners; riveted / bolted and welded connections; HSF bolts ;design of gantry girder and application

Practice

8. Design of plate girder
9. Design of gantry girder

Module VI: DESIGN OF TRANSMISSION AND COMMUNICATION TOWER USING STAAD. Pro (10 HRS)

Theory

Classification of different types of towers; design for wind action; wind load calculation; design of transmission tower; design of a communication tower and design of purlin

Practice

10. Design of Transmission Tower
11. Design of Communication Tower
12. Design of roof truss Purlin

Module VII: DESIGN OF COLUMN BASE USING STAAD.Pro (8HRS)

Theory

Design of slab base and design of gusseted base;

Practice

13. Design of slab base
14. Design of gusseted base

Text Books

15. S K Duggal, " Designing of steel structures",2012.
16. S. Ramamurtham and R. Narayan, " Design of steel structures" ,2014

References

Steel Table by R. Agor

Online Resources

NPTEL

Session Plan

Topics	No. of Sessions	Activity	Assignment	Suggested
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	(in hrs)			Reading
Module I[5 Hours Lecture+2 Hours Practice]				
PLASTIC ANALYSIS Plastic section modulus, Load factor, shape factor	1	Lecture	1.1	Text Book(TB)- 2 Chapter(Ch)-8
plastic moment of resistance, upper bound theorem	2	Lecture + Practice	1.2	TB-2, Ch8
lower bound theorem	2	Lecture + Practice	1.3	TB-2, Ch8
Tensile test of Mild steel specimen to know elastic and plastic failure region in UTM	2	Practice		
Module II [6 Hours Lecture+4 Hours Practice]				
FAILURE MECHANISM OF BEAMS AND PORTAL FRAMES		Lecture	2.1-2.5	TB-1(Ch-17) TB -2(Ch-8)
Plastic analysis of fixed beam	2			
Plastic analysis of continuous beam	2	Lecture		TB-1(Ch-17) TB -2(Ch-8)
Plastic analysis of simple rectangular portal	2	Lecture		TB-1(Ch-17) TB -2(Ch-8)
Failure mechanism of simply supported and cantilever beams with concentrated loads or uniformly distributed load	2	Lecture+ Practice		TB-1(Ch-17) TB -2(Ch-8)
Failure mechanism of portal frames and simple truss with concentrated loads or uniformly distributed load	2	Lecture+ Practice		TB-1(Ch-17) TB -2(Ch-8)
Module III[7 Hour Lecture+6 Hour Practice]				
DESIGN OF BRACED AND UN-BRACED INDUSTRIAL BUILDING USING STAAD. Pro				
Different types of Industrial Floors	1	Lecture		

Different types of bolts and their strength calculation	2	Lecture+ Practice	3.1	TB-1(Ch-2) TB -2(Ch-4)
Different types of welds and their strength calculation	2	Lecture+ Practice	3.2	TB-1(Ch-3) TB -2(Ch-5)
Design of Tension Members	2	Lecture+ Practice	3.3-3.4	TB-1(Ch-6) TB -2(Ch-6) Reference 1
Design of Beams	4	Lecture+ Practice		TB-1(Ch-6) TB -2(Ch-6) Reference 1
Design of Purlin	2	Lecture+ Practice	3.5	TB-1(Ch-7) TB -2(Ch-9) Reference 1
ModuleIV[4 Hour Lecture+4 Hour Practice]				
DESIGN OF COLUMN Design of Short and long Columns				
Design of lacing and battening column	4	Lecture+ Practice		TB -2(Ch-7) TB -2(Ch-7)
Module V [4 Hour Lecture+4 Hour Practice]				
DESIGN OF COLUMN BASE PLATES AND GANTRY GIRDERS Analysis for Lateral Load and Load combination for design	1	Lecture		TB -2(Ch-11)
Lateral Load Resisting Systems for gantry girder	1	Lecture		TB -2(Ch-11)
Design Column base plates and anchor bolts	2	Lecture+ Practice	5.1-5.2	TB -2(Ch-11)
Design of gantry girder	4	Lecture+ Practice		TB -2(Ch-11)
Module VI [6 Hours Lecture+4 Hours Practice]				
DESIGN OF TRANSMISSION AND COMMUNICATION TOWER USING STAAD. Pro	1	Lecture		

Classification of different types of Towers				
Design for wind action and wind load calculation	1	Lecture	6.1	TB1(Ch-13)
Design of transmission tower	4	Lecture+ Practice	6.2-6.3	Online Sources
Design of communication tower	4	Lecture+ Practice		Online Sources
Module VII[2 Hours Lecture+2 Hours Practice]				
DESIGN OF SLAB BASE USING STAAD. Pro				TB-1(Ch-5) TB -2(Ch7) Reference 1
Design of slab base	2	Lecture+ Practice	7.1-7.2	
Design of gusseted base	2	Lecture+ Practice		TB-1(Ch-5) TB -2(Ch7) Reference 1
Total (Hours)	60	(32 Hours Theory+28 Hours Practice)		

Computer Aided Design of Concrete Structure

Course Title	Code	Type of course	T-P-P	Prerequisite
Computer Aided Design of Concrete Structures	CECC0408	Theory+ Practice	2-1-0	Nil

Objective

- To teach the basic theoretical aspects and contemporary issues in the design and fabrication of reinforced concrete members.

Course Outcome

- To gain the knowledge of RCC design calculation with relevant Indian Standards
- To acquire skill of converting clients requirement to structural drawing and BOM by using STAAD PRO.

Evaluation Systems

Internal Examination	Component	% of Marks	Method of Assessment
	Internal Theory	20	Written Examination

	Internal Practice	30 (20+10)	Lab work + Learning Record
External Examination	External Theory	30	Written Examination
	External Practice	20	Lab Work
Total		100	

Course Outline

Module-I: Design & Detailing of Multi-Storied Building Using STAAD PRO(14Hrs)

Practice Sessions:

1. Design detailing of rectangular beam, 'T' and 'L' beam, Design of lintel and sunshades
2. Design detailing of Slabs: Design and detailing of one way and two way slabs, circular slab

Module-II: Analysis and Design of long column (14Hrs)

Practice Sessions:

3. Design detailing of Columns: Short and long columns, axial and eccentrically loaded columns

Module-III: Analysis and Design of Short column (08Hrs)

4. Design detailing of short columns uniaxial-bending
5. Design for torsion, bond and Shear.

Module-IV: Matrix Methods for structural analysis of Trusses and Beam(10Hrs)

Basic concepts of Matrix methods of structural analysis: Flexibility and Stiffness method application to simple trusses and beams

Module-V: Matrix Methods for structural analysis of Trusses and Beam using STAAD Pro (6 Hrs)

6. Matrix method analysis of beams and trusses by STAAD.PRO

Module –VI: Influence Line Diagram of determinate beams (10Hrs)

ILD for simply supported, cantilever and overhanging beams; max BM and SF due to moving loads, Graphical representation of

Practice Sessions:

7. ILD for simply supported beams
8. ILD For cantilever beam

Module-VII: Influence Line Diagram of indeterminate beams(8Hrs)

9. ILD for continuous beam
10. ILD for three hinged arches

Text Books:

- a) Reinforced Design by DevdasMenon
- b) Structural Analysis by R.C Hibbeler
- c) Reinforced Concrete design-S. N. Sihna. Tata McGraw-Hill, New Delhi
- d) Structural analysis vol-1:S.S.Bhavikatti; Vikas Publication house

Online Source:

<https://www.youtube.com/watch?v=8ATp13mOhvg&list=PL51300B0778FB5784&index=24>

<https://www.youtube.com/watch?v=SVC2BeqRKG>

<https://www.youtube.com/watch?v=No71m0oJ6DM>

Session Plan

Topic coverage and Internal Test	No. of Sessions (in hrs.)	Activity (lecture, tutorial, lab practice, field studies/field-trip, Workshop etc.)	Assignment (Project, assignment, field study, seminar, etc.)	Suggested Reading (Book, Video, Online source, etc.)
Module I[6HoursTheory+4Hours Practice]				
DESIGN& DETAILING OF MULTI-STORIED BUILDING USING STAAD PRO Design detailing of rectangular beam	2+0=2	lecture	1.1	Text Book(TB) Chapter (CH)
Design detailing of T' and 'L' beam	2+0=2	lecture	1.2	TB1 CH1
Design of lintel and sunshades	1+1=2	lecture	1.3	TB1 CH1
Design detailing of rectangular beam, 'T' and 'L' beam	0+2=2	practice	1.3	Video
Design and detailing of one way and two way slabs	1+1=2	Lecture+ practice	1.4	TB1 CH2
Sub-Total (hrs)	6+4=10			
Module II[8Hours Theory+6Hours Practice]				
ANALYSIS AND DESIGN OF LONG COLUMN Design detailing of Short and long columns axial and eccentrically loaded columns	4+2=6	Lecture+ practice	2.1	TB2 CH3
Design detailing axial and eccentrically loaded columns	4+2=6	Lecture+ practice	2.2	TB2 CH3

Sub-Total (hrs)	8+4=12			
Module III[4Hours Theory+4Hours Practice]				
ANALYSIS AND DESIGN OF SHORT COLUMN Design detailing of short columns uniaxial-bending	2+2=4	Lecture+ practice	3.1	TB2 CH3
Design for torsion, bond and Shear	2+2=4	Lecture+ practice	3.2	TB2 CH3
Module IV[1HoursTheory+5Hours Practice]				
MATRIX METHODS FOR		Lecture	4.1	TB2 CH1
matrix methods for structural analysis of trusses and beam	2+2=4	Practice	4.2	TB2 CH1
matrix methods for structural analysis of trusses and beam	2+2=4	Practice	4.3	TB2 CH1
Module V[2HoursTheory+2Hours Practice]				
Matrix Methods for structural analysis of Trusses and Beam using STAAD Pro Max BM and SF due to moving loads	1+1=2	Lecture+ Practice	5.1	TB3 CH5
Suspension Bridges with Three- hinged arch; analysis for static loads; BM diagrams: influence line diagrams	1+1=2	Lecture+ Practice	5.2	TB3 CH5
Module VI[4HoursTheory+4Hours Practice]				
Influence Line Diagram of determinate beams		Lecture+ practice		TB3 CH5
ILD for simply supported beams	2+2=4	Lecture+ practice	6.1	TB3 CH5

ILD For cantilever beam	2+2=4	Lecture+ practice	6.2	TB3 CH5
Sub-Total (hrs)	4+4=8hrs			
Module VII[2HoursTheory+2Hours Practice]				
Influence Line Diagram of indeterminate beams				
ILD for continuous beam	3+2	Lecture+ practice	7.1	TB3 CH5
ILD for three hinged arches	3+2	Lecture+ practice	7.2	TB3 CH5
Total (hrs)	60Hrs	(30Theor y+30 Practice)		

GIS and Digital Cartography

Course Title	Code	Type of course	T-P-PJ	Prerequisite
GIS and Digital Cartography	CECC0413	Theory + Practice	2-2-0	Nil

Objective

<ul style="list-style-type: none"> • To study the basic concepts of GIS. • To study the data structure in GIS • To study data conversion in GIS and Meta data • To know the basics, importance, and methods of Cartography • To study the various maps projection and co-ordinate systems.

Course Outcome

<p>At the end of this course the students will be able to:</p> <ul style="list-style-type: none"> • To understand the structure of spatial data including file associations, attribute tables, Metadata, coordinate systems, and projections. • To develop software skills in programs used for map production in the modern cartographic workflow. • To learn the fundamental concepts of Cartography and its advancements as Digital Cartography. The engineers will be enabling to different aspects of Map Making, Generalization, Map Production and Map Reproduction

Evaluation Systems

Internal Examination	Component	% of Marks	Method of Assessment
	Internal Theory	20	Written examination
	Internal Practice	30(20+10)	Lab work + Learning Record
External Examination	External Theory	30	Written examination
	External Practice	20	Lab work
Total		<i>100</i>	

Course outline

Module – I: BASICS OF GIS(7Hrs)

Introduction; concepts, Information system, components of GIS, History, Geospatial data architecture; Operations, Input data for GIS, display, types of output products. GIS categories; Level and scale of Measurement, importance of data quality.

Practice:

Introduction to GIS (Overview, Features, About the software, Main user interface, Main menu-Project menu; Layer menu; View menu; Bookmarks menu; Plug-ins menu; Help menu, Toolbar, Legend window, Preview map, add data to the map area, Opening and saving projects)

Building a catalog of geographic data (Arc Catalog, folder connection, inside the catalog, folder location, create a working copy of the data, connect directly to your copy of the data, and remove folders that do not need)

Module – II: DATA ANALYSIS TOOLS(12Hrs)

The Spatial Analyst Extension and Model Builder; Metadata, Geo-referencing, Geocoding, Network Analyst; Interpolation and Surface Modeling, Interpolation Methods, The Geodatabase , Building a Geodatabase.

Practice:

Exploring data and adding it to a map (The Contents tab, Explore the contents of the Yellowstone folder, The Preview tab, Yellowstone data in Geography view, Explore the contents of a table, The Metadata tab, add a layer to a map, import metadata, Search for items, map compose)

Managing a dataset (Define a shape file's coordinate system, modify attributes in database tables, calculate attribute values in ArcMap, Update the table's metadata, create a layer using the related attributes, Add the vegetation type layer to the map)

ArcGIS Graphics language (generalization, symbology, and colour effect, change symbology and use transparency in creative ways)

Module - III: SPATIAL DATA ANALYSIS(16Hrs)

Spatial interpolation; measurement and analysis methods, reclassification techniques; Buffer analysis, overlay analysis, Vector overlay analysis, Topological overlay, raster over lay analysis, measurement of length, perimeter and area, queries; 2D to 3 D conversion, DTM and DEM, advantages and disadvantages, Network modeling.

Practice:

Projection (Understanding of projection and coordinate system, projecting a dataset, adding projected dataset into the map, define a projection to the layer)

Georeferencing (Basic of georeferencing, Georeferencing a Scanned Image, Assign Projection to the Referenced Image)

Topology (Concept of topology, topology in different GIS format, Coverage, shapefile, DXF-Drawing Exchange File, Geodatabase, Topology principle, Topological Error and Correction process, creating personal Geodatabase, creating a features dataset)

Module – IV: CARTOGRAPHY(13Hrs)

History and development of Cartography; Definition, scope and concepts of cartography., Characteristics of Map; Categories of maps, Methods of mapping, relief maps, thematic maps. Trends in Cartography.

Practice:

Feature Dataset and Domain (Creating Feature Classes within the Feature Dataset, Creating Domain for the Feature Datasets, Digitizing the Feature Classes, Creating Topology in Arc Catalog, Viewing and Editing the Topology).

Google Earth (Introduction to Google Earth, Convert Shape file to KML Format, Extract data From Google Earth, Extract Point Data, Extract Polygon data, Extract line data, Convert KML File to shape file, overlaying an image into google earth)

Module – V: EARTH MAP RELATION(11Hrs)

Geodesy; Map projection, classification principles of construction of common projections, cylindrical, conical, azimuthal and globular projections. Properties & uses of projection. The spheroid, Map scale, and co-ordinate system. Plane co-ordinates in UTM system, projection used in Survey of India topographic sheets.

Practice:

Buffering and Editing tools: (Buffering in ArcGIS, add the data layer, create the buffer, conflation, extend the line, Erase point, Flip line, Snap, trim line, Densify, create a polygon, Create point, Create polygon)

Data Conversion Tools (from Excel to Table and table to Excel, GPS-from GPX to Features, KML to layer, from PDF to TIFF, from Raster to ASCII/Float/Point/Polygon/Polyline/Video, metadata importer/exporter/translator, Export to CAD features class to coverage, table to the database, CAD to a geodatabase, DEM to raster, LAS dataset to raster, Point/line/polygon to raster, feature class to shape file)

Module – VI: GPS and DGPS(11Hrs)

GPS satellites; Introduction, components, Satellite Ranging, codes, GPS, DGPS, GPS Receiver and its Features, Receiver selection, enhancement of receiver, GPS processor Software; GPS Data, Processing of GPS data and types.

Practice:

Mapping of an area using GPS. Error of GPS, **Open Source Data;** Bhuvan (Introduction to Bhuvan web portal, types of data available with Bhuvan, create an account on Bhuvan, Download data)

Model – VII: Total Station (TS)(20Hrs)

Basic concept ; Contouring of an area using TS, Layout of different structures, Demarcation of an area according to the cadastral map, Locating different objects in the map.

Practice:

1. Contouring
2. Layout of building
3. Demarcation of plot
4. Locating different permanent objects

Text Books

1. Burrough P.A., Principles of Geographical Information System for Land Resources Assessment, Oxford Publications, 1980.
2. A.M. Chandra and S.K. Ghosh 2000. Remote Sensing and GIS. Narosa Publishing House, New Delhi.
3. Paul A. Longley, Micheal F. Goodchild, David J. Magaine David J. Magaine, David W Rhind. Geographical Information System. Vol. I & II, John wiley& Sons. Inc.,1999
4. Kang-tsung Chang, Introduction to Geographical Information System, Fourth Edition, Tata McGraw Hill, 2008.
5. Anji Reddy .M, “*Textbook of Remote Sensing and Geographical Information Systems*”, BS Publications, Hyderabad. 2011. ISBN: 81-7800-112-8.

Session Plan

<i>Topic coverage and Internal Test</i>	<i>No. of Sessions (in hrs.)</i>	<i>Activity (lecture, tutorial, lab practice. etc)</i>	<i>A (project , A, seminar , etc.)</i>	<i>Suggested Reading (Book, Video, Online source, etc.)</i>
Module-I				
Introduction, concepts , Information system , components of GIS, History, Geospatial data architecture, Operations, Geographic co-ordinate systems	1	<i>Lecture</i>	<i>1.1</i>	TB:4,CH:1
Map projections, concepts, In-put data for GIS, display, types of output products.	1	<i>Lecture</i>	<i>1.2</i>	TB:4,CH:2
Level and scale of Measurement, importance of data quality.	1	<i>Lecture</i>	<i>1.3</i>	TB:4,CH:1
Practice				
Introduction to GIS (Overview, Features, About the software, Main user interface, Main menu-Project menu; Layer menu View menu; Bookmarks menu; Plug-ins menu; Help menu, Toolbar, Legend window, Preview map, add data to the map area, Opening and saving projects)	2	<i>Lab Practice</i>		https://www.youtube.com/watch?v=3BkaazSVIb https://www.youtube.com/watch?v=irs-1nEsDYQ
Building a catalog of geographic data (Arc Catalog, folder connection, inside the catalog, folder location, create a working copy of the data, connect directly to your copy of the data, and remove folders that do not need)	2	<i>Lab Practice</i>		https://www.youtube.com/watch?v=3BkaazSVIb TB:4,CH:1
Module-II				
GIS data types, data Representation, Data sources, typical GIS data sets, Data	2	<i>Lecture</i>	2.1	TB:4,CH:1 &

Acquisition, vector data model				3
topology, topology rules, Non topological vector data, object based vector data model, relationship between classes	1	<i>Lecture</i>	2.2	TB:4,CH:8
Data structure, data verification and editing spatial data models and errors – GIS database, attribute data input and management.	1	<i>Lecture</i>	2.3	TB:4,CH:9
Practice				
Exploring data and adding it to a map (The Contents tab, Explore the contents of the Yellowstone folder, The Preview tab, Yellowstone data in Geography view, Explore the contents of a table, The Metadata tab, add a layer to a map, import metadata, Search for items, map compose)	2	<i>Lab Practice</i>		https://www.youtube.com/watch?v=3BkaazSVIbI https://www.youtube.com/watch?v=RQ1Xs1D5oUU
Managing a dataset (Define a shape file's coordinate system, modify attributes in database tables, calculate attribute values in ArcMap, Update the table's metadata, create a layer using the related attributes, Add the vegetation type layer to the map)	2	<i>Lab Practice</i>		https://www.youtube.com/watch?v=PHtxbpboDro https://www.youtube.com/watch?v=cv6ltuMpnYM
ArcGIS Graphics language (generalization, symbology, and coloureffect, change symbology and use transparency in creative ways)	4	<i>Lab Practice</i>		https://www.youtube.com/watch?v=w7G3SF4doVg
Module-III				
Raster data – elements of data model, cell, value, data structure, cell by cell encoding	2	<i>Lecture</i>	3.1	TB:4,CH:5

Run length encoding, Quad tree, Header files, format	2	Lecture	3.2	TB:4,CH:1 https://www.youtube.com/watch?v=YI50cJScObI
Types of raster data, data compression, Linking and integration of vector data, Registration.	2	Lecture	3.3	TB:4,CH:1 https://www.gislounge.com/geodatabases-explored-vector-and-raster-data/
Practice				
Projection (Understanding of projection and coordinate system, projecting a dataset, adding projected dataset into the map, define a projection to the layer)	2	Lab Practice		https://www.youtube.com/watch?v=Ij6iOT11xpE https://www.youtube.com/watch?v=eFhsBHgGMIO
Georeferencing (Basic of georeferencing, Georeferencing a Scanned Image, Assign Projection to the Referenced Image)	4	Lab Practice		https://www.youtube.com/watch?v=cv6ltuMpnYM
Topology (Concept of topology, topology in different GIS format, Coverage, shapefile, DXF-Drawing Exchange File, Geodatabase, Topology principle, Topological Error and Correction process, creating personal Geodatabase, creating a features dataset)	4	Lab Practice		https://www.youtube.com/watch?v=hIDxUcG8op0 https://www.youtube.com/watch?v=DQLkdS7omcg
Module-IV				
Data format conversion, Medium	1	Lecture	4.1	TB:4,CH:9

conversion				
Spatial interpolation, measurement and analysis methods, Data accuracy and standards	2	Lecture	4.2	TB:4,CH:9
Attribute data input and Management, Relational mode-Data manipulation, classification techniques.	2	Lecture	4.3	TB:4,CH:9
Practice				
Feature Dataset and Domain (Creating Feature Classes within the Feature Dataset, Creating Domain for the Feature Datasets, Digitizing the Feature Classes, Creating Topology in Arc Catalog, Viewing and Editing the Topology).	4	Lab Practice		https://www.youtube.com/watch?v=OPv_7iZsDQQ
Google Earth (Introduction to Google Earth, Convert Shape file to KML Format, Extract data From Google Earth, Extract Point Data, Extract Polygon data, Extract line data, Convert KML File to shape file, overlaying an image into google earth)	4	Lab Practice		https://www.google.com/intl/en_in/earth/
Module-V				
Geodesy, Map projection, classification principles of construction of common projections, Cylindrical, conical, azimuthal and globular projections. Properties & uses of projection	1	Lecture	5.1	TB:4,CH:2
The spheroid, Map scale, and co-ordinate system. Plane co-ordinates in UTM system	1	Lecture	5.2	TB:4,CH:2
Projection used in Survey of India topographic sheets	1	Lecture	5.3	TB:4,CH:2
Practice				

Buffering and Editing tools: (Buffering in ArcGIS, add the data layer, create the buffer, conflation, extend the line, Erase point, Flip line, Snap, trim line, Densify, create a polygon, Create point, Create polygon)	4	<i>Lab Practice</i>		https://www.youtube.com/watch?v=7AK-jNK39Gs https://www.youtube.com/watch?v=ePScZlhE6A
Data Conversion Tools (from Excel to Table and table to Excel, GPS-from GPX to Features, KML to layer, from PDF to TIFF, from Raster to ASCII/Float/Point/Polygon/Polyline/Video, metadata importer/exporter/translator, Export to CAD features class to coverage, table to the database, CAD to a geodatabase, DEM to raster, LAS dataset to raster, Point/line/polygon to raster, feature class to shape file)	4	<i>Lab Practice</i>		https://www.youtube.com/watch?v=8tS_heOIM1U
Module - VI				
Introduction – GPS satellites – components	1	<i>Lecture</i>	6.1	https://www.maptoaster.com/maptoaster-topo-nz/articles/how-gps-works/how-gps-works.html
Satellite Ranging – codes - GPS – DGPS	1	<i>Lecture</i>	6.2	TB:4,CH:6
GPS Receiver and its Features – Receiver selection	1	<i>Lecture</i>	6.3	TB:4,CH:6
Enhancement of receiver - GPS processor Software – GPS Data	1	<i>Lecture</i>	6.4	TB:4,CH:6
Processing of GPS data and types	1	<i>Lecture</i>	6.4	TB:4,CH:6
Practice				

Mapping of area using GPS	2	<i>Lab Practice</i>		https://www.youtube.com/watch?v=i64d-pAYU0
Error of GPS, Open Source Data- Bhuvan (Introduction to Bhuvan web portal, types of data available with Bhuvan, create an account on Bhuvan, Download data)	4	<i>Lab Practice</i>		https://www.youtube.com/watch?v=Op6Rzx5RftA
Module - VII				
Contouring of an area using TS	1	<i>Lecture</i>	7.1	https://www.slideshare.net/iaeme/experience-on-using-total-station-surveying-for-mapping-and-contouring
Layout of different structures	1	<i>Lecture</i>	7.2	https://www.youtube.com/watch?v=LBUdvH9wvRI
Demarcation of an area according to the cadastral map	1	<i>Lecture</i>	7.3	https://www.youtube.com/watch?v=wf6rCktLqYU
Locating different objects in the map	1	<i>Lecture</i>	7.4	
Practice				
Contouring	4	<i>Lab Practice</i>		https://www.youtube.com/watch?v=d_DoEB4zWEQ
Layout of building	4	<i>Lab Practice</i>		https://www.youtube.com/watch?v=d_DoEB4z

				WEQ
Demarcation of plot	4	<i>Lab Practice</i>		https://www.youtube.com/watch?v=d_DoEB4zWEQ
Locating different permanent objects	4	<i>Lab Practice</i>		https://www.youtube.com/watch?v=d_DoEB4zWEQ
Total(hrs.)	90	(30 Theory+60 Practice)		

Strength of Materials

Course Title	Code	Type of course	T-P-PJ	Prerequisite
Strength of Materials	CECC0411	Theory + Practice	1-2-0	Engineering Mechanics

Objective

- To teach the students on basic theories behind mechanics of solids
- To educate the students on using ANSYS for analysis of various mechanical structures and load transmitting elements

Course Outcome

- Students will have knowledge and practical engineering skills in analysis of mechanical strength of structures and load transmission elements and will be able to design them based on input data
- Students will be able to deploy ANSYS to develop mechanical design solutions

Evaluation Systems

Evaluation	Component	Marks	Method of Evaluation
Internal Evaluation	Internal Theory	20	Written Examination
	Internal Practice	30 (20+10)	Lab Work + Learning Record
External Evaluation	External Theory	30	Written Examination
	External Practice	20	Lab Work
Total Marks		100	

Course Outline

Module I: ANALYSIS OF BEAMS (07 Hrs)

Theory

Shear and Bending Moment in Beams: Types of Beams and Loads; Concept of Shear force; Bending moment and Sign Conventions; Relation Between Load; Shear force and Bending moment; Procedure for Drawing Shear force and Bending moment Diagrams; Point of Contra Flexure.

Practice

1. Simulation (Using ANSYS): Evaluate Shear Force and Bending Moment
2. Simulation (Using ANSYS): Beam Analysis with Point Load, UDL, UVL and Moment

Module II: STRESSES IN BEAMS**(04 Hrs)**

Theory

Simple or Pure Bending; Flexure Formula; Section Modulus; Neutral Axis; Determination of Bending Stresses; Shear Stress Distribution for Different Sections

Practice

3. Simulation (Using ANSYS): To Analyze The Bending Stress of a Cantilevered and Simply Supported Beam

<https://www.youtube.com/watch?v=ekKQvGna0ig>

Module III: DEFLECTION OF BEAMS**(05 Hrs)**

Theory

Equation of Elastic Curve; Direct Integration Method; Strain Energy Method; Castigliano's Theorem

Practice

4. Stress & Deflection Analysis of Mechanical Component (Using ANSYS)

5. Double Shear Test and Deflection Test Using UTM

Module IV: ANALYSIS OF COLUMN AND SHAFT**(06 Hrs)**

Theory

Failure of a Column; End Conditions; Euler's Critical Load for Long Columns; Rankine's Empirical Formula; Effective Length and Slenderness Ratio; Eccentric Loading and Secant Formula

Practice

6. Simulation (Using ANSYS): Buckling Analysis of a Square Column, I-Beam and RCC Beam

Module V: TORSION**(08 Hrs)**

Theory

Torsion Equation, Design of Shafts; Power Transmitted by Shafts; Composite Shafts; Combined Bending and Torsion; Closed-Coiled Helical Springs; Spring Connected in Series and Parallel

Practice

7. Simulation (Using ANSYS): Static and Dynamic Analysis of Shaft

8. Simulation (Using ANSYS): Spring Structural Analysis

9. Simulation (Using ANSYS): Stress Analysis of Suspension System

10. Stiffness Test of a Helical Spring

https://www.youtube.com/watch?v=xI-NqAKZ_60

<https://www.youtube.com/watch?v=rJ2e4DximL0>

Module VI: THEORIES OF FAILURE

(06 Hrs)

Theory

Failure Under Biaxial Loading, Rankine's Theory; Guest's or Tresca's Theory; Von Mises Theory; Graphical Representation of Failure; Safety Factors; Prevention of Failure in Design Stage; Diagnosis of Failure In Post-Manufacturing Stage

Practice

11. Simulation: Spur Gear Fatigue Analysis in Ansys

<https://www.youtube.com/watch?v=2SGqcLZISQ0>

12. Simulation: Chair Structural Analysis in ANSYS

<https://www.youtube.com/watch?v=DIII8bI-ea8>

13. Simulation(Using ANSYS): Bicycle Frame Structural Analysis

https://www.youtube.com/watch?v=p-CUK_pEfR4

Module VII: FATIGUE

(14 Hrs)

Theory

Failure under Cyclic Loading; Endurance Limit.S-N Curve; Stress Concentration; Goodman and Soderberg Criteria.

Pratice

14. Fatigue Failure Analysis(Using ANSYS)

<https://www.youtube.com/watch?v=ywDsB3umK2Y>

15. Fatigue Analysis of a Plate with Hole(Using ANSYS)

<https://www.youtube.com/watch?v=c3yM5fT5Ztc>

16. Fatigue Analysis(Using ANSYS) of Crankshaft of Two Wheeler

<https://www.youtube.com/watch?v=D0g3dpd-uYM>

Software requirement: ANSYS

Text Books:

TB 1. Rattan S.S. , Strength of materials,TataMc-Graw Hill Publication.

TB 2. Bansal R K ,Strength of materials,Laxmi Publication (P) Ltd.

Reference Books:

RB1. Boresi A.P. and Schmidt R.J., Advanced mechanics of materials, Willey India

RB2. P. Popov EgorEngineering Mechanics of Solids, Pearson publication

Online Source: YouTube, NPTEL

Session Plan

Topic coverage and Internal Test	No. of Sessions (in hrs.)	Activity (lecture, tutorial, lab practice, field studies/field-trip, Workshop etc.)	A (project, A, field study, seminar, etc.)	Suggested Reading (Book, Video, Online source, etc.)
Module-I[3hrs.Lecture+4hrs.Practice]				
Shear And Bending Moment In Beams: Types of Beams and Loads, Concept of Shear force, Bending moment and Sign Conventions	1	Theory	1.1	Text Book(TB) Chapter(Ch)1.TB ₁ ,ch-4,page-99
Relation Between Load, Shear force and Bending moment, Procedure for Drawing Shear force and Bending moment Diagrams, Point of Contra Flexure.	2	Theory	1.2	1. TB ₁ ,ch-4,page-103

Simulation (Using ANSYS): Evaluate Shear Force and Bending Moment Simulation (Using ANSYS): Beam Analysis with Point Load, UDL, UVL and Moment	4	Lab practice	1.3	
Module-II[2hrs.Lecture+2hrs.Practice]				
Stresses in beams: Simple or Pure Bending, Flexure Formula, Section Modulus, Neutral Axis, Determination Bending Stresses, Shear Stress Theory Distribution for Different Sections.	2	Theory	2.1	1. TB ₁ ,ch-5,page-129 2. https://www.youtube.com/watch?v=ekKQvGna0ig
Simulation(Using ANSYS): To Analyze The Bending Stress of a Cantilevered and Simply Supported Beam	2	Lab practice	2.2	
Module-III[1hrs.Lecture+4hrs.Practice]				
Deflection of beams: Equation of Elastic Curve, Direct Integration Method, Strain Energy Method,	1	Theory		a) TB 2 ,ch-12,page-511

Stress & Deflection Analysis of Mechanical Component(Using ANSYS) Double Shear Test and Deflection Test Using UTM	4	Lab practice	3.1	
Module-IV[2hrs.Lecture+4hrs.Practice]				
Column analysis: Failure of a Column, End Conditions, Euler's Critical Load for Long Columns, Rankine's Empirical Formula, Effective Length and Slenderness Ratio, Eccentric Loading and Secant Formula.	4	Theory	4.1	1. TB ₁ , ch-12,page-388
Simulation(Using ANSYS): Buckling Analysis of a Square Column, I-Beam and RCC Beam	2	Lab practice	4.2	
Module-V[4hrs.Lecture+4hrs.Practice]				

<p>Torsion: Torsion Equation, Design of Shafts, Power Transmitted by Shafts, Composite Shafts, Combined Bending and Torsion, Closed-Coiled Helical Springs, Spring Connected in Series and Parallel.</p>	4	Theory	5.1	<p>RB₂,ch-6,page no-200</p> <p>2.https://www.youtube.com/watch?v=rJ2e4DximL0</p> <p>3.https://www.youtube.com/watch?v=xI-NqAKZ_60</p>
<p>Simulation (Using ANSYS): Spring Structural Analysis. Stiffness Test of a Helical Spring.</p>	4	Lab practice	5.2	
<p>Module-VI[2hrs.Lecture+4hrs.Practice]</p>				

<p>Theories of failure: Failure Under Biaxial Loading, Rankine's Theory, Guest's or Tresca's Theory, Von Mises Theory, Graphical Representation of Failure, Safety Factors, Prevention of Failure in Design Stage, Diagnosis of Failure In Post-Manufacturing Stage.</p>	2	Theory	6.1	<p>TB₁, ch-3,page-91.</p> <p>2.https://www.youtube.com/watch?v=2SGqcLZISQ0</p> <p>3.https://www.youtube.com/watch?v=p-CUK_pEfR4</p> <p>4.https://www.youtube.com/watch?v=hETp6TDi7-k</p>
<p>Simulation:Spur Gear Fatigue Analysis in Ansys. Simulation(Using ANSYS): Bicycle Frame Structural Analysis</p>	4	Lab practice	6.2	
<p>Module-VII[3hrs.Lecture+8hrs.Practice]</p>				
<p>Fatigue: Failure Under Cyclic Loading, Endurance Limit. S-N Curve, Stress Concentration, Goodman and Soderberg Criteria.</p>	3	Theory	7.1	<p>RB₁,Ch-16,page no-567.</p>

Fatigue Analysis of a Plate With Hole(Using ANSYS). Fatigue Analysis(Using ANSYS) of Crankshaft of Two Wheeler	4	Lab practice	7.2	
Tensile Test, Compression Test	4	Lab practice	7.4	
Total (hrs)	47hrs	(THEORY-17+PRACTICE-30)		

Functional Planning & DPR

Course Title	Code	Type of course	T-P-PJ	Prerequisite
Functional Planning & DPR	CECC0501	Theory + Project	1-0-2	Nil

Objective

<ul style="list-style-type: none"> To enlighten the students about various building components and their nominal sizes. To make the students learn how to plan a structure meeting the functional requirements and To train the students towards preparing a Detailed Project Report (DPR) for various structures.

Course Outcome

<ul style="list-style-type: none"> After successful completion of the course the students will be able to develop a functional plan and write a DPR of various structures through project work.
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Evaluation Systems

Internal Examination	Component	% of Marks	Method of Assessment
	Internal Theory	20	Written examination

	Internal Project	25	Project Work
External Examination	External Theory	30	Written examination
	External Project	25	Project Work + Report
Total		100	

Course outline

Module-I: Introduction to Functional Planning (3 hrs)

Appraisal of various components of buildings - classification of buildings – substructure: various types of foundations; choice of types of foundations – superstructure: types of walls, flooring, doors and windows - Nominal dimensions of building components.

Module-II: Introduction to DPR (2hrs)

Guidelines for project proposal for (NeGP project); DPR for Highway projects (NHAI); DPR for Irrigation projects; JNNURM DPR toolkit; DPR for APTS; Templates for preparation of detailed project report in r/o for KIIFB Assistance.

Module-III: Detailed Functional planning for buildings other than industrial as per IS code SP 41:1987.(2 hrs)

Climatology: Climate, thermal comfort, shading devices, energy requirement for cooling and heating.

Module-IV:Heat insulation,Ventilation&Lighting (3hrs)

Introduction, terminology, requirements, heat transmission through buildings, thermal performance of buildings, orientation of buildings, building characteristics for various climates, thermal design of buildings, influence of design parameters, mechanical controls.

Ventilation: Introduction, terminology, ventilation requirements, minimum standards for ventilation, ventilation design, energy conservation in ventilating systems.

Lighting: General, illumination requirement, daylighting, daylighting analysis, supplementary artificial lighting design, artificial lighting design, energy conservation.

Module-V:Detailed Functional planning for industrial building as per IS code SP 32:1986. (3hrs)

Lighting: Introduction, illumination levels, characteristics of good lighting, daylighting, principles of daylighting design, artificial lighting, maintenance.

Ventilation: Introduction, physiological considerations, standards of temperature, control of heat, amount of ventilation required, natural ventilation, mechanical ventilation, evaporative cooling,

air conditioning, measurement of ventilation, ventilations for contaminants control, installation and operation.

Module-VI: EIA (2hours)

Checklists, Salient features, Statutory clearances, land acquisition, feasibility report, Environmental Impact analysis, Basically Cost – Benefits analysis, Investment criteria, payback period, Discounted cash flow (DCF) Technique, Net Present Worth (NPW), Benefit Cost Ratio (B C Ratio), Internal rate of return (IRR)

Module-VII: Project (30 + 30 = 60 hrs)

Project

Students to select any two projects & prepare report on FP & DPR. Any other projects as per their choice approved by course instructor can also be taken up.

List of projects

- a) Hotel buildings
- b) Hospital buildings
- c) Academic campus buildings
- d) Administrative buildings
- e) Bridges & overpasses
- f) Irrigation projects
- g) Residential buildings
- h) Shopping complex
- i) Convention centre
- j) Micro or Mini-hydel power Plant

Reference

- a) IS code SP 41:1987.
- b) IS code SP 32:1986?

E-content:

- a) Handouts
- b) Various Templates for DPR
- c) Case Studies

Online Source:

Session Plan

Topic coverage and Internal Test	No. of Sessions (in hrs.)	Activity (lecture, tutorial, lab practice, field studies / field-trip, Workshop etc.)	Assignment (project, Assignment, field study, seminar, etc.)	Suggested Reading (Book, Video, Online source, etc.)
Module I				

Introduction to Functional Appraisal of various components of buildings - classification of buildings – substructure: various types of foundations; choice of types of foundations – superstructure: types of walls, flooring, doors and windows - Nominal dimensions of building components.	2 +4	Lecture	field study	E material & Online source
Module II				
Guidelines for project proposal for (NeGP project); DPR for Highway projects (NHAI); DPR for Irrigation projects; JNNURM DPR toolkit; DPR for APTS; Templates for preparation of detailed project report in r/o for KIIFB Assistance.	2+6	Lecture+Project	Project	E material & Online source
Module III				
Detailed Functional planning for other than industrial building as per IS code SP 41:1987. Climatology: Climate, thermal comfort, shading devices, energy requirement for cooling and heating.	2+8	Lecture + Project	Class room project work	E material, Online source & I.S. Codes
Module IV				
Heat insulation: Introduction, terminology, requirements, heat transmission through buildings, thermal performance of buildings, orientation of buildings, building characteristics for various climates, thermal design of buildings, influence of design parameters, mechanical controls. Ventilation: Introduction, terminology, ventilation requirements, minimum standards for ventilation, ventilation design, energy conservation in ventilating systems.	3+ 8	Lecture + Project	Field Study	

Lighting: General, illumination requirement, daylighting, daylighting analysis, supplementary artificial lighting design, artificial lighting design, energy conservation.				
Module V				
Detailed Functional planning for industrial building as per IS code SP 32:1986. Lighting: Introduction, illumination levels, characteristics of good lighting, daylighting, principles of daylighting design, artificial lighting, maintenance. Ventilation: Introduction, physiological considerations, standards of temperature, control of heat, amount of ventilation required, natural ventilation, mechanical ventilation, evaporative cooling, air conditioning, measurement of ventilation, ventilations for contaminants control, installation and operation.	3+12	Lecture + Project	Project work at class room	E material, Online source & I.S. Codes
Module VI				
Checklists, Salient features, Statutory clearances, land acquisition, feasibility report, Environmental Impact analysis, Basically Cost – Benefits analysis, Investment criteria, payback period, Discounted cash flow (DCF) Technique, Net Present Worth (NPW), Benefit Cost Ratio (B C Ratio), Internal rate of return (IRR)	3+12	Lecture + Project	Classroom (Project work)	
Module VII				
Preparation of DPR of projects and submission	20	Project	PPT presentation	
Total (hrs)	75	[15Theory + 60Project =75]		

Domain - Construction Planning & Project Management

Course Code	Course Title	Course Nature	Credits	Prerequisite
DECP0101	Construction Equipment Management.	Theory	3	Nil
DECP0401	Site Supervision & Measurement Methods.	Theory + Practice	4	Nil
DECP0402	Geotechnical Investigations	Theory + Practice	3	Nil
DECP0403	Repairs, Renovation and Rehabilitation of Structures	Theory + Practice	3	Quality control
DECP0601	Tendering Process, Bidding Contract Agreements & Arbitration.	Practice + Project	3	Quality control and DPR
DECP0301	Software Based Project Scheduling and Management	Project	4	Nil
DEET0300	Project	Project	6	
DEET0800	Internship	Practice	4	
Total			30	

Construction Equipment Management

Course Code	Course Title	Course Type	T-P-PJ	Prerequisites
DECP0101	Construction Equipment Management	Theory	3-0-0	Nil

Course Objective:

- To enlighten the student with various equipment used in construction industry including selection criterion and economics of the same.
- To appraise the student with the aspects related to functioning, operation and maintenance of various construction equipment

Course Outcomes:

- After successful completion of the course the students will be able to identify the particular equipment to be used in the construction project they will undertake.
- Prepare plans for economic management of the equipment in the projects they undertake.

Evaluation Systems

	Component	% of Marks	Method of Assessment
Internal Examination	Internal Theory	30	Written examination
	Assignment	5	Report or Presentation + Learning Record
	Attendance	5	Based on class attended
External Examination	External Theory	60	Written examination
Total		100	

Module I (Theory) 6Hrs.

Introduction: Planning & Selection of Equipment - Equipment classification - Selection criteria & Source of Information Economics of Equipment: - Down Time Cost & Obsolescence Cost - Equipment Value, Depreciation, Owning & Operation Cost.

Module II (Theory) 4Hrs.

Time Factors & Equipment Life: Equipment Time - Down Time & Cycle Time. Equipment Life - Economic Life, Useful Life, Operating Life and Working Life Equipment Management & Procurement:

Module III (Theory) 3Hrs.

Equipment Management Check List - Equipment Order and Invoice - Equipment Maintenance sheets and Log Book.

Module IV (Theory & Field Visit) 6Hrs.

Practice based study on the functions, operational process, specifications for different constructional equipment

Road Making Equipment, Material Handling Equipment and Grading Equipment
Batching Plant, Concreting Equipment & Slip form Equipment

Module V (Theory & Field Visit) 6Hrs.

Hauling, Tunneling and other Equipment
Excavation & Embankment Making Equipment and Grading Equipment

Module VI (Theory & Field Visit) 10Hrs.

Batching & Mixing Equipment, Concreting Equipment & Slip form Equipment and Asphaltic Equipment

Material Handling Equipment and Hauling & Hoisting Equipment
Pile Driving Equipment and De-watering Equipment

Module VII (Theory) 10Hrs.

Based study & discussion on Materials Management
Basics of Materials Management
Inventory Management
MRP

Text Books:

1. Construction Equipment-James E. Russel, Prentice Hall.
2. Construction Planning and project management-Neeraj K. Jha.
3. Construction Planning and project management-U.K. Shrivastava.
4. Construction Planning and project management-P.S. Gahlot & B.M. Dhir.

Pedagogy

Sl. No.	Topic	Activity through	T
1	Introduction	L	1
2	Instructional Session 1 <ul style="list-style-type: none"> • Planning & Selection of Equipment • Equipment classification • Equipment Selection criteria & Source of Information. 	L	3
3	Instructional Session 2 <ul style="list-style-type: none"> • Economics of Equipment: - Down Time Cost & Obsolescence Cost • Equipment Value, Depreciation, Owning & Operation Cost. 	L	3
4	Instructional Session 3 <ul style="list-style-type: none"> • Time Factors & Equipment Life • Equipment Time - Down Time & Cycle Time Equipment Life of Economic Life, Useful Life, Operating Life and Working Life. • Equipment Management & Procurement 	L	4
5	Instructional Session 4 <ul style="list-style-type: none"> • Equipment Management Check List • Equipment Order and Invoice • Equipment Maintenance sheets and Log Book. 	L	3
6	Instructional Session 5 <ul style="list-style-type: none"> • Appraisal regarding Equipment for different purposes • Road Making Equipment, Material Handling Equipment and Grading Equipment • Batching Plant, Concreting Equipment & Slip form Equipment 	L & PPT	4
7	Instructional Session 6 <ul style="list-style-type: none"> • Hauling, Tunnelling and other Equipment • Equipment classification 	L & PPT	1
8	Instructional Session 7 <ul style="list-style-type: none"> • Equipment Procurement 	L & PPT	1
9	Instructional Session 8 <ul style="list-style-type: none"> • Excavation & Embankment Making Equipment and • Grading Equipment 	L & PPT	2

10	Instructional Session 9 <ul style="list-style-type: none"> • Batching & Mixing Equipment • Asphaltic Equipment 	L & PPT	2
11	Instructional Session 10 <ul style="list-style-type: none"> • Concreting Equipment & Slip form Equipment 	L & PPT	2
12	Instructional Session 11 <ul style="list-style-type: none"> • Material Handling Equipment and Hauling & Hoisting Equipment. 	L & PPT	2
13	Instructional Session 12 <ul style="list-style-type: none"> • Pile Driving Equipment and • De-watering Equipment 	L & PPT	2
14	Instructional Session 13 <ul style="list-style-type: none"> • Maintenance of construction equipment's. 	L & PPT	2
15	Instructional Session 14 <ul style="list-style-type: none"> • Construction equipment management. 	L & PPT	2
16	Instructional Session 15 <ul style="list-style-type: none"> • Basics of Materials Management 	L & PPT	2
17	Instructional Session 16 <ul style="list-style-type: none"> • Inventory Management • Basics of Materials Management • MRP 	L& PPT	2
18	Field Visit to construction site	FV, GP, RP & PPT	7
TOTAL TIME (45 HRS)			45

Site Supervision & Measurement Methods

Course Code	Course Title	Course Type	T-P-PJ	Prerequisite
DECP0401	Site Supervision & Measurement Methods	Theory + practices	2-2-0	Nil

Course Objectives:

- To provide knowledge about the buildings, bridges and culvert etc
- To make understand about the quality construction
- To make familiar with different technique of construction work
- To provide knowledge about the different component wise practical of construction works.
- To make student familiar with drawing (plans, elevations, sections, etc) for finding out the dimensions.

Course Outcome

- To know the basic knowledge of Civil Construction work, and Identify the Quantity and Quality of work.

Evaluation Systems

Internal Examination	Component	% of Marks	Method of Assessment
	Internal Theory	20	Written examination
	Internal Practice	30(20+10)	Lab work + Learning Record
External Examination	External Theory	30	Written examination
	External Practice	20	Lab work
Total		100	

Module I (5hrs)

Introduction of Site Supervision, Basic knowledge of civil construction, Type of Buildings, Structural system of Building, Principal of site selection, Site plan, Planning Regulations and Bye-Laws, Principal of Planning, Basic functional Requirements of a Building, Important of Building Component, Site investigation, Ground Techniques

Module II (10hrs)

Different Types of Tools and its use Different Equipment's (Construction, pumping, drilling, Concreting, Road making) etc, Units Conversion, measurement of the building,(Plinth area, Builtup areas, Construction area, Floor area, etc, Different types of Safety materials and its use

Module III (15Hrs)

Lay out and marking of the Building,(center line, construction line),Earth work excavation for different foundation work, Foundation (Raft foundation, Shallow foundation,Streep foundation) with RRMasonry(Straight, L,T,+ Junction),

Module IV (15Hrs)

Brick Masonry (Straight, L,T,+ Junction), R.C.C.etc..Plinth Work, Super Superstructure work, Brick Work(Header Bond,Strecher Bond, English Bond, Flemish Bond, Rat Trap Bond, Gardening Bond etc..)Pre-cast Structure, Lintel with Chaja, Different Type of Arches (Segmental Arch, Semi circle, Pointed Arch etc..)

Module V (15Hrs)

Structural Work, Steel Cutting & Bending, Different type of Stirrups, Site visit to see the Bridge work (Well Foundation with, Box Foundation etc..),

Module VI (15Hrs)

Project work for calculation to get the Volume work and Quantity of material consumed with existing structure, cost calculation,etc..

Module VII (15Hrs)

Project work for calculation to get the Volume work and Quantity of material consumed with existing structure, cost calculation,etc..

Reference Books:

1. Building Construction by Rangwala,
2. Esimating and Costing by B.N.Dutta

Pedagogy

SL. NO	Topics	Pedagogy	Instructional hrs.	
	Module: 1 (12hrs)		Theory	Practical (hrs)
1.	Introduction for site supervision,basic knowledge of construction ,type of building,principal of site	Theory	1	0
2.	Introduction for site supervision,basic knowledge of construction ,type of building,principal of site	Theory	1	0
	Different equipment's(Construction,pumping,drilling,	Theory/pract	0	2
	Different types of Safety materials and its use.	Theo/pract	0	2
	Principal of site selection, Site plan, Planning Regulations and Bye-Laws, Principal of Planning, Basic functional Requirements of Building	Theory	1	0
	Principal of site selection, Site plan, Planning Regulations and Bye-Laws, Principal of Planning, Basic functional Requirements of Building	Theory	1	0
	Measurement of the building,(Plinth area,Built-up areas, Construction area, Floor area,Carpet Areas	Practical	0	2
	Lay out and marking of the Building,(center line, construction line)	Practical	0	2
	Module: 2 (12hrs)			
	Important of Building Component, Site investigation, Ground Techniques, Different Types	Theory	1	0
	Important of Building Component, Site investigation, Ground Techniques, Different Types	Theory	1	0
	Lay out and marking of the Building,(center line, construction line),Earth work excavation for different foundation work	Practical	0	2
	Foundation (Raft foundation, Shallow foundation,Streep foundation)	Practical	0	2

	Foundation with rrmasonry(straight &l'junction) with mortar	Theory	1	0
	Foundation with rrmasonry('t'& '+' junction) with mortar and pointing	Theory	1	0
	Foundation with rrmasonry(straight &l'junction) with mortar	Practical	0	2
	Foundation with rrmasonry('t'& '+' junction) with mortar and pointing	Theory	0	2
3.			4	8
4.	Module: 3(12hrs)			
	Foundation with brick masonry(straight &l'junction) with mortar	Theory	1	0
5.	Foundation with brick masonry('t'& '+' junction) with mortar and pointing practical	Theory	1	0
	Foundation with brick masonry('t'& '+' junction) with mortar and pointing	Practical	0	2
	Foundation with brick masonry(straight &l'junction) with mortar	Practical	0	2
	Foundation with brick masonry('t'& '+' junction) with mortar and pointing	Theory	1	0
	Pear&streep foundation with rrmasonry with dry packing	Theory	1	0
	Foundation with brick masonry('t'& '+' junction) with mortar and pointing	Practical	0	2
	Pear&streep foundation with rrmasonry with dry packing	Practical	0	2
6.	Module: 4(18hrs)			
	Brick masonry with header bond with straight l',t'&+'junction	Theory	1	0
	Layout , marking for fixing of door and open	Theory	1	0
	Brick masonry with header bond with straight l',t'&+'junction	Practical	0	2
	Brick masonry with streature bond with straight l',t'&+'junction	Practical	0	2
	Brick masonry with english bond with straight l'junction	Theory	1	0
	Brick masonry with english bond with t'&+'junction	Theory	1	0

	Brick masonry with english bond with straight l'junction	Practical	0	2
	Brick masonry with english bond with t'&+'junction	Practical	0	2
	Brick masonry with flemish bond with straight l'junction	Theory	1	0
	Brick masonry with flemish bond with t'&+'junction	Theory	1	0
	Brick masonry with flemish bond with straight l'junction	Practical	0	2
	Brick masonry with flemish bond with t'&+'junction	Practical	0	2
7.	Module: 5(12hrs)			
	Brick masonry with rat trap bond with straight l't,+junction	Theory	1	0
	Plumbing,indian pan ,comord fitting for toilet,elect	Theory	1	0
	Brick masonry with rat trap bond with straight l'junction	Practical	0	2
8				
	Brick masonry with rat trap bond with t'&+'junction	Theory	1	0
	Brick masonry with arch with rat trap bond	Theory	1	0
	Brick masonry with semi circle arch with flemish	Practical	0	2
	Brick masonry with arch with rat trap bond	Practical	0	2
9.	Module: 6(12hrs)			
10	Low cost building technology with filler slab	Theory	1	0
11	Brick masonry with semi circle arch with english	Theory	1	0
	Plastering,pointing(rough, external&internal)	Practical	0	2
	Brick masonry with semi-circle arch with english bond	Practical	0	2
12	Brick masonry with pointed arch with english bond	Theory	1	0
13	Brick masonry with segmental arch with english bond	Theory	1	0
	Brick masonry with pointed arch with english	Practical	0	2
	Brick masonry with segmental arch with english bond	Practical	0	2
14	Module: 7(12hrs)			
	Project work (collecting data from existing	Theory	1	0
	Project work (collecting data from existing	Theory	1	0

	Project work (to make the drawing)	Practical	0	2
	Project work (to calculate volume of work)	Practical	0	2
	Project work (to calculate volume of work)	Theory	1	0
15	Project work (to calculate volume of work)	Theory	1	0
		Practical		2
16	Project work (to calculate volume of work)		0	
		Practical		2
17	Project work (to calculate volume of work)		0	

Geotechnical Investigations

Course Code	Course Title	Course Type	T-P-PJ	Prerequisite
DECP0402	Geotechnical Investigation	Theory+ Practice	2-1-0	Nil

Course Objectives:

- To make the student realize the importance of geotechnical investigations in construction industry.
- To enlighten the student with the subsurface geotechnical exploration methods and the processes.
- To appraise various impart the procedures of geotechnical investigations for varying soils.
- To give hands on practice to the students in carrying laboratory and field tests during the geotechnical investigation process.
- To involve the student in the boring, drilling, trial pitting and preparation of geotechnical investigation reports.

Course Outcomes:

- Plan geotechnical investigations before constructing a structure.
- Conduct the laboratory and field tests as a part of geotechnical investigations.
- Analyze the geotechnical investigation test data and prepare a report for selected categories of structures

Evaluation Systems

Internal Examination	Component	% of Marks	Method of Assessment
	Internal Theory	20	Written examination
	Internal Practice	30(20+10)	Lab work + Learning Record
External Examination	External Theory	30	Written examination
	External Practice	20	Lab work
Total		100	

Module I (06 hours)

Introduction: Importance of Geotechnical Investigations –Soil Exploration, Methods of site exploration.

Practice:

Estimation of soil parameters for foundation design-Recommendations about the allowable bearing pressure, the type of foundation or structure. Writing a detail about scope of the investigations.

+ \

Module II (13 hours)

Planning for Subsurface Exploration: Fact finding and Geological survey, Reconnaissance, Preliminary Exploration, Detailed Exploration , Planning Trial Pitting, boring and drilling, Boring of Holes-Depth of exploration, Boring Methods.

Practice:

Information Extraction from site investigation topography, Description of the proposed structure, the location & geological condition of the site.

Field Visit for observing Boring, Drilling, Probing and Trial Pitting—Preparation of Borehole Log- Details of the field exploration programme, indicating the number of the borings, their locations & depths

Module III (09 hours)

Subsurface Exploration Necessity & Objectives and Types of Subsurface Explorations. Suitability of different investigation procedures for Shallow & Deep Investigations, Soft Marine Clays & Expansive Soils and Liquefiable soils & Lateritic deposits.

Practice:

Give details of the methods of exploration-Details about the soil formation, depth of change in soil formation from ground level from the geophysical exploration data.

Module IV (08 hours)

Sampling of soils and Sample Analysis: Disturbed samples , Undisturbed samples ,Study of Testing methods (In situ tests) - Different types of samplers, Sample Sizes, equipment / apparatus for different tests and Soil Disturbance during Sampling & its effect, **Requirement of good sampling process.**

Practice:

General description of the sub-soil conditions as obtained from in-situ test, such as standard penetration test, cone test. Discussions of the results.

Module V (09 hours)

Undisturbed Sampling Techniques: Study of Standards available, relevant codes and Sampling, laboratory testing and in situ testing requirements.

Practice:

Field Visit for Undisturbed Sampling and Analysis of field test data.

Module VI (07 hours)**Practice:**

Water table location, Depth of ground water table & the changes in water levels. Finding out solution for different types of problems.

Module VII (08 hours)**Practice:**

Preparation of Geotechnical Investigation Reports for Major Projects - Dams, Hydroelectric Projects, Railway Projects, Commercial Structures, Industrial Structures, Residential Structures.

Resources List:

1. IGS-TC04-GI-Manual 2016
2. IS SP7 (NBC- 2005)
3. Site Investigation (Clayton, Matthews and Simons)
4. Writing Geotechnical Investigation Report

PEDAGOGY

Sl.No	Topic	Pedagogy	Instructional Hours	
			Theory	Practice
	Module I: Introduction: Importance of Geotechnical Investigations –Soil Exploration, Methods of site exploration.	CRT	2	
	Estimation of soil parameters for foundation design- Recommendations about the allowable bearing pressure, the type of foundation or structure. Writing a detail about scope of the investigations.	PRA		4
	Module II: Planning for Subsurface Exploration: Fact finding and Geological survey, Reconnaissance, Preliminary Exploration, Detailed Exploration	CRT	3	
	Planning Trial Pitting, boring and drilling, Boring of Holes- Depth of exploration, Boring Methods.	CRT	4	
	Information Extraction from site investigation topography, Description of the proposed structure, the location & geological condition of the site.	PRA		2
	Field Visit for observing Boring, Drilling, Probing and Trial Pitting—Preparation of Borehole Log- Details of the field exploration programme, indicating the number of the borings, their locations & depths.	PRA		4
	Module III: Subsurface Exploration Necessity & Objectives and Types of Subsurface Explorations.	CRT	3	

	Suitability of different investigation procedures for : <ul style="list-style-type: none"> • Shallow & Deep Investigations • Soft Marine Clays & Expansive Soils • Liquefiable soils & Lateritic deposits 	CRT	4	
	Give details of the methods of exploration-Details about the soil formation, depth of change in soil formation from ground level from the geophysical exploration data.			2
	Module IV : Sampling of soils and Sample Analysis: Disturbed samples , Undisturbed samples ,Study of Testing methods (In situ tests) - Different types of samplers, Sample Sizes, equipment / apparatus for different tests and Soil Disturbance during Sampling & its effect, Requirement of good sampling process.	CRT	6	
	General description of the sub-soil conditions as obtained from in-situ test, such as standard penetration test, cone test. Discussions of the results.	PRA		2
	Module V: Undisturbed Sampling Techniques: Study of Standards available, relevant codes and Sampling, laboratory testing and in situ testing requirements.	CRT	5	
	Field Visit for Undisturbed Sampling and Analysis of field test data.	PRA		4
	Module VI: Water table location, Depth of ground water table & the changes in water levels. Finding out solution for different types of problems.	CRT + PRA	3	4
	Module VII: Preparation of Geotechnical Investigation Reports for Major Projects - Dams, Hydroelectric Projects ,Railway Projects , Commercial Structures ,Industrial Structures , Residential Structures.	PRA		8
	Subtotal		30	30

Repairs, Renovation and Rehabilitation of Structures

Course Code	Course Title	Course Type	T-P-P	Prerequisite
DECP0403	Repairs, Renovation and Rehabilitation of structures	Theory+ Practice	2-1-0	Quality Control

Course Objectives

- To make the students conversant with the emerging technology involved in construction industry causes of deterioration, assessment, repair and renovation and maintenance of distressed/damaged structures and demolition procedures including various processes.
- Students shall gain knowledge about importance and methods of substrate preparation, modern repair materials, and various repair techniques repair renovation of damaged/dilapidated, corroded structures

Course Outcomes

- After successful completion of the course the students will have capability/knowledge of various important, monumental but distressed and damaged modern materials that longevities old concrete and masonry structures

Evaluation Systems

Internal Examination	Component	% of Marks	Method of Assessment
	Internal Theory	20	Written examination
	Internal Practice	30(20+10)	Lab work + Learning Record
External Examination	External Theory	30	Written examination
	External Practice	20	Lab work
Total		100	

Module I: Maintenance and Repair Strategies 4(Theory) +4 (Practice)

Introduction: concepts of durability and degradation of concrete structures - Defect identification, Types of damages of concrete/masonry structures (normal and marine environment), tests for damage evaluation.

Practice Session 1: Study session on Crack Diagnosis and its appraisal - Reasons for crack development / Crack prevention, Monitoring & Measuring Crack propagation and preparing a report on crack repairing techniques (field work)

Module II: Deterioration and distressed structures 4 (Theory) + 4 (Practice)

Deterioration of Structures, Distress in Structures, Causes and Prevention cracks, Mechanism of damage-Types of Damage, Maintenance, Repair and Rehabilitation, Facets of Maintenance, importance of Maintenance, Various aspects of Inspection, Assessment procedure for evaluating a damaged structure, causes of deterioration.

Practice Session 2 (Practice cum Project): Case Study of old building developing cracks due to Natural hazards & Renovation - Natural Hazards

Practice session 3: Damage Control & Building Performance Levels and Structural & Non-structural Performance Levels

Module III: Retrofitting 4 (Theory) + 4 (Practice)

Earthquake damages of buildings, their retrofitting, restoration, effects of earthquakes, response of buildings to earthquake motion, factors related to building damages due to earthquake, methods of seismic retrofitting, restoration of earth quake damaged structures.

Practice session 4: Seismic up gradation of structures, Rehabilitation & Retrofitting and their necessity - Leakage arrest & Water proofing and Termite treatment

Practice Session 5: Study and report preparation on strengthening of different structural elements - Columns, Beams, Slabs and Foundation treatment. Conducting non-destructive tests and preparation of reports

Module IV: Damage diagnosis and assessment 6 (Theory) +6 (Practice)

Visual inspection, Non Destructive Testing using Rebound hammer, Ultra sonic pulse velocity, Semi destructive testing, Probe test, Pull out test, Chloride penetration test, Carbonation, Sulphate attack, Carbonation depth testing, Corrosion activity measurement, Freeze-thaw re

Practice Session 6: Study and report preparation on strengthening of different structural elements - Columns, Beams, Slabs and Foundation treatment.

Practice Session 7: (Practice cum Project): Visits to different buildings in Jatni/JITM campus (or outside) and identify the repairs needed and to prepare a report repair schedule.

Module V: Modern construction materials 4 (Theory) + 4 (Practice)

Advanced Construction materials for repair, renovation and retrofitting, processes and techniques used for repairs, rehabilitation and retrofitting Construction chemicals based on nanotechnology, various types of fibre wrappings, Special concretes and mortar, concrete chemicals, special elements for accelerated strength gain, Expansive cement, polymer concrete, sulphur infiltrated concrete, Ferro cement, Fibre reinforced concrete (basic ideas only)

Practice Session 8: (site visit and submission of report): Special reflection in toilets, plumbing fittings, electrical renovations, choosing interiors, aesthetics, false ceiling, partitions etc.

Practice Session 9: Site visit to old dilapidated structures and reporting possible ameliorative measures or reporting demolition.

Module VI: Techniques for repair and renovation methods 4 (Theory) + 4 (Practice)

Grouting, guniting and shotcreting, Plate bonding, RCC Jacketing / Propping and supporting, Fiber wrap technique and Chemical and electro- chemical methods of repair, Rust eliminators, polymers coating for reinforced bars during repair, foamed concrete, Epoxy injection, Mortar repair for cracks, shoring, shuttering and underpinning.

Practice Session 9: Statutes and acts - Model Building Bye-laws, Ancient Monuments & Archeological Sites & Remains Act 2010, Permissions in Prohibited and Regulated Areas.

Module VII: Repair & Renovation of corrosion and marine structures: 4 (Theory) + 4 (Practice)

Methods of corrosion protection, corrosion inhibitors, corrosion resistant steels, coatings and cathodic protection. Engineered demolition techniques for dilapidated structures – ideas and case studies

Practice session 10: Site visit to an ancient monument and reporting possible renovative measures.

Practice Session 11: Study & Report preparation on Renovation Methodology for different elements of a Building

Text books:

1. Denison Campbell, Allen and Harold Roper, “Concrete Structures, Materials, Maintenance and Repair”, Longman Scientific and Technical UK, 1991.
2. Allen R.T. & Edwards S.C, Repair of Concrete Structures, Blakie and Sons, UK, 1987

References:

1. Shetty M.S., "Concrete Technology - Theory and Practice", S.Chand and Company, 2008.
2. Dov Kominetzky M.S., “Design and Construction Failures”, Galgotia Publications Pvt. Ltd., 2001
3. Ravishankar.K., Krishnamurthy T.S, " Structural Health Monitoring, Repair & Rehabilitation of Concrete Structures", Allied Publishers, 2004.
4. CPWD and Indian Buildings Congress, Hand book on Seismic Retrofit of Buildings, Narosa Publishers, 2008.

Special references:**Resources List**

1. Chemical Action and Strengthening
2. Condition Assessment for Repair - NDM
3. Conservation Heritage Buildings
4. CPWD Handbook on R R of RCC Buildings
5. Fundamentals of Waterproofing
6. NDT Part I - Dr. Fixit
7. NDT Part II - Dr. Fixit
8. Preservation Rehabilitation, Restoration & Reconstruction of Heritage Buildings
9. Renovation of Buildings Maintenance Management - Dr. Fixit
10. Repair Practices and Materials
11. Seismic Retrofitting
12. Waterproofing.doc

PEDAGOGY

Topic coverage and Internal Test	No. of Sessions (in hrs.)	Activity	Assignme nt/Project	Suggest ed Reading (Book, Video, Online source, etc.)
Module I				
Maintenance and Repair Strategies Introduction: concepts of durability and degradation of concrete structures - Defect identification, Types of damages of concrete/masonry structures (normal and marine environment), tests for damage evaluation	4	Theory (PPT mode)		
Practice Session 1: Study session on Crack Diagnosis and its appraisal - Reasons for crack development / Crack prevention, Monitoring & Measuring Crack propagation and preparing a report on crack repairing techniques (field work in Jatni or JITM campus)	4	Campus Building visit and submission of report		
Module II				

<p>Deterioration and distressed structures: Deterioration of Structures, Distress in Structures, Causes and Prevention cracks, Mechanism of damage-Types of Damage, Maintenance, Repair and Rehabilitation, Facets of Maintenance, importance of Maintenance, Various aspects of Inspection, Assessment procedure for evaluating a damaged structure, causes of deterioration.</p>	4	Theory (PPT mode)		
<p>Practice Session 2: (Practice cum Project): Case Study of old building developing cracks due to Natural hazards & Renovation - Natural Hazards Practice session 3: Damage Control & Building Performance Levels and Structural & Non-structural Performance Levels</p>	4	Case study, Class room Practice		
Module III				
<p>Retrofitting: Earthquake damages of buildings, their retrofitting, restoration, effects of earthquakes, response of buildings to earthquake motion, factors related to building damages due to earthquake, methods of seismic retrofitting, restoration of earth quake damaged structures.</p>	4	Theory PPT mode		
<p>Practice session 4: Seismic up gradation of structures, Rehabilitation & Retrofitting and their necessity - Leakage arrest & Water proofing and Termite treatment Practice Session 5: Study and report preparation on strengthening of different structural elements - Columns, Beams, Slabs and Foundation treatment. Conducting nondestructive tests and preparation of reports.</p>	4 periods	Class room Practice		
Module IV				
<p>Damage diagnosis and assessment : Visual inspection, Non Destructive Testing using Rebound hammer, Ultra sonic pulse velocity, Semi destructive testing, Probe test, Pull out test, Chloride penetration test, Carbonation,</p>	6	Theory PPT mode		

Sulphate attack, Carbonation depth testing, Corrosion activity measurement, Freeze-thaw re Practice				
<p>Practice Session 6: Study and report preparation on strengthening of different structural elements - Columns, Beams, Slabs and Foundation treatment.</p> <p>Practice Session 7: (Practice cum Project): Visits to different buildings in Jatni/JITM campus (or outside) and identify the repairs needed and to prepare a report repair schedule. outside) and identify the repairs needed and to prepare a report repair schedule.</p>	6	Site visit and preparation of report		
Module V				
<p>Modern materials for repair and renovation</p> <p>Advanced Construction materials for repair, renovation and retrofitting, processes and techniques used for repairs, rehabilitation and retrofitting Construction chemicals based on nanotechnology, various types of fibre wrappings, Special concretes and mortar, concrete chemicals, special elements for accelerated strength gain, Expansive cement, polymer concrete, sulphur infiltrated concrete, Ferro cement, Fibre reinforced concrete (basic ideas only)</p>	4	Theory PPT mode		
<p>Practice Session 8: (site visit and submission of report): Special reflection in toilets, plumbing fittings, electrical renovations, choosing interiors, aesthetics, false ceiling, partitions etc.</p> <p>Practice Session 9: Site visit to old dilapidated structures and reporting possible ameliorative measures or reporting demolition.</p>	4	Field visit and submission of report		
Module VI:				

<p>Techniques for repair and renovation methods</p> <p>Grouting, Guniting and shotcreting, Plate bonding, RCC Jacketing / Propping and supporting, Fiber wrap technique and Chemical and electro- chemical methods of repair, Rust eliminators, polymers coating for reinforced bars during repair, foamed concrete, Epoxy injection, Mortar repair for cracks, shoring and</p>	4	Theory PPT mode		
<p>Practice Session 9: Statutes and acts - Model Building Bye-laws, Ancient Monuments & Archeological Sites & Remains Act 2010, Permissions in Prohibited and Regulated Areas</p>	4	Class room Practice		
Module VII				
<p>Repair/ Renovation of corrosion in marine structures</p> <p>Methods of corrosion protection, corrosion inhibitors, corrosion resistant steels, coatings and cathodic protection. Engineered demolition techniques for dilapidated structures – ideas and case studies</p>	4	Theory		
<p>Practice session 10: Site visit to an ancient structures and reporting possible renovate measures.</p> <p>Practice Session 11: Study & Report preparation on Renovation Methodology for different elements of a Building</p>	4	Field visit and report submission		
		Theory : 30 hrs	Classroom practice - 30hrs	

Tendering Process, Bidding Contract Agreements Arbitration

Code	Course Title	Type of course	T-P-PJ	Prerequisite
DECP0601	Tendering Process, Bidding Contract Agreements and Arbitration.	Practice + Project	0-2-1	Quality Control and DPR

Objective

- To make students understand the basics of contract to enhance / develop the skills of professionals working in construction and allied sectors to upgrade their skills in procurement in Construction projects and help them to grow in their career

Course Outcome

- Upon successful completion of the course, students shall be fit in CPWD, state Government departments and infrastructural organizations, persons working in development projects in public or private sectors. Consultancy units, research organizations as well as self-employed practitioners engaged in the planning, design, Procurement, construction, operation and maintenance.
- Apply legal aspects of construction projects in construction contract, of issues related to contract administration, apply various disputes resolution techniques including arbitration.

Evaluation Systems

Internal Examination	Component	% of Marks	Method of Assessment
	Internal Practice	50(40+10)	Lab Work + Learning Record
	Internal Project	50	Project Work
External Examination	External Practice	50	Lab Work
	External Project	50	Project Work + Report
Total		200	

Course Outline

Module I (60 hours)

Module I: (Tender basics) :Laws governing structure & Working of Construction firms.

Project cost estimate, administrative approval and Technical sanction. AR, SR, OPWD code, and CPWD code.

Module II: Contract Outlines: Contracts, types of construction contracts, Evaluation of contract documents, need for documents, present stage of national and international contract documents, roles and functions of participants to the contract.

Module III: Tender: Tender as a basis of Contract, Tender Types, Notice inviting Tender, e-tendering, Preparation of tender documents, pre-qualification bid evaluation, Financial bid evaluation, Tendering procedures (submission of bids, analysis of submitted tenders), Basis for evaluation and acceptance, letter of intent, work order and agreement , award of contract, project financing and contract payments,

Module IV: Contracts

Contracts Outline, types of construction contracts, contract specifications, CPWD contract conditions, FIDIC form of contract, General conditions of contract, Evaluation of contract documents, need for documents, present stage of national and international contract documents, roles and functions of participants to the contract. Subcontracting: selection of subcontractors, work order with terms and conditions.

Module V: Contract Conditions: Clarification by parties to contract, obligations and responsibilities of the parties, Securities, protection and indemnification, bonds and insurance, subsurface conditions, inspection of work, change of work, rejected work and deficiencies.

Module VI (Arbitration): Causes and resolution of disputes, settlement for claims and extra items, arbitration., Agreements, Appointment of Arbitrators, Conditions of Arbitrations, Powers and duties of Arbitrator, Enforcement of Award-costs, Arbitration Act old & new.

Claims, Disputes and project closure: Claims its source and management, Disputes and its cause, dispute avoidance and its resolution, Causes leading to arbitration, Contract closure at construction site and at levels of project manager.

Text Books

- Bids Tenders &Praposals, Harold Lewis
- Civil engineering contracts & estimate, B. S. Patil
- Contract management in civil works, V. A. Prakash
- Construction Project Management, Kumar Neerajjha"

Session Plan(practice works appended below)

Topic coverage and Internal Test	No. of Sessions (in hrs.)	Activity	Assignment /Project	Suggested Reading (Book, Video, Online source, etc.)
Module I				

Module I: Tender basics:Laws governing structure & Working of Construction firms, Project cost estimate, administrative approval and Technical sanction. AR, SR, OPWD code and CPWD code.THE INDIAN CONTRACT ACT, 1872.	3+4	Practice +Project		
Module II : Contract Outlines: Contracts, types of construction contracts, Evaluation of contract documents, need for documents, present stage of national and international contract documents, roles and functions of participants to the contract.	3+4	Practice +Project		
Module III: Tender: Tender as a basis of Contract, Tender Types, Notice inviting Tender, e-tendering, Preparation of tender documents, pre-qualification bid evaluation, Financial bid evaluation, Tendering procedures (submission of bids, analysis of submitted tenders), Basis for evaluation and acceptance, letter of intent, work order and agreement award of contract, project financing and contract payments, Surety bonds and Guarantees	4+6	Practice +Project		
Module IV: Contracts: contract specifications, CPWD contract conditions, FIDIC form of contract, General conditions of contract, Evaluation of contract documents, need for documents, present stage of national and international contract documents, roles and functions of participants to the contract. Subcontracting: selection of subcontractors, work order with terms and conditions.	4+8	Practice +Project		
Module V: Contract Conditions (GCC and SCC and BOQ): Clarification by parties to contract, obligations and responsibilities of the parties, Securities, protection and indemnification, bonds and insurance, subsurface conditions, inspection of work, change of work, rejected work and deficiencies. Subcontracts, billing and payments	3+5	Practice +Project		

Module VI (Arbitration): Causes and resolution of disputes, settlement for claims and extra items, arbitration., Agreements, Appointment of Arbitrators, Conditions of Arbitrations, Powers and duties of Arbitrator, Enforcement of Award-costs, Arbitration Act old & new.	4+4	Practice +Project		
Module VII: Claims, Disputes and project closure: Claims its source and management, Disputes and its cause, dispute avoidance and its resolution, Causes leading to arbitration, Contract closure at construction site and at levels of project manager.Arbitration and Conciliation Act 1996; Arbitration case study.	3+5	Practice +Project		
		Theory : 24 classes	Practice projects : 36 classes	

Class room Practice Sessions:

1. **Practice I:** Writing item rate of contract for EW, Concrete, Bitumen roads, Concrete pavements with calculation of leads and lifts like inaccessible areas, Jails and hospitals.
2. **Practice II:** Preparation of Tender call notices for
 - i. Quotation call notices.
 - ii. Short tender call notices
 - iii. Tender call notices for a major work
 - iv. E- tender call notices
 - v. Corrigendum to TCN's
3. **Practice III:** Preparation of pre-bid evaluation documents for different works:
 - i. Multi Storied Building
 - ii. Road works
 - iii. Runways
 - iv. Hydraulic Structures
 - v. Preparation of design projects
4. **Practice session IV:** Preparation of draft financial bid evaluation documents (previous works).
5. **Practice session V:** Case studies of pre-bid evaluation of tenders and preparation comparative statement.

6. **Practice Session VI:** Preparation of Gnat or bar chart, CPM and PERT for construction projects
7. **Practice VII:** Practice of preparation lump Sum, K₂, F₂ and other agreements
8. **Practice Session VIII:** Practice for preparation of different type of bills for payment
9. **Practice session VIII:** Calculation for price escalation for materials, labour and POL
10. **Practice session IX:** Case studies for arbitration cases
11. **Practice session X:** Preparation of contract closure documents at site, managers level and final closure of contract.

Software Based Project Scheduling and Management

Code	Course Title	Course Type	T-P-PJ	Prerequisite
DECP0301	Software Based Project Scheduling and Management	Project	0-0-4	Nil

Course objective

- To enable the student understand the basic principles of Project Management.
- Make the student familiarize with the activities involved in a civil engineering construction project.
- To mold the student for taking up a major project through applying the higher version project software.

Course outcomes

- Identify various activities of a construction project and the critical path for executing the same.
- Carry out a major project and prepare a document that contains all aspects of a construction project.

Students shall take any one of the following projects for practice:

- a. Commercial Structures
- b. Residential Structures
- c. Industrial Structures
- d. Water Resources Structures
- e. Projects on Transportation

Note: The students can take up other activities also related to Construction Project during their Major Project.

Module I (18 Hours):

Lesson 1: Introduction to -MS Project as an execution tool, Project Information.

Lesson 2: Steps before Starting a Project- Activities and Events Identification.

Lesson 3: Creating and Defining Projects-Entering and Scheduling Tasks- Work Breakdown Structure.

Module II (18 Hours)

Lesson 4: Project Views.

Lesson 5: Calendars---Calendar Tasks & Milestones Structure.

Lesson 6: Organizing Tasks- Summary and Sub Tasks- Predecessor and Successor.

Module III (18 Hours)

Lesson 7: Working with Task Duration, Constraints, and Deadlines-Gant Chart.
 Lesson 8: Introducing Dependencies -Task Relationships - Network Development-Network Diagram –
 Task Types- Lag and Lead Time- Identify the Critical Path / Time Constraints

Module IV: (18 Hours)

Lesson 9: Working with Resources-Resource Identification- Equipment and Human Resources Assigning
 Resources to Tasks
 Lesson 10: Customizing and Formatting

Module V: (16 Hours)

Lesson 11: Resource Management
 Lesson 12: Communication and Progress Updates

Module VI: (20 Hours)

Lesson 13: Tracking Work in Project
 Lesson 14: Project Baselines & Running Reports

Module VII: (12 Hours)

Lesson 15: Printing Project Information, Consolidating Projects and Resources, Course Summary and Review.

Pedagogy

Sl. No	Topic	Pedagogy	(Instructional Hours) Project
1	Module I (18 Hours): Lesson 1: Introduction to - MS Project as an execution tool,Project Information.	PRO	6
2	Lesson 2: Steps before Starting a Project- Activities and Events Identification.	PRO	6
3	Lesson 3: Creating and Defining Projects-Entering and Scheduling Tasks- Work Breakdown Structure.	PRO	6
4	Module II (18 Hours) Lesson 4: Project Views.	PRO	6
5	Lesson 5: Calendars---Calendar Tasks & Milestones Structure	PRO	5
6	Lesson 6: Organizing Tasks- Summary and Sub Tasks- Predecessor and Successor.	PRO	5
7	Module III (18 Hours) Lesson 7: Working with Task Duration, Constraints, and Deadlines-Gant Chart.	PRO	6

8	Lesson 8: Introducing Dependencies -Task Relationships - Network Development-Network Diagram – Task Types- Lag and Lead Time- Identify the Critical Path / Time Constraints	PRO	10
9	Module IV: (18 Hours) Lesson 9: Working with Resources-Resource Identification-Equipment and Human Resources Assigning-Resources to Tasks	PRO	10
10	Lesson 10: Customizing and Formatting	PRO	6
11	Module V: (16 Hours) Lesson 11: Resource Management	PRO	8
12	Lesson 12: Communication and Progress Updates	PRO	8
13	Module VI: (20 Hours) Lesson 13: Tracking Work in Project	PRO	8
14	Lesson 14: Project Baselines	PRO	8
15	Running Reports	PRO	4
16	Module VII: (12 Hours) Lesson 15: Printing Project Information	PRO	4
17	Consolidating Projects and Resources	PRO	4
18	Course Summary and Review	PRO	4
	Subtotal		120

Project

Course Title	Code	Course Type	T-P-PJ	Pre-requisites
Project	DEET0300	Project	0-0-6	Not before Semester 4

Students take up group projects and deal the following activities during the course of their project. The project Report should contain the reports of the activities and the explanation of the activity, how the same is taken up and the outcome of the activity.

- Functional Planning of the project,
- Preparation of documents and notices required for obtaining Environmental clearance,
- Preparing working drawings using Auto CAD, Revit & STAADPRO (for Reinforcement Drawing),
- Listing of Specifications, Rate Analysis and Estimating using Estimator Software,
- Resource Scheduling & Levelling,
- Preparing Quality Control checks and Quality Inspection sample reports specific to the project,
- Identifying the possible Risks involved (specific to the project) and listing the Safety Measures,
- Preparing sample M - book and Muster Role (Form 21),
- Tendering Process, and Development of Contract Agreement during their Major Project and x. Project Closure.

Internship

Course Title	Code	Course Type	T-P-PJ	Pre-requisites
Internship	DEET0800	Practice	0-4-0	Not before Semester 4

Students to select a construction firm and obtain training (for about 8 to 10 months) on the works that are being carried out there. They are required to prepare set of different reports on the activities in which they received training. The activities should invariably involve the aspects related to planning and design apart from the topics covered in various subjects of the domain. One report on each of the activities is to be submitted individually even if a group of students work in the same site. The reports should be certified by the authorized technical personnel of the organization.

Domain - Planning, Design & Drawing

Course Code	Course Title	Course Type	Credits	Prerequisite
DEPD0101	Green Building Design	Theory	3	Nil
DEPD0102	Earthquake Resistant Design	Theory	3	Nil
DEPD0103	Barrier Free Design	Theory	2	Nil
DEPD0104	Intelligent Building Design	Theory	2	Nil
DEPD0201	Architectural Design	Practice	6	Nil
DEPD0202	3D Modelling and VR experience of Building	Practice	4	Nil
DEET0300	Project	Project	6	
DEET0800	Internship	Internship	4	
		Total	30	

Green Building Design

Course Title	Course Code	Type of course	T-P-PJ	Prerequisite
Green Building Design	DEPD0101	Theory	3-0-0	Nil

Objective

- To understand the concept of Green Building design
- To understand the various parameters of Green Building design.

Course Outcome

- To study the theory of sustainability.
- To study the changing climatology and contribution of built mass
- To learn reduction of carbon foot prints

Evaluation Systems

	Component	% of Marks	Method of Assessment
Internal Examination	Internal Theory	30	Written examination
	Assignment	5	Report or Presentation + Learning Record
	Attendance	5	Based on class attended
External Examination	External Theory	60	Written examination
Total		100	

Course Outline

Module I Theory of sustainable design (3 hours)

Various regions and their reciprocating design, concept of traditional design and logic, implication of the same logic in today's context, Basic Design Principles, ergonomic data and application

Ex: Dhajji-dwari construction of Kashmir/HP, Nilgiri Hills tribal houses

Module II Principles of Green Building Design (6 hours)

Design responding to climatological data, Eco-friendly use of material, technology used while construction and dependency of energy etc.

Module III Environment management (6 hours)

Design and its equation with environment, Building and its impact on surrounding – short term and in the long run, Measures to cut-down adverse impacts, Alternative methods to reduce the negative impact on environment.

Module IV Ecological Planning (6 hours)

Concepts of ecology, Co-relation with building design, Balance between ecosystem and intervention in terms of built environment, Study the direct proportion between improvements in ecological aspects with Green building design index.

Module V Green building material and technology (6 hours)

Existing building material over the green building material, impact of technology and how to erase the carbon foot prints, alternatives for building materials, cutting edge technology to modify and use/reuse the building materials.

Ex: use of Fly-ash bricks, Fly-ash modified in light weight building blocks

Module VI Green building rating tools (6 hours)

Green building rating tools- Leeds and IGBC codes. GRIHA– Material selection Embodied energy- Operating energy- Façade systems- Ventilation systems- Transportation- Water treatment systems- Water efficiency- Building economics

Module VII Green Building Design Case Study (6 hours)

Students to work through a controlled process of analysis and design to produce drawings and models of their own personal green building project. Topics include building form, orientation and site considerations; conservation measures; energy modeling; heating system; renewable energy systems; material choices. End with student Presentation.

Text Books

1. Colin Porteous, “The New Eco-Architecture”, Spon Press, 2002.
2. Energy Conservation Building Codes: www.bee-india.nic.in
3. Lever More G J, “Building Energy Management Systems”, E and FN Spon, London, 2000.
4. Ganesan T P, “Energy Conservation in Buildings”, ISTE Professional Center, Chennai, 1999.
5. John Littler and Randall Thomas, “Design with Energy: The Conservation and Use of Energy in Buildings”, Cambridge University Press, 1984.

Session Plan:

Weeks- 15

Contact Hours: 3 Hrs per week = 45 Hrs

Sr. NO	TOPICS	PEDAGOGY/ MODE OF PRESENTATION AND REMARKS	HOURS
1	Various regions and their reciprocating design, concept of traditional design and logic, implication of the same logic in today's context, Basic Design Principles, ergonomic data and application Ex: Dhajji-dwari construction of Kashmir/HP, Nilgiri Hills tribal houses	- PPT - Audio-video presentation for awakening	3
2	Design responding to climatological data, Eco-friendly use of material, technology used while construction and dependency of energy etc.	- Class notes - Power point presentation	6
3	Design and its equation with environment, Building and its impact on surrounding – short term and in the long run, Measures to cut-down adverse impacts, Alternative methods to reduce the negative impact on environment.	- Slides and Photographs - Class notes	6
4a	Intrim Exam	Allotted marks 10	1
5	Concepts of ecology, Co-relation with building design, Balance between ecosystem and intervention in terms of built environment, Study the direct proportion between improvements in ecological aspects with Green building design index.	- PPT - Videos	6-8
6	Existing building material over the green building material, impact of technology and how to erase the carbon foot prints, alternatives for building materials, cutting edge technology to modify and use/reuse the building materials. Ex: use of Fly-ash bricks, Fly-ash modified in light weight building	- Sketches on black board -Class notes	4-6

	blocks		
7	Green building rating tools- Leeds and IGBC codes. GRIHA- Material selection Embodied energy- Operating energy- Façade systems- Ventilation systems- Transportation- Water treatment systems- Water efficiency- Building economics	-Class notes and discussions	6
8	Students to work through a controlled process of analysis and design to produce drawings and models of their own personal green building project. Topics include building form, orientation and site considerations; conservation measures; energy modeling; heating system; renewable energy systems; material choices. End with student Presentation.	-Case Study - Solutions on PPT	6
9	Intrim Test - II		1

Earthquake Resistant Design

Course Title	Code	Type of course	T-P-PJ	Prerequisite
Earthquake Resistant Design	DEPD0102	Theory	3-0-0	Nil

Objective

<ul style="list-style-type: none"> • To understand the difference between Earthquake Resistant Design and Structural Design • To expand the parameters of forces and loading impacts. • To understand the design guidelines in disaster resistant construction

Course Outcome

<ul style="list-style-type: none"> • To study co-relation with architectural design and performance of building during earthquake • To study advanced structural design parameters • To analyze the detailing of reinforcement design and its impact on performance
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Evaluation Systems

	Component	% of Marks	Method of Assessment
Internal Examination	Internal Theory	30	Written examination
	Assignment	5	Report or Presentation + Learning Record
	Attendance	5	Based on class attended
External Examination	External Theory	60	Written examination
Total		100	

Course Outline

Module I Introduction to the Subject (3 hours)

Focus on the complexities involved in developing Earthquake resistant buildings, Performance of structural buildings in past earthquake. An overview and possible causes of failure during seismic loading

Module II Design Guidelines & Principles of Earthquake Resistant Design (6 hours)

Formulating the management plan and understanding the design guidelines in disaster resistant construction. Norms by IS codes and prevailing practices. Examples and various regions with iconic buildings as live samples.

Module III Indian Seismicity (6 hours)

Indian Seismicity Map, Past Earthquakes and building performances, Effects of EQ shaking, The philosophy, Indian codes impacting Building configuration and basics.

Module IV Traditional Practices (6 hours)

Vernacular architecture and their response to EQ. Their essence and logic, The advanced construction practices over the conventional practices.

Module V The detailing in Building construction (6 hours)

Masonry construction, frame structures and their performance, Beam-column design and detailing, junction design and detailing.

Module VI Earthquake resistant structural members (6 hours)

Shear wall provisions and detailing; Pounding and seismic joint detailing, Infill walls-cladding-glazing detailing

Module VII Special Construction Features and restoration (6 hours)

Cantilever, staircase design in seismic areas, Building byelaws and urban planning, historic building and possible provisions. Retrofitting techniques, Base isolation concepts.

Text Books

1. Seismic Design hand book for Buildings
2. Earth quake Architecture: New construction techniques for quake disaster Prevention

Session Plan:**Weeks- 15****Contact Hours: 3 Hrs per week = 45 Hrs**

Sr. NO	TOPICS	PEDAGOGY/ MODE OF PRESENTATION AND REMARKS	HOURS
1	Module-1 Introduction to over view of disaster, major natural disasters- flood, tropical cyclone, droughts, landslides, heat waves, earthquakes, fire hazards etc.	- PPT - Audio-video presentation for awakening	6
2	Factors for disasters. Basic understanding on fragile eco system, physiographic and geo chemical data mapping, soil and topography, Hydrological factors, inclement climatic conditions	- Class notes - Power point presentation	3
3a	Module-2	- Slides and Photographs	6

3b	Strategies for disaster prevention and mitigation. Disaster management plan. Revision, Overlap time and overview of the modules	- Class notes - BBC documentary on Loma Preta EQ (1 Hour)	
4a	Intrim Exam	Allotted marks 10	1
4b	National crisis management committee, state management group	- Slides &Notes - Class notes	5
5	Design guidelines in disaster proofing construction	- PPT - Videos on Advanced construction in Japan	6-8
6	Engineering, Agricultural, Architectural, landscaping and planning solution for different type of calamities.	- Sketches on black board -Class notes	3
7	Norms, standard, practice procedure for shelter and settlement. Organizational and management aspt	-Class notes and discussions	3-4
8	- Current Projects/Challenges - Research overview and scope	-Discussion - Examples on PPT	2
9	Intrim Test - II Actual implementation + Revision of Notes/key points	- TERI Projects in EQ-Flood zone - Showing actual projects for more ideas	1 2-3

Barrier Free Design

Course Title	Code	Type of course	T-P-PJ	Prerequisite
Barrier Free Design	DEPD0103	Theory	2-0-0	Nil

Objective

- To understand the disability and its impact on built environment
- To open the built mass for everyone
- To make student able to construct an efficient built mass

Course Outcome

- To study the various provisions in the code
- To design or modification based on provision in the code
- To analyze the improved performance of the same building with different set of users

Evaluation Systems

	Component	% of Marks	Method of Assessment
Internal Examination	Internal Theory	30	Written examination
	Assignment	5	Report or Presentation + Learning Record
	Attendance	5	Based on class attended
External Examination	External Theory	60	Written examination
Total		100	

Course Outline

Module I Introduction to the Barrier Free Design (2 hours)

The need, reason and enforcement by government. Live examples and overview of public buildings.

Module II Types of disability and inferences (4 hours)

Types of disability, mobility devices and controls. Construction and maintenance standards, classification of buildings and access provisions. Examples and various types of building with different functions as live samples.

Module III Design Element within built mass (4 hours)

Design elements within buildings, site planning, parking, approach to plinth levels, corridors, entrance and exit, windows, stairways, lifts, toilets, signage, guiding and warning systems, floor materials.

Module IV Design Element outside the built mass (4 hours)

Design elements outside the building – curb at footpath, road crossing, public toilet, bus stop, toilet booth, and signage

Module V The provision in the codes (4 hours)

Provision in residential building, auditorium, parks, restaurants, railway station. Modern building bye-laws.

Module VI Hands on experience (4 hours)

A small live design problem which aims at design standards and construction techniques for barrier free environment

Module VII Case study based observations (4 hours)

Visit to nearby public buildings, parks: observations related to disability and effectiveness of design.

Text Books

1. Building without barriers for the disabled, Harkness, Sarh P/690.554 HAR/B
2. Disability and rehabilitation Handbook/ Goldenson, RM/362.2002 DIS/M

Session Plan:

Weeks- 15

Contact Hours: 2 Hrs per week = 30 Hrs

Sr. NO	TOPICS	PEDAGOGY/ MODE OF PRESENTATION AND REMARKS	HOURS
1	The need, reason and enforcement by government. Live examples and overview of public buildings.	- PPT - Audio-video presentation for awakening	2
2	Types of disability, mobility devices and controls. Construction and maintenance standards, classification of buildings and access provisions. Examples and various types of building with different functions as live samples.	- Class notes - Power point presentation	4
3a 3b	Design elements within buildings, site planning, parking, approach to plinth levels, corridors, entrance and exit. Design for windows, stairways, lifts, toilets, signage, guiding and warning systems, floor materials.	- Slides and Photographs - Class notes	2 + 2 hrs
4	Intrim Test - I		1

5	Design elements outside the building – curb at footpath, road crossing, public toilet, bus stop, toilet booth, and signage	- PPT - Videos on Advanced construction	4
6	Provision in residential building, auditorium, parks, restaurants, railway station. Modern building bye-laws.	- Sketches on black board -Class notes	4
7	A small live design problem which aims at design standards and construction techniques for barrier free environment	- Hands on experience	4
8	Visit to nearby public buildings, parks: observations related to disability and effectiveness of design.	Case study based observations	4
9	- Current Projects/Challenges - Research overview and scope	-Discussion - Examples on PPT	2
10	Intrim Test - II		1

Intelligent Building Design

Course Title	Code	Type of course	T-P-PJ	Prerequisite
Intelligent Building Design	DEPD0104	Theory	2-0-0	Nil

Objective

<ul style="list-style-type: none"> • To understand the concepts of automated buildings • To understand modern technology within built environment

Course Outcome

<ul style="list-style-type: none"> • To study integrates technology and process to create a facility that is safer, more comfortable and productive for its occupants • To design Smart buildings

Evaluation Systems

Internal Examination	Component	% of Marks	Method of Assessment
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	Internal Theory	30	Written examination
	Assignment	5	Report or Presentation + Learning Record
	Attendance	5	Based on class attended
External Examination	External Theory	60	Written examination
Total		100	

Course Outline

Module I Introduction to the Intelligent buildings (2 hours)

Operationally efficient for its owners. Reasons and necessity, performance and cost saving parameters etc.

Module II Advance Parameters (4 hours)

Reuse of water/waste, structured cabling systems, wireless, communication protocol, interoperable smart building databases, smart disposal of waste.

Module III Efficiency improvement (4 hours)

Advanced technology—combined with improved processes for design, construction and operations—provide a superior indoor environment that improves occupant comfort and productivity while reducing energy consumption and operations staffing.

Module IV Control Systems (4 hours)

Lighting Control systems, electric power management systems, access control systems, video surveillance systems, video IPTV

Module V Digital provisions (4 hours)

digital signage systems, fire alarm and mass notification systems, voice network and distributed antenna systems, data networks, facility management systems.

Module VI Hands on experience (4 hours)

The economics of intelligent buildings, audio visual systems, network integration, energy and sustainability with a small scale live office room/small house design

Module VII Case study based observations (4 hours)

Visit to CUTM Labs, nearby offices and restaurants/supermarkets: observations related to smart building design.

Text Books

1. Smart Buildings systems for Architects, Owner, and Builders. By James Sinopoli, Elsevier
2. Intelligent buildings by James Sinopoli, Elsevier RM/362.2002 DIS/M

Session Plan:

Weeks- 15

Contact Hours: 2 Hrs per week = 30 Hrs

Sr. NO	TOPICS	PEDAGOGY/ MODE OF PRESENTATION AND REMARKS	HOURS
1	Operationally efficient for its owners.Reasons and necessity, performance and cost saving parameters etc.	- PPT - Audio-video presentation for awakening	2
2	Reuse of water/waste, structured cabling systems, wireless, communication protocol, interoperable smart building databases, smart disposal of waste.	- Class notes - Power point presentation	4
3	Advanced technology—combined with improved processes for design, construction and operations— provide a superior indoor environment that improves occupant comfort and productivity while reducing energy consumption and operations staffing.	- Slides and Photographs - Class notes	4 hrs
4	Intrim Test - I		1
5	Lighting Control systems, electric power management systems, access control systems, video surveillance systems, video IPTV	- PPT - Videos on Advanced construction	4
6	digital signage systems, fire alarm and mass notification systems, voice network and distributed antenna systems, data networks, facility management systems.	-Class notes	4
7	The economics of intelligent buildings, audio visual systems, network integration, energy and sustainability with a small scale live office room/small house design	- Hands on experience	4
8	Visit to CUTM Labs, nearby offices and restaurants/supermarkets: observations related to smart building design.	Case study based observations	4
9	- Current Projects/Challenges	-Discussion	2

	- Research overview and scope	- Examples on PPT	
10	Intrim Test - II		1

Architectural Design

Course Code	Course Title	Type of course	T-P-P	Prerequisite
DEPD0201	Architectural Design	Practice	0-6-0	Nil

Objective

<ul style="list-style-type: none"> To understand the Basic Principles of architectural design To understand the overlays of various aspects on architectural building design.

Course Outcome

<ul style="list-style-type: none"> To study the basic concepts of building Design. To study the climatology, soil condition, site analysis and other factors on design. To learn building bye laws application while designing any building
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Evaluation Systems

Internal Examination	Component	% of Marks	Method of Assessment
	Internal Practice	50 (40+10)	Lab work + Learning Record
External Examination	External Practice	50	Lab work
Total		100	

Course Outline

Module I Introduction to Architectural Design (12 hours)

Basic Design Principles, ergonomic data and application

Practice

1. Conceptualization of Design: Own House drafting

Module II Addition of layers (24 hours)

Geological data, climatological data and impact of hydrology: study the result in modified architectural plan

Practice

2. Modification of your own house design for a different region
3. Apply the knowledge to design a small scale house/flat/bungalow

Module III Site Analysis (36 Hours)

Land observation data, Site analysis and application potential information from the same on design

Double line plan, concept of section and elevation

Practice

1. Site Analysis Parameters and implications
2. Correction and re-orientation of Design
3. Preparation of architectural drawings for sanctioning of design (Double line plan, elevation, section)

Module IV Service layouts (24 Hours)

Parking, Road network, Water supply, Electrical and sanitation layouts.

Practice

1. Site plan with parking layout and road network
2. Water supply and electrical layout
3. Storm water and sewage disposal layout (may include roof plan)

Module – V – Planning of bigger scale buildings (36 Hours)

Hotel or Student Hostel, Hospital or Public School.

Practice

1. Architectural Plan
2. Building layout with key sections
3. Complete set of presentation drawings

Module – VI – Structural and service layout (24 Hours)

Adding layer of structural members and services on the designed project of Hotel or Student Hostel/ Hospital or Public School – Any one or live project.

Practice

1. Grid plan
2. Water supply and electrical layout
3. Centre-line and earthwork schedule

Module – VII – Building Bye laws (24 Hours)

Study the building bye laws and practice their implications on design. Modify and cross-check the building design in terms of fire safety, staircase, FAR, projections, ventilation etc
Hotel or Student Hostel/ Hospital or Public School – Any one or live project.

Practice

1. Norms and plan co-relationship
2. Parking and site layout – Pre-viva

3. Complete set of drawings for the building- Final viva

Text Books

1. James Snider Catmese, Introduction to Design.
2. V.S.Parmar, Design fundamentals in Architecture, Somaiya publications private limited, New Delhi
3. Francis D.K.Ching, Architecture-Form, space and order, Van, Nostrand Reinhold company, NewYork.

3D Modelling and VR Experience of Building

Course Code	Course Title	Type of course	T-P-P	Prerequisite
DEPD0202	3D Modelling and VR experience of Building	Practice	0-4-0	Nil

Objective

- To understand the Elements of planning building, fundamentals of Building Information Modelling (BIM).
- To understand the various drawing methods and modes.

Course Outcome

- To understand the Generation of 2D (plan, section and elevation) and 3D modelling.
- Able to carve out detailed specification and dimensioning of the following using AutoCAD, Revit Architecture and CATIA

Evaluation Systems

Internal Examination	Component	% of Marks	Method of Assessment
	Internal Practice	50 (40+10)	Lab work + Learning Record
External Examination	External Practice	50	Lab work
Total		100	

Course outline and Session Plan

(Each Practice session is for 6 hours)

Practice Session 1: Generation of 3D modelling with detailed specification and dimensioning of a (G+20) multi-storeyed building with same floor plans using Revit Architecture and CATIA.

Practice Session 2: Generation of elevation for with detailed specification and dimensioning of a multi-storeyed building with same floor plans using AutoCAD for (practice session 1).

Practice Session 3: Generation of section for with detailed specification and dimensioning of a multi-storeyed building with same floor plans using AutoCAD, Revit Architecture and CATIA (practice session 1).

Practice Session 4: Generation of 3D modelling with detailed specification and dimensioning of a (G+20) multi-storeyed building with varying floor plans using Revit Architecture and CATIA.

Practice Session 5: Generation of elevation for with detailed specification and dimensioning of a multi-storeyed building with varying floor plans using AutoCAD (practice session 4).

Practice Session 6: Generation of section for with detailed specification and dimensioning of a multi-storeyed building with varying floor plans using AutoCAD, Revit Architecture and CATIA (practice session 4).

Practice Session 7: Generation of 3D modelling with detailed specification and dimensioning of a (G+5) shopping complex using Revit Architecture and CATIA.

Practice Session 8: Generation of elevation for with detailed specification and dimensioning of a (G+5) shopping complex using AutoCAD (practice session 7).

Practice Session 9: Generation of section for with detailed specification and dimensioning of a (G+5) shopping complex using AutoCAD, Revit Architecture and CATIA (practice session 7).

Practice Session 10: Generation of 3D modelling with detailed specification and dimensioning of a (G+4) hospital building using Revit Architecture and CATIA.

Practice Session 11: Generation of elevation for with detailed specification and dimensioning of a (G+4) hospital building using AutoCAD (practice session 10).

Practice Session 12: Generation of section for with detailed specification and dimensioning of a (G+4) hospital building using AutoCAD, Revit Architecture and CATIA (practice session 10).

Practice Session 13: Generation of 3D modelling with detailed specification and dimensioning of a (G+4) hostel building using Revit Architecture and CATIA.

Practice Session 14: Generation of elevation for with detailed specification and dimensioning of a (G+4) hostel building using AutoCAD (practice session 13).

Practice Session 15: Generation of section for with detailed specification and dimensioning of a (G+4) hostel building using AutoCAD, Revit Architecture and CATIA (practice session 13).

Domain - Smart City Planning

Course Code	Course Title	Course Nature	Credits	Pre-requisite
DESP0401	Remote Sensing & Digital Image Processing	Theory + Practice	5	Nil
DESP0901	Geospatial Technology and its Application	Theory + Practice+ Project	5	Nil
DESP0402	Photogrammetry and its Application	Theory + Practice	4	Nil
DESP0201	Lidar Remote Sensing and its Applications	Practice	3	Basic Survey
DESP0202	Smart City Planning	Practice	3	Nil
DEET0800	Internship	Practice	4	
DEET0300	Project	Project	6	
			30	

Remote Sensing and Digital Image Processing

Course Title	Code	Type of course	T-P-PJ	Prerequisite
Remote Sensing and Digital Image Processing	DESP0401	Theory + Practice	3-2-0	Nil

Objective

- To teach Basic Principles of Remote Sensing and understand the current remote sensing system, Digital Image processing and Integration.

Course Outcome

- Students will gain knowledge of basic concepts of remote sensing, aerial photogrammetry.
- Students will gain knowledge of applications different satellites imagery, image classification techniques and image analysis and interpretation.

Evaluation Systems

Internal Examination	Component	% of Marks	Method of Assessment
	Internal Theory	20	Written examination
	Internal Practice	30(20+10)	Lab work + Learning Record
External Examination	External Theory	30	Written examination
	External Practice	20	Lab work
Total		100	

Course Outline

Module – I Basic Concept

(7+6 Hrs)

Theory

Introduction of Remote Sensing: Principles of RS and its Type; Energy sources and Radiation principles, Pixel, DN value, Energy equation; EMR and Spectrum; EMR interaction with Atmosphere; scattering, Absorption, Atmospheric window, Black body radiation; EMR interaction with earth surface features, reflection, absorption, emission and transmission, Spectral signature; Interaction with vegetation, soil, water bodies; Advantage of RS over conventional method, Limitation, Ideal remote sensing.

Practice:

1. Installation of Image Processing software's
2. Layer stacking
3. LUT
4. Subset

Module – II Digital Image (6+6=12 hours)

Theory

Data acquisition: Procedure, Reflectance and Digital numbers; Intensity, Reference data, Ground truth, Analog to digital conversion, FCCs, TCC, Platforms and sensors; orbits ,types, Resolutions; Image Interpretation; visual- Interpretation keys.

Practice:

1. FCCs and TCC
2. Resolution
3. Image Interpretation

Module – III Satellite Information and Principles (6+6=12 hours)

Theory

Land observation satellites, characters and applications; PSLV, GSLV, Satellite, Platform Types; LANDSAT series; IRS series; IKONOS Series; QUICKBIRD series; Weather/Meteorological satellites; INSAT series, NOAA, Applications, Marine observation satellites; OCEANSAT

Practice:

1. Download satellite data from GLOVIS / Earth Explorer / Bhuvan etc.
2. Mosaicking

Module – IV IMAGE ACQUISITION AND FORMAT (6+2=8 hours)

Theory

Digital Image Processing; Export and import, Data formats; BSQ, BIL, BIP, Run length encoding, Image Compression Data products.

Practice:

1. Export and Import
2. Histogram
3. Subset using AOI

Module – V Image Processing (6+8=14 hours)

Theory

IMAGE RECTIFICATION; Preprocessing and Post processing Geometric distortion; sources and causes for distortion, rectification, GCP, Resampling, Image registration; Radiometric distortion; sources and causes, atmospheric correction

Practice:

1. Geometric correction
2. Radiometric correction

3. Atmospheric correction

Module – VI Classification (6+12=18 hours)

Theory

IMAGE CLASSIFICATION; Classification techniques, types, Supervised and Un-supervised; PCA; Image Enhancement; Accuracy assessment.

Practice

1. Supervised Classification
2. Un-supervised Classification
3. Image Enhancement
4. Accuracy Assessment

Model – VII Remote Sensing and Its application (8+12=20 hours)

Theory

Hyperspectral RS and its application; Microwave RS and its application; Thermal RS and its application; Optical RS and its application; Sensor and its types.

Practice:

1. Application of Hyperspectral remote sensing and case study
2. Application of microwave remote sensing and case study
3. Application of thermal remote sensing and case study
4. Application of optical remote sensing and case study

Text Books

1. Remote sensing & Image interpretation, THOMAS M. LILLESAND AND RALPH W. KIEFER, JOHN WILEY & SONS, INC. PUBLISHERS.
2. Remote sensing & GIS, B.Bhatta, OXFORD UNIVERSITY PRESS.
3. Remote Sensing principle & application, FLOYDIF SABINS, W.H FREEMAN & COMPANY, NEWYORK.
4. FUNDAMENTALS OF DIGITAL IMAGE PROCESSING, ANIL K JAIN, JAIN, Prentice Hall, New Delhi.
5. DIGITAL IMAGE PROCESSING, ABHISHEK YADAV, POONAM YADAV, OSCAR PUBLICATION, DELHI

Session Plan

Topic coverage and Internal Test	No. of Sessions (in hrs.)	Activity (lecture, tutorial, lab practice, field studies/f field-trip, Worksh op etc.)	Assignment (project, assignment, field study, seminar, etc.)	Suggested Reading (Book, Video, Online source, etc.)
Introduction of Remote Sensing – Principles of RS-Types, Pixel, DN value, Energy sources and Radiation principles, Energy equation	2	Lecture & Video and Practice	1.1	TB:1, CH:1 TB:2, CH:2
EMR and Spectrum, EMR interaction with Atmosphere-scattering, Absorption, Atmospheric window, Black body radiation	2	Lecture and Practice	1.2	TB:1, CH:1 TB:2, CH:2
EMR interaction with earth surface features-reflection, absorption, emission and transmission	1	Lecture & Video	1.3	TB:1, CH:1 TB:2, CH:2
Spectral signature, Interaction with vegetation, soil, water bodies, Advantage of RS over conventional method, Limitation, Ideal remote sensing.	2	Lecture & Practice	1.4	TB:1, CH:1 TB:2, CH:2
PRACTICE				
Installation of Image Processing software's and Data Exploring	2			https://www.youtube.com/watch?v=XO1ZbqEemBM

Layer stacking and LUT	2			https://www.youtube.com/watch?v=Oaxc6UHx1tQ
Subset	2			https://www.youtube.com/watch?v=jIZeXzipmkg
Total	7+6=13			
Module-2				
Data acquisition - Procedure, Reflectance and Digital numbers- Intensity	1	Lecture & Video	2.1	TB:1, CH:1
Ground truth, Analog to digital conversion. FCCs, TCC	2+2	Lecture & Practice	2.2	
Platforms and sensors-orbits - types	1	Lecture & Practice	2.3	TB:2, CH:2
Resolution and its type, Image Interpretation	2+4	Lecture & Practice	2.4	TB:1, CH:1
Total	6+6=12			
Module 3				
Land observation satellites, characters and applications	1	Lecture & Video	3.1	TB:5, CH:1
PSLV and GSLV Concepts	1	Lecture & Video	3.2	TB:5, CH:1
LANDSAT series, IRS Series, IKONOS Series, QUICKBIRD series	2	Lecture & Video	3.3	TB:5, CH:1
Weather/Meteorological satellites, INSAT series, NOAA, Applications, Marine observation satellites, OCEANSAT Download satellite data from GLOVIS / Earth Explorer / Bhuvan etc. ,Mosaicking	2	Lecture & Video	3.4	TB:5, CH:1

PRACTICE				
Satellite Data downloading from Bhuvan, Earth Explorer, GLOVIS	6			https://glovis.usgs.gov/
Total	6+6=12			
Module IV				
Concepts of Digital Image Processing,	2	lecture	4.1	TB:1, CH:1
DIP, Data Formats-BSQ, BIL, BIP , Run length encoding, Export and Import, Image acquisition	2	Lecture	4.2	TB:1 CH:1
Export and Import, Histogram, Subset using AOI	2	Lab. Practice	4.3	TB:1, CH:1
PRACTICE				
Export and Import, Histogram, Subset using AOI	2			https://www.youtube.com/watch?v=jw_AytR6ID0
Total	6+2=8			
Module V				
Pre-processing and Post processing Geometric distortion, sources and causes for distortion	2	Lecture & Video	5.1	TB:3, CH:1
Geometric correction	2	Lab. Practice	5.2	TB:3, CH:1
Radiometric correction ,Atmospheric correction	2	Lab. Practice	5.3	TB:3, CH:1
PRACTICE				
Geometric correction	4			https://www.youtube.com/watch?v=xCDrHf8QxmI
Radiometric correction and Atmospheric correction	4			https://www.youtube.com/watch?v=RPMemRR1UPs
Total	6+8=14			

Module : VI				
Introduction to Classification	2	Lecture & Video	6.1	https://www.youtube.com/watch?v=25HTqFpcmps
Image Enhancement	2	Lecture & Video	6.2	https://www.youtube.com/watch?v=0qKOdmIOZIM
Supervised Classification	1	Lab. Practice	6.3	http://gsp.humboldt.edu/olm_2015/Courses/GSP_216_Online/lesson6-1/supervised.html
Un-supervised Classification, Image Enhancement	2	Lab. Practice	6.4	https://ieeexplore.ieee.org/abstract/document/964969
Accuracy Assessment	1	Lab. Practice	6.5	http://desktop.arcgis.com/en/arcmap/latest/manage-data/raster-and-images/accuracy-assessment-for-image-classification.htm
PRACTICE				
Image Enhancement	4			
Supervised Classification	2			https://www.youtube.com/watch?v=2SjzJHg4wIY
Un-supervised Classification and PCA	4			https://www.youtube.com/watch?v=g_V6BVRz82E
Accuracy Assessment	2			https://www.youtube.com/watch?v=GeyMurueZc
Total	6+12=18			
Module: VII				
Hyperspectral RS and its application, Microwave RS and its application	1	Lecture & Video	7.1	TB:4, CH:1
Thermal RS and its application, Optical RS and its application	1	Lecture & Video	7.2	B:4, CH:2

Application of Hyperspectral remote sensing and case study	1	Lab. Practice	7.3	B:4, CH:3
Application of microwave remote sensing and case study	1	Lab. Practice	7.4	B:4, CH:4
Application of thermal remote sensing and case study	1	Lab. Practice	7.5	B:4, CH:5
Application of optical remote sensing and case study	1	Lab. Practice	7.6	B:4, CH:2
PRACTICE				
Hyper spectral RS and its application, Microwave RS and its application	4			PRACTICAL
Thermal RS and its application, Optical RS and its application	4			PRACTICAL
Application of Hyperspectral remote sensing and case study	4			PRACTICAL
Application of thermal remote sensing and case study	4			PRACTICAL
Application of optical remote sensing and case study	4			PRACTICAL
Total	6+20=26			
	105			

Geospatial Technology and its Application

Course Title	Code	Type of course	T-P-PJ	Prerequisite
Geospatial Technology and its Application	DESP0901	Theory+ Practice+ Project	2-2-1	Nil

Objective

<ul style="list-style-type: none"> To teach the basic concepts of Geospatial Technology and data structure in Geospatial Technology
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Course Outcome

<ul style="list-style-type: none"> Students will gain knowledge about the structure of spatial data including file associations, attribute tables, Metadata, coordinate systems, and projections. To develop software skills in programs used for map production in the modern cartographic workflow.

Evaluation Systems

Internal Examination	Component	% of Marks	Method of Assessment
	Internal Theory	40 (30+5+5)	Written examination + Assignment + Attendance
	Internal Practice	50 (40+10)	Lab Work
	Internal Project	50	Project Work
External Examination	External Theory	60	Written examination
	External Practice	50	Lab Work
	External Project	50	Project Work + Report
Total		300	

Course outline

Module – I: GEOSPATIAL TECHNOLOGY FOR URBAN AND REGIONAL

PLANNING

(8+8+6)

Theory

Relevance of remotely sensed data for Urban & Regional Analysis and Planning; Identification of settlement features from aerospace images; Visual and digital analysis techniques; Scale and Resolution concepts; Scope and limitations.

Urban growth analysis; Slum development; House typology; Site selection for urban development, Density analysis, Population estimation, Transportation network analysis, Change Detection and mapping, classification, Urban fringe, CBD, Urban sprawl, Case studies, Land surface Temperature.

Practice:

1. Urban growth analysis
2. Site selection for urban development
3. Land surface Temperature

Module – II: GEOSPATIAL TECHNOLOGY FOR WATER RESOURCES ENGINEERING**(4+14+6)****Theory**

Watershed, types, divide catchment, command area, stream types, Drainage network, different pattern; morphometric analysis, Bifurcation ratio analysis; Assessment of **Groundwater potential zones** and Groundwater mapping; Site selection for recharge structures, Hydrogeological Mapping GIS applications to ground water studies.

Practice:

4. Mapping of catchment, command area
5. Drainage network analysis
6. Morphometric analysis
7. Mapping of Groundwater potential zones

Module – III: GEOSPATIAL TECHNOLOGY FOR ENVIRONMENTAL ENGINEERING**(4+12+2)****Theory**

Monitoring atmosphere constituents; air pollution, industrial activity, modeling using GIS, Resource development in remote areas, Impacts of anthropogenic activity, Solid Waste management; Water Pollution, Shortest path Identification, Network analysis.

Practice:

1. Air pollution mapping
2. Solid waste management
3. Network analysis
4. Water pollution

Module – IV: GEOSPATIAL TECHNOLOGY FOR AGRICULTURE AND FORESTRY**(4+6+8)****Theory**

Spectral behavior of leaf, Vegetation indices; NDVI, TVI, SVI, PCA; Vegetation classification and mapping; Estimation of Leaf area index, Biomass estimation, Deforestation / afforestation / Change detection in forests, case studies. Identification of crops, acreage estimation, production forecasting, pests and disease attacks through remote sensing, crop stress detection due to flood and drought.

Practice:

8. Biomass estimation
9. Calculation of different Indices
10. Forest (Deforestation, afforestation) mapping
11. Crop estimation

Model – V: GEOSPATIAL TECHNOLOGY FOR DISASTER MANAGEMENT (4+6+2)

Theory

Types of disaster Natural and manmade; Cyclone, flood, landslide, land subsidence, fire, Tsunami and earthquake. Issues and concern for various causes of disasters; Principles of Disaster Management; Natural Disasters, Hazards, Risks and Vulnerabilities. Issues in Environmental Health, Water & Sanitation

Practice:

12. Area of Flood, landslide, Tsunami and earthquake mapping using GIS
13. Health GIS

Model – VI: Web GIS (3+8+2)

Theory

FOSS and its use in web mapping; Designing web services and web maps, storing and processing spatial data with FOSS, Drawing and querying maps on the server with WMS, Putting layers together with a web mapping API, Drawing vector layers with the browser.

Practice:

14. Designing web services and web maps
15. Drawing and querying maps on the server with WMS
16. Putting layers together with a web mapping API
- 17 Drawing vector layers with the browser

Model – VII: GEOSPATIAL TECHNOLOGY FOR OCEAN ENGINEERING & COASTAL MANAGEMENT (3+6+4)

Theory:

Coastal erosion and protection; alt-water intrusion studies; Estuaries and their impact on coastal process wetland mapping, thematic data base generation in GIS and analysis, mangroves and coastal zone management Coastal Vulnerability.

Practice:

18. Shoreline change detection
19. Mangrove change detection
20. Saltwater intrusion
21. Coastal Vulnerability mapping

Text Book

1. Anji Reddy .M, “Textbook of Remote Sensing and Geographical Information Systems”, BS Publications, Hyderabad. 2011. ISBN: 81-7800-112-8.
2. Kang tsung Chang , “Introduction to Geographical Information System”, Tata McGraw Hill, 7th edition, 2010

3. Burrough .P.A, “Principles of Geographical Information System for Land Resources Assessment”, Oxford Publications, | ISBN-13: 978-0198545927, 1986.
4. Chandra .A.M and Ghosh .S.K, “Remote Sensing and Geographical Information System”, Narosa Publishing House, New Delhi. 2006.
5. Paul A. Longley, Micheal F. Goodchild, David J. Magaine David J. Magaine, David W. Rhind, “Geographical Information System”, Vol. I & II, John wiley & Sons.Inc1999.

Session Plan

Topic coverage and Internal Test	No. of Sessions (in hrs.)	Activity (lecture, tutorial, lab practice, field studies/field-trip, Workshop etc.)	Assignment (Project, assignment, field study, seminar, etc.)	Suggested Reading (Book, Video, Online source, etc.)
Module-I (6 hours lecture + 14 hours practice)				
Relevance of remotely sensed data for Urban & Regional Analysis and Planning - Identification of settlement features from aerospace images	2	Lecture	1.1	TB:4, CH:2
Visual and digital analysis techniques - Scale and Resolution concepts - Scope and limitations.	2	Lecture	1.2	TB:1, CH:1
Urban growth analysis - Slum development - House typology - Site selection for urban development - Density analysis - Population estimation	2	Lecture	1.3	TB:4, CH:3
Transportation network analysis - Change Detection and mapping- classification - Urban fringe - CBD - Urban sprawl-Case studies, Land surface Temperature	2	Lecture		TB:4, CH:4
PRACTICE				
Urban growth analysis	2+2	Practice	1.4	https://www.youtube.com/watch?v=oq7EBgNe4d0

Site selection for urban development	2+2	Practice	1.5	https://www.youtube.com/watch?v=ItZHK3WemWE
Land surface Temperature	4+2	Practice	1.6	https://www.youtube.com/watch?v=G09MOTHFikM
Module-II (4 hours Lecture + 14 hours practice + 6 hours project)				
Watershed, types, divide catchment, command area	1	Lecture	2.1	TB:5, CH:1
stream types, Drainage network, different pattern, morphometric analysis, Bifurcation ratio analysis	1	Lecture	2.2	TB:5, CH:2
Assessment of groundwater potential zones and groundwater mapping	1	Lecture		TB:5, CH:2
Hydrogeological Mapping GIS applications to ground water studies	1	Lecture		TB:5, CH:3
Practice + Project (14+6)				
Mapping of catchment, command area	2	Practice	2.3	
Drainage network analysis	2	Practice	2.4	
Morphometric analysis	4+2	Practice	2.5	
Mapping of Groundwater potential zones	6+4	Practice		
Module III (4 hours lecture + 12 hours Practice +2 hours project)				
Monitoring atmosphere constituents- air pollution - industrial activity, modeling using GIS	1	Lecture	3.1	
Resource development in remote areas-Impacts of anthropogenic activity	1	Lecture	3.2	
Solid Waste management, Water Pollution,	1	Lecture		
Shortest path Identification, Network analysis	1	Lecture		
Practice + Project (12+2)				
Air pollution mapping	4	Practice	3.3	

Solid waste management	4	Practice	3.4	
Network analysis	2+2	Practice	3.5	
Water pollution	2	Practice	3.6	
Module IV 4 hours lecture + 6 hours practice + 8 hours project)				
Spectral behavior of leaf – Vegetation indices – NDVI, TVI, SVI, PCA – Vegetation classification and mapping	1	Lecture	4.1	TB:1, CH:1
Estimation of Leaf area index, Biomass estimation, Deforestation / afforestation / Change detection in forests - case studies	1	Lecture	4.2	TB:1, CH:1
Identification of crops -acreage estimation -production forecasting - pests and disease attacks through remote sensing	1	Lecture	4.3	TB:1, CH:2
crop stress detection due to flood and drought	1	Lecture	4.4	TB:1, CH:2
Practice + Project (6+8)				
Biomass estimation	2+6	Practice and Project		https://www.youtube.com/watch?v=Odm8A1myBaI
Calculation of different Indices Forest (Deforestation, afforestation) mapping	2	Practice		https://www.youtube.com/watch?v=Odm8A1myBaI
Crop estimation	2+2	Practice and project		https://www.youtube.com/watch?v=Odm8A1myBaI
Module V (3 hours lecture + 6 hours practice + 2 hours project)				
Types of disaster Natural and manmade: Cyclone, flood, landslide, land subsidence, fire, Tsunami and earthquake.	2	Lecture	Assignment	INCOIS BULLETIN
Issues and concern for various causes of disasters. Principles of Disaster Management	1	Lecture		INCOIS BULLETIN
Natural Disasters, Hazards,	1	Lecture		INCOIS BULLETIN

Risks and Vulnerabilities, Issues in Environmental Health, Water & Sanitation				
Practice + Project (6+2)				
Area of Flood, landslide, Tsunami and earthquake mapping using GIS	4	Practice	5.1	https://www.youtube.com/watch?v=jppv9YSw8_8
Health GIS	2+2	.Practice and project	5.2	https://www.youtube.com/watch?v=jppv9YSw8_8
Module VI (3 hours lecture + 8 hours practice + 2 hours project)				
FOSS and its use in web mapping, Designing web services and web maps	1	lecture	6.1	https://enterprise.arcgis.com/en/server/latest/create-web-apps/windows/about-web-gis.htm
storing and processing spatial data with FOSS, Drawing and querying maps on the server with WMS	1	Lecture	6.2	https://enterprise.arcgis.com/en/server/latest/create-web-apps/windows/about-web-gis.htm
Putting layers together with a web mapping API, Drawing vector layers with the browser	1	Lab Practice	6.3	https://enterprise.arcgis.com/en/server/latest/create-web-apps/windows/about-web-gis.htm
Practice + Project (8+2)				
Designing web services and web maps	2	Practice		https://www.youtube.com/watch?v=8y2GiwdcKUU
Drawing and querying maps on the server with WMS	2	Practice		https://www.youtube.com/watch?v=8y2GiwdcKUU
Putting layers together with a web mapping API	2	Practice		
Drawing vector layers with the browser	2+2	Practice		
Module VII (3 hours lecture + 6 hours practice + 4 hours project)				
Coastal erosion and protection, salt-water intrusion studies	1	Lecture	7.1	TB: 6, CH:5
Estuaries and their impact on	1	Lecture	7.2	TB: 6, CH:5

coastal process wetland mapping				
Thematic data base generation in GIS and analysis, mangroves and coastal zone management Coastal Vulnerability.	1	Lecture		TB: 6, CH:5
Practice + Project (6+4)				
Shoreline change detection	2+2	Practice		https://www.youtube.com/watch?v=MUkpE_uWKcA
Mangrove change detection	2+2	Practice		https://www.youtube.com/watch?v=29Ku8hX3f5M
Saltwater intrusion and Coastal Vulnerability mapping	2	Practice		
Total (Hrs.)	120			

Photogrammetry and Application

Course Title	Code	Type of course	T-P-PJ	Prerequisite
Photogrammetry and Application	DESP0402	Theory+ Practice	2-2-0	Nil

Objective

To teach digital photogrammetry techniques and applications

Course Outcome

- Students will gain knowledge about the survey by Photogrammetry method.
- Prepare DEM, TIN model and generate contour map.

Evaluation Systems

Internal Examination	Component	% of Marks	Method of Assessment
	Internal Theory	20	Written examination
	Internal Practice	30(20+10)	Lab work + Learning Record
External Examination	External Theory	30	Written examination
	External Practice	20	Lab work
Total		<i>100</i>	

Course outline

Module -I: INTRODUCTION (3+6 hours)

Theory:

Fundamentals of photogrammetry and aerial photography; History, aerial cameras, aerial films and processing. Types of aerial photos. Fundamentals and geometry of aerial photographs; Scale, Advantages and disadvantages of small scale and large-scale aerial photographs.

Practice:

1. Scale determination from aerial photo
2. Aerial photo Interpretation

Module - II: CONCEPT of PHOTOGRAMMETRY (7+8 hours)

Theory

Introduction, Terrestrial and Aerial photographs; vertical and oblique photographs, height determination, contouring, photographic interpretations, stereoscopy, parallax bar; Flight Planning, Photo Interpretation, Applications of aerial Photos, Photo theodolite.

Practice:

3. Use of Parallax bar and determination of Height from stereo pair
4. Satellite DEM and ortho Image generation

Module - III: DIGITAL PHOTOGRAMMETRY & ITS COMPONENTS (4+6 hours)

Theory:

Digital Cameras; CCD Camera, Full frame CCD, Frame transfer CCD, CCD cameras with piezo shift, Interline transfer CCD, Time delay integration CCD sensor, Spectral Sensitivity of CCD sensor, Geometric problems of CCD images; line jitter, blooming, warm up effect, tailing, Typical CCD systems.

Practice:

5. Primary and additive colour creation
6. Stereo test

Module – IV: RELIEF AND TILT DISPLACEMENTS (5+8 hours)

Theory:

Mosaics and types of mosaics, stereoscopic vision and stereoscopes; image displacement due to relief, concepts of stereo-photogrammetry, normal vision, depth perception and vertical exaggeration.

Practice:

7. Mosaic
8. Stereoscopic vision
9. Relief displacement

Module – V: DIGITAL CONVERSIONS (3+12 hours)

Theory:

Analog to digital conversion; Scanner, flat bed, drum type, Sensor characteristics; Scanner resolutions, Scanner calibration, Video Cameras, Frame Grabber ; Typical Scanner systems and Video cameras.

Practice:

10. Analog to digital conversion

11. Orientation of stereo model

12. Determination of Height

Module – VI: DRONE SURVEY

(5+12 hours)

Theory:

Aerial mapping and modelling using drone; types of mapping, types of mapping product, mapping for agriculture, mapping for Construction, Autonomous flight planning, Waypoints, collecting nadir imagery for 2D mapping, Collecting oblique imagery for 3d mapping, Volumetric measurements, map accuracy, ground truthing, ground control points.

Practice:

13. Aerial mapping using DRONE

14. Mosaicking of aerial Photo

15. Correction and rectification

Module – VII: DIGITAL PHOTOGRAMMETRIC APPLICATIONS (3+8 hours)

Theory:

DTM generation; Image correlation, Image matching, Digital Ortho-photo generation, Automated aero triangulation, Link between GIS and Digital Photogrammetry.

Practice:

16. DTM generation

17. Image correction

18. Link between GIS and Digital Photogrammetry

19. Ortho Image generation

References Book

1. Krauss .J, “Photogrammetry”, Vol. I IV Edition, Springier -Verlag Publishers, 1993.
2. “International Archieves of Photogrammetry and Remota Sensing”, ISPRS, Volume XXIX, B5, Commission 5, 1995.

3. Remote sensing & Image interpretation, THOMAS M. LILLESAND AND RALPH W. KIEFER, JOHN WILEY & SONS, INC. PUBLISHERS.
4. Anji Reddy .M, “Textbook of Remote Sensing and Geographical Information Systems”, BS Publications, Hyderabad. 2011. ISBN: 81-7800-112-8.
5. Proceedings of Annual Convention of ASPRS, 1993-96

Session Plan

Topic coverage and Internal Test	No. of Sessions (in hrs.)	Activity (lecture, tutorial, lab practice, field studies/field-trip, Workshop etc.)	Assignment (project, assignment, seminar, etc.)	Suggested Reading (Book, Video, Online source, etc.)
Module - I (3 hours lecture + 6 hours practice)				
Fundamentals of photogrammetry and aerial photography: History, aerial cameras, aerial films and processing	1	Lecture & Video	1.1	TB:1, CH:1
Types of aerial photos. Fundamentals and geometry of aerial photographs, Scale	1	Lecture & Video	1.2	TB:1, CH:1
Advantages and disadvantages of small scale and large-scale aerial photographs	1	Lecture, Video + Practice	1.3	TB:1, CH:1
PRACTICE				
Scale determination from aerial photo, Aerial photo Interpretation	6	Practice		https://www.youtube.com/watch?v=CPz0vs_jO5Y
Module - II (7 hours lecture + 8 hours practice)				
Introduction, Terrestrial and Aerial photographs , vertical and oblique	2	Lecture	2.1	http://ncert.nic.in/textbook/pdf/kegy306.pdf

photographs, height determination contouring				
Photographic interpretations, stereoscopy, parallax bar- Flight Planning	3	lecture	2.2	TB:4,CH:2
Photo Interpretation, Applications of aerial Photos-Photo theodolite.	2	Lecture	2.3	TB:4,CH:2
Practice				
Use of Parallax bar and determination of Height from stereo pair	4			https://www.youtube.com/watch?v=2kIWR_ZXY3w
Satellite DEM and ortho Image generation	4			https://www.youtube.com/watch?v=SuLnyGF0jqI
Module - III 4 hours Lecture and Video+ 6 hours practice)				
Digital Cameras - CCD Camera - Full frame CCD Frame transfer CCD	1	Lecture & Video	3.1	TB:4,CH:3
CCD cameras 1 with piezo shift, Interline transfer CCD, Time delay integration CCD sensor	1	Lecture & Video	3.2	TB:4,CH:3
- Spectral Sensitivity of CCD sensor, Geometric problems of CCD images - line jitter, blooming, warm up effect, tailing	1	Lecture & Video	3.3	TB:4,CH:3
Typical CCD systems, line scanners - SPOT, MOMS Data	1	Lecture & Video	3.4	TB:4,CH:3
Practice				
Primary and additive colour creation, Stereo	6	Practice		https://www.youtube.com/watch?v=2kIWR_ZXY3w

test				ZXY3w
Module –IV (6 hours Lecture + 8 hours practice)				
Mosaics and types of mosaics, stereoscopic vision and stereoscopes	2	lecture	4.1	TB:3, CH:3 https://pdfs.semanticscholar.org/ec65/6357da18445dd339a1f18a1c71de4b0ca62f.pdf
Image displacement due to relief, concepts of stereo-photogrammetry	2	Lecture	4.2	TB:3,CH:2
Normal vision, depth perception and vertical exaggeration	1	Lecture	4.3	TB:3,CH:3
Practice				
Mosaic, Stereoscopic vision	4	Practice		https://www.youtube.com/watch?v=1MXNRrHLuWk
Relief displacement	4	Practice		https://www.youtube.com/watch?v=G8gfC27Ybew
Module –V (3 hours lecture + 12 hours practice)				
Analog to digital conversion - Scanner - flat bed, drum type	1	Lecture	5.1	TB:4, CH:2
Sensor characteristics - Scanner resolutions - Scanner calibration	1	Lecture	5.2	TB:4, CH:2
Video Cameras - Frame Grabber - Typical Scanner systems and Video cameras	1	Lecture		TB:4, CH:2

Practical				
Analog to digital conversion	4	Practice		https://www.youtube.com/watch?v=V3Yp8imYE4I
Orientation of stereo model	4	Practice		https://www.youtube.com/watch?v=qS7GaaXwW4c
Determination of Height	4	Practice		https://www.youtube.com/watch?v=_rAcGShrM8
Module –VI (5 hours lecture and 12 hours practice)				
Aerial mapping and modelling using drone, types of mapping, types of mapping product, mapping for agriculture, mapping for Construction	2	Lecture		TB:1,CH:4
Autonomous flight planning, Waypoints, collecting nadir imagery for 2D mapping, Collecting oblique imagery for 3d mapping	2	Lecture		TB:1,CH:4
Volumetric measurements, map accuracy, ground truthing, ground control points.	1	Lecture		TB:1,CH:4
Practical				
Aerial mapping using DRONE	4	Practice		https://www.youtube.com/watch?v=UXVH8er9LTE

Mosaicking of aerial Photo	4	Practice		https://www.youtube.com/watch?v=RwTkUG28wW0
Correction and rectification	4	Practice		https://www.youtube.com/watch?v=KrzUMDpH9d0
Module –VII (3 hours lecture + 8 hours practice)				
DTM generation - Image correlation - Image matching	1			TB:1,CH:5
Digital Ortho-photo generation – Automated aero triangulation	1			TB:1,CH:5
Link between GIS and Digital Photogrammetry	1			TB:1,CH:5
Practical				
DTM generation, Image correction	4	Practice		https://www.youtube.com/watch?v=bB6AWRr-8mw
Link between GIS and Digital Photogrammetry, Ortho Image generation	4	Practice		https://www.youtube.com/watch?v=bB6AWRr-8mw
Total	90			

LIDAR Remote Sensing and Application

Course Title	Code	Type of course	T-P-PJ	Prerequisite
LIDAR Remote Sensing and Application	DESP0201	Practice	0-3-0	Basic Survey

Objective

<ul style="list-style-type: none"> To teach LIDAR technique for linear and elevation measurement for multiple use geospatial management and planning plans, LIDAR technique to get 3D map and terrain information and 3D Experience Platform and Catia.
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Course Outcome

<ul style="list-style-type: none"> Students will gain knowledge about LIDAR and its application. Students will be more skilled in CATIA Civil module
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Evaluation Systems

Internal Examination	Component	% of Marks	Method of Assessment
	Internal Practice	50 (40+10)	Lab work + Learning Record
External Examination	External Practice	50	Lab work
Total		100	

Course Outline

Model – I: LIDAR SYSTEM DESIGN

1. Download of LIDAR data
2. Layer stacking
3. Data Validation

Module – II: GEOREFERENCING AND CALIBRATION OF LIDAR DATA

4. Georeferencing Technology
5. Boresight Calibration - Lidar Data Preprocessing
6. Project Coverage Verification - Review Lidar Data against Field Control

7. Lidar data errors and rectifications, - processes calibration of Lidar data - artifacts and anomalies - Lidar Error Budget.

Module – III: AUTOMATED CLASSIFICATION

- 8. Noise Removal and other sensor-related artifacts - Layer Extraction - Automated Filtering 9. Manual Editing and Product Generation – Surface Editing - Hydrologic Enforcement
- 10. DEM, DSM -TIN,
- 11. Breaklines, Contours, and Accuracy Assessment.

Module – IV: LIDAR APPLICATIONS

- 12. Topographic Mapping, , flood inundation analysis, line-of-sight analysis
- 13. Forestry, various types of LIDAR sensors-, vegetation metric calculations - specific application software.
- 14. Corridor mapping system, data processing and quality control procedures.
- 15. Modelling

Resources List

- 1. Lidar: Range-Resolved Optical Remote Sensing of the Atmosphere, edited by Claus Weitkamp.
- 2. Manual of Airborne Topographic Lidar by Michael S. Renslow.
- 3. Lidar Techniques and Remote Sensing in the Atmosphere: Understanding the Use of Laser Light in the Atmosphere by Francis Emmanuel Mensah.

Session Plan

Sl. No.	Topic	Pedagogy	Hour	REFERENCES
1.	Download of LIDAR data	PRACTICE	6	https://www.youtube.com/watch?v=9IIRZm29HBg
2.	Layer stacking	PRACTICE	6	https://www.youtube.com/watch?v=prA10TUCPtg
3.	Data Validation	PRACTICE	6	https://www.youtube.com/watch?v=G8IC6dD5L-A
4.	Georeferencing Technology	PRACTICE	6	https://www.youtube.com/watch?v=XJ-s5BMZqJ8&t=160s
5.	Boresight Calibration - Lidar Data Preprocessing	PRACTICE	6	https://www.youtube.com/watch?v=BcmBrXfDkcs
6.	Project Coverage Verification - Review Lidar	PRACTICE	6	https://www.youtube.com/watch?v=DcjHGc3Z24w&t=34s

	Data against Field Control			
7.	Lidar data errors and rectifications, - processes calibration of Lidar data - artifacts and anomalies - Lidar Error Budget	PRACTICE	6	https://www.youtube.com/watch?v=9IIRZm29HBg
8.	Noise Removal and other sensor-related artifacts - Layer Extraction - Automated Filtering	PRACTICE	6	https://www.youtube.com/watch?v=prA10TUCPtg
9.	Manual Editing and Product Generation – Surface Editing - Hydrologic Enforcement	PRACTICE	6	https://www.youtube.com/watch?v=G8IC6dD5L-A
10.	DEM, DSM -TIN	PRACTICE	6	https://www.youtube.com/watch?v=XJ-s5BMZqJ8&t=160s
11.	Breaklines, Contours, and Accuracy Assessment.	PRACTICE	6	https://www.youtube.com/watch?v=BcmBrXfDkcs
12.	Topographic Mapping, , flood inundation analysis, line-of-sight analysis	PRACTICE	6	https://www.youtube.com/watch?v=DcjHGc3Z24w&t=34s
13.	Forestry, various types of lidar sensors-, vegetation metric calculations - specific application software.	PRACTICE	6	https://www.youtube.com/watch?v=G8IC6dD5L-A
14.	Corridor mapping system, data processing and quality control procedures	PRACTICE	6	https://www.youtube.com/watch?v=XJ-s5BMZqJ8&t=160s
15.	Modelling	PRACTICE	6	https://www.youtube.com/watch?v=BcmBrXfDkcs
	Total		90	https://www.youtube.com/watch?v=DcjHGc3Z24w&t=34s

Smart City Planning

Course Title	Code	Type of course	T-P-PJ	Prerequisite
Smart City Planning	DESP0202	Practice	0-3-0	Nil

Objective

- To teach students learning with Autodesk Infracad and work with Open Street Map and Drafting of different types of buildings in the project area, the concept of terrain and slope for designing of drainage, road and railway and designing the city features including park, garden etc.

Course Outcome

- Students will gain knowledge about to design and plan a twin city model.
- Students will get more knowledge on designing of building, road, drainage etc. through Autodesk Infracad and 3D EXPERIENCE Platform

Evaluation Systems

Internal Examination	Component	% of Marks	Method of Assessment
	Internal Practice	50 (40+10)	Lab work + Learning Record
External Examination	External Practice	50	Lab work
Total		100	

Course outline

Module-I City Modelling

Digital Twin city, Open source data: - Open Street Map, City GML, Open Topography, SRTM, Google Satellite maps.

Module-II Terrain Preparation

3DModeling:- base maps, terrain preparation, contour preparations, 3DModeling of city furniture's such as Buildings, Bridges, road, canal, assembly, stadium.

Module-III 3D Modelling

3DModeling; Texturing and rendering, virtual reality using HTC vive or 360-degree point capture.

Module-IV Simulation

Virtual Simulations; Shadow analysis, Strome Water management

MODULE-V Risk Management

Virtual Simulations; Pedestrian behaviour, solar lights intensity, risk management.

Module-VI Virtual Simulations

Virtual Simulations; urban scope Generation, mobility and traffic Simulation, urban emergency management, water supply, flood simulations, city electric power management, health, education, governance.

Module-VII City planning

Virtual Simulations: - flood simulations, city electric power management, health, education, Good governance.

6. Session Plan

Sl. No.	Topic	Pedagogy	Hour	REFERENCES
1.	Digital Twin city, Open source data: - Open Street Map, City GML	PRACTICE	6	https://youtu.be/VPJz-AucqF4
2.	Open Topography, SRTM, Google Satellite maps	PRACTICE	6	https://youtu.be/0zwBFc9aVtE
3.	3DModeling:- base maps, terrain preparation, contour preparations,	PRACTICE	6	https://youtu.be/tXDWxGUp8N0
4.	3DModeling of city furniture's such as Buildings, Bridges, road, canal, assembly, and stadium.	PRACTICE	6	https://youtu.be/P8qKaL9IGjk
5.	Texturing and rendering, virtual reality using HTC vive or 360-degree point capture.	PRACTICE	6	https://youtu.be/ZBLwb2nisJQ
6.	Shadow analysis, Strome Water management	PRACTICE	6	https://youtu.be/9nV9rNYYbxw
7.	Pedestrian behaviour, solar lights intensity,	PRACTICE	6	https://youtu.be/VPJz-AucqF4
8.	Generation scope, mobility and traffic Simulation	PRACTICE	6	https://youtu.be/0zwBFc9aVtE

9.	Flood simulations	PRACTICE	6	https://youtu.be/tXDWxGUp8N0
10.	Urban emergency management,	PRACTICE	6	https://youtu.be/P8qKaL9IGjk
11.	Water supply	PRACTICE	6	https://youtu.be/ZBLwb2nisJQ
12.	City electric power management	PRACTICE	6	https://youtu.be/9nV9rNYYbxw
13.	Risk management	PRACTICE	6	https://youtu.be/VPJz-AucqF4
14.	Health, Education,	PRACTICE	6	https://youtu.be/0zwBFc9aVtE
15.	E-Governance	PRACTICE	6	https://youtu.be/tXDWxGUp8N0
Total			90	

Project

Course Title	Code	Type of course	T-P-PJ	Prerequisite
Project	DEET0300	Project	0-0-6	Nil

Course objectives:

To teach application of remote sensing and GIS and mold the student for taking up a major project through applying the GIS and Remote sensing image-processing software's.

Course Outcome:

Students take up group projects and deal the following activities during the course of their project. The project Report should contain the reports of the activities and the explanation of the activity, how the same is taken up and the outcome of the activity.

1. Functional Planning of the project

2. Identification of Objects

3. Literature Review

4. Preparation of Flow chart for Methodology

5. Layer creation and GIS analysis

6. Identifying the possible Risks involved (specific to the project)

7. Result and Discussion

8. Conclusion

9. Recommendation

10. References

Internship

Course Title	Code	Type of course	T-P-PJ	Prerequisite
Internship	DEET0800	Practice	0-4-0	Nil

Students have to undergo twelve-week practical training in remote sensing and Geographical information System related organizations of their choice but with the approval of the department. At the end of the training student will submit a report as per the prescribed format to the department.

Assessment process

This course is mandatory and a student has to pass the course to become eligible for the award of degree. The student shall make a presentation before a committee constituted by the department, which will assess the student based on the report submitted, and the presentation made. Marks will be awarded out of 100 and appropriate grades assigned as per the regulations.

The following colour represents the syllabus revision, skill, employability and entrepreneurship.

Green : Skill

Pink : Employability

Sky : Entrepreneurship

Centurion University of Technology and Management Odisha

CHOICE BASED CREDIT SYSTEM

COURSE STRUCTURE & SYLLABUS

BASKET - I



School of Engineering & Technology

2019

BASKET - I
(Basic Sciences)

<i>Course Code</i>	<i>Course Title</i>	<i>Course Type</i>	<i>Credits</i>	<i>Prerequisite</i>	<i>Department Offering</i>
<i>FCBS0101</i>	<i>Environmental Science</i>	<i>Theory</i>	<i>3</i>	<i>Nil</i>	<i>Chemistry</i>
<i>FCBS 0102</i>	<i>Differential Equations</i>	<i>Theory</i>	<i>3</i>	<i>Nil</i>	<i>Mathematics</i>
<i>FCBS 0103</i>	<i>Linear Algebra & Vector Calculus</i>	<i>Theory</i>	<i>3</i>	<i>Nil</i>	<i>Mathematics</i>
<i>FCBS 0104</i>	<i>Integral Transform</i>	<i>Theory</i>	<i>3</i>	<i>Nil</i>	<i>Mathematics</i>
<i>FCBS 0105</i>	<i>Complex Analysis</i>	<i>Theory</i>	<i>3</i>	<i>Nil</i>	<i>Mathematics</i>
<i>FCBS0106</i>	<i>Discrete Mathematics</i>	<i>Theory</i>	<i>3</i>	<i>Nil</i>	<i>Mathematics</i>
<i>FCBS0107</i>	<i>Calculus</i>	<i>Theory</i>	<i>3</i>	<i>Nil</i>	<i>Mathematics</i>
<i>FCBS0108</i>	<i>Probability & Statistics</i>	<i>Theory</i>	<i>3</i>	<i>Nil</i>	<i>Mathematics</i>
<i>FCBS0109</i>	<i>Numerical Methods</i>	<i>Theory</i>	<i>3</i>	<i>FCBS0102 Differential Equations</i>	<i>Mathematics</i>
<i>FCBS0401</i>	<i>Applied Analytical Chemistry</i>	<i>Theory + Practice</i>	<i>3</i>	<i>Nil</i>	<i>Chemistry</i>
<i>FCBS0402</i>	<i>Industrial Chemistry</i>	<i>Theory + Practice</i>	<i>3</i>	<i>Nil</i>	<i>Chemistry</i>
<i>FCBS0403</i>	<i>Applied Engineering Materials</i>	<i>Theory + Practice</i>	<i>3</i>	<i>Nil</i>	<i>Chemistry</i>
<i>FCBS0404</i>	<i>Electricity and Magnetism</i>	<i>Theory + Practice</i>	<i>4</i>	<i>Nil</i>	<i>Physics</i>
<i>FCBS0405</i>	<i>Basic Mechanics and Properties of Matter</i>	<i>Theory + Practice</i>	<i>4</i>	<i>Nil</i>	<i>Physics</i>
<i>FCBS0406</i>	<i>Optics and Optical Fibres</i>	<i>Theory + Practice</i>	<i>4</i>	<i>Nil</i>	<i>Physics</i>

Environmental Science

Course Name	Code	Type of course	T-P-PJ (Credit)	Prerequisite
Environmental Science	FCBS0101	Theory	3	Nil

Course Objective:

- To understand the concept of multi-disciplinary nature of Environmental Science where different aspects are dealt with a holistic approach.
- Students will develop a sense of community responsibility by becoming aware of environmental issues in the larger social context.
- One must be environmentally educated.

Course Outcome:

- Understand the natural environment and its relationships with human activities.
- Characterize and analyze human impacts on the environment.
- Integrate facts, concepts, and methods from multiple disciplines and apply to environmental problems.
- Design and evaluate strategies, technologies and methods for sustainable management of environmental systems and for the remediation or restoration of degraded environments.

Evaluation System

	Component	% of Marks	Method of Assessment
Internal Examination	Midterm Test	30	Written examination
	Assignment	05	Report and Presentation
	Attendance	05	Attendance percentage
	Total	40	
External Examination		60	Written examination
Total		100	

MODULE-I

Environment and its multidisciplinary nature; Need for public awareness; Renewable and non renewable resources—forest, water, mineral, land, food and energy resources; Structure and function of ecosystems of forest, grass land, desert and aquatic types.

MODULE -II

Biodiversity and its conservation: Biodiversity at global, national and local levels; Threats to biodiversity - Habitat loss; wild life poaching and man - wildlife conflicts; Endangered and endemic species; conservation measures.

Causes, effects and control measures of pollution, air, water and noise pollution; Nuclear hazards; solid-waste management—Causes, effects and control measures; Management of disasters due to natural causes of floods, earthquakes, cyclones and landslides.

MODULE-III

Social issues and the environment; Sustainable environment, Water conservation measures; Rain water harvesting; Resettlement and rehabilitation of people; Climate change and global warming; Acid rain; Ozone layer depletion; water land reclamation; Consumerism and waste products; Features of

Environment Protection Act, Air pollution and Control of Pollution Acts; Water Pollution and its Control Act. Effects of Pollution explosion on environment and public health; Need for value education to Protect environment and resources.

Text Book: Anubhav Kaushik & C.P. Kaushik : Environmental Studies-New age International Publishers.

Reference Books:

1. Benny Joseph : Environmental Studies-Tata Mac Graw Hill
2. E. Bharucha : Text book of Environmental Studies for Under graduate courses– Universities Press. (Book prepared by UGC Committee.

Differential Equations

Course Name	Code	Type of course	T-P-PJ (Credit)	Prerequisite
Differential Equations	FCBS 0102	Theory	3	Nil

Course Objectives:

- To understand most of the physical phenomena from Science and Engineering which are modeled by differential equations.
- To find and interpret the solutions of the ODE & PDE appearing in signal systems, dynamical systems, stability theory and a number of applications to scientific and engineering problems.
- To develop the ability to apply differential equations to significant applied and/or theoretical problems.

Course Outcomes: Upon successful completion of this course, the student will be able to:

- Learn fundamental concepts of ODE & PDE theories and where and how such equations arise in applications to scientific and engineering problems.
- Be competent in solving linear/non-linear 1st & higher order ODEs & PDEs using analytical solution methods to obtain their exact solutions.
- Recognize the major classification of ODEs & PDEs and the qualitative differences between the classes of equations.

Evaluation System

	Component	% of Marks	Method of Assessment
Internal Examination	Midterm Test	30	Written examination
	Assignment	05	Report and Presentation
	Attendance	05	Attendance percentage
	Total	40	
External Examination		60	Written examination
Total		100	

MODULE-I (12 Hours)

First Order Differential Equations: Separable Equations, Homogeneous & Non-homogeneous Equations, Exact Differential Equations, Integrating Factor, Linear Differential Equations, Bernoulli Equation.

MODULE-II (15 Hours)

Second & Higher Order Linear Differential Equations: Linear Dependence and Independence of Solutions, Wronskian, Constant Coefficient Homogeneous Equations, Cauchy-Euler Equation, Nonhomogeneous Equations, Method of Variation of Parameter, Method of Inverse Operator, Legendre Equation.

MODULE-III (15Hrs)

Partial Differential Equation of First Order, Linear and Non-linear Partial Differential Equations, Charpit's Method, Homogeneous and Non-homogeneous Linear Partial Differential Equations with Constant Coefficients, Cauchy Type Differential Equation.

Text Book:

1) *Higher Engineering Mathematics* by B.V. Raman Publisher: TMH

Chapters: 8 (8.1 to 8.10); 9 (9.1 to 9.7), 18 (18.1 to 18.8) **Reference**

Book: 1) *Advanced Engineering Mathematics* by P.V.O' Neil

Publisher: Thomson

Linear Algebra & Vector Calculus

Course Name	Code	Type of course	T-P-PJ (Credit)	Prerequisite
Linear Algebra & Vector Calculus	FCBS 0103	Theory	3	Nil

Course Objectives:

- To apply concepts of Linear Algebra & Vector Calculus to the problems related to models in work, circulation and flux Problems, hydrodynamics and fluid dynamics, electrical circuits, networking, linear programming, graph theory, computer graphics, cryptography, thermodynamics, construction of curves and surfaces through specified points etc.
- To solve the system of linear equations appearing in the problems of electrical engineering, mechanical engineering, applied mechanics etc.
- To apply vectors in higher dimensional space in experimental data, storage and warehousing, electrical circuits, graphical images, mechanical systems and in physics.

Course Outcomes:

Upon successful completion of this course, the student will be able to:

- Use matrix operations to solve systems of linear equations and be able to determine the nature of the solutions.
- Compute with the characteristic polynomial, eigenvalues, eigenvectors and eigenspaces of a matrix as well as the geometric and the algebraic multiplicities of an eigenvalue and then to diagonalise that matrix.
- Determine the important quantities associated with scalar and vector fields.

Evaluation System

Internal Examination	Component	% of Marks	Method of Assessment
	Midterm Test	30	Written examination

	Assignment	05	Report and Presentation
	Attendance	05	Attendance percentage
	Total	40	
External Examination		60	Written examination
Total		100	

MODULE-I (14 Hours)

Linear Algebra, Basic Concepts, Linear System of Equations, Solution by Gauss Elimination, Conditions of Existence and Uniqueness of Solutions, Rank of a Matrix, Determinants and Cramer's Rule, Linear Dependence and Independence.

MODULE-II (14 Hours)

Eigen Values and Eigen Vectors, Basis, Symmetric, Skew-Symmetric and Orthogonal Matrices, Complex Matrices, Similarity of Matrices, Diagonalization.

MODULE-III (14 Hours)

Vector Differential Calculus: Vector Algebra, Inner Product, Vector Product, Vector & Scalar Functions and Fields, Derivatives, Gradient of a Scalar Field, Directional Derivative, Divergence of a Vector Field, Curl of a Vector Field.

Text Book:

1) *Advanced Engineering Mathematics* by E. Kreyszig Publisher: Johnwiley & Sons Inc-8th Edition Chapters: 6 (6.1 to 6.6); 7 (7.1, 7.3 to 7.5), 8 (8.1 to 8.4, 8.9 to 8.11) **Reference Books:**

1) *Advanced Engineering Mathematics* by P.V.O' Neil Publisher: Thomson
Mathematical Methods by Potter & Goldberg ; Publisher : PHI

Integral Transform

Course Name	Code	Type of course	T-P-PJ (Credit)	Prerequisite
Integral Transform	FCBS 0104	Theory	3	Nil

Course Objectives: To describe the ideas of Fourier and Laplace Transforms and indicate their applications in the fields such as Signal & System, Digital Signal Processing, Image Processing, Theory of Control Systems, Differential Equations and many others.

- To use Fourier series for solving boundary value problems appearing in scientific & engineering problems.
- To get acquainted with the fact that the Laplace transform is related to the Fourier transform, but the Fourier transform expresses a function or signal as a series of modes of vibration (frequencies), whereas the Laplace transform resolves a function into its moments.

Course Outcomes: Upon successful completion of this course, the student will be able to:

- Obtain Laplace transform of simple functions, functions expressed in graphical form, integrals and derivatives.
- Solve differential & integral equations with initial conditions using Laplace transform.
- Compute the Fourier series representation of a periodic function, in both exponential and sine-cosine forms.
- Evaluate the Fourier transform of a continuous function and be familiar with its basic properties.

Evaluation System

	<i>Component</i>	<i>% of Marks</i>	<i>Method of Assessment</i>
Internal Examination	Midterm Test	30	Written examination
	Assignment	05	Report and Presentation
	Attendance	05	Attendance percentage
	Total	40	
External Examination		60	Written examination
Total		100	

MODULE-I (16 Hours)

Laplace Transforms, Transforms of Derivatives and Integrals, Derivatives and Integrals of Transforms, Shifting Properties, Unit Step Function, Dirac’s Delta Function, Convolution, Inverse Transforms, Solution to Differential Equation, Integral Equation.

MODULE-II (12 Hours)

Periodic Functions, Trigonometric Series, Fourier Series, Fourier Expansion of Functions of any Period, Even and Odd Functions, Half Range Expansions,

MODULE-III (14Hrs)

Fourier Integrals: Fourier Sine Integral, Fourier cosine Integral. Fourier Transforms: Fourier Sine Transform, Fourier Cosine Transform.

Text Book:

Advanced Engineering Mathematics by E.Kreyszig

Publisher: Johnwiley& Sons Inc-8th Edition

Chapters: 5 (5.1 to 5.6); 10 (10.1 to 10.4, 10.8, 10.9)

Reference Books:

1) *Advanced Engineering Mathematics by P.V.O’Neil .Publisher: Thomson*

2) *Higher Engineering Mathematics by B.V.Raman .Publisher: TMH*

Complex Analysis

Course Name	Code	Type of course	T-P-PJ (Credit)	Prerequisite
Complex Analysis	FCBS 0105	Theory	3	Nil

Course Objectives:

- *To understand the application of Complex Analysis to Two-Dimensional problems in Physics including Hydrodynamics and Thermodynamics and also in Engineering fields such as; Nuclear, Aerospace, Mechanical and Civil engineering, signal processing & communications.*
- *To acquire the skill of contour integration to evaluate complicated real integrals appearing in Engineering problems via residue calculus.*

Course Outcomes: Upon successful completion of this course, the student will be able to:

- To get equipped with the understanding of the fundamental concepts of functions of a complex variable along with the concepts of analyticity, Cauchy-Riemann relations and harmonic functions.
- Evaluate complex contour integrals applying the Cauchy integral theorem, Cauchy integral formula and Residue theorem.
- Illustrate the applications of the calculus of residues in the evaluation of real integrals.

Evaluation System

	Component	% of Marks	Method of Assessment
Internal Examination	Midterm Test	30	Written examination
	Assignment	05	Report and Presentation
	Attendance	05	Attendance percentage
	Total	40	
External Examination		60	Written examination
Total		100	

MODULE-I (14 Hours)

Complex Analysis: Analytic Function, Cauchy-Riemann Equations, Laplace Equation, Harmonic Function, Linear Fractional Transformation.

MODULE-II (14 Hours)

Parametric representation, Line Integral in the Complex plane, Cauchy's Integral Theorem, Cauchy's Integral Formula, Derivatives of Analytic Function.

MODULE-III (14Hrs)

Power Series, Taylor's Series, Maclaurin Series, Laurent's Series, Singularities and Zeroes, Residue Theorem, Residue Integration Method, Evaluation of Real Integrals.

Text Book:

1) *Advanced Engineering Mathematics* by E. Kreyszig Publisher: Johnwiley & Sons Inc-8th Edition Chapters: 12 (12.1 to 12.4, 12.9); 13, 14 (14.2, 14.4) & 15.

Reference Books:

- 1) *Advanced Engineering Mathematics* by P.V. O'Neil Publisher: Thomson
- 2) *Fundamentals of Complex Analysis (with Applications to Engineering and Science)* by E.B. Saff & A.D. Snider Publisher: Pearson

Discrete Mathematics

Course Name	Code	Type of course	T-P-PJ (Credit)	Prerequisite
Discrete Mathematics	FCBS 0106	Theory	3	Nil

Course Objectives:

- To learn a particular set of mathematical facts and to apply their applications in many subjects of Computer Science and Engineering such as Cryptography, Theory of Computation & Data Networking.
- To understand mathematical reasoning in order to read, comprehend and construct mathematical arguments as well as to solve problems, occurred in the development of programming languages.
- To work with discrete structures such as graphs to study the structure of the world wide web, to model a computer network and to find the shortest path between two places in a transportation network.

Course Outcomes: Upon successful completion of this course, the student will be able to:

- Evaluate elementary mathematical arguments and identify fallacious reasoning.
- Apply the logical structure of proofs and work symbolically with connectives and quantifiers to produce logically valid, correct and clear arguments.
- Reformulate statements from common language to formal logic. Apply truth tables and the rules of propositional and predicate calculus.
- Model and solve real-world problems using graphs, both quantitatively and qualitatively.

Evaluation System

	Component	% of Marks	Method of Assessment
Internal Examination	Midterm Test	30	Written examination
	Assignment	05	Report and Presentation
	Attendance	05	Attendance percentage
	Total	40	
External Examination		60	Written examination
Total		100	

MODULE-I (12 Hours)

Propositional Logic, Propositional Equivalence, Predicates and Quantifiers, Nested Quantifiers, Rules of Inference, Recurrence Relations, Solving Linear Recurrence Relations.

MODULE-II (16 Hours)

Relations and its properties, Representation of Relations, Closure of Relations, Equivalence Relations and Partitions, Partial Ordering, POSet, Hasse Diagram, Maximal & Minimal elements of a Poset, Supremum & Infimum of a Poset, Lattice, Basic properties of Lattices.

MODULE-III (14Hrs)

Introduction to Graph Theory, Graph terminology, Representation of graphs, Graph Isomorphism, Connectivity, Euler and Hamiltonian Paths, Planar graph, Graph Coloring, **Text Books:**

- 1 *Discrete Mathematics and its Applications* by K.H.Rosen Publisher: TMH, Sixth Edition
Chapters: 1(1.1 to 1.5) ; 6 (6.1, 6.2) ; 7; 8(8.1 to 8.5, 8.7, 8.8)
- 2 *Elements of Discrete Mathematics* by C.L.liu & D.P. Mohapatra Publisher: TMH, Third Edition Chapter: 11 (11.1 to 11.4) **Reference Books:**
Discrete and Combinatorial Mathematics by R.P.Grimaldi Publisher: Pearson
Discrete Mathematics and Applications by Thomas Koshy Publisher: Elsevier
Discrete Mathematical Structures by B. Kolman, R.C. Busby & S. Ross Publisher: PHI

Calculus

Course Name	Code	Type of	T-P-PJ	Prerequisite
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		course	(Credit)	
Calculus	FCBS0107	Theory	3	Nil

Objective

- To study how things change. It provides a framework for modeling systems in which there is change, and a way to deduce the predictions of such models.
- To construct a relatively simple quantitative models of change, and to deduce their consequences.
- The fundamental idea of calculus is to study change by studying “instantaneous” change, by which we mean change over tiny interval of time.

Course Outcome

- Upon successful completion of this course, students will be able to:
- Understand the importance of linear functions in mathematics.
 - Understand the major problems of differential and integral calculus.
 - Understand and recognize other important classes of functions (such as trigonometric and rational functions), and be able to use calculus with these functions.

Evaluation Systems

	<i>Component</i>	<i>% of Marks</i>	<i>Method of Assessment</i>
<i>Internal Examination</i>	Midterm Test	30	Written examination
	Assignment	05	Report and Presentation
	Attendance	05	Attendance percentage
	Total	40	
<i>External Examination</i>		60	Written examination
<i>Total</i>		100	

MODULE-I

(6 Hours)

Asymptotes

MODULE-II

(6 Hours)

Curve Tracing

MODULE-III

(6 Hours)

Curvature

MODULE-IV

(6 Hours)

Reduction Formulae

MODULE-V

(6 Hours)

Vector Integral Calculus: Line Integrals.

MODULE-VI

(6 Hours)

Surface Integrals, Green’s Theorem

MODULE-VII

(6 Hours)

Volume Integrals, Gauss’s Theorem, Stokes’ Theorem (without proof).

Text Books:

- 1) A Text book of Calculus Part-III : Shantinakaran
Chapters: 1 (Art 1 & 3), 3(Art 7, 8, 9)
- 2) A Text book of Calculus Part – II : Shantinakaran
Chapter: 8 (Art. 24, 25, 26),
- 3) A Text book of Calculus Part – II : Shantinakaran
Chapter: 10 (Art.33, 34, 35, 36, 37)

- 4) A Textbook of Vector Calculus by Shanti Narayan & P. K. Mittal, S. Chand & Co. , 2003
Chapters: 7 (7.1 to 7.6, 7.8 & 7.11)

Probability & Statistics

Course Name	Code	Type of course	T-P-PJ (Credit)	Prerequisite
Probability & Statistics	FCBS0108	Theory	3	Nil

Objective

- To translate real-world problems into probability models.
- To motivate in students an intrinsic interest in statistical thinking.
- To recognize the role of and application of probability theory, descriptive and inferential statistics in many different fields of engineering.

Course Outcome

- Upon successful completion of this course, students will be able to:
- Define and illustrate the concepts of sample space, events and compute the probability and conditional probability of events.
 - Define, illustrate and apply the concepts of discrete and continuous random variables, the discrete and continuous probability distributions.
 - Define, illustrate and apply the concept of the expectation to the mean, variance and covariance of random variables.
 - Compute probabilities based on practical situations using the Binomial, Poisson and Normal distributions.

Evaluation Systems

	<i>Component</i>	<i>% of Marks</i>	<i>Method of Assessment</i>
<i>Internal Examination</i>	Midterm Test	30	Written examination
	Assignment	05	Report and Presentation
	Attendance	05	Attendance percentage
	Total	40	
<i>External Examination</i>		60	Written examination
<i>Total</i>		100	

MODULE-I

(6 Hours)

Probability: Sample space and Events, Principles of Counting, Classical definition of probability.

MODULE-II

(6 Hours)

Axioms of probability, Elementary theorems, Addition and Multiplication rules, Conditional probability.

MODULE-III

(6 Hours)

Probability Distributions: Discrete and Continuous Random Variables.

MODULE-IV

(6 Hours)

Probability Density and Distribution functions, Mean and Variance of Distributions. Binomial Distribution.

MODULE-V

(6 Hours)

Poisson Distribution, Normal Distributions, Poisson and Normal Distributions as Limiting forms of Binomial Distribution.

MODULE-VI**(6 Hours)**

Statistics: Random Sampling, Population and Sample, Sample Mean and Variances.

MODULE-VII**(6 Hours)**

Point and Interval Estimations, Confidence Intervals, Fitting Straight Lines, Correlation and Regression.

Text Book:

1) Advanced Engineering Mathematics by E. Kreyszig

Publisher: John Willey & Sons Inc-8th Edition

Chapters: 22(22.1 to 22.8), 23(23.1 to 23.3, 23.9, 23.10)

Reference Books:

1) Statistical Methods By S.P. Gupta (31st Edition); Publisher: Sultan Chand & Sons.

2) Mathematical Statistics By S.C. Gupta & V.K. Kapur (10th Edition); Publisher: Sultan Chand & Sons.

Numerical Methods

Course Name	Code	Type of course	T-P-PJ (Credit)	Prerequisite
Numerical Methods	FCBS0109	Theory	3	FCBS0102 Differential Equations

Objective

- To understand the limitations of analytical methods and the need for numerical methods and the ability to apply these numerical methods to obtain the approximate solutions to engineering and mathematical problems.
- Ability to decide and to derive appropriate numerical methods for approximating the solutions of various types of problems in engineering and science and analyze the error incumbent in any such numerical approximation.
- Ability to report analysis, solution and results in a standard engineering format.

Course Outcome

- Upon successful completion of this course, students will be able to:
- Perform error analysis to select an appropriate numerical model and to estimate errors in numerical solution of a given problem.
 - Derive a variety of numerical algorithms/methods & compare the viability of different approaches to the numerical solutions of various mathematical problems arising in roots of linear and non-linear equations, interpolation and approximation, numerical differentiation and integration, system of linear algebraic equations and differential equations.
 - Analyze and evaluate the accuracy of common numerical methods.

Evaluation Systems

	<i>Component</i>	<i>% of Marks</i>	<i>Method of Assessment</i>
<i>Internal Examination</i>	Midterm Test	30	Written examination
	Assignment	05	Report and Presentation
	Attendance	05	Attendance percentage
	Total	40	
<i>External Examination</i>		60	Written examination
<i>Total</i>		100	

MODULE-I

(6 Hours)

Approximation and round of errors, Truncation error and Taylor's series, Roots of equation using Bisection Method.

MODULE-II

(6 Hours)

Roots of equation using the false-position method, fixed point iteration, Newton-Raphson method, Secant method.

MODULE-III

(6 Hours)

Solution of System of Linear algebraic equations: Gauss-Seidel method, Lagrange Interpolation.

MODULE-IV

(6 Hours)

Newton divided difference interpolation, Inverse Interpolation, Lagrange Interpolation, Newton's forward and backward interpolation.

MODULE-V**(6 Hours)**

Numerical Differentiation, Numerical integration by the trapezoidal rule.

MODULE-VI**(6 Hours)**

Numerical integration by the Simpson's rules, Gauss quadrature rule.

MODULE-VII**(6 Hours)**

Solution of Ordinary Differential Equations: Euler's method, Improvement of Euler's method, Runge-Kutta methods.

Text Book:

- 1) Advanced Engineering Mathematics by E. Kreyszig
Publisher: John Willey & Sons Inc-8th Edition
Chapters: 17 (17.1 to 17.3, 17.5), 18 (18.3), 19 (19.1)

Reference Books:

- 1) Numerical Methods for Scientific and Engineering Computation by M. K. Jain, S. R. K. Iyengar & R.K. Jain; New Age International Publishers.
- 2) Introductory Methods of Numerical Analysis by S.S. Sastry; Third Edition, Prentice Hall India.

Applied Analytical Chemistry

Course Name	Code	Type of course	T-P-PJ (Credit)	Prerequisite
Applied Analytical Chemistry	FCBS0401	Theory + Practice	3	Nil

Course Objective

- The aim of this course is to give students that are going to carry out an experimental work the necessary comprehension in analytical chemistry.
- The course will also provide the student with knowledge to be able to understand and critically evaluate experimental data produced by others.

Course outcome

- Explain fundamental principles for environmental analytical methods (titration, electrochemistry, instrumentation and basic parameters of water, soil, fuel etc)
- Point out suitable analytical techniques for analyzing a specific compounds in an environmental matrix
- Point out suitable techniques for sampling and handling of environmental samples
- Apply quality control on chemical analysis and laboratory work and explain its importance
- Plan and carry out laboratory experiments, including data analysis and conclusions
- Describe simple approaches for troubleshooting

Evaluation System

	Component	% of Marks	Method of Assessment
Internal Examination	Internal	20	Written examination
	Assignment	30	Report and Presentation
External Examination	End Sem	30	Written examination
	Practice	20	Experiment followed by Viva
Total		100	

Module-1

Water Analysis: Importance of water, different types of water, sources and uses of water, types of water pollutants and domestic and industrial significance of analysis of water. Removal of hardness by Lime-Soda, Zeolite and Ion exchange methods. Removal of DO and dissolved CO₂ from water by De-aeration method. Desalination of brackish water by Reverse osmosis and electro dialysis process. Water disinfection by bleaching powder, liquid Cl₂, and chloramine.

Practice:

1. Determination of total hardness by EDTA method, total dissolved solids, total alkalinity
2. Determination of Turbidity by nepheloturbidity meter, pH, Conductivity.
3. Determinations of BOD, COD, DO.

NB: The above parameters can also be determined by using water kits and the results are to be compared with those obtained manually.

Module-2

Soil Analysis: Composition of rocks and minerals, soil profile and properties.

Practice:

1. Determination of texture of soil.
2. Determination of moisture content in a soil sample, pH, electrical conductivity,
3. Determination of water holding capacity of soil.
4. Measurement of Calcium and Magnesium Using EDTA methods.

Module-3

Chemistry of fuels: Classification of fuels, composition and properties of Petroleum, LPG, Water gas, producer gas, CNG. Knocking – Mechanism of knocking, harmful effects, Anti knocking agents – TEL, Catalytic converters – Principle & working, Unleaded petrol, Power alcohol & Biodiesel. Photovoltaic cells - construction & working of a PV cell **Practice:**

1. Proximate analysis of fuel (Coal, biomass etc.) Moisture, Volatile content, Ash, fixed carbon
2. Testing of fuel properties of the plastic oil and bio diesel: Specific gravity by picnometer, flash point and fire point by pesky-Marten flash point apparatus, viscosity by Redwood viscometer, calorific value by bomb calorimeter

Industrial Chemistry

Course Name	Code	Type of course	T-P-PJ (Credit)	Prerequisite
Industrial Chemistry	FCBS0402	Theory + Practice	3	Nil

Course Objective

Students may also explore in depth specialized areas of chemistry of materials, including ores, metals, cemenas well as dyes, oils, soaps

- *Introduce the students to industrial processing principles as applicable to chemical and allied industries.*
- *Provide the students with the knowledge of how raw materials are sourced for various chemical industries and how these materials are processed.*
- *Provide students with advanced technical skills in Chemical Engineering that will enable them to (a) translate fundamental discoveries in materials and other high technology areas to commercial exploitation, and (b) adapt readily to the challenges presented in a diverse range of industrial sectors that can benefit from process engineering approaches.*

Course outcome

- *Appreciate better their future roles as chemists in Industrial establishments*
- *Be able to explain the origin of raw materials used in the chemical and allied industries*
- *Have a good understanding of how chemical raw materials are processed into finished products.*
- *Graduates find employment in, quality control, oil and petroleum industry, textile industry, dyes and paints industry, cement industry, just to name a few.*

Evaluation System

	<i>Component</i>	<i>% of Marks</i>	<i>Method of Assessment</i>
<i>Internal Examination</i>	Internal	20	Written examination
	Assignment	30	Report and Presentation
<i>External Examination</i>	<i>End Sem</i>	30	Written examination
	<i>Practice</i>	20	Experiment followed by Viva
<i>Total</i>		100	

Module 1: Preparation of soap, dyes and oil analysis :

Introduction: Types of soap (soft and hard soap), methods of preparation of soap, mechanism, difference between fats and oils, physical properties of fats and oil, general introduction to chemistry of dye, various example of dyes, types of dyes.

Practice:

- Preparation of soap by saponification
- Determination of the properties different type of soap
 1. pH test
 2. Foam test

- Hard water test
- Determination of iodine number of oil
- Preparation of dyes (azo dyes): 2- naphthol + 4 - nitro aniline: salicylic acid + 4- nitro aniline
- Preparation of Phenyle.

Applications: Effect of water hardness in cleansing action of soap. Application of dyes to cloth

Module 2: Metals estimation from ores

Introduction: General introduction on ores, types of ore, important ore minerals, application of ores.

Practice:

- Estimation of Cu in copper ore
- Determination of Fe as ferrous iron in an ore sample
- Determination of Zn in Zinc ore by EDTA complex metric method

Module 3: Analysis of cement

Introduction: what is cement? types of cement, composition of cement, preparation of cement, applications.

Practice:

- Estimation of calcium in Portland cement
- Cement hydration and pH evaluation during caving
- To check the quality of cement (colour, texture, smell test, float test, shape test and strength test)

Applied Engineering Materials

Course Name	Code	Type of course	T-P-PJ (Credit)	Prerequisite
Applied Engineering Materials	FCBS0403	Theory + Practice	3	Nil

Course Objective

- To understand the importance of the chemical approach to nanomaterials
- To study the preparation, analysis and applications of metal nanoparticles
- To develop an understanding of conjugated polymers and their applications
- To understand how polymer composition and architecture imparts unique properties and behavior
- To study organic-inorganic hybrid materials (COMPOSITES) and how the incorporation of metals in the polymer architecture leads to new properties and applications

Course outcome

- Know what it takes to have a career in nanotechnology
- Understand the need to increase Nanotechnology awareness
- Understand the definition of Nanotechnology
- Know the processing of Nanoparticles and Nanomaterials □ Know the application of Nanotechnology and nanomaterials

Evaluation System

<i>Internal Examination</i>	<i>Component</i>	<i>% of Marks</i>	<i>Method of Assessment</i>
	Internal	20	Written examination
	Assignment	30	Report and Presentation
<i>External Examination</i>	<i>End Sem</i>	30	Written examination
	<i>Practice</i>	20	Experiment followed by Viva
<i>Total</i>		100	

Module 1: Nano Materials:

Introduction, nano scale, applications in various fields.

Practice:

- Synthesis of Ag, Au nano particles by wet chemical methods. □ Synthesis of ZnO Nanoparticles by Precipitation Method □ Synthesis of Cu nano particles Sonochemical method.
- Synthesis of Fe nano particles Co-precipitation method.
- Thickness measurement by sol-gel process of coating.

Module 2: Polymers

Introduction, types of polymers, Polymerisation mechanisms.

Practice:

- Synthesis of Thiokol Rubber
- Synthesis of a Rubber Ball from Rubber Latex
- Synthesis of Polystyrene (PS)
- Synthesis of Polymethyl Methacrylate (PMMA) □ Synthesis of Nylon-6:6.
- Determination of molecular weight of polymers by visometry method.

Module 3: Composites

Introduction :Biopolymers or synthetic polymers reinforced with natural or biofibers(termed as bio composites) as a viable alternative to glass fibre composites.Biocomposites“ refers to those composites that can be employed in bioengineering.Biocomposites are composite materials, that is, materials formed by a matrix (resin) and a reinforcement of natural fibers (usually derived from plants or cellulose). Bio composites are the combination of natural fibers (biofibers) such as wood fibers (hardwood and softwood) or non - wood fibers (e.g., wheat, kenaf, hemp, jute, sisal, and flax) with polymer matrices from both renewable and non-renewable resources.

Practice:

- Synthesis of bio composite materials by using jute fibres and wood fibres

Electricity and Magnetism

Course Name	Code	Type of course	T-P-PJ (Credit)	Prerequisite
Electricity and Magnetism	FCBS0404	Theory + Practice	4	Nil

Course Objective

- To understand electric circuit components and their use.
- To learn and verify the fundamental laws of electricity, learn how to use certain electrical devices.
- Understanding magnetic properties of matter and performing experiments to realize magnetism.

Course outcome

- Realizing the importance and use of electrical components in a circuit.
- Learning how to do different connections and their purpose.
- Understanding magnetism of matter and its applications

Evaluation Criteria

Internal Examination	Component	% of Marks	Method of Assessment
	Internal	20	Written examination
	Assignment	30	Report and Presentation
External Examination			
	End Sem	30	Written examination
	Practice	20	Experiment followed by Viva
Total		100	

Practice I Theory:

Electric field, Potential, EMF, capacitance, resistance, series connection, parallel connection, Kirchoff’s laws, RC circuits, LC circuits.

Lab:

1. Use a Multi-meter for measuring (a) Resistance, (b) AC and DC Voltages, (c) DC Current, (d) Capacitance and (e) Checking electrical fuses.
2. To determine an unknown Low Resistance using Potentiometer.
3. To determine an unknown Low Resistance using Carey Foster’s Bridge.

Practice II

Theory: Electrical Circuits: AC Circuits: Kirchhoff's laws for AC circuits. Complex Reactance and Impedance. Series LCR Circuit: (1) Resonance, (2) Power Dissipation and (3) Quality Factor, and (4) Band Width. Parallel LCR Circuit.

Lab:

1. To verify the Superposition, and Maximum power transfer theorems.
2. To determine self-inductance of a coil by Anderson's bridge.
3. To study response curve of a Series LCR circuit and determine its (a) Resonant Frequency, (b) Impedance at resonance, (c) Quality factor Q, and (d) Band width.
4. To study the response curve of a parallel LCR circuit and determine its (a) Anti- resonant frequency and (b) Quality factor Q.

PRACTICE III

Theory: Magnetic Properties of Matter: Magnetization vector (**M**). Magnetic Intensity (**H**). Magnetic Susceptibility and permeability. Relation between **B**, **H**, **M**. Ferromagnetism. B-H curve and hysteresis. Electromagnetic Induction: Faraday's Law. Lenz's Law. Self Inductance and Mutual Inductance. Reciprocity Theorem. Energy stored in a Magnetic Field.

Lab:

2. To study the induced e.m.f. as a function of the velocity of the magnet.
3. Measurement of field strength B and its variation in a solenoid.
4. Determination of μ_r ratio.

Text Book:

1. *Electricity and Magnetism* By K. K. Tiwari, S. Chand Publishing References:
2. *Electricity and Magnetism*, By M. C. Saxena, Satya Prakash, V. P. Arora, Publisher: Pragati Prakashan
3. *Introduction to Electrodynamics*, by David J. Griffiths Prentice-Hall; 3 edition (2011)
4. *Electricity and Magnetism* by - D. C. Tayal, Himalaya Publishing, 2009.

Basic Mechanics and Properties of Matter

Course Name	Code	Type of course	T-P-PJ (Credit)	Prerequisite
Basic Mechanics and Properties of Matter	FCBS0405	Theory + Practice	4	Nil

Course Objective

- To give the students overall idea about material properties and also hands on experience to measure them.
- To make them realize the applications of material properties.
- To expose them to phenomena like hydrostatics, elasticity, viscosity, surface tension and their applications in various places.
- Encouraging them to build simple models to explain the mechanical properties. **Theory:**

Course outcome

- To understand material properties and perform experiments on them.
- To understand the applications of material properties in real life.
- To be able to make small models for explain few mechanical properties.

Evaluation System

	Component	% of Marks	Method of Assessment
Internal Examination	Internal	20	Written examination
	Assignment	30	Report and Presentation
External Examination	End Sem	30	Written examination
	Practice	20	Experiment followed by Viva
Total		100	

Elasticity: Elastic constants, Relation among elastic constants, torsion of right circular cylinder, bending of beams, Vibration of loaded cantilever.

Lab:

1. Young's modulus by single/double cantilever
2. Young's modulus by Searle's method
3. Rigidity modulus using Barton's apparatus
4. Poisson's ratio

Practice II Theory:

Hydrostatics: hydrostatic force on a body, buoyancy, metacentric height, hydrostatic pressure, pressure measurement: manometer

Viscosity: Viscosity of fluids, Stoke's law, terminal velocity, Poiseuille's equation, Searle's viscometer.

Surface tension & surface energy: Pressure difference across curved liquid surface. **Lab:**

1. Viscosity by Stokes method
2. Viscosity by Poiseuille's method
3. Metacentric height of floating body

4. Measurement of Pressure by manometer
5. Surface tension by capillary rise method
6. Determination of surface tension by Quincke's method

Practice III:

Basic Mechanics

Theory: Kinematics and Kinetics, Effort amplification using levers and pulleys, Friction, Laws of friction.

Rotational Motion: Moment of Inertia, Theorem of Parallel and Perpendicular axes. Moment of inertia of circular disc.

Lab:

1. Effort-output ratio using combination of pulleys
2. Verification of laws of static and dynamic friction
3. Moment of inertia of fly wheel

Text Book:

1. Elements of Properties of Matter, Dec 2010 by D.S. Mathur, S.Chand (G/L) & Company Ltd

Reference Books:

- 1. A Text Book of Fluid Mechanics by R.K. Bansal, Laxmi Publishers, 2005*
- 2. Engineering Mechanics Statics and Dynamics by A. K. Tayal, Umesh Publications.*

Optics and Optics Fibre

Course Name	Code	Type of course	T-P-PJ (Credit)	Prerequisite
Optics and Optics Fibre	FCBS0406	Theory + Practice	4	Nil

Course Objective

To understand optical phenomena.

- *To understand different light sources and their use*
- *Understand designing of microscope and artificial light sources*
- *Understanding optical fiber and its applications*

Course outcome

- *Students should understand optical phenomena.*
- *Students should learn about different light sources and their use*
- *Students should be able to understand optical fiber principle, operations and its applications.*

Evaluation System

	Component	% of Marks	Method of Assessment
Internal Examination	Internal	20	Written examination
	Assignment	30	Report and Presentation
External Examination	End Sem	30	Written examination
	Practice	20	Experiment followed by Viva
Total		100	

Practice I

Theory: Reflection and refraction of light. Mirror formula, lens maker's formula. Refraction through a prism. Dispersion, light sources: Principle and operations of sodium lamp, mercury lamp and LASER.

Lab:

1. To determine refractive index of the Material of a prism using sodium source.
2. To determine the dispersive power and Cauchy constants of the material of a prism using mercury source.
3. To determine the refractive index of glass slab using travelling microscope.
4. Designing of a compound microscope.

Practice II

Theory: Interference. Young's experiment, conditions for interference, Intensity distribution of fringes, Interference in thin films, Newton's rings.

Diffraction: types of diffraction, Fraunhofer diffraction at a single slit, diffraction at N-parallel slits and plane diffraction grating.

Polarization: Polariser and analyser, optical rotation and Polarimeter

Lab:

1. Determination of wavelength of light by Newton's ring method.
2. Determination of wavelength of LASER source by diffraction grating method
3. Thickness of thin paper by wedge-shaped films
4. Dispersive power and resolving power of a plane diffraction grating.
5. Polarimetry

Practice-III

Theory: Optical properties—scattering, refraction, reflection, transmission & absorption. Introduction, principle of Laser, stimulated and spontaneous emission, Coherence (temporal and spatial) Ruby Laser, Application of Lasers.

Optical Fibres: Introduction, numerical aperture, step index and graded index fibres, attenuation & dispersion mechanism in optical fibers (Qualitative only), application of optical fibres, optical communication (block diagram only)

Lab:

1. Measurement of attenuation and bending losses of an optical fibre.
2. Measurement of numerical aperture of a optical fibre
3. Study of spatial and temporal coherence of LASER
4. Making of a light guide

Text Book:

1. *A Text Book of Optics by M.N. Avadhanulu, Brij Lal, N. Subrahmanyam, S Chand; 23rd Rev. Edn.*

References:

2. *Optics by Ajoy Ghatak, McGraw Hill Education; 5 edition*
3. *Physics-I for engineering degree students by B.B. Swain and P.K.Jena.*
4. *Concepts in Engineering Physics by I Md. N. Khan.*

Centurion University of Technology and Management Odisha

COURSE STRUCTURE & SYLLABUS

BASKET - II



Centurion
UNIVERSITY

Shaping Lives...
Empowering Communities...

CENTURION UNIVERSITY OF TECHNOLOGY AND MANAGEMENT

School of Engineering & Technology

2019

CURRICULUM

COURSES OFFERED BY DEPARTMENT OF HUMANITIES AND MANAGEMENT BASKET - II

Course Code	Course Title	Course type	Credits	Prerequisite
FCHU1201	Foundations of English Communication	Workshop	2	Nil
FCHU1202	Communicative Practice Laboratory -1	Workshop	2	Nil
FCHU1203	Business Communication	Workshop	2	Nil
FCHU1204	Communicative Practice Laboratory-II	Workshop	2	Nil
FCHU1205	Corporate Readiness Laboratory	Workshop	2	Nil
FCHU1206	IT Enabled Communication	Workshop	2	Nil
FCHU1207	Career Communication	Workshop	2	Nil
FCHU1208	Personality Development	Workshop	2	Nil
FCHU1209	Seminar and Technical Writing	Workshop	2	Nil

FCHU1210	Professional Etiquette	Workshop	2	Nil
FCHU1211	Creative Writing	Workshop	2	Nil
FCHU1212	English for Competition (GRE/GMAT/TOEFL/IELTS)	Workshop	2	Nil
FCHU1213	Be a Contributor	Workshop	2	Nil
FCHU0213	Life Skills Development (LSD) – I	Practice	2	Nil
FCHU0214	Life Skills Development (LSD) – II	Practice	2	Nil
FCHU0215	Life Skills Development (LSD) - III	Practice	2	Nil
FCHU0216	Life Skills Development (LSD) - IV	Practice	2	Nil
FCMG0114	Economics	Theory	2	Nil
FCMG0102	Accounting & Finance	Theory	2	Nil
FCMG0103	Management Processes and OB	Theory	2	Nil
FCMG0104	Production and Operation Management	Theory	2	Nil
FCMG0105	Marketing Management	Theory	2	Nil
FCMG0108	Introduction to Research	Theory	2	Nil
FCMG0113	Indian Society and Culture	Theory	2	Nil
FCMG1203	Introduction Human Rights	Workshop	2	Nil
FCMG1204	Introduction to Ethics	Workshop	2	Nil
FCMG1201	Disaster Management	Workshop	2	Nil
FCMG1202	Ms Excel	Workshop	2	Nil
FCMG1205	Introduction to Gender	Workshop	2	Nil

Note: The evaluation for Workshop type subject will be 100% internal by the concerned faculty.

SYLLABUS
FCHU1201FOUNDATIONS OF ENGLISH COMMUNICATION

Pre - requisites	Course Type	Credits
Nil	Workshop	2

COURSE OBJECTIVES

- To develop vocabulary and grammar knowledge
- To develop reading comprehension skills

COURSE OUTCOMES

- Development of academic and sub-technical vocabulary
- Enhancement of basic language skills, i.e., listening, speaking, reading and writing
- Development of grammatical competence
- Confidence level improvement

This course aims to build the vocabulary, comprehension, and writing skills for effective communication in English language. It will focus on reading, listening to, and writing passages, as a means of learning communications skills.

The essential elements of this course will include:

MODULE-I: READING SKILLS (7hrs.)

Read **one** of the following books:

- Animal Farm
- Alice in Wonderland
- Guide
- Malgudi Days
- Harry Potter
- Amar Chitra Katha

Comprehension Skills: Students will respond to comprehension lessons from the chosen book.

MODULE-II: WRITING SKILLS (7hr.)

Students learn grammar and usage by writing passages, and getting formal feedback on these.

MODULE-III: LISTENING SKILLS (6hrs.)

Students respond to questions based on listening to videos, audio, or speaking assignments of classmates.

MODULE-IV: SPEAKING SKILLS (7hrs.)

Speaking assignments based on chosen book or contemporary topics.

TEXT BOOKS:

Esteras, Santiago Remacha and Fabre, Elena Marco. (2007). Professional English in Use ICT Student's Book. Cambridge: Cambridge University Press.

REFERENCES:

Grellet, F. (1981). Developing Reading Skills. Cambridge: Cambridge University Press

McCarthy, M. & O'Dell, F. (2008). Academic Vocabulary in Use. Cambridge: Cambridge University Press.

Ur Penny, (1992). Five-Minute Activities: A Resource Book of Short Activities (Cambridge Handbooks for Language Teachers). Cambridge: CUP

F Klippel. (1984). Keep Talking. Cambridge: CUP

EVALUATION SYSTEM (CONTINUOUS INTERNAL ASSESSMENT)

Methods	Conversations	Listening Comprehension	Book Review Presentation	Vocab.	Mid-I (Presentation)	Mid-II (Online) Common Errors	Mid-III (Written)	% of Marks 100(Best 5)
Total	20	20	20	20	20	20	20	100

S. No.	Topic	Pedagogy	Details	Instructional Hrs			
				Th	Pract	vide o	Pro j
1	Getting to Know Each Other	Activity Based Learning	Catch the Ball Introductions Ice-breaker Share an interesting fact, stories, questions, memories, embarrassing moments or sometimes relevant to the context. Useful link: http://www.icebreakers.ws/small-group/catch-ball-introductions-icebreaker.html	0	1	0	0

2	Conversations on Practice	Pair work using Realia	Formulaic Expressions Doing Things with Words/ Objects <u>Description:</u> Student practice real life situations like using maps, asking for directions, small talk on weather, holidays, parties and eating out.	0	1	1	0
3	Formal and Informal Communication	Degrees of Formality	Worksheet: Ask the students to work in small groups of 2/3. They must read through the phrases in the table, deciding whether each phrase is formal or informal in conversation a conversation situation. When they have finished, review the exercise as a class (answers provided in the worksheet)	0	1	1	0

S. No.	Topic	Pedagog	Details	Instructional Hrs			
				Th	Pract	vide o	Pro j
4	Shadowing	Pronunciation – intonation, stress, pause	Find an Audio to Listen & Repeat – BBC News, Seminar Talk, Ted Talk etc. https://www.youtube.com/watch?v=GVWFGIyNswI	0	1	1	0
5	Speech Acts	Plain English	Students can 'become' anyone they like for a short time! They will be encouraged to come forward and perform small speech acts and role-plays.	0	1	0	0
6	Ask Me Questions Challenge	Questions & Responses	Individual to respond- the whole class to ask questions. In this session, a student will learn communication management.	0	1	0	0
7	TED Talk Listening	Listening Comprehension	Ice-breaker: Talkathon Assignment: In groups of 4, you are going to create/write 10 questions about the TED Talk Afterwards, the groups of 4 will split up in new groups of 4 to discuss and compare their questions. Comprehension Test	0	1	1	0
8	Ted Talks	Communication & Confidence Body Language	Listen to a Ted Talk & make a presentation on a popular/contemporary topic	0	1	1	0
9	Reading Comprehension Strategies - 1	Pre-reading	Students are encouraged to read any two books in the first semester. [Animal Farm/Old Man and The Sea/ Guide/Malgudi Days/Amar Chitra Katha]	0	1	1	0
10	Reading Comprehension Strategies - 2	Mid - reading	Students respond to comprehension lessons from the chosen books. [Comprehension Passages, Gap filling and Sentence Completion]	0	1	1	0
11	Reading	Post	Students respond to comprehension lessons from the	0	1	0	0

	Comprehension Strategies - 3	Reading	chosen books. [Summarizing/ Narrating/ Enacting/Vocabulary Quiz/]				
12	Book Review	Writing Short Passages/ Paragraphs	Write a review of your favorite book in at least 250 words. Mention 3 specific learnings and 3 distinct ways in which you plan to incorporate them in your life. To choose from the recommended books.	0	1	0	0
13	News Reading	7 Cs of Communication	Group Activity: Campus/ National News Reading Students read notice boards and visit departments Prepare campus news headlines Present in the class	0	1	0	0

S. No.	Topic	Pedagog	Details	Instructional Hrs			
				Th	Pract	vide o	Pro j
14	Writing to the Point	Word Usage and Sentence Structure Main Idea, Coherence & Cohesion	Each group is seated in a circle. In this activity, the leader of each group cannot see (either blind or blind fold using a handkerchief), but can hear the peer voice. Ask the leader to flip through the pages, and put the finger randomly on fifteen words from the chosen book in five minutes. The other participates copy the words that are closest to the finger. This time bound activity increases the curiosity of the students and engages them in exciting communication and completion of the task. Then, I ask the students to shape the randomly chosen disconnected words into a short poem/story/essay by adding a title to it. Read Out Loud in the Class	0	1	0	0
15	Word Power	Synonyms & Antonyms	App: SPEAK ENGLISH	0	1	1	0
16	Homonyms	Some confusable words Minimizing errors through discussions	Activity: Select the correct option, Use the confusables in sentences to bring out their meaning	0	1	0	0
17	Reading and Writing about visuals	Useful Expressions	Presentation about visuals Task: Selecting information from a visual	0	1	0	0
18	Word Formation	Word structure Word hunt Vocabulary	Group Activity: Students make word clouds	0	1	0	0

		explorations					
19	Vocabulary Building	Descriptive words	Activity : Describe yourself/ your favorite person using 5 descriptive words	0	1	0	0
20	Listen to Popular Songs	Verb tense and aspect of grammar Vocabulary Idioms and expressions	Listen to the song with lyrics Ask questions about the title Gap Filling Exercises	0	1	0	0
21	Vocabulary Development	Word Power	Quiz/ Puzzle	0	1	0	0
22	Grammar	Common Errors	Surprise Quiz && debriefing	0	1	0	0
23	Grammar	Correct Usage	Easy Grammar App-Practice Sets	0	1	0	0
24	English Language Enhancement-I	Tenses	Usage, Question and explanation Fill in the blanks	0	1	0	0
25	English Language Enhancement -II	Active and Passive	I am passive..../I am active activity	0	1	0	0
26	English Language Enhancement-III	Reported Speech	Assignment & debriefing	0	1	0	0
27	English Language Enhancement -IV	Subject-verb agreement	Online Quiz & debriefing	0	1	0	0
28	Learn Grammar with Fun	Conditionals	Activity: The whole class is divided into The Zero Conditional, The First conditional, The Second conditional, and The Conditional to perform the task	0	1	0	0

Pre - requisites	Course Type	Credits
Nil	Workshop	2

The language laboratory acts as a platform for learning, practicing and producing language skills through interactive lessons and communicative mode of teaching.

COURSE OBJECTIVES

- To expose the students to a variety of self- instructional, learner- friendly modes of language learning.
- To enable them to learn better pronunciation through stress on word accent, intonation, and rhythm.
- To maintain good linguistic - through accuracy in grammar, pronunciation and vocabulary.

COURSE OUTCOMES

- Ability to communicate fluently in different business situation
- Effective oral and written communication
- Appropriate word usage with correct pronunciation
- Clarity of word stress and intonation

A student is required to take up five lab tests of 100 marks- three tests in spoken mode and two tests in written mode.

MODULE-I: FRIENDLY COMMUNICATION (9 HOURS)

- Doing Things with Words: To ask for information, help, permission; To instruct, command, request, accept, refuse, prohibit, persuade
- Practice of Formulaic Expressions: Greetings, farewells, introductions, thanks, apologies, regrets, good wishes, congratulations, condolences, offers.
- Conversation Practice in familiar and unfamiliar situations

(This module will be practiced through conversation activities in pairs & groups)

MODULE-II: GRAMMAR AND VOCABULARY (9 HOURS)

The focus will be on the appropriate usage of language.

- Elimination of common errors
- Editing passages
- Word power A-Z: Easy and quick techniques
- Vocabulary building exercises

(Open Source Language Laboratory will be used to take quizzes and practice grammar & vocabulary)

MODULE-III: PHONETICS AND SPOKEN ENGLISH (12 HOURS)

Students will be trained to find out the correct pronunciation of words with the help of a dictionary /software, to enable them to monitor and correct their own pronunciation.

- Pronunciation Guidelines: Consonants and Vowels
- Pronunciation practice (for accent neutralization), particularly of problem sounds, in isolated words as well as sentences
- Speaking Techniques: Using correct stress patterns, developing voice quality
- Rhythm and Intonation

(Reading aloud of dialogues, speeches etc. for practice in pronunciation)

(In this module, the learners will use video series from BBC & Sky Pronunciation Suite to improve spoken English)

TEXT BOOKS:

Dwyer, J. (2000). The Business Communication Handbook. New Jersey: Prentice Hall.

REFERENCES:

Brown, G & Yule, G. (1983). Teaching the Spoken Language. Cambridge: Cambridge University Press.

Brown, H. D. (1994). Teaching by Principles: An Interactive Approach to Language Pedagogy. New Jersey: Prentice Hall.

EVALUATION SYSTEM (CONTINUOUS INTERNAL ASSESSMENT)

Methods	Role play	Speech Acts	Grammar Quiz	Story Telling	JAM	Vocabulary-Exercise	Vocabulary-Quiz	% of Marks 100(Best 5)
Total	20	20	20	20	20	20	20	100

SESSION PLAN: COMMUNICATIVE PRACTICE LABORATORY -1

MODULE I: FRIENDLY COMMUNICATION (9 HOURS)

S. No.	Topic	Pedagogy	Details	Instructional Hrs.			
				Th	Prac	Vide o	Pro j
Lab-1	Ice-Breaking/ Introductory Session	Name Game and Other Ice-breaking Activities	Knowing Each Other http://www.buzzle.com/articles/classroom-icebreaker-activities-for-students.html http://cutmlanguagelab.org/course/view.php?id=3	0	2	0	0
Lab - 2	Conversation Practice-I	Role Plays OSL (Moodle)	Speech Acts/ Formulaic Expression http://cutmlanguagelab.org/course/view.php?id=3	0	2	0	0
Lab - 3	Conversation Practice-Ii	Small Skits	Small Skits Using Formulaic Expressions http://www.lazybeescripts.co.uk/Scripts/Results.aspx?iSh=5&iSk=1&iMR=11&iXR=15&iPo=2&i17=1&iAS=2&iPS=2 http://cutmlanguagelab.org/course/view.php?id=3	0	2	0	0

MODULE II: GRAMMAR AND VOCABULARY (12 HOURS)

S. No.	Topic	Pedagogy	Details	Instructional Hrs.			
				Th	Prac	Vide o	Pro j
Lab-4	Elimination of Common Grammatical Errors	Quiz OSL (Moodle)	Emphasis on Tense, Verbs, Modals, Conditionals, Active and Passive Voice, Statements, Questions and Responses, Articles, Preposition & Concord http://cutmlanguagelab.org/course/view.php?id=3 http://www.learnenglishfeelgo	0	2	0	0

			od.com				
Lab - 5	Document Makeover	Assignment OSL (Moodle)	Editing passages: Grammatical and Construction errors http://cutmlanguagelab.org/course/view.php?id=3	0	2	0	0
Lab - 6	Vocabulary Building- Word Power	Assignment and Online practice	http://a4esl.org/ http://cutmlanguagelab.org/course/view.php?id3	0	2	0	0
Lab - 7 & 8	Vocabulary Building	Assignment and Online practice	Synonyms, Antonyms, Homophones, One-Word Substitution, Phrasal Verbs http://www.majortests.com/word-focus/vocabulary-tests.php http://www.grammarbank.com/synonyms-antonyms-worksheet.html http://cutmlanguagelab.org/course/view.php?id3	0	2	0	0

MODULE-III: PHONETICS AND SPOKEN ENGLISH (12 HOURS)

S. No.	Topic	Pedagogy	Details	Instructional Hrs.			
				Th	Prac	Video	Proj
Lab -9	Phonetics-I	Online Practice OSL (Moodle)	Phonemic Transcription Using IPA Symbols, Stress Pattern in Words and Phrases http://usefulelenglish.ru/phonetics/practice-consonants http://www.agendaweb.org/phonetic.html http://cutmlanguagelab.org/course/view.php?id=3 https://www.youtube.com/watch?v=htmkblboG9Q	0	1	1	0
Lab -10	Phonetics-Ii	Online Practice OSL (Moodle) Sky Pronunciation Suite	Rhythm and Intonation http://www.learning-english-online.net/areas/pronunciation/stress-and-intonation/ http://www.tolearnenglish.com/english_lessons/intonation-exercises http://cutmlanguagelab.org/course/view.php?id=3	0	2	0	0

Lab -11	Event Narration, Story Telling	Assignment	http://gdpi.hitbullseye.com/other-selection-tools-extempore.php http://cutmlanguage.com/course/view.php?id=3 http://grammar.about.com/od/developingessays/a/topnarrative07.htm	0	2	0	0
Lab -12	Speaking - Jam, Extempore	Activity Based OSL (Moodle)	http://orelt.col.org/module/unit/3-practice-public-speaking http://cutmlanguage.com/course/view.php?id=3 https://www.youtube.com/watch?v=wV566cH5uQ https://www.youtube.com/watch?v=Mnw-4T7qQS4	0	2	0	0

FCHU1203 BUSINESS COMMUNICATION

Pre - requisites	Course Type	Credits
Nil	Workshop	2

COURSE OBJECTIVES

- The course on Business Communication focuses on the basic skills required to be an effective communicator. It aims at imparting the communication skills that are needed in the academic and professional pursuits.
- This is directed towards helping the students gain skills in comprehension, group discussions, presentations, interviews, active listening, technical writing and the ability to manage cross-cultural interactions. The focus is on the difficulty experienced by individual students, and the effort to explore a useful strategy for self-improvement. This is achieved through an amalgamation of lecture oriented approach of teaching with the task based skill oriented methodology of learning.

COURSE OUTCOMES

- Understand the differences between general communication and business communication
- Development of basic language skills, i.e., listening, speaking, reading and writing
- Effective participation in group discussion and job interviews

MODULE-I: UNDERSTANDING COMMUNICATION IN BUSINESS (8 hrs.)

The module is a guide to organization communication. It is directed towards enabling students to develop the skills necessary to manage the human resources of their organization.

- General Communication and Business Communication
- Communication in Organizational Settings: Patterns of Communication in the Business World – Upward, Downward, Horizontal Grapevine etc, Channels of Communication- Internal and External, Formal and Informal
- Introduction to Cross Cultural Communication
- Strategies to Overcome Communication Barriers

MODULE-II: READING AND WRITING (10 hrs.)

This unit works on the competency in reading and writing skills through such tasks/activities as reading

books, articles, magazines, novels, developing outlines, key expressions, situations, slogan writing and theme building exercises, dialogue writing, interpreting pictures, technical writing.

- Importance of Developing Reading Skills
- Sub-Skills of Reading: Predicting Content, Skimming & Scanning, Topic sentence and supporting details, Inferential Reading, Guessing the Meaning of Unfamiliar Words, Note Making
- Importance of Writing Skills and Principles of Effective Writing
- Writing Process: Pre-writing, Drafting and Re-Writing
- Paragraph Writing
- Summaries and Abstracts
- Business Correspondence: Writing Business Letters, E-mail Messages, Memo, Notice, Circulars, Reports, Proposals
- Career Communication: Writing Resume/ CV and Job Application Letter

MODULE-III: LISTENING AND SPEAKING (9 HOURS)

Listening is the mother of all speaking. This unit aims to achieve competence in speaking i.e., the ability to communicate orally in clear, coherent, and persuasive language appropriate to purpose, occasion, and audience. The module focuses on developing this competency which includes acquiring poise and developing control of the language through experience in making presentations to small groups, to large groups, and through the media.

- Listening Skills: Listening Process, Hearing and Listening, Types and Barriers, Effective Listening Strategies
- Common forms of Oral Communication in the Business World:
- Meetings: Organize Meetings, Preparing an Agenda, Chairing a Meeting, Drafting Resolutions, Writing Minutes
- Persuasive Speaking: Improving Fluency and Self-Expressions, Articulation, Good Pronunciation, Voice Quality
- Making an Oral Presentation: Planning, Preparing and Delivery
- Facing an Interview: Preparation, Types of Interview, Do's and Don'ts
- Group Discussions: Debate and GD, Types of GD, GD Etiquette

(Treatment: Developing listening and speaking skills through various activities, such as role play activities, practicing short dialogues, JAM, group discussions, debates, speeches, listening to news bulletins, viewing and reviewing documentaries and short films etc.)

TEXT BOOKS:

An Introduction to Professional English and soft skills by B.K Das et al., Cambridge University Press

REFERENCES:

Effective Technical Communication, M. Ashraf Rizvi, TMH Publications.

Business Communication, Krizan. Merrier. Logan. Williams, Thomson

Business Communication Today, Courtland L Bovee, John V Thill&MukeshChaturvedi, Pearson Education.

Business communication by Meenakshi Raman and Prakash Singh (Oxford)

Business Communication, UrmilaRai& S.M Rai, Himalaya Publishing House

EVALUATION SYSTEM (CONTINUOUS INTERNAL ASSESSMENT)

Methods	Role Plays	Reading Comprehension	Listening & Individual	GD	Mid-I (Online	Mid-II (Written	Mid-III (Oral	% of Marks
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	(Org. Comm.)	& Note –Making	Presentation		Test on Vocabulary)	exam on module 2)	Presentation)	100(Best 5)
Total	20	20	20	20	20	20	20	100

SESSION PLAN: BUSINESS COMMUNICATION

S. No.	Topic	Pedagogy	Details	Instructional Hrs			
				Th	Pract	video	Proj
1	Introduction To Business Communication	Business games Written Assignment	What is Business Communication? General Communication vs. Professional Comm. Das, AIPE & SS,	0	1	0	0
2	General Communication & Business Communication	Audio-visual clips Communication game- Change your style	Difference in Style Degrees of Formality pp. 6-7 http://christopherhouse.blogspot.in/2012/08/difference-between-business.html	0	1	0	0
3	Communication In Organisational Settings	Small group work Role Plays Quiz	Internal Communication: Formal Communication Network Informal Communication Network External Communication Raman, BC, pp- 13-21 http://keydifferences.com/difference-between-formal-and-informal-communication.html	0	1	0	0
4	Understanding The Importance Of Cross-Cultural Communications	Flip class- Match your points Role Plays	The Global Marketplace The Multicultural Workforce Krizen, BC, Chapter 2 & Bovee, BCT, pp. 63- 65 http://study.com/academy/lesson/cross-cultural-communication-definition-strategies-examples.html	0	1	0	0

S. No.	Topic	Pedagogy	Details	Instructional Hrs			
				Th	Pract	video	Proj
5	Improving Intercultural Sensitivity	Communication Games and activities	Recognise Cultural Differences Overcome Ethnocentrism Study other Cultures Overcome Language Barriers Develop Effective intercultural Skills Bovee, BCT, pp. 66-82	0	1	0	0
6	Over Coming Miscommunication	Workshop (Emphasis on listening skill)	The Information Gap principle Organizational Structure Difference in Status Incorrect Choice of Medium	0	1	0	0

			Message Complexity Cultural Differences Psychological Barriers Noise, and barriers http://www.businesscoachphil.com/overcoming-miscommunication-at-work Raman, BC, pp.22-27				
7	Strategies For Improving Organisational Communication	Good Listener Case Studies Role plays & presentations	Open Feedback, Simple Language, Avoid Overload, Walk the Talk http://debo10199businesscommunication.blogspot.in/2012/02/strategies-for-improving-organizational.html Raman, BC, pp.34-40	0	1	0	0

MODULE II: READING AND WRITING

S. No.	Topic	Pedagogy	Details	Instructional Hrs			
				Th	Prac t	vide o	Pro j
8	Importance Of Developing Reading Skills & Reading Strategies	Reading News clips	<i>The Importance of Developing Reading Skills</i> <i>Vocabulary Skills</i> <i>Word Meaning Recognition</i> <i>Guessing the Meaning from Word Structure and Context</i> <i>Guidelines for Improving Reading Skill</i> <i>Types of Reading</i> <i>Tips for Improving Reading Speed</i> Rizvi, ETC, pp. 219- 224 http://www.nclrc.org/essentials/reading/stratread.htm	0	1	0	0
9	The Sub-Skills of Reading	Guessing Game	Understanding the Main Idea and Supporting Details Reading between the Lines: Inferential Reading Understanding the Writer's Point Of View Making Predictions <ul style="list-style-type: none"> • Guessing the Meanings of Unfamiliar Words • Skimming and Scanning Rizvi, ETC, pp. 228-250 http://literallycommunication.blogspot.in/2013/06/reading-skills-and-its-sub-skills.html	0	1	0	0
10	Note-Making	Topicalizing Schematising Use of Reduction Devices Methods of Sequencing Practice in Note	Mechanics of Note Making Note Writing Techniques Rizvi, ETC, pp.273-289 <ul style="list-style-type: none"> • http://www2.le.ac.uk/offices/ld/resources/study/notes 	0	1	0	0

S. No.	Topic	Pedagogy	Details	Instructional Hrs			
				Th	Pract	video	Proj
11	Importance of Writing Skills	Tasks on small paragraphs Creative writing	Writing Process: Pre-writing, Drafting and Re-writing Idea Mapping Writing and Editing Rai, BC, pp. 182-192 http://smallbusiness.chron.com/importance-writing-skills-business-845.html	0	1	0	0
12	Paragraph Writing	Written Assignment Developing story outline	Unity in writing Topic sentence Chronological order of development Using Connectives Organizing a Paragraph Adequate Development of supporting details Cohesion & Coherence in a Paragraph Rizvi, ETC, pp.337-350 http://www.wikihow.com/Write-a-Paragraph	0	1	0	0
13	Summaries & Abstracts	Written Assignment based on guidelines	Differences between Abstract and Summary Procedure for Writing Abstracts Procedure for writing summary Rizvi, ETC, pp.290-307 http://www.uts.edu.au/current-students/support/helps/self-help-resources/academic-writing/abstract-and-executive-summary	0	1	0	0
14	Writing Business Letter & Proposal	Written Assignment based on guidelines	Purpose & goal Principles of effective letter writing: Courtesy and consideration, Directness and conciseness, Avoid verbosity, Participial endings, Positive and direct statements, Clarity and precision Structure and layout Rizvi, ETC, pp.351-365 & Raman, BC, PP.256-260 http://www.writing-business-letters.com/business-proposal-letter.html	0	1	0	0
15	Memo, Notice, Circulars & Email	Written Assignment based on guidelines	What is a Memo? Email writing format Characteristics of Effective Memo Difference between notice and circular Essentials of notice and notice format Rizvi, ETC, pp.423-436 http://www.umuc.edu/writingcenter/writingresources/effective_memos.cfm http://www.englishtransform.com/2014/04/difference-between-circular-memo-notice.html	0	1	0	0
16	Reports	Written Assignment based on guidelines	Definition and Types Deciding on Format and Length Structure / Parts of Formal Report Topics Covered in a Report Introduction,	0	1	0	0

			Body and Closing Krizen, BC, pp 259-303 & Rizvi, ETC, pp. 452-467 http://cgu.edu/pages/852.asp				
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TREATMENT: Tasks/activities as reading books, articles, magazines, novels, developing outlines, key expressions, situations, slogan writing and theme building exercises, dialogue writing, interpreting pictures, technical writing.

MODULE III: LISTENING AND SPEAKING

S. No.	Topic	Pedagogy	Details	Instructional Hrs			
				Th	Pract	video	Proj
17	Listening Skills	Effective Listening Strategies TED Talks: Listening and individual presentation	Listening Process Hearing and Listening Types and Barriers Rizvi, ETC, pp. 59-75 Video : https://www.youtube.com/watch?v=C8zNx_IarUw	0	1	0	0
18	Listening Attentively	News video clips and quizzing	Overall comprehension Extracting Detail information Listening between the lines Note taking Video https://www.youtube.com/watch?v=t2z9mdX1j4A	0	1	0	0
19	Persuasive Speaking	Inspirational audio-video clips for language improvement	Communication module for persuasive meeting Feed back Taking care of non-verbal elements Decoding message Handling noise Raman, BC, pp. 123- 169 & Rizvi, ETC, pp.195 -218 Video: https://www.youtube.com/watch?v=NBObNfR2n_4 Refrence: http://www.speaking.pitt.edu/student/public-speaking/persuasive.html	0	1	0	0
20	Oral Presentation	Individual presentation on Events	Improving Fluency and Self-Expressions Articulation Good Pronunciation, Voice Quality Planning & Preparing your Oral Presentation Types of Delivery Guidelines for Delivery: Verbal elements, non-verbal elements, visual elements Practice delivery elements Controlling Nervousness and Stage freight Handling questions responsively	0	2	0	0

			narration/JAM Raman, BC, pp. 123- 169 & Rizvi, ETC, pp.195 -218 http://www4.caes.hku.hk/epc/presentation/VIDEO https://www.youtube.com/watch?v=WJIOZfLQ5w4				
21	Group Discussions	GD Sessions on current/ social issues	Nature of Group Discussion Characteristics of Group Discussion Skills Selection Group Discussions Subject knowledge Oral communication skills Team management Group Discussion Strategies Role Functions in Group Discussions Rizvi, ETC, pp 165-187 https://www.youtube.com/watch?v=ymcMo7JWSu8 http://placement.freshersworld.com/what-is-group-discussion/33122049	0	2	0	0
22	Group Discussions	GD Sessions on current/ social issues	Debate and GD Types of GD GD Etiquette		1		
23	Revision	TUTORIAL	Module - I		1		
24	Revision	TUTORIAL	Module - I		1		
25	Revision	TUTORIAL	Module - I		1		

FCHU1204COMMUNICATIVE PRACTICE LABORATORY –II

Pre - requisites	Course Type	Credits
Nil	Workshop	2

The suggestive assignments in the laboratory are intended as learning activities to facilitate the students in accomplishing the language skills which are needed to succeed in the business world.

COURSE OBJECTIVES

- To master Study Skills

- To acquire strategic competence to use both spoken & written language to use in a wide range of communication strategies
- To acquire Business Performance Skills

COURSE OUTCOMES

The students will be able to

- Write effectively for a variety of professional and social settings. They will practice writing as a process of motivated inquiry engaging others writers' ideas as they explore and develop their own. They will demonstrate an ability to revise for content and edit for grammatical and stylistic clarity. And they will develop an awareness and confidence in their own voice as a writer.
- Become accomplished, active readers who appreciate ambiguity and complexity, and who can articulate their own interpretations with an awareness and curiosity for other perspectives.
- Demonstrate the skills needed to participate in a conversation that builds knowledge collaboratively; listening carefully and respectfully to others' view points; articulating their own ideas in relation to other voices and ideas. Students will be able to prepare, organize and deliver and engaging oral presentation.

A student is required to take up five lab tests of 100 marks- at least two tests in written mode and three tests in spoken mode.

MODULE-I: LISTENING (6 HOURS)

Exercises on Active Listening: The whole group listens to any speech/news broadcast in English and notes down the important points. They listen again to check their points and evaluate themselves. The group then compares points to see how well they have understood the broadcast.

MODULE- II: SPEAKING (8 HOURS)

- Situational Dialogues / Role Play: Organization Communication
- Oral Presentations- Prepared and Extempore
- 'Just a minute' Sessions (JAM)
- Debates
- Mock Meetings
- Cracking Job Interviews: Mock Sessions
- Group Discussions on current topics

(This module will be practiced through speaking activities like role plays, presentations, and discussions)

MODULE-III: READING (8 HOURS)

Students will be given practice in reading and comprehension 6-8 passages of 100-300 words each, on topics of General as well as professional interest. The texts will be supported by suitable exercises designed to foster comprehension skills and vocabulary enrichment. Students are encouraged to read newspapers, articles, books and novels.

- Reading Comprehension Exercises Through Tests, Writing Summary and Presenting, Note Making

- Review Presentation (Movie/ Article/ Book)

- Vocabulary Building Exercises

(This module encourages extensive use of reading materials)

MODULE-IV: WRITING (8 HOURS)

The Writing Lab content is designed to acquaint the students not only with the techniques of effective writing but also give them an insight into planning and writing documents that produce results.

- Short Paragraphs on current general and technical topics
- Creative Writing: Idea Generation
- Business Letters, Email Messages, Project Writing
- Writing Resumes and Cover Letters

(* Students will be required to produce and submit by the end of second semester a 350-500 word project report on a topic of their choice. The project should involve data collection, analysis and reporting. Ten marks (out of 100 marks allocated for Lab Test) will be set apart for the project.)

TEXT BOOK:

An Introduction to Professional English and soft skills by B.K Das et al., Cambridge University Press

REFERENCES:

Effective Business Communication, AshaKaul, Prentice Hall

Professional Communication, ArunaKoneru, TMH

EVALUATION SYSTEM (CONTINUOUS INTERNAL ASSESSMENT)

Methods	Listening Skills	Movie Review	Role Plays	Group Discussion	Mock Interview	JAM	Vocabulary/ Comprehension	% of Marks
Total	20	20	20	20	20	20	20	100(Best 5)

SESSION PLAN: COMMUNICATIVE PRACTICE LABORATORY –II

MODULE I: LISTENING (6 HOURS)

S No.	Topic	Pedagogy	Details	Instructional Hrs			
				Th	Pract	Video	Proj
Lab-1	Introduction and Ice Breakers	Activity - Based	Knowing Each Other, People’s Bingo http://cutmlanguagelab.org/course/view.php?id=4	0	2	0	0
Lab -2	Exercises On Active Listening	Activity Based	Feedback, Note Taking, Summarizing, Paraphrasing and Non-verbal Cues http://cutmlanguagelab.org/course/view.php?id=4 https://www.youtube.com/watch?v=cSohjIYQI2A	0	1	1	0
Lab -3	Movie Review Presentation	Activity Based	The October Sky/ In Pursuit of Happiness/A Beautiful Mind/ Any Other http://cutmlanguagelab.org/course/view.php?id=4	0	1	1	0

MODULE II: SPEAKING (8 HOURS)

S. No.	Topic	Pedagogy	Details	Instructional Hrs			
				Th	Pract	Video	Pro
Lab-4	Organization Communication	Role play	Business Situations and Mock Meeting http://cutmlanguagelab.org/course/view.php?id=4 http://eduscapes.com/distance/cour	0	2	0	0

			se_activities/simulations.htm https://www.youtube.com/watch?v=3X51J-ZDMmE				
Lab - 5	Oral Presentations	Activity OSL (Moodle)	Prepared and Extempore/ Debate / 'Just a Minute' Talk (JAM) http://cutmlanguagelab.org/course/view.php?id=4	0	2	0	0
Lab - 6	Interview /Group Discussion	Mock Interview /Group Discussion OSL (Moodle)	Frequently Asked Questions (FAQs) Discussion on Current Topics - General, Social, Political, Management, Creative, Education and Sports http://cutmlanguagelab.org/course/view.php?id=4 https://www.youtube.com/watch?v=ymcMo7JWSu8 https://www.youtube.com/watch?v=7gcsZ9H2I6s	0	2	0	0

MODULE-III: READING (8 HOURS)

S. No.	Topic	Pedagogy	Details	Instructional Hrs			
				Th	Pract	Video	Pro
Lab -7	Reading Assignment - I	Assignment , online practice and discussion	Reading abridged texts, relevant topics, and news articles http://cutmlanguagelab.org/course/view.php?id=4	0	2	0	0
Lab -8	Reading Assignment - II		Reading for comprehension and vocabulary http://cutmlanguagelab.org/course/view.php?id=4 http://www.majortests.com/sat/reading-comprehension.php	0	2	0	0

MODULE-IV: WRITING (8 HOURS)

S. No.	Topic	Pedagogy	Details	Instructional Hrs			
				Th	Pract	Video	Pro
Lab -9	Writing Short Paragraphs - General, Current and Technical Topics	Assignment , online practice and discussion	Write, Rewrite, Expand, Correct, Complete, and Improve Paragraphs http://cutmlanguagelab.org/course/view.php?id4	0	2	0	0
Lab -10	Idea Generation and Creative Writing	Assignment and discussion	Problem solving/decision making, Strategy development, Outline a proposal, Create a timeline Collaboration technique, Expression of creativity, Condensing various thoughts, Put visuals and text together http://cutmlanguagelab.org/course/view.php?id=4	0	2	0	0
Lab -11	Memo Writing & Emails	Assignment and discussion	Adopt the steps of writing process for preparing of memo and emails http://cutmlanguagelab.org/course/view.php?id=4 https://www.youtube.com/watch?v=6zHLHc9CcvQ	0	2	0	0
Lab -12	Preparation Of Business Reports/ Proposals And Presentation	Project Work and discussion	Adopt the steps of writing process for preparing business reports and proposals http://cutmlanguagelab.org/course/view.php?id=4 mails https://www.youtube.com/watch?v=elKVDBAMvQ	0	2	0	0

FCHU1205CORPORATE READINESS LABORATORY

Pre - requisites	Course Type	Credits
Nil	Workshop	2

A real-time project approach in the laboratory is intended to provide a developmentally appropriate ambience, make the students proactive, encourage and motivate as well as develop skills to become a good listener, good communicator and responsible. A student will experience the challenging application process and at the same time prepare for the challenging world. The experience gained from working on projects can help one understand the appropriate and effective use of language skills. It also creates context in which learners engage in purposeful communication.

All communication activities are supported with the help of live projects on general techno-management or local themes which provide exposure to the students and help them to find a suitable job in the industry.

A student is required to take up five laboratory tests of 100 marks.

COURSE OBJECTIVES

- Understand the process of communication
- View communication from the perspective of each stakeholder
- Plan and manage communication difficulties
- Learn exactly how, when and what of communication

COURSE OUTCOMES

- Understanding the convention of project report
- Understanding the process of data collection and documentation
- Preparation and presentation of project report
- Preparation for various academic and professional needs

INSTRUCTION AND DELIVERY

Instruction- led facilitation highlights interactions between students and their facilitators, and emphasizes guidance from the facilitator who will track, assess and mentor them.

Students will make a team of four members who will take up real problems and run through the semester trying to solve the problems. The lab program will augment this learning with the right theory.

Participants will use PPTS, flash presentations or high impact presentations, flip charts, blogs, boards with graphical or pictorial representations, with captions and outlines, video display or any other best mode of presentation, post-it notes and group activities to document all processes and methodology.

OUTLINE

LAB1: Introduction to the Lab Program (Session will be driven by the Facilitators)

(Structure, Objective, Methodology, Objective of Choosing Project as a Vehicle to Learn the Course, Process of Carrying out the Project, Announcing the List of Projects)

LAB2: Discussion on Project Approach and Communication (Session will be driven by the Facilitators)

LAB3: Win Your Project: A Presentation by Groups (Session will be driven by the Students)

LAB4: Project Plan Presentation by Groups (Session will be driven by the Students)

LAB5: Review of Weekly Status Reports by the Guide, and Discussions (Session will be driven by the Students)

LAB6: Progress Presentation by Groups, and Feedback by Guide and Co-Guide (Session will be driven by the Students)

LAB7: Review of Documentation File/Dossier, and Feedback by Guide

LAB8: Progress Presentation and Submission of Dossier Containing Documentary Notes

(E.g., compilation of weekly status reports, minutes, photocopies of emails, feedbacks, testimonials, photographs)

LAB 9: Presentation on the Project, Feedback by the Guide and Co-guide

LAB 10: Final Presentation by Groups in front of a Panel and Submission of Project Work

TEXT BOOK:

The Essential Guide to Doing your Research Project by O'LEARY (2011)

REFERENCES:

Logical Framework Analysis, Capacity Building Workshop for Dryland Management, May 3-5, 2000

Professional Presentations by Goodale (2007)

EVALUATION SYSTEM (CONTINUOUS INTERNAL ASSESSMENT)

Methods	Win Your Project	Project Plan Presentation	Weekly Reports	Progress Presentation	Project Presentation	Documentation	Project Report	% of Marks 100 (Best 5)
Total	20	20	20	20	20	20	20	100

S. No.	Topic	Pedagogy	Details	Instructional Hrs			
				Th	Pract	video	Proj
1	Introduction to the Lab Program	Project-based Learning Discussion Beyond the class Learning	Structure, Objective, Methodology, Objective of Choosing Project as a Vehicle to Learn the Course, Process of Carrying out the Project (Session will be driven by the Facilitators)	0	2	0	0
2	Announcing the List of Projects		Topics available in OSLL (Moodle) http://cutmlanguagelab.org/	0	1	0	1
3	Project Approach & Communication		(Session will be driven by the Facilitators) https://www.youtube.com/watch?v=1ybtFwYb7Oc	0	1	0	1
4	Win Your Project		Rationale for choosing the project topic What makes you say that you deserve the project?/ Why should we give you the project (Session will be driven by the Students)	0	1	0	1
5	Project Plan		Stakeholder Analysis, Objective Analysis, Situation Analysis, Problem Analysis, Strategy Analysis (Session will be driven by the Students)	0	1	0	1
6	6Review of Weekly Status		Dossier Verification/Reports by the Guide	0	1	0	1
7	Review of Progress		Project-based Learning	Progress Presentation by Groups, and Feedback by Guide and Co-Guide	0	1	0

		Group Presentation with Facilitator Beyond the class Learning	(Session will be driven by the Students)				
8	Documentation Review		Review of Documentation File/Dossier, and Feedback by Guide	0	1	0	1
9	Progression Presentation and Report Submission	Project-based Learning Presentation and Report Writing Beyond the class Learning	Progress Presentation and Submission of Dossier Containing Documentary Notes (E.g., compilation of weekly status reports, minutes, photocopies of emails, feedbacks, testimonials, photographs)	0	1	0	1
10	Presentation on the Project	Project-based Learning Presentation Beyond the class Learning	Presentation on the Project, Feedback by the Guide and Co-guide	0	1	0	1
11	Project Work	Discussion	Performance Analysis	0	0	0	2
12	Communication	Discussion	Performance Analysis	0	2	0	0

FCHU1206IT ENABLED COMMUNICATION

Pre - requisites	Course Type	Credits
Nil	Workshop	2

COURSE OBJECTIVE AND OUTCOME

Upon completing the syllabus, students should be able to:

- Speak confidently and fluently, in both formal and informal contexts.
- Write clearly, correctly and cogently
- Design and have a Home Page/Blog Space, Facebook Page and post comments/reports for collaboration & online presence
- Evolve from the role of an 'information provider', through 'motivator' and 'catalyst of change', to 'Change Agent'.

COURSE OUTLINE

MODULE I: CONCEPTUAL FOUNDATIONS

- Pre-Course Assessment
- Tell me a bit about yourself: Your background, your major, your professional aspirations ... your likes ... and maybe your favorite movie, and what you like to do in your spare time...
- Do you know?
- Introduction to IT Enabled Communication
- Communication in the New Age Context and Demand for Communication Interventions

(This module includes pre-course assessments and presentations)

MODULE II: BLOG DESIGNING & POSTING

- Step-by- Step to Writing a Blog: Researching, Brainstorming and Structuring, Writing, Posting, Editing and Accessorizing
- Photoshop for Image, Editing and graphic design

(This module will be driven through methods like self-learning, learning by doing, and workshop)

MODULE III: TECHNOLOGY AND COMMUNICATION

- Tools for Business Correspondence and web-based exercises
- Creating and delivering high impact presentations with Slides and other Visuals
- Video Documentaries
- Video Conferencing Sites, Skype, Team Viewer

(This module will be facilitated through presentations, use of tools and technology)

TEXT BOOKS

- Shirley Taylor, Model Business Letters (MBL) and Other Business Documents, 5th Edition. Krizen. Merrier. Logan. Williams, Business Communication, and Thomson (BC: Krizen).
- M.M. Monippally, Business Communication Strategies (BCS: MMM), TMH, New Delhi, 2001.
- Arthur H. Bell & Dayle M. Smith, Management Communication (MC: AHB & DMS), Wiley Student Edition, 2005

LINKS

http://ctb.ku.edu/en/tablecontents/section_1017.htm

Useful websites for some topics will be linked to the course for improving language proficiency skills of the students.

www.a4esl.org

www.learnenglishfeelgood.com

EVALUATION SYSTEM (CONTINUOUS INTERNAL ASSESSMENT)

Methods	Presen- tation	Blog Design	Video Documentary	E-mail Writing	Business Letters	Poster/ Template	Mid-Sem written	% of Marks 100(Best
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		& Post				Design	Exam	5)
Total	20	20	20	20	20	20	20	100

MODULE I: CONCEPTUAL FOUNDATIONS (3HRS)

S. No.	Topic	Pedagogy	Details	Instructional Hrs			
				Th	Pract	vide o	Proj
1	Pre-Course Assessment [IT Enabled Communication]	Record pre-course assessments on communication management & technology by 'Probing & Doing'	Do you Know?	0	1	0	0
2	Tell me a bit about yourself	Know each other, and create a classroom philosophy through a game	Your background, your major, your professional aspirations ... your likes ... and maybe your favorite movie, and what you like to do in your spare time...	0	1	0	0
3	Communication in the New Age	Presentation	Context and Demand for Communication Interventions Explore top five social networking sites relevant to technology sector and present in the class, create and maintain online presence on Facebook, Google + or any other	0	1	0	0

MODULE II: BLOG DESIGNING & POSTING

S. No.	Topic	Pedagogy	Details	Instructional Hrs			
				Th	Pract	vide o	Proj
4	Step-by- Step to Writing a Blog - 1	Learning to Learn (Self-learning)	Researching	0	1	0	0
5	Step-by- Step to Writing a Blog - 2	Learning to Learn (Self-learning)	Brainstorming & Structuring	0	1	0	0
6	Step-by- Step to Writing a Blog - 3	Learning to Learn (Self-learning)	Writing & Posting	0	1	0	0
7	Step-by- Step to Writing a Blog - 4	Learning to Learn (Self-learning)	Editing & Accessorizing	0	1	0	0
8	Blog	Workshop (Self-learning)	One Day Workshop On Blog Design (CUTM e-content)	0	1	1	0
9	Blog Design	Posting assignments/ weekly reports/share what he/she has learnt (Doing)	Assignment: "Me in a Minute" blog post, email your blog's web address to the facilitators and peer group	0	1	0	0

10	Photoshop - 2	Self- Learning & Peer Learning	Editing and Graphic Design	0	1	1	0
11	Photoshop -3	Photoshop (FOSS) Training	Video tool www.spoken-tutorial.org	0	1	0	0
12	Photoshop	Workshop	One Day Workshop On Blog Design (CUTM e-content)	0	1	1	0

MODULE III: TECHNOLOGY AND COMMUNICATION

S. No.	Topic	Pedagogy	Details	Instructional Hrs			
				Th	Pract	vide o	Proj
13	Business Correspondence	Document Makeover, Web-based Exercises	Letters & Emails [Write to the point with correctness, conciseness, coherence and completeness]	0	1	0	0
14	Impress Presentation	Training and Practice	Language Laboratory Impress (FOSS)- Presentations (www.spoken-tutorial.org)	0	1	0	0
15	Enhancing presentation through slides and other visuals	Use of media for presenting the visual contents to reinforce the message, and create online presence	Equip the learners with techniques where they feel more confident in front of an audience Assignment [Improve the slides] Slide Share/ Upload on YouTube or Google +	0	1	0	0
16	Delivering High Impact Presentations	Video Recording & Peer Evaluation	Mastering the Art of Delivery, Preparing to Speak, Overcoming Anxiety, Handling Questions Watch-YouTube: Steve Jobs and iPod	0	1	0	0
17	Video Documentaries	Video documentary (Self- Learning)	Each student/group will make a short documentary movie (CSR, Facilities Labs, Student Projects etc.)	0	1	0	0
18	Making of Video Documentary	Workshop	One Day Workshop on Making Video Documentaries	0	1	1	0
19	Documentary Movie	10 min. video presentation by individuals/ groups	Feedback and Analysis	0	1	0	0
20	Video Conferencing	Free conference calls, webcam chat, video conferencing, group	Create Account & Practice [Skype, TeamViewer, Mobile]	0	1	0	0

		calls					
21	Organize and Manage a Video Conference	Use video conference for business meetings Video conference etiquette & tips	Organise, Share & Collaborate	0	1	0	0

FCHU1207 CAREER COMMUNICATION

Pre - requisites	Course Type	Credits
Nil	Workshop	2

OBJECTIVES

- Prepare the graduates to acquire their dream jobs.
- Build their mindset with right attitude, self-awareness, pro-activeness.
- Build confidence, and enhance their communication skills to handle all situations.

OUTCOMES

- Build the confidence of students
- Trigger the thinking and analyzing ability of the learners to solve problems.
- Readiness to work on their dream jobs.

List of Experiments

LAB 1: Introduction to Career Communication

LAB 2: Presentation on Corporate House

- Create an awareness and exposure on corporate life and culture.
- Learners get exposure to corporate life and culture.

LAB 3: Corporate Quiz

LAB 4: Telephonic Conversation

- Learners are equipped with basic knowledge and skill practice for improved telephonic communication.

LAB 5: Email Writing

- Learn the characteristics of successful e- mail messages.
- Create an effective e-mail message.

LAB 6: Mini Test on Email Writing

LAB 7: Learning Etiquette

- Understand what etiquette is & why it's important.
- Provide practical techniques and generally-accepted professional and ethical conduct or behaviour that will help create a favourable impression in social and professional life.
- Practice proper manners like greeting, saying 'please', 'thank you'.
- Appear professional and well groomed.

LAB 8 :Identifying Traits for Professional and Interpersonal Success

- Understand the importance of effective interpersonal communication and traits for professional success.
- Explore the significance of Active Listening, Problem Solving, Respect, Decision Making, Empathy, Co-operation and Non-verbal communication for professional success.

LAB 9: Job-Application -Cover Letter

- Develop the career writing skills of the learners with special emphasis on their interest in specific job positions, their strengths and what values they will bring to the organisation.

LAB 10: Job-Applications – CV

- Produce a polished and impressive CV that can be tailored to each specific job application.
- Develop the career writing skills of the learners with special emphasis on Statement of Purpose.

- Provide with tools to showcase Unique Selling Points for the specified job description.

LAB 11: Participating in Group Discussion (GD)

- Mock Interview on basic questions

LAB 12: Facing an Interview

EVALUATION SYSTEM (CONTINUOUS INTERNAL ASSESSMENT)

Methods	Presentation	Corporate Quiz	Telephonic Conversation	Email Writing	CV	GD	Interview	% of Marks 100(Best 5)
Total	20	20	20	20	20	20	20	100

SESSION PLAN: CAREER COMMUNICATION

S. No.	Topic	Pedagogy	Details	Instructional Hrs.			
				Th	Pract	vide o	Pro j
LA B-1	Introduction to Career Communication	Discussion	The Course introduces students to the resources and skills necessary for a successful job or internship search http://cutmlanguagelab.org/course/view.php?id=2	0	2	0	0
LA B - 2	Presentation on Corporate House	Team Presentation OSL (Moodle)	Create an awareness and exposure on corporate life and culture. Learners get exposure to corporate life and culture. http://cutmlanguagelab.org/course/view.php?id=2 https://www.youtube.com/watch?v=g-_xABU21Yc	0	1	1	0
LAB -3	Corporate Quiz	Quiz OSL (Moodle)	This Corporate Quiz is an initiative to bring forth all the updates and insights from various industries. Through this quiz , students will be updated with the current happening in the present Corporate world http://cutmlanguagelab.org/course/view.php?id=2	0	2	0	0
LA B-4	Telephonic Conversation	Role play (Pair Work)	Learners are equipped with basic knowledge and skill practice for improved telephonic communication https://www.youtube.com/watch?v=mmXAqMQe0AI https://www.youtube.com/watch?v=6tfFRD0enV0	0	1	1	0
LA B - 5	Email Writing	Doing	Learn the characteristics of successful e- mail messages.Create an effective e-mail message. http://cutmlanguagelab.org/course/view.php?id=2 https://www.youtube.com/watch?v=mmXAqMQe0AI	0	1	1	0
LAB -6	Email Writing	Mini Test OSL (Moodle)	(Questions from TCS) http://cutmlanguagelab.org/course/view.php?id=2	0	2	0	0

			https://www.youtube.com/watch?v=LTKb5Fexcuk				
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S. No.	Topic	Pedagog	Details	Instructional Hrs.			
				Th	Prac t	vide o	Pro j
LAB -7	Learning Etiquette	Demonstration Video Analysis	Understand what etiquette is & why it's important. Provide practical techniques and generally-accepted professional and ethical conduct or behaviour that will help create a favourable impression in social and professional life. http://cutmlanguagelab.org/course/view.php?id=2 https://www.youtube.com/watch?v=ieYuoQ9sMvA	0	1	1	0
LAB -8	Identifying Traits for Professional and Interpersonal Success	Group Activity Video Analysis	Understand the importance of effective interpersonal communication and traits for professional success. Explore the significance of Active Listening, Problem Solving, Respect, Decision Making, Empathy, Co-operation and Non-verbal communication for professional success. http://cutmlanguagelab.org/course/view.php?id=2	0	1	1	0
LAB -9	Job-Application - Cover Letter	Document Makeover	Develop the career writing skills of the learners with special emphasis on their interest in specific job positions, their strengths and what values they will bring to the organisation. http://cutmlanguagelab.org/course/view.php?id=2 https://www.youtube.com/watch?v=37TbhadX0C8	0	2	0	0

FCHU1208PERSONALITY DEVELOPMENT

Pre - requisites	Course Type	Credits
Nil	Workshop	2

The laboratory aims at the promotion of the strategies for the personality development of the participants. The rationale behind this endeavor is the recognition of the multifaceted influence of the personality of the participants.

A student is required to take up five laboratory tests of 100 marks.

COURSE OBJECTIVE

Project the force of inner self, assert individuality, influence others and power to success.

COURSE OUTCOME

Learners develop a positive attitude and graceful personality.

LIST OF EXPERIMENTS

Lab 1: Self-Discovery/Self-Analysis

Identifying strengths and weaknesses through games and activities

Lab 2: Impression Management

Formation of impression, first and lasting impression, change: warm-up discussion

Lab 3: Body Language and Communication Style Profile Test

Lab 4 : Working on Attitude: Assertive, Aggressive, Passive

Measure your attitude, case study and role plays

Lab 5: Build Your Skills

Interpersonal Communication and Self

Lab 6: Team Building and Teamwork

Ice-breaker, test your team skills, exercise on stages of formation and effective teams

Lab 6: Explore Your Personality

Lab 7 : Motivation and Success

Ted talks, invited talks and success stories

Lab 8: Time Management

Identifying important time wasters, time management exercises

Lab 10 : Stress Management

Case-based discussions to identify causes of stress, and manage stress

Lab 11: Etiquette and Manners

Test your etiquette and manners, practice good manners

Lab 12 : Personality and Career Choice

Matching your career & personality

TEXT BOOKS:

Basic Managerial Skills for All, 9th Edition, E.H. McGrath, S.J.

Personality Development by Harold R. Wallace & L. Ann Masters, 2006.

REFERENCES:

Personality Development by [John Aurther](#) .Reprint, 2009.

[Personality Development - Transform Yourself](#) by [Rajiv K. Mishra](#), 2004.

[Power of One - Personality and Self-Development](#) by [Dr. Abhishek Mishra](#), 2007.

EVALUATION SYSTEM (CONTINUOUS INTERNAL ASSESSMENT)

Methods	Self-introduction in sales pitch	Debate/Extempore	Presentation (USP)	Group Activity (Communication)	Public Speaking on Current Topic	Case-based Discussions	Motivation Speech	% of Marks 100 (Best 5)
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Total	20	20	20	20	20	20	20	100
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SESSION PLAN: PERSONALITY DEVELOPMENT

S. No.	Topic	Pedagogy	Details	Instructional Hrs			
				Th	Pract	video	Proj
1	Self-Discovery/Self-Analysis	Activity Based Learning	Game	0	2	0	0
2	Impression Management	Videos and interactions	19 tips to impress others https://www.buzzfeed.com/carolynkylstra/impress-literally-everyone-you-meet?utm_term=.nbz2MKVQJO#.qywdZLkQXO	0	1	1	0
3	Body Language and Communication Style Profile Test	Understanding of different postures and gestures through online test	http://www.queendom.com/queendom_tests/transfer	0	1	1	0
4	Working on Assertive, Aggressive, Passive	Role Plays and Encouraged to watch videos	https://www.youtube.com/watch?v=O6eyUUKpoU8 Role plays	0	1	1	0
5	Build Your Skills	Videos	https://www.youtube.com/watch?v=w97dR3OJB1k http://www.investopedia.com/video/play/interpersonal-skills/	0	1	1	0
6	Team Building and Teamwork	Activity Based Learning	Coin Logo Time Required: 5-10 minutes Begin by asking all participants to empty their pockets, purses, and wallets of any coins they may have and place them on the table in front of them. If someone doesn't have any coins or only has very few, others in the room can share their coins with them. Instruct each person to create their own personal logo using the coins in front of them in just one minute. Other materials they may have on them, such as pens, notebooks, wallets, etc. can also be used in creation of the logo. If there is a particularly large group, people can be broken up into teams of 3-6 people and instructed to create a logo that represents them as a team or the whole room can gather to use the coins to create a logo for the organization/group/department/etc. Each solitary participant can explain their logo to the group or if the room was split into groups, the leader can have each group discuss what led to the team logo and what it says about them. Not only does this activity promote self	0	1	1	0

			and mutual awareness, but it also enables participants to get to know each other on a more personal level. http://www.livestrong.com/article/219775-team-building-exercises-for-small-groups/				
7	Explore Your Personality	videos	https://www.16personalities.com/free-personality-test	0	1	1	0
8	Motivation and Success	videos	https://www.youtube.com/watch?v=LEg5EZw3iQ https://www.youtube.com/watch?v=g-PNJHhf-ag	0	1	1	0
9	Stress Management	Classroom Exercise	Time Wasters Exercise.pdf	0	1	0	0
10	Etiquette and Manners	videos	https://www.youtube.com/watch?v=55cXVve0ipw for table manners https://www.youtube.com/watch?v=VLqKVfSG-bk for interview etiquette. https://www.youtube.com/watch?v=4-8AlriF908 for manners.	0	1	1	0

S. No.	Topic	Pedagogy	Details	Instructional Hrs			
				Th	Pract	vide o	Proj
11	Personality and Career Choice	Classroom exercise	rs_self-assessment.pdf	0	1	0	0
12	Time Management	Group Activity	<p>How long is a minute?</p> <p>At the beginning of session ask people to close their eyes for 30 seconds and after that to open it. Nobody can watch the clock and don't measure the time. Ask of participants to open their eyes after what they believe has been 30 seconds. Of course, they all open them at different times. Afterwards, we talk about our understanding of time. Even though everyone has an equal (24 hours a day or 30 seconds for exercise), in fact, we experience it and use it in different ways. Some of us experienced it as a short period, other as a long. This always works as a good opener.</p> <p>2) Cover all the clocks in the room, then ask participants to remove their wrist watches and stand up. Instruct them to sit down when they think 1 minute has elapsed after you shout "Start" to begin the countdown. You will be surprised with the results. Just enjoy the fun that follows this activity</p>	0	1	0	0

FCHU1209 SEMINAR AND TECHNICAL WRITING

Pre - requisites	Course Type	Credits
Nil	Workshop	2

Seminar allows students the opportunity to put all of information together. The students are required to prepare technical reports including oral presentations supported by written technical papers. Seminar is designed to assist students in preparing for their career.

COURSE OBJECTIVES

- Understand the requirements and ethics of technical writing in the 21st Century workplace.
- Work professionally, individually and in a team to produce effective technical documents incorporating verbal, visual, and multimedia materials as necessary.
- Communicate effectively by analyzing audience, organizing documents, writing clearly and precisely with no grammar errors and presenting the document with skillful design.
- Locate, evaluate, and incorporate pertinent information.
- Write clear, intelligent technical reports
- Make seminar presentations

COURSE OUTCOMES

- Understand how technical communication is used in the workplace.
- Understand and use the principles of design in business and technical communication.
- Apply useful descriptive language to your technical documents.
- Students will gain experience in preparing a technical report including an oral presentation supported by a written technical paper.

MODULE-I: TECHNICAL COMMUNICATION ESSENTIALS

COURSE OUTCOMES

- Describe the writing process most useful in today's technical writing environment.
- Analyze an audience and consider appropriate writing situations to meet the audience's needs.
- Understand the ethics of the workplace and apply those ethics to their technical and business writing.

OUTLINE: Communicating in the Workplace, Technical Writing Process Today, Readers and Contexts of Use, Ethics in the Technical Workplace

MODULE- II: DOCUMENT DESIGN

COURSE OUTCOMES

- Create and use graphics that complement your business and technical communication.

OUTLINE: Designing Documents and Interfaces, Creating and Using Graphics

MODULE-III: TECHNICAL COMMUNICATION STRATEGIES AND RESEARCHED REPORT WRITING

COURSE OUTCOMES

- Define terms clearly in technical documents.
- Explain instructions and processes clearly.
- Write clear proposals for business and technical situations.
- Research and manage information.
- Write an analytical report.

OUTLINE: Researching and Managing Information, Organizing and Drafting, Technical Definitions, Technical Descriptions, Instructions and Documentation, Proposals, Analytical Reports

MODULE-IV: SEMINAR PRESENTATION

COURSE OUTCOME

- Students will not only learn from the experience gained in preparing and presenting their seminar, but will have the opportunity to observe and participate in the seminar given by their classmates.

OUTLINE: Technical Report, Seminar Presentation

(Planning, Preparing, Organizing and Seminar Presentation are the 4 stages of this module)

TEXT BOOK:

Gerson, Sharon J. and Gerson, Steven M. (2007). Technical Writing Process and Product. Delhi: Pearson Education.

REFERENCES:

Effective Technical Communication, M. Ashraf Rizvi, TMH Publications.

Business Communication Today, Courtland L Bovee, John V Thill & Mukesh Chaturvedi, Pearson Education.

EVALUATION SYSTEM (CONTINUOUS INTERNAL ASSESSMENT)

Methods	Proposal Writing	Report Writing	Organizing Seminar	Document Formatting	Preparing a Technical Paper	Seminar Presentation-I	Seminar Presentation-II	% of Marks 100 (Best 5)
Total	20	20	20	20	20	20	20	100

SESSION PLAN: SEMINAR AND TECHNICAL WRITING

S. No.	Topic	Pedagogy	Details	Instructional Hrs			
				Th	Pract	vide o	Pro j
1	Introduction to Technical Writing	Activity Based Learning	Writing Genres: Technical versus non-technical writings https://www.youtube.com/watch?v=LTDsgd0ytbE	0	1	0	0
2	Preparing to Write	Doing	Audience Analysis Brainstorming Organizing information Link: https://www.youtube.com/watch?v=wxKJT13EhuM	0	1	0	0
3	Gathering	Google Search	How do we gather information?	0	2	0	0

	information		Ways, techniques and tools				
4	Focusing on Writing Skills	Workshop	Brainstorming , Drafting , Editing	0	2	0	0
5	Technical Writing Conventions	Analysis and Discussion	Analysis of different case studies	0	1	0	0
6	Reporting	Learning to Learn Analysis and Discussion	FORMAT: Preliminary pages, Summary, Main section, Conclusion, Recommendations References	0	2	0	0

S. No.	Topic	Pedagogy	Details	Instructional Hrs			
				Th	Pract	vide o	Proj
7	Using and interpreting Graphics	Group work and Discussion	Matching Games : Texts and graphic types	0	2	0	0
8	Document Formatting	Workshop	Layouts Use of MS Word for Documenting Document templates APA Format (6th) - Microsoft Word 2010 https://www.youtube.com/watch?v=aWT9zgMPyiY	0	2	0	0
9	Documentation	Workshop	Documenting Sources: https://www.youtube.com/watch?v=-H2fRG_Rtns	0	2	0	0
10	Introduction to Seminar	Discussion	Seminar : Needs and ways of preparation Video : https://www.youtube.com/watch?v=Rz2II40tQuI	0	1	0	0
11	Questioning Skills	Workshop	Asking and Responding to questions in Seminars TED TALK: https://www.youtube.com/watch?v=PkcHstP6Ht0	0	2	0	0
12	Analysis of various Seminars	Videos and Discussion	Analysis of Seminars: Pros and Cons How to make a seminar effective? https://www.youtube.com/watch?v=x7qPAY9JqE4	0	1	1	0
13	Preparing for a Seminar	Group Work	Grouping Selection of topics	0	1	0	0
14	Collection of Information	Workshop	Primary and secondary sources Preparing sample PPTs	0	2	0	0
15	Seminar Presentation-I	Group Work	Demonstration and Discussion	0	2	0	0
16	Seminar Presentation-II		Demonstration and Discussion	0	2	0	0

FCHU1210PROFESSIONAL ETIQUETTE

Pre - requisites	Course Type	Credits
Nil	Workshop	2

Etiquette begins with meeting and greeting. Good professional etiquettes indicate that you are a mature responsible, adult who can aptly represent any organization. Etiquettes center upon respect.

COURSE OBJECTIVES

- To recognize the importance of proper etiquette at workplace
- To understand the elements and characteristics of proper etiquette
- To behave professionally and gain respect
- To develop an action plan to improve professionalism

COURSE OUTCOMES

At the end of this course students would be able to learn:

- Professional behavior, standards for appearance, action and attitude in a business environment
- Handle a variety of social and business situation
- Different styles of communication based on different situations.

MODULE- I: MEETING AND GREETING ETIQUETTE, OFFICE ETIQUETTE (7hrs)

- Personal Branding and First Impressions
- Introducing yourself and introducing a guest
- Professionalism at office
- Language styles, tone and attitude

MODULE-II: COMMUNICATION EXCELLENCE (7hrs)

- Techno Etiquette
- Phone Etiquette
- Email Etiquette
- Social Media Etiquette

MODULE-III: NETWORKING ETIQUETTE (6hrs)

- Business Card Etiquette
- Names
- Titles
- Net Etiquette
- Proper Introductions

MODULE-IV: BUSINESS ETIQUETTE (7)

- Presentation Etiquette
- Meeting Etiquette
- Dining Etiquette
- Global Etiquette

TEXT BOOK:

The New Etiquette, Real Manners for Real People in Real situations- An A-to-Z Guide by Marjabella Young Stewart, St. Martin Griffin.

Soft Skills, Know Yourself and the World, K.Alex.

REFERENCES:

Do's and Taboos of Hosting International Visitors, Roger E. Axtell, John Wiley & Sons, Inc.

Breaking through Culture Shock: What You Need to Succeed in International Business by Elisabeth Marx.

Dos and Taboos of International Trade by Roger E. Axtell, John Wiley & Sons, Inc.

The Art of Writing Effective E-mails, Jayprakash, Sajitha, Himalayan Publications.

International Communication Management-Individual & Organizational Outcomes by Antonio Ragus, Bookboon, 2010.

Business Communication for Success by Scott Mac Lean, Flat World Knowledge, 2010.

Effective Technical Communication, M. Ashraf Rizvi, TMH Publications.

EVALUATION SYSTEM (CONTINUOUS INTERNAL ASSESSMENT)

Methods	Introducing others, Small Talk	Role Play in formal & informal situations	Presentation	Telephonic interview	Email	Mock Meeting	Quiz on Professional Etiquette	% of Marks 100(Best 5)
Total	20	20	20	20	20	20	20	100

LESSON PLAN: PROFESSIONAL ETIQUETTE

S. No.	Topic	Pedagogy	Details	Instructional Hrs			
				Th	Pract	vide o	Pro j
MODULE 1: MEETING & GREETING ETIQUETTE, OFFICE ETIQUETTE							
1	Personal Introduction	Role play on formal situation with proper introduction	http://smallbusiness.chron.com/first-impressions-business-etiquette-2908.html	0	1	0	0
2	Introducing Others	Knowing each other Fish bowl game	http://www.fasset.org.za/downloads/Office_Etiquette_Material/Handbook_Essential_Office_Etiquette.pdf				
3	Basics of Etiquette	Video clips Small skits	http://www.fasset.org.za/downloads/Office_Etiquette_Material/Handbook_Essential_Office_Etiquette.pdf	0	1	0	0
4	Interpersonal Etiquette	Video clips Activity on using speech acts with	http://www.fasset.org.za/downloads/Office_Etiquette_Material/Handbook_Essential_Office_Etiquette.pdf	0	1	0	0

		appropriate body language Guessing game					
5	Professionalism And Front Office Etiquette	Video Clips Role play on front office management on their dream company Quiz	http://careerplanning.about.com/od/workplacesurvival/a/professionilionalism.htm http://www.octech.edu/sites/www/Uploads/files/TRIO/Professionalism%20in%20the%20Workplace.pdf	0	1	0	0
6	Professional Conduct	Conversational practice and SWOT Analysis in pair/group task	http://www.fasset.org.za/downloads/Office_Etiquette_Material/Handbook_Essential_Office_Etiquette.pdf	0	1	0	0
7	Professionalism And Front Office Etiquette	Video Clips Role play on front office management on their dream company Quiz	http://careerplanning.about.com/od/workplacesurvival/a/professionilionalism.htm http://www.octech.edu/sites/www/Uploads/files/TRIO/Professionalism%20in%20the%20Workplace.pdf	0	1	0	0
8	Formal & Informal Attire	Communication Game Quiz	http://www.fasset.org.za/downloads/Office_Etiquette_Material/Handbook_Essential_Office_Etiquette.pdf	0	1	0	0
9	Language Etiquette And Attitude	Enactment in different formal situations with appropriate communication styles	http://www.english.wisc.edu/rfyoung/336/attitudes.pdf https://blog.udemy.com/communication-styles/ http://www.english.wisc.edu/rfyoung/336/attitudes.pdf	0	1	0	0
10	Techno Etiquette	Conversational practice and Small skits	http://theedgeexecutivecoaching.com/articles/etiquette/techno-etiquette/# Question & Answers http://www.workforce.com/articles/q-a-about-techno-etiquette	0	1	0	0
11	Smart Phone Etiquette	Dialogue Exchange Telephonic Quiz	http://www.talkenglish.com/LessonPracti ce.aspx?ALID=483	0	1	0	0
12	Email Etiquette Social Media Etiquette	Video Clips Written task practice Group work Debate	http://www.businessmailetiquette.com/business-e-mail-etiquette-basics/ http://www.realsimple.com/work-life/work-life-etiquette/manners/social-media-etiquette http://www.moneycrashers.com/social-media-etiquette-tips-personal-business/ Video : https://www.youtube.com/watch?v=RFZwtkoNGrk https://www.youtube.com/watch?v=ootxii bcOWc	0	0	1	0

MODULE II: COMMUNICATION EXCELLENCE (7 HOURS)

S. No.	Topic	Pedagogy	Details	Instructional Hrs			
				Th	Prac t	vide o	Pro j

10	Techno Etiquette	Conversational practice and Small skits	http://theedgeexecutivecoaching.com/articles/etiquette/techno-etiquette/# Question & Answers : http://www.workforce.com/articles/q-a-about-techno-etiquette	0	1	0	0
11	Smart Phone Etiquette	Dialogue Exchange Telephonic Quiz	http://www.talkenglish.com/LessonPractice.aspx?ALID=483	0	1	0	0
12	Email Etiquette Social Media Etiquette	Video Clips Written task practice Group work Debate	http://www.businessemail etiquette.com/business-e-mail-etiquette-basics/ http://www.realsimple.com/work-life/work-life-etiquette/manners/social-media-etiquette http://www.moneycrashers.com/social-media-etiquette-tips-personal-business/ Video : https://www.youtube.com/watch?v=RFZwtkoNGrk https://www.youtube.com/watch?v=ootxiibcOWc	0	0	1	0

MODULE-III NETWORKING ETIQUETTE (6HRS)

S. No.	Topic	Pedagogy	Details	Instructional Hrs			
				Th	Prac t	vide o	Pro j
13	Netiquette	Written Assignment Drafting Email	http://jillbremer.com/articles/etiquette/techno-etiquette/ http://www.slideshare.net/MarcellineChitolie/techno-etiquette-final-copy	0	1	1	0
14	Business Card Etiquette	Presentations and small group work	http://www.careerealism.com/3-rules-to-smart-business-card-etiquette/	0	1	1	0
15	Forms of Addressing	Written assignment Scrabble and puzzles	http://www.talkenglish.com/LessonPractice.aspx?ALID=483	0	1	1	0

MODULE IV: BUSINESS ETIQUETTE (7 hours)

S. No.	Topic	Pedagogy	Details	Instructional Hrs			
				Th	Prac t	vide o	Pro j
16	Presentation Etiquette	Demonstration	http://dianegottsman.com/2013/11/business-etiquette-9-powerful-presentation-tips/ http://dianegottsman.com/2012/07/stand-and-deliver-ten-tips-to-delivering-a-powerful-presentation/	0	1	1	0
17	Meeting Etiquette	Mock Meeting	http://businessculture.org/northern-europe/uk-business-culture/meeting-etiquette/ http://www.fasset.org.za/downloads/Office_Etiquette_Material/Handbook_Essential_Office_Etiquette.pdf	0	1	1	0

18	Dinning Etiquette	Activity on- Playing the role of the Host/Hostess, Playing the role of the Guest	Rizvi, ETC, pp.139-164 Soft Skill, Dr.K.Alex-pp-203-219	0	1	1	0
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S. No.	Topic	Pedagogy	Details	Instructional Hrs			
				Th	Pract	video	Proj
19	Golden Rules of Global Etiquette	Discussion and Activity	Developing intercultural skill http://www.kwintessential.co.uk/cultural-services/articles/international-business-etiquette.html http://www.kwintessential.co.uk/resources/country-profiles.html http://www.forbes.com/sites/susanadams/2012/06/15/business-etiquette-tips-for-international-travel/ http://www.marcaria.com/international-business-etiquette-customs-and-culture.asp	0	1	1	0
20	Doubt Clearing	One-to-One Interaction	Practice	0	1	0	0
21	Recap	Discussion	Performance Analysis	0	1	0	0

FCHU1211 CREATIVE WRITING

Pre - requisites	Course Type	Credits
Nil	Workshop	2

The aim of the course is to prepare students for careers in a workplace that is information-rich and that increasingly values communication skills and the ability to think creatively and critically. The class time will be devoted to writing workshop, innovation exercises, and the critical appreciation of write-ups. The Creative Writing course will focus on

- Reading
- Writing Creatively
- Presentations

Thus the main objective is to breed a culture of learning where students learn a variety of approaches to

creative writing in a cooperative learning environment.

COURSE OBJECTIVES

- Develop thinking skills
- Acquire basic skills and techniques to develop a suitable practice of creative writing in context
- Use a constructive approach to critique his/her own work, as well as work by his/her peers
- Organize, prepare and present spoken presentations clearly and expressively

COURSE OUTCOMES

Upon the Completion of the course, a student will

- Create Blog/ Online Presence
- Submit works for publication
- Compose a variety of written responses for different purposes and audiences
- Collaborate by sharing ideas, examples and insights, productively and respectfully in informal conversations and discussions.
- Students will put into practice the learning into the personal, professional and technical sphere.

MODULE -I: WRITING CREATIVELY (12hrs)

Foundational activities

- Introduction to Class Standards
(Workshops, peer conferencing, blogging, reading outside the classroom)
- Collaborative Creation of Classroom Philosophy
- Basics of Creative Writing

Different forms of expression

- Memoirs/Writing the Personal Narratives
- Situational Writing/ Writing for the Target Audience
- Dialogues, Essay, Poetry Slam
- Script Writing
- Writing for Blogs
- Cooking Up Interview Stories

Writing from visuals

- Pictures, Graphs, Images, Diagrams and Designs, Cartoons
- Brochures and Newsletters

(This module will be facilitated through creative writing and speaking activities)

MODULE-II: READING AND CRITICAL APPRECIATION (8hrs)

- Book
(Independent Study: Two Master Piece)

- Article
- Movie

(Student Work: Free Choice, Discussion and Oral/ Written Critiquing, Editing/ Revision

- Publication/ Sharing, Short Report on Two Authors

(This module will be facilitated through reading activities and critical appreciation)

MODULE-III: POWER OF LATERAL THINKING TO CREATE NEW IDEAS (7hrs)

- General Concepts: Creativity and Lateral Thinking
- Using the Technique of Lateral Thinking in Writing
- Idea Generation Games and Activities
- Six Thinking Hats

(This module will be facilitated through idea generation activities and presentation)

TEXT BOOKS

Creative Writing: A Workbook with Readings- Linda Anderson

Creative Writing- By DevAnjanaNeira

REFERENCES

The Cambridge Companion to Creative Writing by David Morley, Philip Neilsen
 Creative Writing- By Adele Ramet
 The Creative Writing Mfa Handbook: A Guide for Prospective Graduate Students By Tom Kealey

EVALUATION SYSTEM (CONTINUOUS INTERNAL ASSESSMENT)

Methods	Memoirs	Essay/ Dialogue Writing	Slam Poetry	Script Writing	Writing for Blog	Presentation from Visuals	Cooking up Interview Stories	% of Marks 100(Best 5)
Total	20	20	20	20	20	20	20	100

**SESSION PLAN: CREATIVE WRITING
 MODULE-1 : WRITING CREATIVELY (12 hours)**

S. No.	Topics	Pedagogy	Details	Instructional Hrs			
				Th	Prac t	Vide o	Proj
1	Foundational activities Introduction to Class Standards (Workshops, peer conferencing, blogging, reading outside the classroom)	Conversational practice, Role Plays	https://www.teachingchannel.org/videos/peer-conferencing https://blogging.org/	0	2	0	0
2	Collaborative Creation of Classroom Philosophy	Group tasks	http://writing-speech.dartmouth.edu/teaching/first-year-writing-pedagogies-methods-design/collaborative-learninglearning-peers	0	2	0	0
3	Basics of Creative Writing	Video links /Practice	https://www.earlham.edu/media/894432/creative_writing_rules.pdf http://www.idiotsguides.com/education/creative-writing/creative-writing-basics/ https://www.youtube.com/watch?v=syuuXYpV4zA	0	2	0	0
4	Different forms of expression Memoirs/Writing the Personal Narratives Situational Writing/ Writing for the Target Audience	Group work, writing, video links ,	http://classroom.synonym.com/difference-between-memoir-personal-narrative-1729.html https://www.quia.com/files/quia/users/learningcircle/Situational-Writing-Tips https://www.youtube.com/watch?v=PLHkuSpJxPs https://www.youtube.com/watch?v=ZA3xtoKkWas	0	2	0	0
5	Dialogues, Essay, Poetry Slam	Role Plays, Written tasks	https://www.youtube.com/watch?v=zJGX2raiafU https://en.wikipedia.org/wiki/Poetry_slam Examples of poetry slams :	0	2	0	0

			http://www.poetrysoup.com/poems/best/slam				
6	Script Writing Writing for Blogs	Writing tasks individual/pairs Video links Blog writing practice	https://www.writersstore.com/how-to-write-a-screenplay-a-guide-to-scriptwriting/ https://www.youtube.com/watch?v=XZs_zextv6yE BLOGS https://www.youtube.com/watch?v=t21sKonfylk	0	2	0	0
7	Cooking Up Interview Stories		https://www.themuse.com/advice/6-types-of-stories-you-should-have-on-hand-for-job-interviews http://lifehacker.com/prepare-these-15-stories-for-your-next-job-interview-1610270959 https://www.themuse.com/advice/the-interview-technique-you-should-be-using	0	1	0	0
8	Writing from visuals Pictures, Graphs, Images, Diagrams and Designs, Cartoons Brochures and Newsletters		https://twp.duke.edu/uploads/assets/Using%20Visual%20Rhetoric%20in%20Academic%20Writing.pdf https://www.youtube.com/watch?v=r6ZVGBQYNXE	0	1	0	0

MODULE-II: READING AND CRITICAL APPRECIATION 8 HOURS)

S. No.	Topics	Pedagogy	Details	Instructional Hrs			
				Th	Prac t	Vide o	Proj
9	Book (Independent Study: Two Master Piece)		http://www.howtolearn.com/2012/08/different-reading-techniques-and-when-to-use-them/	0	2	0	0
10	Article writing			0	2	0	0
11	Movie Review (Student Work: Free Choice, Discussion and Oral/ Written Critiquing, Editing/ Revision			0	1	1	0
12	Publication/ Sharing, Short Report on Two Authors		https://www.elsevier.com/authors/book-authors/science-and-technology-book-publishing/overview-of-the-publishing-process	0	2	0	0

MODULE-III: POWER OF LATERAL THINKING TO CREATE NEW IDEAS (7hrs)

S. No.	Topics	Pedagogy	Details	Instructional Hrs			
				Th	Prac t	Vide o	Proj
13	General Concepts: Creativity and Lateral Thinking	Role Plays/ Oral Presentations Practice	www.brainstorming.co.uk/tutorials/definitions.html http://www.trainingcoursematerial.com/free-training-articles/creativity-problem-solving-decision-making-and-lateral-thinking/defining-lateral-thinking-parallel-thinking-creativity-and-innovation Video :https://www.youtube.com/watch?v=H7PyFNzPSVY	0	1	1	0
14	Idea Generation Games and Activities	Pair/group activities	http://study.com/academy/lesson/what-is-idea-generation-definition-process-techniques.html	0	1	1	0
15	Six Thinking Hats	Group task	http://www.debonogroup.com/six_thinking_hats.php	0	1	1	0
16	DOUBT CLEARING			0	1	0	0

FCHU1212ENGLISH FOR COMPETITION (GRE/GMAT/TOEFL/IELTS)

Pre - requisites	Course Type	Credits
Nil	Workshop	2

COURSE OBJECTIVE

- Familiarize the learners with the pattern of the TOEFL/GMAT/IELTS/GRE examination and improve overall English skills to face the competitive exams confidently.

COURSE OUTCOME

- Learners understand the pattern of the TOEFL, IELTS and GRE examination and apply test-taking strategies in exams.

A student is required to take up five laboratory tests of 100 marks.

LIST OF EXPERIMENTS

1: TOEFL Listening

Developing Listening Comprehension by taking notes after the short recorded conversations.

2: TOEFL Speaking

Developing test taking strategies to face speaking test of TOEFL exam through role play and Mock Interview.

3: TOEFL Reading

Practicing and improving student's confidence in completing the various sections of reading test in TOEFL examination.

4: TOEFL Writing

Learning and enhancing writing skills required for TOEFL writing test.

5: IELTS Listening

Practicing the listening comprehension of the students and handling questions while listening the recorded conversations.

6: IELTS Speaking

Developing test taking strategies to face speaking test of IELTS examination through role plays and mock interviews.

7: IELTS Writing

Summarizing or explaining information presented in a graph, chart, table or diagram.

8: IELTS Reading

Understanding and interpreting the text in its particular use of language, ideas and style.

9: GRE Reading Comprehension

Taking GRE Reading Comprehension examination with confidence utilizing the methods and strategies.

10: GRE SENTENCE COMPLETION

Developing sentence completion strategies through logical thinking.

11: GRE SENTENCE EQUIVALENCE

Learning and developing strategies to deal with sentence equivalence questions.

12: GRE VOCABULARY

Understanding and using appropriate choice of vocabulary in GRE vocabulary section.

13. GRE Vocabulary & Verbal-Sentence Corrections

14. GMAT Verbal-Critical Reasoning

15. GMAT Verbal- Reading Comprehension

(The entire lab will be facilitated through online quizzes, and practice sets available in language lab))

TEXT BOOKS:

NorthStar Building Skills for the TOEFL iBT, High Intermediate Level (Pearson Education).

NorthStar Building Skills for the TOEFL iBT, Intermediate Level (Pearson Education).
 McGraw-Hill's New GRE: 2011-2012 Edition
 Princeton Review: Cracking the New GRE 2012

REFERENCES:

Longman Preparation Course for the TOEFL Test – iBT Speaking (Pearson Education).
 Longman Preparation Course for the TOEFL Test – iBT Listening (Pearson Education).
 Longman Preparation Course for the TOEFL Test – iBT Writing (Pearson Education).
 Longman Preparation Course for the TOEFL Test – iBT Reading (Pearson Education).
 NorthStar Building Skills for the TOEFL iBT, Advanced Level (Pearson Education).
 Achieve IELTS Workbook: Intermediate to Upper Intermediate: English for International Education (Achieve IELTS Intermediate/Upper) (Paperback).
 Kaplan New GRE Premier 2011-2012
 Barron's New GRE 19th Edition Grade
 Manhattan GRE
 Gruber's Complete GRE Guide 2012
 Nova's GRE Prep Course Grade
 ETS's Official Guide to the GRE Revised General Test
 Barron's GRE Verbal Workbook
 Barron's IELTS with Audio CD: International English Language Testing System (Paperback)
 Achieve IELTS Teacher's Book: Intermediate to Upper Intermediate: English for International Education (Achieve IELTS Intermediate/Upper) (Paperback)
 Step Up to IELTS Self-study Student's Book [STUDENT EDITION] (Paperback)
 IELTS Collected Papers: Research in speaking and writing assessment (Studies in Language Testing) (Paperback)

EVALUATION SYSTEM (CONTINUOUS INTERNAL ASSESSMENT)

M e t h o d s	Listening & fill-up blanks, short answers, Multiple-choice	JAM/ Questions & Responses	Vocabulary Quiz, Sentence Completion & Re-order paragraphs	Reading Comprehension	Summarize /Data Comment	Essay Writing	Analytical Writing	% of Marks 100 (Best 5)
T o t a l	20	20	20	20	20	20	20	100

SESSION PLAN: ENGLISH FOR COMPETITION

S. No.	Topic	Pedagogy	Details	Instructional Hrs			
				Th	Pract	vide o	Pro t
1	TOEFL Listening	Listening Activity Based Learning	http://www.examenglish.com/TOEFL/toefl_listening.htm	0	1	1	0
2	TOEFL Speaking	Listening and speaking activity	http://www.examenglish.com/TOEFL/TOEFL_Speaking_part5.htm	0	1	1	0

3	TOEFL Reading & Writing	Reading and Writing Practice	http://www.examenglish.com/TOEFL/TOEFL_reading1.htm (Reading) https://www.englishclub.com/esl-exams/ets-toefl-practice-writing.htm http://www.time4writing.com/toefl/ (Writing)	0	2	0	0
4	IELTS Listening	Listening Practice	http://takeielts.britishcouncil.org/prepare-your-test/free-ielts-practice-tests/listening-practice-test-1	0	1	1	0
5	IELTS Speaking	Speaking Practice	http://takeielts.britishcouncil.org/prepare-your-test/free-practice-tests/speaking-practice-test-1	0	2	0	0
6	IELTS Writing & Reading	Writing & Reading Practice	http://takeielts.britishcouncil.org/prepare-your-test/free-practice-tests/writing-practice-test-1-ielts-academic http://takeielts.britishcouncil.org/sites/default/files/Writing_practice_test_1_IELTS_Academic_questions.pdf (writing) http://takeielts.britishcouncil.org/prepare-test/practice-tests/reading-practice-test-1-academic (Reading)	0	2	0	0
7	GRE Reading Comprehension	Reading Practice	http://gre.graduateshotline.com/reading_comprehension_practice.html#.V2kJDRITXCM https://www.ets.org/gre/revised_general/prepare/verbal_reasoning/reading_comprehension/sample_questions	0	2	0	0
8	GRE Sentence Completion & Sentence Equivalence	Online practice	http://gre.graduateshotline.com/gre_sentence_completion.pl https://www.ets.org/gre/revised_general/prepare/verbal_reasoning/text_completion/sample_questions http://www.examfocus.com/gre/pt/verbal/sentence-equivalence-1.html	0	2	0	0
9	GRE Vocabulary	Online practice	http://gre.graduateshotline.com/	0	2	0	0
10	GMA Verbal-Sentence Corrections	Online practice	http://freemattest.net/Questions http://www.majortests.com/gmat/sentence_correction.php	0	2	0	0
11	GMAT Verbal-Critical Reasoning	Online practice	http://www.majortests.com/gmat/critical_reasoning_test01	0	2	0	0
12	GMAT Verbal-Reading Comprehension	Online practice	http://www.majortests.com/gmat/reading_comprehension_test01	0	2	0	0

FCHU1213BE A CONTRIBUTOR

Pre - requisites	Course Type	Credits
Nil	Workshop	2

PROGRAM OBJECTIVES:




1. Build consciousness of ‘contributor thinking’ in students systematically by exposing them to the essential building blocks of contributor thinking. [The 4 sets of the program represent the 4 fundamental building block of the program]
2. Through projects expose students to the ‘realness’ of contributor way of thinking in the world around them.

SESSION PLAN:

Semester 1 of program delivery	SET 1: CONTRIBUTOR BASICS	
	UNIT 1: Who is a Contributor?	~5hrs
	UNIT 2: Scope of Contribution (Self, Organization, Society)	~5hrs
	UNIT 3: Depth of Contribution (From ‘opportunities to contribute’ to a ‘life of Purpose’)	~5hrs
	SET 2: BASIC AXIOMS OF LIFE	
	UNIT 4: The Contributor’s Response (From ‘victim’ to ‘creator of my destiny’)	~5hrs
	UNIT 5: The Contributor’s Identity (From ‘static identities’ to ‘dynamic identities’)	~5hrs
Semester 2 of program delivery	UNIT 6: The Contributor’s Vision of Success & Career (From an ‘acquisitive vision’ to a ‘contributive vision’)	
	SET 3: CONTRIBUTOR EFFECTIVENESS	
	UNIT 7: Engage Deeply	~5hrs
	UNIT 8: Design Solutions	~5hrs
	UNIT 9: Create Value	~5hrs
	SET 4: CONTRIBUTOR CONDUCT	
	UNIT 10: Thinking Win-win (Enlightened Self-Interest)	~5hrs
UNIT 11: Thinking Human-impact (Imaginative Sympathy)	~5hrs	
UNIT 12: Building Trust-surplus (Trust Behaviors)	~5hrs	

Full program duration	~60hrs
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1.0 | Faculty can utilise the 5 hours of classroom as follows –

<p>i. The Class Engagement Books (for each unit)</p>  <p>Students fill in the book, in the class, while going through a class engagement</p>	
<p>ii. The Program App (Channel Illumine App)</p>  <p>The app is used along with the book to create a rich learning experience</p>  <p>Participants scan the QR-code given in the book to open the relevant app unit.</p>	<p>~ 4hrs for Book and App engagement.</p>
<p>iii. Projects (for each unit)</p> <p>Students can do 1-2 projects in each semester. The project is done out of class. In-class time is only for student presentation.</p>	<p>~1hr for project presentations</p>

Source: This document is an abridged version of ‘Overview of Become a Contributor Program’ given in your Facilitator Guide. It is strongly recommended that faculty refer the detailed Facilitator Guide for more details.

EVALUATION PARAMETERS (Total-100 Marks)

A] ENGAGEMENT IN CLASS		40 marks
1	Regular attendance across classes	10 marks
2	Quality of class participation (involvement in discussions, asking thoughtful questions, sharing examples, etc.)	15 marks
3	In-class assignments <ul style="list-style-type: none">• Students can be asked to submit their filled books for specific in-class assignments (Illumine can provide a list of which class engagements in each book, can be checked for this)• Any 4 books (one from each set), can be considered for marking.	15 marks
B] PROJECT WORK <ul style="list-style-type: none">• Project assignments are provided by Illumine for the course.• Mark students on their best 3, from these project assignments.		30 marks
1	Completion & submission of assigned projects, with basic quality	10 marks
2	Design and execution of the project (Methodology of project work) (students present how they went about the project – their approach, method, documentation of research work)	10 marks
3	Project presentation & project output uploads (assessed against the project goal)	10 marks
C] PRE & POST TEST		20 marks
1	Completion of pre-test	5 marks
2	Completion of post-test	5 marks
3	Improvement (sent by Illumine, based on test results)	10 marks
D] APP USAGE (sent by Illumine, based on app usage pattern)		10 marks

FCHU0213 LIFE SKILLS DEVELOPMENT-I [Aptitude & Reasoning]

Pre - requisites	Course Type	Credits
Nil	Practice	2

OBJECTIVES

- To provide ample opportunities for practice.
- To make the students solve each & every question within 30-40 seconds.
- To make the students visit all the questions in any exam.
- To make them learn the art of skipping questions which require more time.
- To make the students eligible to score 70% or more in each written tests.

OUTCOMES

- Quantitative Ability skills will be increased.
- Calculation & Logical thinking skills will be increased.
- Time spent per questions will be minimized.
- Students will be able to score minimum of 70%.
- Improved skills to qualify all competitive exams like Campus Written tests, Banking Exams, SSC Exams, Railway Exams, GATE Exams.

MODULE I: (12 HOURS)

S. No.	Topic	Pedagogy	Details	Instructional Hrs			
				Th	Pract	vide o	Proj
1	Speed Math-1	Classroom Practice	Multiplication tricks, Square, cube, square root, Cube root tricks	0	1	0	0
2	Speed Math-2	Classroom Practice	Speed Calculations	0	1	0	0
3	Number System-01	Classroom Practice	Operation on Numbers, Classification of Numbers, Tests of Divisibility, Unit Digit Calculation	0	2	0	0
4	Number System-02	Classroom Practice	Factors & Factorials, Trailing Zeroes, Remainder Theorem	0	2	0	0
5	Series-1	Classroom Practice	Arithmetic Progression, Geometric Progression, Number series (Missing & Wrong)	0	2	0	0
6	Series-2	Classroom Practice	Letter, Alpha numeric, Miscellaneous series	0	2	0	0
	Internal-I	Online / Offline Test	Test & Discussion	0	2	0	0

MODULE-2 (14 HOURS)

S. No.	Topic	Pedagogy	Details	Instructional Hrs			
				Th	Pract	vide o	Proj
	HCF & LCM	Classroom Practice	Concepts, short tricks, question discussion	0	3	0	0
	Average	Classroom Practice	Concepts, short tricks, question discussion	0	2	0	0
	Coding & Decoding	Classroom Practice	Letter Coding, Number coding, Message coding, Substitution coding, Conditional coding	0	3	0	0
	Word Problem	Classroom Practice	Analogy, Odd man out, word formation, letter pair	0	2	0	0
	Logical Thinking	Classroom Practice	Brain Riddles	0	2	0	0
	Internal-II	Online / Offline Test	Test & Discussion	0	2	0	0

EVALUATION SYSTEM: INTERNAL ASSESSMENT (50) + EXTERNAL ASSESSMENT (50)

Methods	Online/Offline Test-I	Online/Offline Test-II	Attendance	Assignment	% of Marks 50
Total	15	15	10	10	100

FCHU0214 LIFE SKILLS DEVELOPMENT-II [Aptitude & Reasoning]

Pre - requisites	Course Type	Credits
LSD-I	Practice	2

OBJECTIVES

- To provide ample opportunities for practice.
- To make the students solve each and every question within 30-40 seconds.
- To make the students visit all the questions in any exam.
- To make them learn the art of skipping questions which require more time.
- To make the students eligible to score 70% or more in each written tests.

OUTCOMES

- Quantitative Ability skills will be increased.
- Calculation & Logical thinking skills will be increased.
- Time spent per questions will be minimized.
- Students will be able to score minimum of 70%.
- Improved skills to qualify all competitive exams like Campus Written tests, Banking Exams, SSC Exams, Railway Exams, GATE Exams.

SESSION PLAN: APTITUDE MODULE I: (13 HOURS)

S. No.	Topic	Pedagogy	Details	Instructional Hrs			
				Th	Pract	video	Proj
1	Percentage-01	Classroom Practice	Basics of Percentage, Effective percentage, shortcuts	0	2	0	0
2	Percentage-02	Classroom Practice	Advanced questions and discussions	0	2	0	0
3	Profit & Loss-01	Classroom Practice	Basics and advanced questions of Profit & Loss and shortcuts	0	2	0	0
4	Profit & Loss-02	Classroom Practice	MRP, Discount, Successive discount	0	1	0	0
5	Order & Ranking	Classroom Practice	Ranking & Sequence	0	2	0	0
6	Direction Sense Test	Classroom Practice	Shortest Distance, Angular movement concept and Dusk & Dawn	0	2	0	0
7	Internal-I	Online / Offline Test	Test & Discussion	0	2	0	0

MODULE II: (13 HOURS)

S. No.	Topic	Pedagogy	Details	Instructional Hrs			
				Th	Pract	vide o	Pro j
1	Ratio & Proportion	Classroom Practice	Types of ratios, Basics & Advanced Question	0	2	0	0
2	Age	Classroom Practice	Concepts & Shortcuts	0	1	0	0
3	Partnership	Classroom Practice	Concepts & Shortcuts	0	1	0	0
4	Mixture & Allegations	Classroom Practice	Rule of Alligation, Basics & Advanced question, Short tricks	0	2	0	0
5	Clock	Classroom Practice	Concepts of Angle, Reflex angle, Right angle Opposite, Coincide and Incorrect clock	0	2	0	0
6	Calendar	Classroom Practice	All concepts & Shortcuts	0	1	0	0
7	Blood Relation	Classroom Practice	Jumbled-up descriptions, coded relations, Relation Puzzles	0	2	0	0
8	Internal-II	Online / Offline Test	Test & Discussion	0	2	0	0

EVALUATION SYSTEM: INTERNAL ASSESSMENT (50) + EXTERNAL ASSESSMENT (50)

Methods	Online/Offline Test-I	Online/Offline Test-II	Attendance	Assignment	% of Marks 50
Total	15	15	10	10	100

FCHU0215 LIFE SKILLS DEVELOPMENT – III [Aptitude & Reasoning]

Pre - requisites	Course Type	Credits
LSD-II	Practice	2

OBJECTIVES

- To provide ample opportunities for practice.
- To make the students solve each and every question within 30-40 seconds.
- To make the students visit all the questions in any exam.
- To make them learn the art of skipping questions which require more time.
- To make the students eligible to score 70% or more in each written tests.

OUTCOMES

- Quantitative Ability skills will be increased.
- Calculation & Logical thinking skills will be increased.
- Time spent per questions will be minimized.
- Students will be able to score minimum of 70%.
- Improved skills to qualify all competitive exams like Campus Written tests, Banking Exams, SSC Exams, Railway Exams, GATE Exams.

SESSION PLAN: APTITUDE MODULE I: (14 HOURS)

S. No.	Topic	Pedagogy	Details	Instructional Hrs			
				Th	Pract	video	Proj
1	Time, Speed, Distance	Classroom Practice	Concepts, Problems based on relations, Average speed, Stoppage time,	0	2	0	0
2	Trains	Classroom Practice	Relative Speed & All types of train problems	0	1	0	0
3	Boats & Streams	Classroom Practice	Basics, Upstream, Downstream & Shortcuts	0	1	0	0
4	Race	Classroom Practice	All concepts & Shortcuts	0	1	0	0
4	Time & Work	Classroom Practice	Time & Work (Efficiency, wages, alternative day, chain rule)	0	3	0	0
5	Pipes & Cistern	Classroom Practice	Pipes & Cisterns (-ve & +ve work)	0	1	0	0
6	Cubes & Dices	Classroom Practice	All concepts & Shortcuts	0	1	0	0
7	Cubes & Cuboids	Classroom Practice	All concepts & Shortcuts	0	1	0	0
8	Embedded Figure & Figure	Classroom Practice	All concepts & Shortcuts	0	1	0	0

	series						
9	Internal-I	Online / Offline Test	Test & Discussion	0	2	0	0

MODULE II: (13 HOURS)

S. No.	Topic	Pedagogy	Details	Instructional Hrs			
				Th	Pract	video	Proj
1	SI	Classroom Practice	Concepts & Shortcuts on Simple Interest & Installments	0	2	0	0
2	CI	Classroom Practice	Concepts & Shortcuts on Compound Interest & Installments	0	2	0	0
3	Logarithm	Classroom Practice	All Formulae, concepts & Shortcuts	0	1	0	0
4	Equation	Classroom Practice	Linear & Quadratic	0	2	0	0
5	Figure Puzzle & Figure grouping	Classroom Practice	All concepts & Shortcuts	0	1	0	0
6	Figure Counting	Classroom Practice	All concepts & Shortcuts	0	1	0	0
7	Mirror & Water Image	Classroom Practice	All concepts & Shortcuts	0	1	0	0
8	Paper Cutting & Paper folding	Classroom Practice	All concepts & Shortcuts	0	1	0	0
9	Internal-II	Online / Offline Test	Test & Discussion	0	2	0	0

EVALUATION SYSTEM: INTERNAL ASSESSMENT (50) + EXTERNAL ASSESSMENT (50)

Methods	Online/Offline Test-I	Online/Offline Test-II	Attendance	Assignment	% of Marks
Total	15	15	10	10	50
					100

FCHU0216 LIFE SKILLS DEVELOPMENT – IV [Aptitude & Reasoning]

Pre - requisites	Course Type	Credits
LSD-III	Practice	2

OBJECTIVES

- To provide ample opportunities for practice.
- To make the students solve each and every question within 30-40 seconds.
- To make the students visit all the questions in any exam.
- To make them learn the art of skipping questions which require more time.
- To make the students eligible to score 70% or more in each written tests.

OUTCOMES

- Quantitative Ability skills will be increased.
- Calculation & Logical thinking skills will be increased.
- Time spent per questions will be minimized.
- Students will be able to score minimum of 70%.
- Improved skills to qualify all competitive exams like Campus Written tests, Banking Exams, SSC Exams, Railway Exams, GATE Exams.

SESSION PLAN: APTITUDE MODULE I: (14 HOURS)

S. No.	Topic	Pedagogy	Details	Instructional Hrs			
				Th	Pract	video	Proj
1	Permutation	Classroom Practice	All concepts & Shortcuts on factorial, fundamental principles of counting	0	2	0	0
2	Combination	Classroom Practice	All concepts & Shortcuts on Selection (Groups/teams)	0	2	0	0
3	Probability	Classroom Practice	Terms related to Probability, Event, Theorems related Probability, Conditional Probability. Shortcuts on coins, dices, balls, cards, etc	0	2	0	0
4	Sitting Arrangement	Classroom Practice	Circular, Square, Rectangular, Linear, Triangular	0	2	0	0
5	Puzzle	Classroom Practice	Box, Floor, Month, Day	0	2	0	0
6	Advanced Puzzle	Classroom Practice	3 variable	0	2	0	0
7	Internal-I	Online / Offline Test	Test & Discussion	0	2	0	0

MODULE II: (14 HOURS)

S. No.	Topic	Pedagogy	Details	Instructional Hrs			
				Th	Pract	vide o	Proj
1	Data Interpretation	Classroom Practice	(Bar/Pi-Chart /Line graph)	0	2	0	0
2	Mensuration	Classroom Practice	Area & Volume	0	2	0	0
3	Height & Distance	Classroom Practice	Lines of Sight, Horizontal line, Angle of Elevation, Angle of Depression	0	1	0	0
4	Logical Venn Diagram	Classroom Practice	All concepts & Shortcuts	0	1	0	0
5	Syllogism	Classroom Practice	All concepts & Shortcuts	0	2	0	0
6	Statement Assumption	Classroom Practice	All concepts & Shortcuts	0	1	0	0
7	Statement Conclusion	Classroom Practice	All concepts & Shortcuts	0	1	0	0
8	Data Sufficiency	Classroom Practice	All concepts & Shortcuts	0	2	0	0
9	Internal-II	Online / Offline Test	Test & Discussion	0	2	0	0

EVALUATION SYSTEM: INTERNAL ASSESSMENT (50) + EXTERNAL ASSESSMENT (50)

Methods	Online/Offline Test-I	Online/Offline Test-II	Attendance	Assignment	% of Marks 50
Total	15	15	10	10	100

FCMG0114 ECONOMICS

Pre - requisites	Course Type	Credits
Nil	Theory	2

Course Objective:

In today's dynamic economic environment, effective managerial decision making requires timely and efficient use of information. The basic purpose of this course is to provide students with a basic understanding of the economic principles, methodologies and analytical tools that can be used in business decision making problems. It provides an understanding of the economic environment and its impact on strategy formulation. The course also focuses on the impact of economic policies on managerial decision-making by providing an understanding of fiscal policy, and national and global economic issues affecting business.

The language of science (and all analytical thinking) is mathematics. Since economics is a social science, use of some mathematical tools, basically the constrained and un-constrained optimization techniques will help in measuring and solving the basic economic problems and thus improves decision-making. It becomes difficult and totally un-practicable to solve business (economic) problems logically and systematically without use of mathematics. The basic objective is to solve problems mathematically and interpret the results economically.

Module-1: Micro Economics

Introduction to economics: Scarcity, Choice and Efficiency, Fundamental issues of what, how and for whom to produce to make the best use of economics. Demand for a commodity: Law of demand, Demand schedule and demand curve, Individual and market demand, Change in demand, Consumer behavior: Analysing law of demand through Marshallian utility analysis, Indifference curve technique and Consumer Surplus.

Elasticity of demand: Price Elasticity of demand: Estimation, Types, Elasticity and revenue, Factors affecting price elasticity of demand. Income elasticity, Cross elasticity, Uses of different concepts of elasticity in business decisions.

Analysis of Supply: Law of Supply, Supply schedule and supply curve, Change in supply, Price elasticity of supply, Equilibrium of demand and supply: Equilibrium with demand and supply curves, Effect of a shift of demand and supply curves.

Production Function: Production function with one variable input, Production function with two variable inputs, optimal combination of inputs, Returns to scale

Cost Theory: Types of costs, Production and cost, Short-run cost functions, Long-run cost functions, Economies of scale and scope, Cost-Volume-profit Analysis

Market: Meaning, types and characteristics of different market structure (Perfect competition, Monopoly, Monopolistic competition and Oligopoly)

Module: 2: Macro Economics

National Income Accounting: Circular flow of Income, National Income Concept, Eight variants of national product aggregates, Measurement (Income, Value Added and Expenditure), Real and Nominal GNP, Difficulties in measuring the national income, Uses of National income statistics, Money and Inflation: Demand for and supply of money. Causes and consequences of Inflation. Commercial and central banking: Role and functions of commercial banks and R.B.I., Monetary Policy and Fiscal policy: Objectives and Instruments, Balance of Payment (BoP): Meaning, BoP Account, Disequilibrium in BoP, Measures to correct disequilibrium in BoP, Foreign Exchange: Floating Exchange Rate and Fixed Exchange Rates

Books & Reference:

1. Managerial Economics in a Global Economy, by D. Salvatore, Sixth Edition, OUP, 2008

2. Managerial Economics, Truett&Truett, Wiley Publication.
3. Managerial Economics, by Petersen Craig H. Cris Lewis and S.K. Jain, Pearson, 2007
4. Modern Micro Economics, Koutsoyiannis, (1975) , A, Macmillan Press
5. Managerial Economics, Mehta, P. L (1999), Sultan Chand & Sons
6. Principles of Microeconomics, Mankiw, N. G (2006), Cengage Learning
7. Macroeconomics, Mankiw, N. G, (2009), Worth Publishers
8. Macroeconomics, Theory and Policy, Dwivedy, D.N (2007), Tata McGraw Hill
9. Macroeconomics, D'Souza, E (2008), Pearson Education
10. Macroeconomic Analysis, Shapiro, E (2003), Galgotia Publications
11. Environmental Economics in Theory and Practice – Hankey N, Shogren J F, and White B – 1999 – Macmillan Indian Limited
12. Indian Economy, Mishra &Puri (2011), Himalaya Publishing House

FCMG0102 ACCOUNTING AND FINANCE

Pre - requisites	Course Type	Credits
Nil	Theory	2

Course Objective:

- To familiarize the students with basic terms of accounting, accounting principles, concepts and convention.
- To equip the students with various concepts, tools and techniques of Cost accounting as well as Management accounting essential for managerial decision making process.
- To aware students overview of Time Value of Money, Working Capital and Stock Market

Course outcomes:

On the successful completion of this paper the students should be able composed the information about:

- Develop a basic understanding of accounting and financial ratio analysis.
- Students will be able to create, balance and deliver a budget and use budget information for planning and decision purposes.
- Undertake various costing techniques and information for planning and decision-making
- Demonstrate time management by understand various financial funding options for project planning and working capital management of an organizations.
- Know how financial markets as well as the global economy are impacting their organization today and how they will impact their organization into the future.

Module 1:

Basic Accounting Concepts and Conventions, Basic Accounting Equation, Accounting Mechanism: Journals, Ledgers, Trial Balance, Basic Financial Statements: Analysis of Items found in Balance Sheet and Income Statement, Ratio Analysis

Module 2:

Cost Concepts and Cost Terms: Financial Accounting vrs. Cost Accounting, Direct and Indirect Costs, Fixed, Variable and Semi-variable Costs, Standard, Budgeted and Actual Costs, Controllable and Non-controllable costs, Preparation of Cost Sheet, Cost-Volume-Profit Analysis: Concept of Marginal Cost and Contribution, Concept of Break Even Analysis, Applications of Marginal Costing

Module 3:

Time Value of Money: Concept, Simple and Compound Interest, Present Value of a Single Amount, Present Value of an Uneven Series, Future Value of an Annuity, Present Value of an Annuity
Working Capital Management: Meaning and Components of Working Capital, Determinants of Working Capital, Profitability-Risk Trade-off, Types of Working Capital, Importance of Working Capital, Operating Cycle: Concept and Estimation
Stock Market: Types of Capital Issues: Initial Public Offer, Follow-on Public Offer, Rights Issues, Preferential Issues, Red-herring Prospectus, Free Pricing of Issues, Greenshoe Option, Lock-in Period, Safety Net, Listing of Securities on Stock Exchanges

Books Recommended:

1. Accounting for Management—Ashok Sehgal, Taxxman
2. Financial Accounting -- A managerial Perspective, R. Narayanswamy, PHI
3. Khan & Jain – Management Accounting, TMH.
4. Horngren ,Datar, Foster- Cost Accounting, Pearson.
5. Financial Accounting, Jain/Narang/Agrawal, Kalyani.
6. Basic Financial Accounting for Management, Shah, Oxford.
7. Financial Management by I. M. Pandey
8. Financial Management – Theory and Practice by Chandra
9. Financial Management – Text and Problems by Khan & Jain

FCMG0103 MANAGEMENT PROCESSES AND ORGANIZATIONAL BEHAVIOR

Pre - requisites	Course Type	Credits
Nil	Theory	2

Course Objectives:

Management as a subject of study has brought a new paradigm in managing organizations. The young professionals has to learn and reflect the basic principles of management. Along with it the knowledge of Individual and group behaviour and its impact at the workplace is vital. Organizational Behavior (OB) is a field of study that investigates the impact that individuals, groups, and structure have on behavior within an organization. Then it applies that knowledge to make organizations work more effectively. This course will expose students to gain knowledge on the basic principles of management and organization behavior.

Course Introduction

Management as a subject of study has brought a new paradigm in managing organizations. The young professionals has to learn and reflect the basic principles of management. Along with it the knowledge of Individual and group behaviour and its impact at the workplace is vital. Organizational Behavior (OB) is a field of study that investigates the impact that individuals, groups, and structure have on behavior within an organization. Then it applies that knowledge to make organizations work more effectively. This course will expose students to gain knowledge on the basic principles of management and organization behavior.

Course Content

Unit: I

Emergence of Management as a discipline, Principles of management, (Planning, organizing, staffing and controlling) Contributions to management by Luther Gullick , Henri Fayol and Peter F. Drucker and Introduction: Concept and models of OB, Approaches to OB (Systems, Human resource and Contingency)

Unit: II

Individual System: Learning, Perception, Personality and Motivation,

Unit: III

Social System: Group Dynamics and Leadership.

Books Recommended:

1. Robins & Sanghii; Organizational Behavior, Pearson
2. Luthans ,F; Organizational Behavior-TMH
3. Udai Pareek ; Understanding Organizational Behavior, Oxford
4. Prasad,L.M; Organization behavior, S.Chand.
5. K. Aswathappa; Organization behaviour
6. Prasad.L.M ; Principles of Management,

FCMG0104 PRODUCTION AND OPERATION MANAGEMENT

Pre - requisites	Course Type	Credits
Nil	Theory	2

Course Objective:

The course is designed to acquaint the students with decision making in production and operation function of an organization.

Course Outcomes :

- Acquire a working understanding of the roles/functions of production management in the context of business enterprise.
- The learner will have a deep knowledge of the fundamental theory and mathematical principles involved in Production and Operation Management.
- They can use specialized knowledge in Operations Management to solve business processes.
- They will be capable of applying these principles to solve relevant production or service system problems.

Module 1:

Operations Management- An Introduction : Primary topics in Operations Management, Operations Function and Transformation process . Manufacturing Strategy and Mass customization, Product Development and Service Design , New Product design, Product life cycle, Process design, Process life cycle

Module 2:

Project scheduling Models: Project Network, Critical path Method (CPM), Programme Evaluation Review Technique (PERT).

Scheduling: Objective of Scheduling, Sequencing, Sequencing model: "n" jobs 1 machine, "n" jobs 2 machines.

Module 3:

Inventory Management: Concept of inventory with independent demand: Inventory cost structure, Deterministic inventory model - EOQ models, instantaneous receipt, Inventory model with discounts.

Module 4:

Quality Management: Concept of quality; Quality of design, Conformance & performance; Cost of poor process performance and quality. Statistical Quality Control - Process Control (X-bar, R & P chart, np chart).

Concept of TQM, Just in Time and Lean Production Basic element in JIT, Pull system, Push system

Books Recommended:

- 1) Chase, Jacobs, Aquilano, Agarwal, - “Operations Management”, TMH
- 2) Krajewski, Ritzman, Kansal, - “Operations Management”, Pearson
- 3) Everette. Adam Jr., Ronald J. Ebert, - “Production and Operations Management”, PHI
- 4) Roberta S. Russell & Bernard W. Taylor III, - “Operations Management”, Pearson/ PHI
- 5) Aswathappa & Sridhar Bhat, - “Production and Operations Management”, HPH
- 6) Gaither, Frazier- Operations Management

FCMG0105 MARKETING MANAGEMENT

Pre - requisites	Course Type	Credits
Nil	Theory	2

Course Objective:

- a) To familiarize the students with the concepts and theories and strategies of marketing.
- b) To focus on the application of these concepts to various marketing contexts
- c) To focus on the emerging areas of marketing

Course outcomes :

- The students will understand the various marketing approach in today’s competitive scenario.
- The students will learn the application of various marketing tools for solving business problems
- The students will acquire and develop the marketing skills to be a successful marketing person

Module 1:

Introduction to marketing; What is marketing?, Importance of marketing function, Process of marketing, Concepts like need, want, value, satisfaction etc, Elementary idea of marketing mix. Understanding Marketing Environment; Factors affecting marketing environment (PESTEL), Porter’s five forces model, Introduction to market research

Module 2:

Segmentation, Targeting & positioning (STP); What is market segmentation?, Criteria for effective segmentation, Targeting selected markets, Targeting strategies, Positioning, Effective positioning strategies, Positioning of brands and repositioning, introduction to consumer behavior.

Module 3:

Product Management; Classification of products, Product life cycle (PLC), Brand and branding. Pricing; Meaning & objective, steps in setting the price, pricing policies. Promotion; What is promotion, types of

promotion, advertising, sales promotion, integrated marketing communication Place; Marketing channels, Channel conflict management, Distribution system. Introduction to services marketing, Emerging concepts like green marketing, e-marketing & social marketing.

Books Recommended:

1. Marketing Management: A South Asian Perspective- Phillip Kotler, Kevin Lane Keller, Abraham Koshy and MithileshwarJha, 13th Edition Pearson, Education Publication
2. Marketing Mangement: Fourth edition- RajanSaxena
3. Positioning: The Battle for Your Mind- Al Ries& Jack Trout, Warner Books USA

FCMG0108 INTRODUCTION TO RESEARCH

Pre - requisites	Course Type	Credits
Nil	Theory	2

Course Objectives:

- To introduce the students about research, methods and techniques.
- To understand the process and apply in other areas.

Course outcome:

- Students will be able to understand the process of doing a research.
- Students will be able to write a research report.

Course Contents:

Module: I Science and Social Science as Knowledge

Common sense view of Science, Seeing is believing?, Visual Experiences, Relevant Facts, Facts precede theory, Observation, Experiment as an adequate basis of Science, Deductive and inductive logic, falsification-A logical view,

Module: II Process of doing Research

Overview: Problem Definition, hypothesis and its function, Types of Research, Literature Review, Research Design, Sampling: Census and sample survey, different types of sample design, Measurement: Measurement and scaling techniques, Methods of Data Collections: Experimentation, observation,

interview, Survey, case study; Data Analysis and Interpretation: Qualitative and quantitative data, data presentation, central tendency and dispersion, association, test of significance.

Module: III Report Writing and Presentation

Significance of report writing, different steps in report writing, layout of research report & Types of Report, Presentation, Ethics in Report Writing.

Books Recommended

1. Ranjit Kumar, 2011, Research Methodology: A Step by Step Guide, Sage South Asia Publication.

FCMG0113 INDIAN SOCIETY AND CULTURE

Pre – requisites	Course Type	Credits
Nil	Theory	2

Course Objectives:

- a) Develop an understanding social environment
- b) Develop an understanding of cultural environment
- c) Understanding the linkages among social, cultural and business environment

Course outcomes :

- Students would develop an idea about the socio-cultural environment in which they would be working as scientists, researchers and entrepreneurs.
- More specifically, they would get an appreciation of how societal and cultural issues interface with technology and science in the context of overall development of the country.
- Attempt is also made to familiarise students with the science and technology policies that would benefit modern India.

Course Contents:

Module 1: Introduction to Indian Society

Indian Society - Roots of Indian Society , Social Structure – Rural and Urban Contexts, Social Institutions in Indian Society, Caste, Tribe, Dalits and Other Excluded Groups, Power and Conflicts

Module 2: Introduction to Culture in Indian Society

Culture in Ancient, Medieval and Modern India, Languages and Literature in India, Culture Change and its Impact on Indian Society

Module 3: Social Movements

Reformers and Radicals – Rammohan Roy, Syed Ahmed Khan, JotiroPhule, Gopal Krishna Gokhale, BalGangadharTilak, TarabaiShinde, DayanandaSaraswatiand Vivekananda Nurturing a Nation – M. K. Gandhi, RabindraNath Tagore, B R Ambedkar, Mohammad Ali Jinnah, EV Ramaswami, Jawaharlal Nehru, RammanoharLohia, Jayaprakash Narayan, Verrier Elwin Peasant, Tribal, Women and Environment movement

Module 4: Social Issues in Modern India

Poverty, Gender Inequality, Disparity and Social Exclusion: SC, ST, Women, Child, Challenged

Module 5: Science, Technology and Society

Science, Technology and Development Linkage, Appropriate Technology, Science and Technology Policy

Books Recommended:

1. Indian Society and Culture: Continuity and Change – by N. Hasnain
2. Social and Cultural History of India – O.M. Prakash
3. Makers of Modern India – RamachandraGuha

Introduction to Human Rights

Course	Code	Type of course	Credit
Introduction to Human Rights	FCMG1203	Workshop	2

Objective

- The course is an introduction to human rights. Human beings are rational beings. They by virtue of their being human possess certain basic and inalienable rights which are commonly known as human rights. Human Rights are defined as all those rights which are essential for the protection and maintenance of dignity of individuals and create conditions in which every human being can develop his or her personality to the fullest extent. The purpose of this course is for students to gain a holistic view of human rights and their implications.

Course outcome

- Develop an understanding of human rights, its history, characteristics and types,
- Gain a nuanced understanding of protection, violation and the legal framework for their protection - International Human Rights Law, Council of Human Rights, Universal Declaration of Human Rights, Legal Effects of the Declaration, International Humanitarian Law
- Conflicts of Rights: Challenges of the past and Challenges for the future

Course outline

Module I	Introduction to Human Rights
Topic	Meaning and Definition, History, Principles, Characteristics, Types
Pedagogy	Example: lecture (ppt), videos, etc
Lab/Activity	
Assignment/practice	
No. of hours	6
Reference materials: Book/e-content/online source	

Module 2	Human Rights Law
Topic	Protection, violation and the legal framework for their protection - International Human Rights Law, Council of Human Rights, Universal Declaration of Human Rights, Legal Effects of the Declaration, International Humanitarian Law
Pedagogy	Example: lecture, videos, Case studies, etc
Lab/Activity	
Assignment/practice	
No. of hours	8
Reference materials: Book/e-content/online source	

Module 3	Conflicts of Rights: Challenges of the past and challenges for the future
Topic	Persistence of discrimination, poverty, and inequality in the region, efforts in the search for justice for past violations, continued struggle for human rights and accountability

Pedagogy	Example: lecture, videos, case studies, etc
Lab/Activity	
Assignment/practice	
No. of hours	16
Reference materials: Book/e-content/online source	

Reference

E-content:

Text Books:

1. Arihants UGC NET Human Rights and Duties
2. Kapoor, S. K. Central Law Agency's Human Rights under International Law and National Law

Reference Books:

1. Ciapham Andrew, 2015, Human Rights: A Very Short Introduction, Oxford University Press
2. Smith Rhona, 2015, Textbook on International Human Rights, Oxford University Press

Online Source:

8 Human Rights Study Books you can download for free

<https://www.humanrightscareers.com/.../10-human-rights-study-books-you-can-download>

<https://www.humanrightscareers.com/courses/>

Session Plan

Topic coverage and Internal Test	No. of Sessions (in hrs.)	Activity (lecture, tutorial, lab practice, field studies/field-trip, Workshop etc.)	Assignment (project, assignment, field study, seminar, etc.)	Suggested Reading (Book, Video, Online source, etc.)
Module 1				
Meaning and Definitions of Human Rights	2	Lecture		Lecture Notes and reference in books, online resources
History of Human Rights?	2	Lecture		Lecture Notes and reference in books, online resources
Principles, Characteristics and Types	2	Lecture		Lecture Notes and reference in books, online resources
Module 2				
Introduction - Protection, violation and the legal framework for the protection of Human Rights	2	Lecture		Lecture Notes and Articles, online resources
International Human Rights Law	2	Lecture		Lecture Notes and Articles, online resources
Council of Human Rights and Universal Declaration of Human Rights	1	Lecture		Lecture Notes and Articles, online resources
Legal Effects of the Universal Declaration of Human Rights	1	Lecture		Lecture Notes and Articles, online resources

International Humanitarian Law	2	Lecture		Lecture Notes and Articles, online resources
Module 3				
Persistence of discrimination, poverty, and inequality in the region	2	Lecture		Handouts and online resources
Efforts in the search for justice for past violations	2	Lecture		Handouts and online resources
Continued struggle for human rights and accountability	2	Lecture		Handouts and online resources
Project work and presentations	8 hours			

Introduction to Ethics

Course	Code	Type of course	Credit
Introduction to Ethics	FCMG1204	Workshop	2

Course Objective

<ul style="list-style-type: none"> The course is an introduction to Ethics. This course will introduce to the meaning of ethics and the historical development – utilitarianism, ethical relativism and virtue ethics. Will also examine some current ethical issues. Questions which will be considered are: what is the good life? Do we have a moral duty to act in certain ways? Are there such things as natural human rights? Are some values more compelling than or better than others?
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Course outcome

<ul style="list-style-type: none"> Demonstrate knowledge of important ethical systems Demonstrate their respect of different ethical perspectives Critique some aspects of an ethical position Clearly formulate their ethical position on an issue and develop arguments based on sound inferences and clear premises (through project)
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Course outline

Module I	Introduction to Ethics
Topic	What is the study of ethics, Introduction to Indian and Western Ethics
Pedagogy	lecture (ppt),
Lab/Activity	
Assignment/practice	
No. of hours	6
Reference materials: Book/e-content/online source	

Module 2	Different Ethical systems and Perspectives
Topic	Ethical relativism and its implications, utilitarianism, duty ethics and virtue ethics
Pedagogy	lecture, Case studies, small group work
Lab/Activity	
Assignment/practice	
No. of hours	8
Reference materials: Book/e-content/online source	

Module 3	Critique of various aspects of ethical positions
Topic	Critique an ethical issue/ problem and formulate own ethical position on the issue/ problem
Pedagogy	lecture, small group work
Lab/Activity	
Assignment/practice	
No. of hours	16
Reference materials: Book/e-content/online source	

Reference

E-content:

https://youtu.be/3_t4obUc51A

Text Books:

1. Frankena, WK, 1973, Ethics (2nd Edition), Pearson.

Reference Books:

2. Singer, P. 2011, Practical Ethics (3rd ed), Cambridge University Press.
3. Smart, JJC and Williams, B. 1973, Utilitarianism: For and Against, Cambridge University Press.

Session Plan

Topic coverage and Internal Test	No. of Sessions (in hrs.)	Activity (lecture, tutorial, lab practice, field studies/field-trip, Workshop etc.)	Assignment (project, assignment, field study, seminar, etc.)	Suggested Reading (Book, Video, Online source, etc.)
Module 1				
Meaning and Definitions of Ethics	2	Lecture		Lecture Notes and reference in books, online resources
Introduction to Indian and Western Ethics	4	Lecture		Lecture Notes and reference in books, online resources
Module 2				
Ethical Relativism and its implications	2	Lecture		Lecture Notes and Articles, online resources
Utilitarianism and its implications	2	Lecture		Lecture Notes and Articles, online resources
Duty ethics and its implications	2	Lecture		Lecture Notes and Articles, online resources
Virtue ethics and its implications	2	Lecture		Lecture Notes and Articles, online resources
Module 3				
Critique of various aspects of ethical positions	4	Lecture		Handouts and online resources
How to formulate an ethical position on an issue	4	Lecture		Handouts and online resources

Project work and presentations	8 hours			
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FCMG1201 DISASTER MANAGEMENT

Pre – requisites	Course Type	Credits
Nil	Workshop	2

Course Objective		
<p>The aim is to impart knowledge on</p> <ul style="list-style-type: none"> • To provide students an exposure to disasters, their significance, types & Comprehensive understanding on the concurrence of Disasters and its management. • To ensure that students begin to understand the relationship between vulnerability, disasters, disaster prevention, risk reduction and the basic understanding of the research methodology for risk reduction measures. • Equipped with knowledge, concepts, and principles, skills pertaining to Planning, Organizing, Decision-making and Problem solving methods for Disaster Management. • The course also facilitates students to globally share their views, ideas and information pertaining to Disaster Management on a common platform. • To develop rudimentary ability to respond to their surroundings with potential disaster response in areas where they live, with due sensitivity. 		

GUIDELINES ON GRADING AND STANDARDS OF ASSESSMENT

A continuous evaluation system will be adopted to evaluate the students. There will be an individual and group assignments, presentations and written test.

COURSE CONTENT			
Module - 1			
UNIT I – Introduction to Disaster Management (2hrs)			
Session	Topic	Coverage	Reading/Reference
4hrs	Disaster & Emergencies : Concept & Fundamentals of Disaster Management	<ul style="list-style-type: none"> • Introduction/ Brain storming/ Group formation • History of Disasters • Concepts and Definitions • Hazard, Risk, Vulnerability, Capacity, Disaster & Equations of Disaster Management 	
		<ul style="list-style-type: none"> • Types & Classification of Disasters • Factors responsible for disasters like flood, 	

		cyclone and Earthquake.	
UNIT II – Effect and Impact of Disaster (4 Hrs)			
1hr	Effect and Impacts of Disasters (Group work)	<ul style="list-style-type: none"> Disasters Impact – Social, Economic, Political, Environmental, Health, Psychosocial, etc. Differential impacts- in terms of Caste, Class, Gender, Age, Location, Disability. 	Disaster Mgmt. and India: Responding Internally and Simultaneously in Neighboring Countries Kailash Gupta, BE (Elec.), MBA(IIMA)
1 hr	Disaster vs Development	<ul style="list-style-type: none"> Disaster is the causes of destruction Disaster leads to development 	
2 hrs	Global warming and climate change	<ul style="list-style-type: none"> Concept and understanding of global warming and climate change Causes and factors Remedial measures 	
Module – II		•	
UNIT III – Disaster Risk Management - (6 hours)			
2 hrs	Community Managed Disaster Risk Reduction And Village Contingency Plan (Group work) Role of Task force/ ODRAF/ NDRF for DRR at community level.	<ul style="list-style-type: none"> Hazard analysis and assessment Vulnerability analysis Resource capability assessment Mapping & Seasonality Calendar Structural and Non Structural assessment. Task forces with various roles for DRR. 	CBDRM for Local Authorities: PARTICIPANT’S WORKBOOK – adpc www.adpc.net
2 hours	Rapid Need Assessment Pre and Post Disaster (Group work and Practical demo)	<ul style="list-style-type: none"> Meaning and Importance Rapid Need Assessment in emergency and its significance Process and Methods 	
2 hrs	Stress Management	<ul style="list-style-type: none"> Causes and consequences of Stress What are the best ways to handle pressure Psychosocial Support 	

UNIT IV – Disaster Management (8 hrs)			
2 hrs	Disaster Management Cycle	<ul style="list-style-type: none"> • Disaster Management Cycle • Phases of Disasters • Prevention, Mitigation Preparedness, Warning, Response, Rehabilitation, Reconstruction 	
2 hrs	Fire safety (Practical)	<ul style="list-style-type: none"> • Practical 	
2 hours	First Aid & Driving Learning (Theory and Practical)	<ul style="list-style-type: none"> • ABCD of First Aid • Dressing and Bandages Practical session • Emerging need and importance of learning driving 	
2hrs	Building Rescue operation or Demonstration of ODRAF/NDRAF rescue materials	<ul style="list-style-type: none"> • Practical 	
Module – III		<ul style="list-style-type: none"> • 	
UNIT V – Humanitarian Charter and Minimum Standards in Humanitarian Response (4 hrs)			
2hrs	Sphere Standards (Group Work)	<ul style="list-style-type: none"> • The Humanitarian Charter • Protection Principles • Core Standards 	
2hrs	Restoring Life Line Services (WASH) (Group work)	<ul style="list-style-type: none"> • Water , Sanitation & Hygiene Promotion • Food Security & Nutrition • Health Services • Health Services • Shelter and Settlement 	The Sphere Project , Humanitarian Charter and Minimum Standards In Humanitarian Response
UNIT VI – Disaster Management Projects –(6 hours)			
6hrs	Seminars / Workshop	<ul style="list-style-type: none"> • Adapting Climate Change • Disaster Resilience Structures and Buildings • IT in Disaster Management • Inter-relationship between Disasters and Development • Urban Disaster 	

		<ul style="list-style-type: none"> • Rain Water Harvesting • Inclusions – Disability, Aged, Social etc 	
		<ul style="list-style-type: none"> • 	
		<ul style="list-style-type: none"> • 	

- Team of 10 – 15 members would be formed
- Each Team would take up a project work in one of the topics above or related topics with prior approval : 2 Weeks
- Each Team would organize one Seminar / Workshop during the session

FCMG1202MS Excel

Pre – requisites	Course Type	Credits
Nil	Workshop	2

Course Objective		
<p>The aim is to impart knowledge on</p> <ul style="list-style-type: none"> • Indicate the names and functions of the Excel interface components. • Enter and edit data. • Format data and cells. • Construct formulas, including the use of built-in functions, and relative and absolute references. • Create and modify charts. • Preview and print worksheets. • Use the Excel online Help feature. 		
<p>Course Outcome</p> <ul style="list-style-type: none"> • Navigate your way around Microsoft Excel • Work with data analysis and presentation • Create and work with formulas and functions, understand and use formula cell • Use Excel for Business application 		
GUIDELINES ON GRADING AND STANDARDS OF ASSESSMENT		
<p>A continuous evaluation system will be adopted to evaluate the students. There will be an individual and group assignments and presentations.</p>		

Course Contents:

Unit 1: Excel Introduction, direct right, The Excel Interface, direct right, Basic Navigation and Editing,

Unit 2: Getting Going, Orientation & efficiency, Editing, Viewing, Spreadsheet Structure, Cell References, Named Ranges, Basic Macros, Design

Unit 3: Administration, Customising Excel, Housekeeping, Connecting Workbooks Documentation, Protecting and Sharing, Google Docs, Excel Troubleshooting, Data Handling, Sorting and Filtering, Controlling User Input, - Working with Dates & Times

Unit 4: U- Working with Text, Lookup and Reference, Logical Functions, Data Analysis, Working with Numbers, Summarising Data, PivotTables 1 - Simple Summaries, PivotTables 2 - Manipulating Data,

Unit 5: PowerPivot: Handling Big Data, Formula Auditing, Advanced Macros and VBA, Modelling, Presentation, Cell Formatting, Number Formatting, Conditional Formatting, Graphs and Charts, Page and print setup

Introduction to Gender

Subject Name	Code	Type of course	Credit
Introduction to Gender	FCMG1205	Workshop	2

Objective

- In the traditional social order women have been assigned a subordinate status in society for centuries. They have been deprived of many social privileges and suffered from discriminations that prevented them from contributing to the development process. They have remained marginalized in society. To remedy the prevailing situation, gender concerns have become increasingly important in the development agenda in the last few decades. In spite of special policies and programmes being implemented, gender based injustice continues to exist and hinder development

Course outcome

- Develop an understanding of perspectives on gender and development
- Discuss in detail the gender question in selected development sectors and globalisation
- Familiarise with the different tools and techniques for gender planning, analysis and evaluation in the development sector

The course has three modules covering these three aspects of gender and development.

Course outline

Module I

UNDERSTANDING AND CONCEPTUALISING GENDER RELATIONS

Module II

GENDER ISSUES IN DEVELOPMENT SECTORS

Module III

GENDER ANALYSIS, TOOLS, TECHNIQUES AND FRAMEWORKS

References

- a) "Why Gender is a Development Issue", Handout 4, Oxfam Gender Training Manual (1994)
- b) Freedman, Jane. (2002), "Introduction: Feminism or Feminisms?" in *Feminism*, Viva Books, N. Delhi.
- c) Chafetz, J.S. (1990), "The Coercive Bases of Gender Inequality", in *Gender Equity: An Integrated Theory of Stability and Change*, Sage.
- d) Kabeer, Naila. (1994), "Connecting, Extending, Reversing: Development from a Gender Perspective", in *Reversed Realities*, Verso, London.
- e) Moser, C.O.N. (1991), "Gender Planning in the Third World: Meeting Practical and Strategic Gender Needs", in T. Wallace & C. March (eds.) *Changing Perceptions: Writings on Gender and Development*, Oxfam.
- f) Boonsue, K. (1992), "Development Models of WID, WAD and GAD" in *Women's Development Models and Gender Analysis: A Review*, Gender Studies (AIT, Bangkok).
- g) Agarwal, B. (1994), "Conceptualising Gender Relations" in *A Field of One's Own: Gender and Land Rights in South Asia*, Cambridge University Press.
- h) "Women and the Economy" in *Human Development in South Asia 2000: The Gender Question*, MahabubUIHaq Development Centre/OUP, Islamabad.
- i) Rajagopal, S. (1999), "Closing the Gender Gap in Education: The Shikshakarmi Programme" in N. Kabeer & R. Subrahmanian (eds.), *Institutions, Relations and Outcomes*, Kali for Women, Delhi.
- j) Thakur, S.G. (1995), "Access to Health Care – A Gender Perspective" *The Administrator*, Vol 11, April-June, pp 169-181.
- k) Kusum, K & Barua, K. (2001), "Gender Equality and Women's Health – A Human Rights Perspective", *Indian Journal of Adult Education*, Jan-Mar, pp 44-49.
- l) Mohanty, B. (1995), "Panchayati raj, 73rd Constitutional Amendment and Women", *Economic and Political Weekly*, Dec 30, 3346-3350.
- m) Kapoor, N. (2002), "Women and Governance", *Participation & Governance*, Vol. 8, No.23, pp 11.
- n) Resurreccion, B.P. (2005), "Women in-between: Gender, Transnational and Rural-Urban Mobility in the Mekong Region", *Gender, Technology and Development*, Vol.9, No.1, Jan-April, pp 31-51.
- o) Gender and Globalisation – A Note
- p) Overholt, C.A. et.al. (1991), "Gender Analysis Framework", in A. Rao et.al. (eds.), *Gender Analysis in Development Planning*, Kumarian Press.
- q) Handouts to be given in the class on Gender Assessment Study.
- r) The Gender Analysis Matrix: A Teaching Note.
- s) March. C. et.al (1999), "Women's Empowerment (Longwe) Framework", in *A Guide to Gender Analysis Frameworks*, Oxfam: Oxford.
- t) Gender and Organisations – Handout in the class.

1. Session Plan

Topic coverage and Internal Test	No. of Sessions (in hrs.)	Activity (lecture, tutorial, lab practice, field studies/field-trip, Workshop etc.)	Assignment (project, assignment, field study, seminar, etc.)	Suggested Reading (Book, Video, Online source, etc.)
Module 1				
Difference between Sex and Gender	1	Lecture		Lecture Notes and Book chapters
Why gender is a development issue?	1	Lecture		Lecture Notes and Book chapters
Gender system and inequality	1	Lecture		Lecture Notes and Book chapters
Understanding gender relations	1	Lecture		Lecture Notes and Book chapters
Gender planning – practical and strategic gender needs	1	Lecture		Lecture Notes and Book
Approaches to address gender inequality – WID, GAD and GID	1	Lecture		Lecture Notes and Monograph
Module 2				
Gender issues in the economic sector	1	Quiz 1 and Lecture		Lecture Notes and Articles
Gender issues in the education sector	1	Lecture		Lecture Notes and Articles
Gender issues in the health sector	1	Lecture		Lecture Notes and Articles
Gender issues in the governance sector	1	Lecture		Lecture Notes and Articles
Gender issues in globalisation	1	Lecture		Lecture Notes and Articles
Module 3				

Harvard Analytical Framework	1	Lecture		Handouts and Book chapter
Gender Assessment Study and Gender Analysis Matrix	1	Lecture		Handouts and Book Chapters
Gender Empowerment Framework	1	Quiz 2 and Lecture		Handouts and Book Chapters
Gender and Organisations	1	Lecture		Handouts and Book Chapters
Student Presentations based on group projects	Extra classes			
Total (hrs)	15 hours +3 hours			

Centurion University of Technology and Management Odisha

Choice Based Credit System

Course Structure & Syllabus

BASKET - III



CENTURION UNIVERSITY OF TECHNOLOGY AND MANAGEMENT

School of Engineering & Technology

2019

Course Structure

Basket – III

Course Code	Course Title	Type of course	Cr	Prerequisite	C	C	C	C	C	C	C	C	P	P	P
					O	O	O	O	O	O	O	O	O	O	O
					1	2	3	4	5	6	7	8	1	2	3
ENFC 0101	Engineering Mechanics	Theory	3	Nil	H	-	-	-	-	-	-	H	-	H	-
ENFC 0102	Material Sciences	Theory	3	Nil	H	M	L	L	M	M	H	H		-	-
ENFC 0103	Thermodynamics	Theory	3	Nil	H	M	H	-	-	-	-	M	-	M	-
ENFC 0104	Introduction to Communication Engineering	Theory	3	Nil	H	H	H	L	M	L	-	L	M	H	L
ENFC 0105	Introduction to Aerospace Engineering	Theory	3	Nil	H	L	M	-	M	-	-	L	M	M	L
FCEN 0120	Introduction to Computer	Theory	3	Nil	H	M	M	L	H	M	H	H	H	H	L
FCEN 0118	Computer Fundamental and Organizat	Theory	3	Nil	H	M	L	L	M	L	M	M	M	H	L
FCEN 0119	Operating System Building Blocks	Theory	3	Nil	H	H	H	L	H	M	H	M	M	H	L
FCEN 0115	Introduction To Biotechnology	Theory	3	Nil	H	M	M	L	M	L	H	M	M	L	L
FCEN 0116	Introduction to Biophysics	Theory	3	Nil	H	M	M	L	M	L	H	M	H	M	M
FCEN	Biosafety,	Theory	3	Nil	M	M	M	M	M	M	M	M	H	H	L

0117	bioethics, IPR and Patents																
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FCEN0111	Earth System Science	Theory	3	Nil	H	M	L	L	M	H	H	M	M	H	L
FCEN0112	Introduction to Mining	Theory	2	Nil	M	M	L	L	M	L	M	M	L	M	M
FCEN0113	Mine Development	Theory	3		H	H	L	M	M	M	M	L	H	M	L
FCEN0114	Mine Surveying I	Theory	3		H	H	H	M	H	L	L	H	H	M	L
ENFC0201	Workshop Practice	Theory	3		H	-	-	-	-	-	-	-	H	L	-
ENFC0202	Geometric Modelling Lab	Theory	3		H	H	M	M	M	L		L	H	H	M
ENFC0203	Introduction to Robotics	Practice	2	Nil	H	L	L	L	H	M		L	M	H	M
ENFC0204	3D Modeling	Practice	2	Nil	H	H	L	L	M	L	M	M	M	H	M
ENFC0205	Electrical Workshop	Practice	2	Nil	H	M	H	-	M	H	M	H	H	H	-
FCEN0214	Mine Surveying-I Lab	Practice	2	Nil	M	H	H	M	H	M	H	H	H	H	M
ENFC0208	Aerodynamics Laboratory	Practice	2	Nil	H	L	L	-	M	-	-	M	M	L	L
ENFC0401	Engineering Metrology and Measurements	Practice	2		H	-	-	-	H	H	-	H	H	H	-
ENFC0402	Basic Fluid Mechanics	Practice	2	Nil	H	M	M	M	H	M		L	H	M	M
ENFC0403	Basic Surveying	Theory+ Practice	3	Nil	H	M	M	H	H	L	H	H	M	H	L

ENFC040 4	Basic Electrical Engineering	Theory + Practice	3	Nil	H	H	H	-	M	M	H	H	M	M	L
ENFC040 5	Electrical Machines	Theory + Practice	3	Nil	H	H	H	-	H	M	M	H	H	H	-
ENFC040 6	Introduction to automation	Theory+ Practice	3	Nil	H	H	H	-	H	H	M	H	M	H	L
ENFC040 7	Introductio n to Web Technology	Theory+ Practice	3	Nil	H	H	H	L	H	M	M	H	H	H	L
ENFC040 8	Information Security I	Theory+ Practice	3	Nil	H	M	H	L	H	M	H	M	H	L	L
ENFC040 9	Programmi ng in C	Theory + Practice	3	Nil	H	H	H	L	H	M	H	H	H	H	L
ENFC041 0	Desktop Operating System (Windows 10)	Theory+ practice	3	Nil	H	L	M	L	M	L	L	L	M	L	L
FCEN040 8	Principles of Biochemistr y	Theory+ practice	3	Nil	H	M	L	L	L	M	H	H	H	M	M
FCEN040 9	Cell Biology	Theory+ Practice	3	Operatin g System Building Blocks	H	M	L	L	L	M	H	M	H	M	M
ENFC041 2	Programmi ng for Problem Solving – Java	Theory + Practice	5	Nil	H	H	H	M	H	H	-	M	H	M	-

ENFC041 4	Data Base Managem ent System	Theory + Practice	5	Nil	H	H	H	M	M	M	M	M	M	H	H	-
ENFC041 5	Electronics and Its Application	Theory + Practice	3	Nil	H	H	M	-	H	H	H	H	H	H	M	M
ENFC041 6	Electronic Devices	Theory + Practice	3	Nil	H	H	H	-	M	-	M	H	H	H	H	-
ENFC041 7	Sensors and IOT	Theory + Practice	3	Nil	H	H	M	-	H	H	H	H	H	H	H	H
ENFC041 8	Problem Solving & Programmin g	Theory & Practice	3	Nil	M	H	H	M	H	M	H	H	M	H	-	-
ENFC041 9	Data Structures	Theory & Practice	3	Nil	H	H	L	L	H	L	-	L	L	H	L	-
ENFC042 0	Switching Theory and Logic Design	Theory & Practice	3	Nil	H	L	L	L	H	H	-	L	H	H	H	-
ENFC042 2	Operating System	Theory & Practice	3	Nil	H	H	H	M	M	M	-	M	H	M	M	-
ENFC042 3	Big Data Analytics	Theory & Practice	3	Nil	M	M	M	-	-	-	-	H	H	M	M	-
ENFC042 4	Block Chain and Smart Contracts	Theory + Practice	3	Nil	H	H	L	L	H	L	-	L	H	H	L	-
ENFC060 1	Product Developme nt	Theory + Practice	3	Nil	M	M	-	-	-	-	-	H	-	-	L	-

ENFC060 3	AI Tools, Techniques and applications	Theory + Practice	3	Nil	M	M	M		L	-	-	-	L	L	L
ENFC060 2	Cloud Computing and its applications using Linux OS	Theory + Practice	2	Nil	M	M	M	-	-	-	-	-	-	M	-
ENFC090 1	Problem Solving using Python	Practice + Project	3	Nil	-	-	-	-	H	-	-	-	H	-	-
ENFC090 2	Object Oriented Programmi ng through Java	Practice + Project	3	Nil	M	M	M	-	-	-	-	M	H	M	L
ENFC090 3	Web Technologie s	Practice + Project	3	Nil	H	L	L	L	M	M		L	L	H	L
ENFC090 4	Software Engineering using Agile	Theory + Practice	3	Nil	H	H	H	L	M	L	-	L	H	L	M
ENFC140 7	Internet of Things	Theory + Practice + Project	3	Nil	M	M	M	-	-	-	-	H	H	-	-
ENFC140 2	Build your own Computer	Theory & Practice + Project	3	Nil	M	M	M	-	-	L	-	L	H	L	L
ENFC140 3	Cloud Computing Application	Theory + Practice + Project	3	Nil	M	M	M	M	-	-	-	-	-	M	-
ENFC140	Design thinking	Worksho p	2	Nil	M	M	M	-	-	-	-	-	L	L	-

5	and Innovation																
ENFC140 6	Problem solving Technique	Worksho P	2	Nil	L	L	-	-	-	-	-	L	H	M	H		

Syllabus

Engineering Mechanics

Course Title	Code	Type of course	T-P-PJ	Prerequisite
Engineering Mechanics	ENFC0101	Theory	3-0-0	Nil

Objective

- To provide the students with a clear and thorough understanding on theory and application of principles of mechanics as applied in engineering problems.

Course Outcome

- Students will acquire knowledge and skill to analyze the effect of force and motion on rigid bodies to solve engineering problems through application of basic laws of mechanics.

Evaluation Systems

	Component	% of Marks	Method of Assessment
Internal Examination	Internal Theory	30	Written examination
	Assignment	5	Report or Presentation + Learning Record
	Attendance	5	Based on class attended
External Examination	External Theory	60	Written examination
Total		100	

Course Outline

Module: I (9 Hrs)

Coplanar Forces : Principles of Statics, Law of Transmissibility of a Force, Composition and Resolution of Forces, Resultant and Equilibrant, Free Body Diagram, Equilibrium of Concurrent Coplanar Forces, Lami's Theorem (Case Studies : - Analysis of a Boom, Analysis of a Tripod Stand, Equilibrium Analysis of a Wall Bracket)

To Understand the Equilibrium of a Particle under the Action of Forces in a Plane using Gravesand's Apparatus or Coplanar Force Setup. (The theory can be taught in practice mode)

Module: II (6 Hrs)

Moment and Couple, Varignon's Principle of Moment, General Conditions of Equilibrium, Types of Supports and Support Reactions,

Friction :Equilibrium of Bodies on Rough Inclined Planes, Ladder Friction, Applications of Friction (Friction in Square Threaded Screw, Disc and Bearing Friction, Belt Friction)

To Determine the Coefficient of Static Friction between two given Material with the Help of an Inclined Plane. (The theory can be taught in practice mode)

Module : III (10 Hrs)

Center of Gravity : General Case of Parallel Forces in a Plane, Centre of Parallel Forces in a Plane, Centroid and Centre of Gravity, Axis of Symmetry, Centroid of Composite Plane Figures and Curves.

Moment of Inertia : Rectangular and Polar Moment of Inertia, Radius of Gyration, Parallel Axis Theorem and Perpendicular Axis Theorem, Moment of Inertia of Plane Composite Figures and Material Bodies.Determination of Moment of Inertia of a Flywheel. (The theory can be taught in practice mode)

Module : IV (6 Hrs)

Linear Motion : Motion under Gravity and Variable Acceleration, Principles of Dynamics such as Newton's Second Law, D'Alembert's Principle, Work-Energy Relation, Impulse-Momentum Relation, Law of Conservation of Momentum and Energy, Impact and its Types, Impact of a Body on a Fixed Plane.

Module : V (5 Hrs)

Concept of Stress and Strain :Types of Stresses and Strains, Hooke's Law, Stress-Strain Diagrams for Ductile and Brittle Materials, Analysis of Axially Loaded Bars. Stress Strain Curve of a Ductile Material (Mild Steel) using UTM.

Module: VI (5Hrs)

Bars of Varying Cross-section, Composite Bars, and Poisson are Ratio, Complimentary Shear Stress, Volumetric Strain, Elastic Constants and their Relationship. Longitudinal and Hoop Stress in Thin-walled Pressure Vessels Subjected to Internal Pressure.

Module : VII (4 Hrs)

Principal Stresses and Strains : Transformation of Stress and Strain, Principal Stresses, Principal Strains, Mohr's Circle for Stress and Strain.

Text Books :

Engineering Mechanics by D.S. Kumar, S.K. Kataria and Sons Strength of Materials by S.S. Rattan, Tata Mc-Graw Hill Publication. Reference Books : Engineering Mechanics by S. Timoshenko, D.H. Young and J.V. Rao, Tata McGraw Hill. Online Source : NPTEL, You tube

Session Plan

Topic coverage and Internal Test	No. of Sessions (in hrs.)	Activity (lecture, tutorial, lab practice, field studies/field -trip, Workshop)	Assignment (project, assignment, field study, seminar, etc.)	Suggested Reading (Book, Video, Online source, etc.)
Module I				
Principles of statics, law of transmissibility of a force, composition and resolution of forces	3	Lecture	Assignment	Engineering Mechanics by D.S. Kumar
Resultant and equilibrant, free body diagram	2	Lecture	Assignment	Engineering Mechanics by D.S. Kumar
Equilibrium of concurrent coplanar forces,	1	Lecture	Assignment	Engineering Mechanics by D.S. Kumar
Lami's theorem, (case studies : - analysis of a boom, analysis of a tripod stand, equilibrium analysis of a wall bracket)	1+2	Lecture + practice	Assignment	Engineering Mechanics by D.S. Kumar
Module II				
Moment and couple, Varignon's principle of moment, general conditions of equilibrium	2	Lecture	Assignment	Engineering Mechanics by D.S. Kumar
Types of supports and support reactions.	1	Lecture	Assignment	Engineering Mechanics by D.S. Kumar
Equilibrium of bodies on rough inclined planes, ladder friction	2	Lecture	Assignment	Engineering Mechanics by D.S. Kumar
Wedge friction, applications of friction (friction in square threaded screw, disc and bearing friction, belt	1	Lecture	Assignment	Engineering Mechanics by D.S. Kumar

friction				
Module III				
Center of Gravity : General case of parallel forces in a plane, centre of parallel forces in a plane, centroid and centre of gravity, axis of symmetry, centroid of composite plane figures and curves.	5	Lecture	Assignment	Engineering Mechanics by D.S. Kumar
Moment of Inertia : Rectangular and polar moment of inertia, radius of gyration, parallel axis theorem and perpendicular axis theorem, moment of inertia of plane composite figures and material bodies. Determination of moment of inertia of a flywheel.	5	Lecture	Assignment	Engineering Mechanics by D.S. Kumar
Module IV				
Linear Motion : Motion under gravity and variable acceleration, principles of dynamics such as Newton's second law, D'Alembert's principle, work-energy relation, impulse-momentum relation, law of conservation of momentum and energy, impact and its types, impact of a body on a fixed plane.	6	Lecture	Assignment	Engineering Mechanics by D.S. Kumar http : //vlab.amrita.edu/?sub=1 &brch=74&sim=189&cnt =4)
Module V				
Concept of stress and strain : Types of stresses and strains, Hooke's law,	3	Lecture	Assignment	Strength of materials by S.S. Rattan

stress–strain diagrams for ductile and brittle materials, analysis of axially loaded bars.				
Stress-strain curve of a ductile material (mild steel) using UTM	2	Practice		Strength of materials by S.S. Rattan
Module VI				
Mechanical properties of materials Rockwell and Brinell hardness tests	2	Practice		Strength of materials by S.S. Rattan
Bars of varying cross-section, composite bars, Poisson's ratio, complimentary shear stress, volumetric strain, Elastic constants and their relationship.	2	Lecture	Assignment	Strength of materials by S.S. Rattan
Longitudinal and hoop stress in thin-walled pressure vessels subjected to internal pressure.	1	Lecture	Assignment	Strength of materials by S.S. Rattan
Module VII				
Principal stresses and strains : Transformation of stress and strain, principal stresses, principal strains, Mohr's circle for stress and strain.	2+2	Lecture + Practice	Assignment	Strength of materials by S.S. Rattan
Total				45

Material Sciences

Course Title	Code	Type of course	T-P-PJ	Prerequisite
Material Sciences	ENFC0102	Theory	3-0-0	Nil

Objective

- To study classification and properties of materials used in day to day life
- To understand the material application and it's needed.

Course Outcome

- Students will able to identify materials for engineering use.
- Students will able to select best materials for a specific design and production.

Evaluation Systems

	Component	% of Marks	Method of Assessment
Internal Examination	Internal Theory	30	Written examination
	Assignment	5	Report or Presentation + Learning Record
	Attendance	5	Based on class attended
External Examination	External Theory	60	Written examination
Total		100	

Course Outline

Module: I (8 Hrs)

Steel, Stainless Steel & Types, HSLA Steels, Dual Phase Steels, Tool and Die Steels. Nonferrous Alloys- Aluminum & Alloys, Copper & Alloys, Zinc & alloys, Nickel & Alloys , Magnesium Alloys, Titanium Alloys, Super Alloys.

Module: II (7 Hrs)

Polymer- Thermosetting, Thermoplastics; Elastomers- Natural & Synthetic Rubber; Composites Material- Classification Based on Matrix and Topology, Particle Reinforced Composites, Fiber Reinforced Composites. Structural Composites, Constituents of Composites, MMC, PMC and FRP. Ceramic Composites, Geosynthetics, Pre-stressed Hollow Concrete Panel, Carbon Composites Fullerenes, C64, Bucky Ball Structures, Graphene.

Module: III (5 Hrs)

Prefabricated Materials: Types and Applications, Autoclaved Aerated Concrete (AAC), Cellular Lightweight Concrete (CLC).

Module: IV (8 Hrs)

Electrical & Magnetic Materials: Classifications, Properties, Advantages & Applications, Photo Voltaic Material, Dielectric Materials.

Module: V (6 Hrs)

Solar Cell and Super Conductivity, Ferro Electricity, Electro-active Polymers, Piezoelectric Material, Magneto Electric Materials, Electrorheological Fluids.

Module: VI (6 Hrs)

Fiber Optic Sensors, Photoconductivity; Introduction to Nano-materials, CNTs Production Process and Uses, Fibers Production and Uses.

Module: VII (8Hrs)

Smart Material, Shape Memory Alloys, Piezoelectric Ceramics, Biomaterials, Bioactive Glass & Ceramic, Polymer & Composite, UHTC, Soft Materials, Energy Materials.

Text Books:

1. Materials Science and Engineering, W D Callister, 2014, 2nd Edition, Wiley India Private Limited, India.

Reference Books:

1. Material Science and Engineering, V Raghavan, 2013, 5th Edition, PHI publication, India.
2. Material Science and Engineering, S Chawla, 2011, 1st Edition, Dhanpat Rai & co Private Ltd., India.

Session Plan

Topic coverage and Internal Test	No. of Sessions (in hrs.)	Activity (lecture, tutorial, lab practice, field studies/field-trip, Workshop etc.)	Assignment (Project, assignment, field study, seminar, etc.)	Suggested Reading (Book, Video, Online source, etc.)
Module I				

Steel	01	Lecture	field study	<p>nptel.ac.in/courses/113104059/lecture_pdf/Lecture%201.pdf Materials Science and Engineering, W D Callister, 2014, 2nd Edition, Wiley India Private Limited, India.</p> <p>https : //www.youtube.com/watch?v=917JqonyoKA https : //www.youtube.com/watch?v=sc24cSZJQcg https : //www.youtube.com/watch?v=hTw9LVMBLns</p>
Stainless Steel & Types	01	Lecture	field study	<p>https : //en.wikipedia.org/wiki/Stainless_steel Materials Science and Engineering, W D Callister, 2014, 2nd Edition, Wiley India Private Limited, India. http : //nptel.ac.in/courses/113104059/</p>
HSLA Steels, Dual Phase steels	01	Lecture		<p>https : //www.metalsupermarkets.com/what-is-hsla-steel/ https : //en.wikipedia.org/wiki/High-strength_low-alloy_steel https : //mme.iitm.ac.in/vsarma/mm5025/TRI-P-DP-TWP-Notes.pdf https : //www.worldautosteel.org/steel-basics/steel-types/dual-phase-dp-steels/</p>
Tool and Die Steels	01			<p>https : //www.hitachi-metals.co.jp/e/products/auto/ml/pdf/ys_s_tool_steels_d.pdf http : //www.substech.com/dokuwiki/doku.php?id=tool_and_die_steels</p>
Aluminium & Alloys	01	Lecture		<p>https : //materialsdata.nist.gov/.../Aluminum%20and%20Aluminum%20Alloys%20Davis nptel.ac.in/.../16%20-%20Properties%20and%20Applications%20of%20Materials.pdf nptel.ac.in/courses/112104203/12</p>

				Raghavan, V, Material science and Engineering, 2013, 5th Edition, PHI publication, India.
Copper & Alloys	02	Lecture		Material science and Engineering, V Raghavan, 2013, 5th Edition, PHI publication, India. nptel.ac.in/courses/103106109/.../Lecture%20%20Material%20of%20const ruction.pdf.
Magnesium Alloys, Titanium Alloys, Super Alloys	01	Lecture		W D Callister, Materials Science and Engineering, 2014, 2nd Edition, Wiley India Private Limited, India. https : //www.sciencedirect.com/topics/materials-science/aluminum-magnesium-alloys https : //uknowledge.uky.edu/cgi/viewcontent.cgi?article=1036&context=cme_etds nptel.ac.in/courses/113105057/25 http : //megamex.com/superalloys.html
Module II				
Polymer- Thermosetting, Thermoplastics	02	Lecture	field study	1.nptel.ac.in/courses/112107086/13 2.nptel.ac.in/courses/112104229/15 3. W D Callister, Materials Science and Engineering, 2014, 2nd Edition, Wiley India Private Limited, India.
Elastomers- Natural & Synthetic Rubber	01	Lecture		1.WD Callister, Materials Science and Engineering, 2014, 2nd Edition, Wiley India Private Limited, India.
Classification based on matrix and topology, Particle Reinforced Composites, Fiber Reinforced Composites	01	Lecture		1.W D Callister, Materials Science and Engineering, 2014, 2nd Edition, Wiley India Private Limited, India. 2. https : //onlinecourses.nptel.ac.in/noc18_me03 3.nptel.ac.in/downloads/112104168 4.http :

				//nptel.ac.in/courses/101104010
Structural Composites, Constituents of Composites	01	Lecture		1.nptel.ac.in/courses/112108150/pdf/PTs/MTS_12_m.pdf
MMC, PMC and FRP	01	Lecture	field study	http : //nptel.ac.in/courses/112107086/22 http : //nptel.ac.in/courses/113105028/32
Ceramic Composites, Geosynthetics, Pre-stressed Hollow Concrete Panel, Carbon Composites Fullerenes, C64,Bucky ball Structures, Grapheme	01	Lecture	field study	nptel.ac.in/courses/112107085/module6/lecture6/lecture6.pdf nptel.ac.in/courses/112104122/22
Module –III				
Prefabricated Materials : Types and Applications	02	Lecture	field study	https : //www.youtube.com/watch?v=ixNre1dGyp0 2. http : //www.hollowcore.com.au/ 3. https : //en.wikipedia.org/wiki/Fullerene
Autoclaved Aera ted Concrete (AAC), Cellular Lightweight Concrete (CLC).	03	Lecture	field study	https : //www.cogentoa.com/article/10.1080/23312009.2015.1026638.pdf www.understandingnano.com/what-is-buckyball-c60.html https : //en.wikipedia.org/wiki/Autoclaved_aerated_concrete textofvideo.nptel.ac.in/105102012/lec41.pdf nptel.ac.in/courses/105102088/27 https : //www.youtube.com/watch?v=uwbFxUXG2cM
Module IV				

Electrical & Magnetic Materials : Classifications, Properties, Advantages & Applications, Dielectric Materials	08	Lecture		1. nptel.ac.in/courses/115104088/42 2. V Raghavan, Material science and Engineering, 2013, 5th Edition, PHI publication, India.
Module V				
Photo Voltaic Material, Semi conductivity, Solar Cell and Super Conductivity	03	Lecture	field study	nptel.ac.in/courses/113106062/Lec19.pdf 2.nptel.ac.in/courses/113105025/40 3.nptel.ac.in/courses/113104012/34
Ferro electricity, Electro-active polymers	01	Lecture		https : //en.wikipedia.org/wiki/Electroactive_polymers https : //www.azom.com/article.aspx?ArticleID=13516
Piezoelectric Material , Magneto Electric Materials, Electrorheological Fluids	02	Lecture		1.nptel.ac.in/courses/113104005/69 2.nptel.ac.in/courses/112107088/module1/lecture28/lecture28.pdf
Module –VI				
Fiber optic Sensors, Photoconductivity	02	Lecture	field study	nptel.ac.in/courses/112104158/lecture39.pdf https : //onlinecourses.nptel.ac.in/noc18_ph06
Introduction to Nano-Materials, CNTs Production Process and Uses	02	Lecture	field study	http : //www.nptel.ac.in/courses/103103033/ 38 2.nptel.ac.in/courses/118104008/ 3.nptel.ac.in/courses/103103026/42 4. https : //www.cheaptubes.com/carbon-nanotubes-history-and-production-methods-2/ https : //www.youtube.com/watch?v=CuqS8GSpC-4

Fiber Production and Uses.	02	Lecture	field study	https : //www.youtube.com/watch?v=Ivveb58PCo
Module –VII				
Smart Material, Shape Memory Alloys	02	Lecture		nptel.ac.in/courses/112104173/Mod_1_smart_mat_lec_5.pdf 2. W D Callister, Materials Science and Engineering, 2014, 2nd Edition, Wiley India Private Limited, India.
Piezoelectric Ceramics	02	Lecture		1.https : //www.youtube.com/watch?v=qXLStQQxHzU
Biomaterials, Bioactive glass & Ceramic, Polymer & Composite	02	Lecture		1.https : //www.youtube.com/watch?v=XqFS1G6WKO0 2.https : //www.youtube.com/watch?v=yZKdFVAJcrE 3.https : //www.youtube.com/watch?v=s5mDURF8YuQ
UHTC	01	Lecture		1.https : //www.youtube.com/watch?v=A-pd3ia8Y4g 2.https : //www.youtube.com/watch?v=XIikWlh1nYQ 3.ceramics.org/wp-content/uploads/2011/08/applications-uhtc-johnson.pdf 4.https : //en.wikipedia.org/wiki/Ultra-high-temperature_ceramics
Soft Materials, Energy Materials	01	Lecture		https : //www.youtube.com/watch?v=HdwFkEV8dek https : //www.youtube.com/watch?v=Od4g5kcWsu0 https : //www.youtube.com/watch?v=IipCijIBHeQ https : //www.youtube.com/watch?v=f5RwX_plgw
Total				48 Hrs

Thermodynamics

Course Title	Code	Type of Course	T-P-PJ	Prerequisite
Thermodynamics	ENFC0103	Theory	3-0-0	Nil

Objective

- To know the Laws of Thermodynamics and Conditions for Energy Transformation.
- To get Familiar with Different Thermodynamic Properties of Pure Substances.

Course Outcome

- Students will be able to prepare Energy Balance Sheet.
- Students will be able to determine Efficiency of Various Thermal Devices.

Evaluation Systems

	Component	% of Marks	Method of Assessment
Internal Examination	Internal Theory	30	Written examination
	Assignment	5	Report or Presentation + Learning Record
	Attendance	5	Based on class attended
External Examination	External Theory	60	Written examination
Total		100	

Course outline

Module: I (6 Hours)

Introduction : Difference between Statistical Thermodynamics and Classical Thermodynamics, Concept of Continuum, Traceability of Thermodynamic Change, Concept of Reversibility, Concept of Equilibrium, Design of Thermometers with Three Different Liquids Having Different Coefficient of Thermal Expansion, To Explain Zeroth Law of Thermodynamics. Ideal Gas Temperature Scale and Calibration of Thermometers.

Module: II (9 Hours)

Work Transfer Calculations: Various Modes of Displacement Work. Calculation of Work for Various Processes & Cycles.

Application of First Law of Thermodynamics : Closed Systems & Open Systems. Concept of Internal Energy, Enthalpy & Its Calculation Using Specific Heats.

Module: III (3 Hours)

Energy Balance analysis: Sheet for Opens Systems and Closed Systems : Nozzle, Diffuser, Compressor, Turbine, Heat Exchanger, Throttling Devices, Boilers and Condensers.

Module: IV (10 Hours)

Second Law of Thermodynamics: Working of Refrigerator and Heat Pump. Kelvin Planck and Clausius Statement of Second Law, Corollaries, Clausius Inequality.

Entropy : Definition, Principle of Increase of Entropy. Change of Entropy of Perfect Gas in Various Processes.

Module: V (5 Hours)

Properties of Pure Substance :P-V, P-T, T-S, H-S Diagram for Steam, Triple Point of Water. Different Types of Steam.

Introduction to Steam Tables : Specific Volume, Pressure, Temperature, Enthalpy and Entropy.

Module: VI (6 Hours)

IC Engines :Working Of IC Engines. Classification of IC Engines : 2 Strokes & 4 Strokes Engine, Petrol & Diesel Engines. Engine Nomenclature.

Module: VII (6 Hours)

Gas Power Cycles : Carnot Cycle, Air Standard Cycles-Otto, Diesel, Dual Combustion.

Introduction to Gas Turbine Cycles : Open & Closed Cycle.

Text Books:

1. A Text Book of Engineering Thermodynamics: R K Rajput,4th Edition. Laxmi Publications
2. Thermodynamics an Engineering Approach, Y.A Cengel, M. A Boles, Tata Mcgraw Hill Companies

Reference Books:

1. Fundamentals of Thermodynamics, C. Borgnakke, R. E. Sonntag, Wiley Publication.

Session Plan

Topic coverage and Internal Test	No. of Sessions (in hrs.)	Activity (lecture, tutorial, lab practice, field studies/field-trip, Workshop etc.)	Assignment (project, assignment, field study, seminar, etc.)	Suggested Reading (Book, Video, Online source, etc.)
Module I (6 Hrs)				

Difference between statistical thermodynamics and classical thermodynamics.	1	CRT	Assignment-I	A text book of Engineering Thermodynamics : R K Rajput,4 th edition. Laxmi publications. Thermodynamics Engineering. Approach, Y.A Cengel, M. A Boles, Tata McGraw Hill Companies.
Concept of continuum. Traceability of thermodynamic change : Concept of reversibility. Concept of equilibrium.	2	CRT	Assignment-I	A text book of Engineering Thermodynamics : R K Rajput,4 th edition. Laxmi publications. Thermodynamics An Engineering. Approach, Y.A Cengel, M. A Boles, Tata McGraw Hill Companies
Design of thermometers with 3 different liquids having different coefficient of thermal expansion to explain zeroth law of thermodynamics.	2	CRT & Video presentation	Assignment-I	A text book of Engineering Thermodynamics : R K Rajput,4 th edition. Laxmi publications Thermodynamics An Engineering. Approach, Y.A Cengel, M. A Boles, Tata McGraw Hill Companies <u>https : //www.youtube.com/watch?v=1nECy2s_qEo</u>
Ideal gas temperature scale and calibration of thermometers.	1	CRT	Assignment-I	A text book of Engineering Thermodynamics : R K Rajput,4 th edition. Laxmi publications. Thermodynamics An Engineering. Approach, Y.A Cengel, M. A Boles, Tata McGraw Hill Companies.
Module II (9 Hrs)				
Work Transfer Calculations : Various modes of displacement work.	5	CRT	Assignment-I	A text book of Engineering Thermodynamics : R K Rajput,4 th edition. Laxmi publications.

Calculation of work for various processes & cycles.				Thermodynamics An Engineering. Approach, Y.A Cengel, M. A Boles, Tata McGraw Hill Companies.
Application of first law of thermodynamics to closed systems & open systems. Concept of internal energy, enthalpy & its calculation using specific heats	4	CRT	Assignment-I	A text book of Engineering Thermodynamics : R K Rajput, 4 th edition. Laxmi publications. Thermodynamics An Engineering. Approach, Y.A Cengel, M. A Boles, Tata McGraw Hill Companies.
Module III (3 Hrs)				
Energy balance sheet for opens systems and closed systems : Nozzle, Diffuser, compressor, turbine, heat exchanger, throttling devices, boilers and condensers.	3	CRT & Video presentation	Assignment-I	A text book of Engineering Thermodynamics : R K Rajput, 4 th edition. Laxmi publications. Thermodynamics An Engineering. Approach, Y.A Cengel, M. A Boles, Tata McGraw Hill Companies. <u>https : //www.youtube.com/watch? v=Nv2G8Dpruxc</u> <u>https : //www.youtube.com/watch? v=-CRjNmIOdZo</u>
Module IV (10 Hrs)				
Working of refrigerator and heat pump.	3	CRT	Assignment-II	A text book of Engineering Thermodynamics : R K Rajput, 4 th edition. Laxmi publications. Thermodynamics An Engineering. Approach, Y.A Cengel, M. A Boles, Tata McGraw Hill Companies.
Kelvin Planck and Clausius statement	2	CRT	Assignment-	A text book of Engineering Thermodynamics : R K

of second law, corollaries.			II	Rajput, 4 th edition. Laxmi publications. Thermodynamics An Engineering. Approach, Y.A Cengel, M. A Boles, Tata McGraw Hill Companies.
Clausius inequality.	1	CRT & Video Presentation	Assignment-II	A text book of Engineering Thermodynamics : R K Rajput, 4 th edition. Laxmi publications. Thermodynamics Engineering. Approach, Y.A Cengel, M. A Boles, Tata McGraw Hill Companies. <u>https : //www.youtube.com/watch?v=wd0Rghxmf3M</u> <u>https : //www.youtube.com/watch?v=MbyfTw5YFZs</u>
Entropy : Definition, principle of increase of entropy.	2	CRT	Assignment-II	A text book of Engineering Thermodynamics : R K Rajput, 4 th edition. Laxmi publications. Thermodynamics Engineering. Approach, Y.A Cengel, M. A Boles, Tata McGraw Hill Companies.
Change of entropy of perfect gas in various processes	2	CRT	Assignment-II	A text book of Engineering Thermodynamics : R K Rajput, 4 th edition. Laxmi publications. Thermodynamics An Engineering. Approach, Y.A Cengel, M. A Boles, Tata McGraw Hill Companies.
Module V (5 Hrs)				
Properties of pure substance : p-v, p-T, T-S, h-S	3	CRT & Video presentation	Assignment-II	A text book of Engineering Thermodynamics : R K Rajput, 4 th edition. Laxmi

<p>diagram for steam, Triple point of water. Different types of steam.</p>				<p>publications. Thermodynamics Engineering. Approach, Y.A Cengel, M. A Boles, Tata McGraw Hill Companies. <u>https : //www.youtube.com/watch?v=pP2HuLPkrkY</u> <u>https : //www.youtube.com/watch?v=pJM9Fh9Fp-I</u></p>
<p>Introduction to steam table with respect to specific volume, pressure, temperature, enthalpy and entropy</p>	2	CRT	Assignment-II	<p>A text book of Engineering Thermodynamics : R K Rajput, 4th edition. Laxmi publications. Thermodynamics An Engineering. Approach, Y.A Cengel, M. A Boles, Tata McGraw Hill Companies.</p>
<p>Module VI (6 Hrs)</p>				
<p>IC Engines :Working of IC engines. Classification of IC engines.</p>	2	CRT & Videopresentation	Assignment-III	<p>A text book of Engineering Thermodynamics : R K Rajput, 4th edition. Laxmi publications. Thermodynamics Engineering. Approach, Y.A Cengel, M. A Boles, Tata McGraw Hill Companies. <u>https : //www.youtube.com/watch?v=emSXIjwGfQU</u> <u>https : //www.youtube.com/watch?v=Pu7g3uIG6Zo</u> <u>https : //www.youtube.com/watch?v=fD7GOrF7laY</u> <u>https : //www.youtube.com/watch?</u></p>

				<u>v=rhzgeNAXvfs</u>
2 strokes & 4 strokes engine, Petrol & diesel engines. Engine nomenclature.	4	PRA	Assignment-III	A text book of Engineering Thermodynamics : R K Rajput,4 th edition. Laxmi publications. Thermodynamics Engineering. Approach, Y.A Cengel, M. A Boles, Tata McGraw Hill Companies.
Module VII (6 Hrs)				
Gas Power Cycles : Carnot cycle, Air standard cycles- Otto, Diesel and Dual Combustion cycle.	4	CRT	Assignment-III	A text book of Engineering Thermodynamics : R K Rajput,4 th edition. Laxmi publications. Thermodynamics An Engineering. Approach, Y.A Cengel, M. A Boles, Tata McGraw Hill Companies.
Introduction to Gas Turbine Cycles : Open & Closed Cycle	2	Video	Assignment-III	<u>https :</u> <u>//www.youtube.com/watch?v=m4kvSLxAaI</u> <u>https :</u> <u>//www.youtube.com/watch?v=eTJkz99Jjx8</u> <u>https :</u> <u>//www.youtube.com/watch?v=zcWkEKNvqCA</u>
Total (hrs)				45

Introduction to Communication Engineering

Course Title	Code	Type of Course	T-P-PJ	Prerequisite
Introduction to Communication Engineering	ENFC0104	Theory	3-0-0	Nil

Objective

- The objective of this subject is to impart the fundamentals of modern digital & analog communication systems.

Course Outcome

- Upon successful completion of this subject students should be able to : understand important concepts in communication engineering and an insight into modern communication standards.

Evaluation Systems

	Component	% of Marks	Method of Assessment
Internal Examination	Internal Theory	30	Written examination
	Assignment	5	Report or Presentation + Learning Record
	Attendance	5	Based on class attended
External Examination	External Theory	60	Written examination
Total		100	

Course Outline

Module: I (06 Hours)

Land Line Communication :

Evolution of telecommunications, simple telephone communication, basics of switching system, switching system parameters, signaling tones, electronic space division switching centralized and distributed SPC

Module : II (06 Hours)

Optical Communication:

Fiber-Optic Cable, Optical Principles, Optical Communication System, Fiber Optical Cables.

Module: III (07 Hours)

Elements of a Television System : Picture Transmission, Sound Transmission, Picture Reception, Sound Reception, Synchronization, Receiver Controls, Color Television.

Signal Transmission and Channel Bandwidth : Amplitude Modulation, Channel Bandwidth, Vestigial Sideband, Transmission, Transmission Efficiency Complete Channel Bandwidth, Reception of Vestigial Sideband Signals, Frequency Modulation, FM Channel Bandwidth, Channel Bandwidth for Colour Transmission, Allocation of Frequency Bands for Television Signal Transmission, Television Standards.

Module: IV (06 Hours)

Mobile Communication: Overview of Cellular Systems and Evolution of 2G/3G/4G/5G, Cellular Concepts – Cellular Systems, Hexagonal Cell Geometry, Frequency reuse, Co-channel and Adjacent channel Interference, Cell Splitting, Handoff, Blocking, GSM& CDMA Standards. WLAN, Bluetooth, Infrared Wireless, Wi-fi, Wi-Max.

Module: V (06 Hours)

Radar Communication : RADAR, Applications, Types, Frequency Bands, Basic Radar, RADAR range equation, Pulsed RADAR, CW RADAR, MTI RADAR, Tracking RADAR, Global Positioning System.

Module: VI (06 Hours)

Satellite Communication: Basic Satellite Systems, Indian Scenario, Satellite Orbits, Satellite Communication Systems, satellite link design,

Module: VII (08 Hours)

Internet Communication:

Data Communication Architecture, Link To Link Layers, End-To-End Layers, Switching Techniques for Data Transmission, LAN, MAN, ISDN, BISDN.

Text Books:

1. Telecommunication Switching Systems and Networks, Thiagarajan Vishwanathan PHI Publisher .
2. Fiber-Optic Communication Systems, 3ed Paperback – 2007 by Govind P. Agrawal.
3. Monochrome and colour television by R.R.Gulati
4. Satellite Communication by T. Pratt, C. Bostian and J. Allnutt. 2nd Edition, Joihn Wiley Co.
5. Radar engineering by G. S. N. Raju

Session Plan

Topic Coverage and Internal Test	No. of Sessions (in hrs.)	Activity (lecture, tutorial, lab practice, field studies/field-trip, Workshop etc.)	Assignment (Project, assignment, field study, seminar, etc.)	Suggested Reading (Book, Video, Online source, etc.)
Module-I [06 hrs. Lecture]				
Evolution of telecommunications, simple telephone communication,	1	Lecture		Text Book-1
Basics of switching system,	1	Lecture		Text Book-1
switching system parameters,	1	Lecture		Text Book-1
signaling tones,	1	Lecture		Text Book-1
electronic space division switching	1	Lecture		Text Book-1
centralized and distributed SPC	1	Lecture		Text Book-1
Module-II [06 hrs. Lecture]				
Fiber-Optic Cable	1	Lecture		Text Book-2
Optical Principles	1	Lecture		Text Book-2
Optical Communication System	2	Lecture		Text Book-2
Fiber Optical Cables.	2	Lecture		Text Book-2
Module-III [07 hrs. Lecture]				
Elements of a Television System : Picture Transmission, Sound Transmission, Picture Reception	1	Lecture		Text Book-3
Sound Reception, Synchronization, Receiver Controls , Colour Television.	1	Lecture		Text Book-3

Signal Transmission and Channel Bandwidth : Amplitude Modulation , Channel Bandwidth	1	Lecture		Text Book-3
Vestigial Sideband ,Transmission , Transmission Efficiency	1	Lecture		Text Book-3
Complete Channel Bandwidth , Reception of Vestigial Sideband Signals , Frequency Modulation	1	Lecture		Text Book-3
FM Channel Bandwidth, Channel Bandwidth for Colour Transmission	1	Lecture		Text Book-3
Allocation of Frequency Bands for Television Signal Transmission, Television Standards.	1	Lecture		Text Book-3
Module-IV [06 hrs. Lecture]				
Overview of Cellular Systems and Evolution of 2G/3G/4G/5G	1	Lecture		Text Book-4
Cellular Concepts – Cellular Systems, Hexagonal Cell Geometry	1	Lecture		Text Book-4
Frequency reuse, Co-channel and Adjacent channel Interference	1	Lecture		Text Book-4
Cell Splitting, Handoff, Blocking, GSM & CDMA	1	Lecture		Text Book-4
Standards. WLAN, Bluetooth	1	Lecture		Text Book-4
Infrared Wireless, Wi-fi, Wi-Max	1	Lecture		Text Book-4
Module-V [06 hrs. Lecture]				
RADAR, Applications, Types, Frequency Bands	1	Lecture		Text Book-5
Basic Radar , RADAR range equation,	1	Lecture		Text Book-5
Pulsed RADAR,	1	Lecture		Text Book-5
CW RADAR,	1	Lecture		Text Book-5
MTI RADAR, Tracking RADAR	1	Lecture		Text Book-5
Global Positioning System.	1	Lecture		Text Book-5
Module-VI [06 hrs. Lecture]				

Basic Satellite Systems	1	Lecture		Text Book-4
Indian Scenario	1	Lecture		Text Book-4
Satellite Orbits	1	Lecture		Text Book-4
Satellite Communication Systems	2	Lecture		Text Book-4
Satellite link design	1	Lecture		Text Book-4
Module-VII [08hrs. Lecture]				
Data Communication Architecture	1	Lecture		Text Book-1
Link To Link Layers	1	Lecture		Text Book-1
End-To-End Layers	1	Lecture		Text Book-1
Switching Techniques for Data Transmission	2	Lecture		Text Book-1
LAN, MAN	1	Lecture		Text Book-1
ISDN	1	Lecture		Text Book-1
BISDN.	1	Lecture		Text Book-1
Total (hrs.)				45 hr.

Introduction to Aerospace Engineering

Course Title	Code	Type of course	T-P-PJ	Prerequisite
Introduction to Aerospace Engineering	ENFC0105	Theory	3-0-0	Nil

Objective

- To familiarize with the Basic Concepts of Flying, Aircraft Structures, Systems, Instruments and Power Plants used in Airplanes.

Course Outcome

- To Identify the Component of Flight and Suitable Materials for Aircraft Structure.
- To Perform Basic Calculation on Mechanics using Newton Law for Lift, Drag and Moment.

Evaluation Systems

	Component	% of Marks	Method of Assessment
Internal Examination	Internal Theory	30	Written examination
	Assignment	5	Report or Presentation + Learning Record
	Attendance	5	Based on class attended
External Examination	External Theory	60	Written examination
Total		100	

Course Outline

Module: I (08 Hrs)

History of Flight:

Early flying vehicles by Wright brothers, hot air balloons, Classification of flight vehicles, biplanes and monoplanes, developments in aerodynamics airplanes and Helicopters, Components of an airplane and their functions.

Module: II (06 Hrs)

Basics of Aeronautics: Physical properties and structure of the atmosphere, temperature, pressure and altitude relationships.

Module: III (08 Hrs)

Newton's law of motions applied to aeronautics - evolution of lift, drag and moment. aerofoils, mach number, subsonic, transonic, supersonic, hypersonic flows.

Module: IV (06 Hrs)

Airplane Structures and Materials :General types of construction, monocoque and semi-monocoque constructions, typical wing and fuselage structure.

Module: V (06 Hrs)

Airplane Structures and Materials:Materials used in aircraft metallic and non-metallic materials, use of aluminium alloy, titanium, stainless steel and composite materials.

Module: VI (06 Hrs)

Systems and Instruments:Conventional control, Powered controls, Basic instruments for flying, typical systems for control actuation.

Module: VII (08 Hrs)

Power Plants : Basic ideas about piston, turboprop and jet engines - use of propeller and jets for thrust production - comparative merits, principles of operation of rocket, types of rockets and typical applications, exploration into space.

References

Text Books :

J.D. Anderson, Introduction to Flight, McGraw Hill

A.C. Kermode, Mechanics of Flight, Himalayan Book

Reference Books :

E.H.J. Pallet, Aircraft Instruments & Principles, Pitman & Co

Online Source : NPTEL, You tube

Introduction to Computer Networks

Course Title	Code	Type of course	T-P-PJ	Prerequisite
Introduction to Computer Networks	FCEN0120	Theory	3-0-0	Nil

Objective

- This course introduces the architecture, functions, and components of the Internet and computer networks, the principles and structure of IP addressing and sub netting, the fundamentals of Ethernet, the architecture, components and operations of routers, routing protocols and switches in a network.
- Topics include TCP/IP, Ethernet, IPv4, routers, switches.

Course Outcome

- Upon successful completion of this course students will be able to define layers of the OSI model and identify the protocols, and services associated with each layer, identify the purpose, features, and functions of current common network hardware and the OSI layer with which each is associated
- Explain the operation principles of current common network hardware devices, describe current common protocols in terms of their function, routing, addressing schemes, interoperability, and naming conventions, justify information security issues in computer net works.

Evaluation Systems

	Component	% of Marks	Method of Assessment
Internal Examination	Internal Theory	30	Written examination
	Assignment	5	Report or Presentation + Learning Record
	Attendance	5	Based on class attended
External Examination	External Theory	60	Written examination
Total		100	

Course outline

Module I Computer Networking Fundamentals

(8Hrs.)

Networking fundamentals, Internet, Access Networks, Physical Media, Switching techniques, Layered Architecture, Introduction to the Seven layers of the OSI model, concept of the OSI model, TCP/IP model and comparison with OSI model, the Application Layer, the Presentation Layer, the Session Layer, the Transport Layer, the Network Layer, the Data Link Layer & the Physical layer.

Module II (Part-1) Security Protocols - Application Layer (5 Hrs.)

Introduction to Protocol concepts, Important Protocols, File Transfer Protocol, Socket Secure OCKS), Secure Shell (SSH), Remote Terminal Control Protocol (Telnet), HTTP.

Module III (Part -2) Security Protocols - Application Layer (2) (4 Hrs.)

Transport Layer Security/Secure Sockets Layer (TLS/SSL), Extensible Messaging & Presence Protocol (XMPP), Wireless Application Protocol (WAP) & Internet Relay Chat (IRC), SMTP.

Module IV (Part-1)Transport Layer (4 Hrs.)

Introduction to Transport Layer, TCP/IP, User Datagram Protocol (UDP), Real-time Transport Protocol (RTP)

Module V (Part-2) Transport Layer (4 Hrs)

Datagram Congestion Control Protocol (DCCP), Stream Control Transmission Protocol (SCTP), Resource reservation Protocol (RSVP)&Explicit Congestion Notification (ECN)

Module VI Network Layer (8Hrs.)

Introduction to Network Layer, Internet Protocol Version 4 (IPv4), Internet Protocol Version 6 (IPv6), internet Protocol Security (IPSEC), Internet Control Message Protocol (ICMP) & Internet Group Management Protocol (IGMP)

Module VII: Data Link Layer (8Hrs.)

Introduction to Data Link Layer, Error correction and detection, CRC, the Address Resolution Protocol (ARP), Tunneling Protocol (Tunnels) &the Point to Point Protocol (PPP), HDLC.

E-content: LMS Content

Reference Books/Text Books:

1. Information Systems Security: Security Management, Metrics, Frameworks and Best Practices by Nina Godbole
2. Network Security Bible by Eric Cole.
3. Computer Networking by Kurose, Ross

Online Source:

1. <https://www.lifewire.com/layers-of-the-osi-model-illustrated-818017>
2. https://www.webopedia.com/quick_ref/OSI_Layers.asp
3. https://www.tutorialspoint.com/network_security/network_security_application_layer.htm
4. https://www.tutorialspoint.com/data_communication_computer_network/transport_layer_introduction.htm
5. <https://www.studytonight.com/computer-networks/osi-model-network-layer>
6. https://www.tutorialspoint.com/data_communication_computer_network/data_link_layer_introduction.htm

Session Plan

Topic coverage and Internal Test	No. of Sessions (in hrs.)	Activity (lecture, tutorial, lab practice, field studies/field-trip, Workshop etc.)	Assignment (project, assignment, field study, seminar, etc.)	Suggested Reading (Book, Video, Online source, etc.)
Module-1 Computer Networking Fundamentals (Total = 8hrs)				
Networking fundamentals, Internet,	2	Lecture + PPT	Assignment	Book,Online Sources,LMS
Access Networks, Physical Media	1	Lecture + PPT	Assignment	Book,Online Sources,LMS
Switching techniques, Layered Architecture,	1	Lecture + PPT	Assignment	Book,Online Sources,LMS
Introduction to the Seven layers of the OSI model, concept of the OSI model, TCP/IP model and comparison with OSI model,	2	Lecture + PPT	Assignment	Book,Online Sources,LMS
<ul style="list-style-type: none"> the Application Layer, the Presentation Layer, the Session Layer, 	1	Lecture + PPT	Assignment	Book,Online Sources,LMS
<ul style="list-style-type: none"> the Transport Layer, the Network Layer, the Data Link Layer & the Physical layer. 	1	Lecture + PPT	Assignment	Book,Online Sources,LMS
Module-2 (Part -1) Security Protocols - Application Layer (2) (Total = 5hrs)				
Introduction to Protocol concepts, Important Protocols	2	Lecture + PPT	Assignment	Book,Online Sources,LMS
,File Transfer Protocol, Socket Secure (SOCKS), Secure Shell (SSH), Remote Terminal Control Protocol (Telnet). HTTP	3	Lecture + PPT	Assignment	Book,Online Sources,LMS

Module-3 (Part -2) Security Protocols - Application Layer (2) (Total = 4 hrs)				
Transport Layer Security/Secure Sockets Layer (TLS/SSL),	2	Lecture + PPT	Assignment	Book,Online Sources,LMS
Extensible Messaging & Presence Protocol (XMPP), Wireless Application Protocol (WAP) & Internet Relay Chat (IRC), SMTP	2	Lecture + PPT	Assignment	Book,Online Sources,LMS
Module-4 (Part-1) Transport Layer (Total = 4 hrs)				
Introduction to Transport Layer, TCP/IP, User Datagram Protocol (UDP), Real-time Transport Protocol (RTP)	4	Lecture + PPT	Assignment	Book,Online Sources,LMS
Module-5 (Part-2) Transport Layer (Total = 4 hrs)				
Datagram Congestion Control Protocol (DCCP)	1	Lecture + PPT	Assignment	Book,Online Sources,LMS
Stream Control Transmission Protocol (SCTP),	1	Lecture + PPT	Assignment	Book,Online Sources,LMS
Resource reservation Protocol (RSVP)&Explicit Congestion Notification (ECN)	2	Lecture + PPT	Assignment	Book,Online Sources,LMS
Module-6 Network Layer (Total = 8hrs)				
Introduction to Network Layer, Internet Protocol Version 4 (IPv4), Internet Protocol Version 6 (IPv6),	4	Lecture + PPT	Assignment	Book,Online Sources,LMS
Internet Protocol Security (IPSEC), Internet Control Message Protocol (ICMP) & Internet Group Management Protocol (IGMP)	4	Lecture + PPT	Assignment	Book,Online Sources,LMS

Module-7 Data Link Layer (Total = 8hrs)				
Introduction to Data Link Layer, Error correction and Detection, CRC the Address Resolution Protocol (ARP), the Open Shortest Path First (OSPF), the Neighbor Discovery Protocol (NDP).	5	Lecture + PPT	Assignment	Book,Online Sources,LMS
TheTunneling Protocol (Tunnels) &the Point to Point Protocol (PPP),HDLC	3	Lecture + PPT	Assignment	Book,Online Sources,LMS
<i>Total (hrs)</i>	Total = 41 Hours (Theory)			

Computer Fundamental and Organization

Course Title	Code	Type of course	T-P-PJ	Prerequisite
Computer Fundamental and Organization	FCEN 0118	Theory	3-0-0	Nil

Objective

- To explore the organization of computer system and its working.
- To understand the basics of computer networks.
- To use office packages like MS Office.

Course Outcome

- After completing the course students will able to
- Explain different components of computer system and their functions.
- Know the basics about computer networks.
- Use word processing, spreadsheet, and power point applications.

Evaluation Systems

	Component	% of Marks	Method of Assessment
Internal Examination	Internal Theory	30	Written examination
	Assignment	5	Report or Presentation + Learning Record
	Attendance	5	Based on class attended
External Examination	External Theory	60	Written examination
Total		100	

Course outline

Module: I (7 hrs)

General Features of a Computer: General features of a computer, Generation of computers, Personal computer, workstation, mainframe computer and super computers. Computer applications – data processing, information processing, commercial, office automation, industry and engineering, healthcare, education, graphics and multimedia.

Module: II (6 hrs)

Computer Organization: Computer organization, central processing unit, computer memory – primary memory and secondary memory. Secondary storage devices – Magnetic and optical media. Input and output units. OMR, OCR, MICR, scanner, mouse, modem.

Module: III (5 hrs)

Computer Hardware and Software Computer hardware and software. Machine language and high level language. Application software, computer program, operating system. Computer virus, antivirus and computer security. Elements of MS DOS and Windows OS.

Module IV: (5 hrs)

Computer Arithmetic and Number System :Computer arithmetic, Binary, octal and hexadecimal number systems.

Module V: (6 hrs)

Logic Gates:Algorithm and flowcharts, illustrations, elements of a database and its applications
Basic Gates (**De Morgan's** theorems, duality theorem, NOR, NAND, XOR, XNOR gates), Boolean expressions and logic diagrams, Types of Boolean expressions.

Module: VI: (5 hrs)

MS Office: Word processing and electronic spread sheet. An overview of MSWORD, MSEXCEL and MSPOWER POINT.

Module VII : (5 hrs)

Introduction to Networking: Network of computers. Types of networks, LAN, Intranet and Internet. Internet applications. World Wide Web, E-mail, browsing and searching, search engines, multimedia applications.

Reference

E-content : LMS

Reference Books:

Alexis Leon and Mathews Leon (1999) : Fundamentals of information Technology, Leon

Techworld Pub.

Jain, S K (1999) : Information Technology “O” level made simple, BPB Pub

Jain V K (2000) “O” Level Personal Computer software, BPB Pub.

Rajaraman, V (1999) : Fundamentals of Computers, Prentice Hall India

Hamacher, Computer Organization McGrawhill

Alexis Leon : Computers for everyone. Vikas, UBS

Anil Madaan : Illustrated Computer Encyclopedia. Dreamland Pub

Sinha. Computer Fundamentals BPB Pub.

Online Source : Microsoft academy, Edx

Session Plan

Topic coverage and Internal Test	No. of Sessions (in hrs.)	Activity (lecture, tutorial, lab practice, field studies/field-trip, Workshop etc.)	Assignment (project, assignment, field study, seminar, etc.)	Suggested Reading (Book, Video, Online source, etc.)
Module I Lecture=7 Hrs.				
General features of a computer, Generation of computers, Personal computer, workstation mainframe computer and super computers	3	lecture	assignment	Book, Online Source, SLM
Mainframe computer and super computers	2	lecture	assignment	Book, Online Source, SLM
Computer applications – data processing, information processing, commercial, office automation, industry and engineering, healthcare, education, graphics and multimedia.	2	lecture	assignment	Book, Online Source, SLM
Module II Lecture=6 Hrs.				
Computer organization, central processing unit, computer memory – primary memory and secondary memory.	3	lecture	assignment	Book, Online Source, SLM
Secondary storage devices – Magnetic and optical media. Input and output units. OMR, OCR, MICR, scanner, mouse, modem.	3	lecture	assignment	Book, Online Source, SLM
Module III Lecture=5 Hrs.				

Computer hardware and software. Machine language and high level language.	2	lecture	assignment	Book, Online Source, SLM
Application software, computer program, operating system. Computer virus, antivirus and computer security. Elements of MS DOS and Windows OS.	3	lecture	seminar	Book, Online Source, SLM
Module IV Lecture=5 Hrs.				
Computer arithmetic, Binary, octal and hexadecimal number systems.	5	lecture	assignment	Book, Online Source, SLM
Module V Lecture=6 Hrs.				
Algorithm and flowcharts, illustrations, elements of a database and its applications.	3	lecture	assignment	Book, Online Source, SLM
Basic Gates (De Morgan's theorems, duality theorem, NOR, NAND, XOR, XNOR gates), Boolean expressions and logic diagrams, Types of Boolean expressions.	3	lecture	assignment	Book, Online Source, SLM
Module VI Lecture=5 Hrs.				
Word processing and electronic spread sheet. An overview of MS WORD, MS EXCEL and MS POWER POINT	5	lecture	assignment	Book, Online Source, SLM
Module VII Lecture=5 Hrs.				
Network of computers. Types of networks, LAN, Intranet and Internet.	2	lecture	assignment	Book, Online Source, SLM

Internet applications. World Wide Web, E-mail, browsing and searching, search engines, multimedia applications.	3	lecture	Assignment	Book, Online Source, SLM
Total (hrs)	39			

Operating System Building Blocks

Course Title	Code	Type of course	T-P-PJ	Prerequisite
Operating System Building Blocks	FCEN 0119	Theory	3-0-0	Nil

Objective

- The operating system is the most important program that runs on a computer. Every general-purpose computer must have an operating system to run other programs.
- Operating systems perform basic tasks, such as recognizing input from the keyboard, sending output to the display screen, keeping track of files and directories on the disk, and controlling peripheral devices such as disk drives and printers.
- This course covers the concept of operating system and its applications.

Course Outcome

- After learning the fundamental concepts in Operating system including how OS has evolved over the years and different components of OS, students will continue to more significant functions of OS like Process management, storage and memory management etc.
- This will provide the necessary information for students to extract maximum benefits out of the OS while developing programs, working with applications etc.

Evaluation Systems

	Component	% of Marks	Method of Assessment
Internal Examination	Internal Theory	30	Written examination
	Assignment	5	Report or Presentation + Learning Record
	Attendance	5	Based on class attended
External Examination	External Theory	60	Written examination
Total		100	

Course outline

Module I: (5 Hrs.)

Introduction to Operating System: Objectives and Functions of OS, Evolution of OS, OS Structures, OS Components, OS Services, System calls, System programs, Virtual Machines.

Module II: (8 Hrs.)**Process Management – Processes and Threads**

Processes: Process concept, Process scheduling, Co-operating processes, Operations on processes, Inter process communication, Communication in client-server systems. Threads : Introduction to Threads, Single and Multi-threaded processes and its benefits, User and Kernel threads, Multithreading models, threading issues. CPU Scheduling : Basic concepts, Scheduling criteria, Scheduling Algorithms, Multiple Processor Scheduling, Real-time Scheduling, Algorithm Evaluation, Process Scheduling Models.

Module III: (6 Hrs.)

Process Management – Synchronization : Process Synchronization : Mutual Exclusion, Critical – section problem, Synchronization hardware, Semaphores, Classic problems of synchronization, Critical Regions, Monitors, OSS Synchronization, Atomic Transactions.

Module IV: (4 Hrs)

Deadlock Handling Deadlocks: System Model, Deadlock characterization, Methods for handling Deadlocks, Deadlock prevention, Deadlock Avoidance, Deadlock, Detection, Recovery from Deadlock.

Module V: (8 Hrs.)

Memory Management: Memory Management: Logical and physical Address Space, Swapping, Contiguous Memory Allocation, Paging, Segmentation with Paging. Virtual Management : Demand paging, Process creation, Page Replacement Algorithms, Allocation of Frames, Thrashing, Operating System Examples, Page size and other considerations, Demand segmentation.

Module VI: (4 Hrs.)

Device and File Management File-System Interface : File concept, Access Methods, Directory structure, File- system Mounting, File sharing, Protection and consistency semantics. File-System Implementation: File-System structure, File-System Implementations, Directory Implementation, Allocation Methods, Free-space Management, Efficiency and Performance, Recovery. Disk Management Disk Structure, Disk Scheduling, Disk Management, Swap-Space Management, Disk Attachment, stable-storage Implementation.

Module VII : (4 Hrs.)

Protection and Security Protection : Goals of Protection, Domain of Protection, Access Matrix, Implementation of Access Matrix, Revocation of Access Rights, Capability- Based Systems, Language – Based Protection. Security : Security Problem, User Authentication, One – Time Password, Program Threats, System Threats, Cryptography, Computer – Security Classifications.

E-content: LMS Content

Text Books:

1. Operating System by Silberschatz / Galvin / Gagne, 6th Edition, WSE (WILEY Publication)
2. Operating System by Abraham Silberschatz and peter Baer Galvin, 8th Edition, Pearson Education 1989 (Chapter 1,3.1,3.2,3.3,3.4,3.6,4,5,6 (Except 6.8,6.9), 7, 8,9,10,11,13, (Except 13.6) 19 (Except 19.6),20(Except 20.8, 20.9), 22,23).

Reference Books:

1. Operating System Concepts and design by Milan Milonkovic, II Edition, McGraw Hill 1992.
2. Operation System Concepts by Tanenbaum, 2nd Edition, Pearson Education.
3. Operating System by William Stallings, 4th Edition, Pearson Education.
4. Operating System by H.M. Deitel , 2nd Edition Pearson Education.
5. Operating Systems by Nutt, 3/e Pearson Education 2004.

Online Source:

[http : //www.sci.brooklyn.cuny.edu/~jniu/teaching/csc33200/files/0915-OperatingSystemsOverview.pdf](http://www.sci.brooklyn.cuny.edu/~jniu/teaching/csc33200/files/0915-OperatingSystemsOverview.pdf)
[http : //codex.cs.yale.edu/avi/os-book/OS8/os8c/slide-dir/PDF-dir/ch1.pdf](http://codex.cs.yale.edu/avi/os-book/OS8/os8c/slide-dir/PDF-dir/ch1.pdf)
[http : //www.ddegjust.ac.in/studymaterial/mca-3/ms-08.pdf](http://www.ddegjust.ac.in/studymaterial/mca-3/ms-08.pdf)
<http://www2.latech.edu/~box/os/ch06a.pdf>
[http : //www.cs.ucsb.edu/~rich/class/cs170/notes/IntroThreads](http://www.cs.ucsb.edu/~rich/class/cs170/notes/IntroThreads)
[http : //codex.cs.yale.edu/avi/os-book/OS8/os8c/slide-dir/PDF-dir/ch5.pdf](http://codex.cs.yale.edu/avi/os-book/OS8/os8c/slide-dir/PDF-dir/ch5.pdf)
[https : //www.kernel.org/doc/gorman/html/understand/understand014.html](https://www.kernel.org/doc/gorman/html/understand/understand014.html)
[https : //www.cs.uic.edu/~jbell/CourseNotes/OperatingSystems/14_Protection.html](https://www.cs.uic.edu/~jbell/CourseNotes/OperatingSystems/14_Protection.html)
[http : //www.slideshare.net/Colin058/network-security-threats-and-solutions-1018888](http://www.slideshare.net/Colin058/network-security-threats-and-solutions-1018888)
[http : //www.openbsd.org/papers/crypt-service.pdf](http://www.openbsd.org/papers/crypt-service.pdf)

Session Plan

Topic coverage and Internal Test	No. of Sessions (in hrs.)	Activity (lecture, tutorial, lab practice, field studies/field-trip, Workshop etc.)	Assignment (project, assignment, field study, seminar, etc.)	Suggested Reading (Book, Video, Online source, etc.)
Module - I (5 Hrs.)				
Introduction to Operating System : Objectives and Functions of OS, Evolution of OS	3	Lecture	Assignment	Book, Online Source

OS Structures, OS Components, OS Services	1	Lecture	Assignment	Book, Online Source
System Calls	1	Lecture	Assignment	Book, Online Source
Module - II (8 Hrs.)				
Process Management – Processes and Threads : Processes : Process concept, Process scheduling, Co-operating processes, Operations on processes	2	Lecture	Assignment	Book, Online Source
Inter process communication, Communication in client-server systems.	2	Lecture	Assignment	Book, Online Source
Threads : Introduction to Threads, Single and Multi-threaded processes and its benefits, User and Kernel threads, Multithreading models, Threading issues.	1	Lecture	Assignment	Book, Online Source
CPU Scheduling : Basic concepts, Scheduling criteria, Scheduling Algorithms, Multiple Processor Scheduling, Real-time Scheduling, Algorithm Evaluation, Process Scheduling Models.	3	Lecture	Assignment	Book, Online Source
Module - III (6 Hrs.)				
Process Management – Synchronization Mutual Exclusion,	3	Lecture	Assignment	Book, Online Source

Critical – section problem, Synchronization hardware, Semaphores				
Classic problems of synchronization, Critical Regions.	3	Lecture	Assignment	Book, Online Source
Module - IV (4 Hrs.)				
Deadlock Handling : System Model, Deadlock characterization, Methods for handling Deadlocks, Deadlock prevention, Deadlock Avoidance.	2	Lecture	Assignment	Book, Online Source
Deadlock Detection, Recovery from Deadlock.	2	Lecture	Assignment	Book, Online Source
Module - V (8 Hrs.)				
Memory Management : Logical and physical Address Space, Swapping.	3	Lecture	Assignment	Book, Online Source
Contiguous Memory Allocation	2	Lecture	Assignment	Book, Online Source
Paging, Segmentation with Paging.	3	Lecture	Assignment	Book, Online Source
Module - VI (4 Hrs.)				
Device and File Management : File-System Interface: File concept, Access Methods, Directory structure, File- system Mounting, File sharing, Protection and consistency semantics.	1	Lecture	Assignment	Book, Online Source
File-System Implementation: File-System structure, File-System	1	Lecture	Assignment	Book, Online Source

Implementations, Directory Implementation, Allocation Methods, Free-space Management, Efficiency and Performance, Recovery.				
Disk Management: Disk Structure, Disk Scheduling, Disk Management, Swap-Space Management, Disk Attachment, stable-storage Implementation.	2	Lecture	Assignment	Book, Online Source
Module-VII (4 Hrs.)				
Protection and Security: Protection: Goals of Protection, Domain of Protection, Access Matrix, Implementation of Access Matrix, Revocation of Access Rights, Capability-Based Systems, Language – Based Protection.	2	Lecture	Assignment	Book, Online Source
Security : Security Problem, User Authentication, One – Time Password, Program Threats, System Threats, Cryptography, Computer – Security Classifications	2	Lecture	Assignment	Book, Online Source
Total (hrs)	39 Hrs.			

Introduction to Biotechnology

Course Title	Code	Type of course	T-P-PJ	Prerequisite
Introduction To Biotechnology	FCEN0115	Theory	3-0-0	Nil

Objective

- To introduce students basic knowledge about biotechnology

Course Outcome

- To impart a sound knowledge on the principles of Biotechnology involving the different application oriented topics required for all engineering branches.

Evaluation Systems

	Component	% of Marks	Method of Assessment
Internal Examination	Internal Theory	30	Written examination
	Assignment	5	Report or Presentation + Learning Record
	Attendance	5	Based on class attended
External Examination	External Theory	60	Written examination
Total		100	

Course outline

Module: I

Biochemistry: Component of the cell, structure and biochemical functions,

Module: II

Biomolecules-Carbohydrates, lipids, proteins, Nucleic acids, Structure and classification of enzymes

Module: III

Cell Biology Eukaryotic, Prokaryotic cells, Cell cycle – Mitosis and Meiosis,

Module: IV

Cell fractionation and flow cytometry.

Module: V

Introduction to nucleic acids: Nucleic acids as genetic material, Structure and physicochemical properties of elements in DNA and RNA, Biological significance of differences in DNA and RNA.

Module: VI

Immunology: Cells of immune system, Development, maturation, activation and differentiation of Tcells and Bcells, Phagocytosis process

Module VII

Biotechnology Applications: Industrial production, Drug discovery and development

Text Books:

1. Lehninger A.L., Nelson D.L. and Cox M.M. Principles of Biochemistry. CBS publishers and distributors.
2. Murray R.K., Granner D.K., Mayes P.A. and Rodwell V.W. Harpers Biochemistry. Appleton and Lange ,Stanford ,Conneticut.

Reference Books:

1. Lodish, Harvey etal., “ Molecular Cell Biology,” 6th Edition. W.H.Freeman, 2008
2. Alberts, Bruce, “Molecular Biology of Cell”, 5th Edition, Garland Science, 2008.
3. Satyanarayana, U. “Biotechnology” Books & Allied (P) Ltd., 2005.
4. Friefelder, David. “Molecular Biology.” Narosa Publications, 199

Session Plan

Topic coverage and Internal Test	No. of Sessions (in hrs.)	Activity (lecture, tutorial, lab practice, field studies/field-trip, Workshop etc.)	Assignment (project, assignment, field study, seminar, etc.)	Suggested Reading (Book, Video, Online source, etc.)
Module I		lecture, tutorial	assignment	Book, Video, Notes
Component of the cell	1			
Cell structure	1			
biochemical functions	1			
Module II				
Carbohydrates	3			
lipids	3			
Proteins	3			

Nucleic Acids	3			
Structure of Enzymes	3			
Module III				
Eukaryotic, Prokaryotic cells	5	lecture, tutorial	assignment	Book, Video, Notes
Cell Cycle	5			
Nucleic acids as genetic material				
Module IV				
Cells of immune system	3	lecture, tutorial	assignment	Book, Video, Notes
activation and differentiation of Tcells and Bcells	3			
Drug discovery and development	2			
Module IV				
Cell fractionation and flow cytometry.	2	lecture, tutorial	assignment	Book, Video, Notes
Module V				
Nucleic acids as genetic material	1	lecture, tutorial	assignment	Book, Video, Notes
Structure and physicochemical properties of elements in DNA and RNA	2			
Biological significance of differences in DNA and RNA.	1			
Module VI				
Cells of immune system, Development, ,	1	lecture, tutorial	assignment	Book, Video, Notes
maturation, activation and differentiation of Tcells and Bcells	2			

Phagocytosis process	1			
Module VII		lecture, tutorial	assignment	Book, Video, Notes
Industrial production	1			
Drug discovery and development	2			
Total (hrs)	45			

Introduction to Biophysics

Course Title	Code	Type of course	T-P-PJ	Prerequisite
Introduction To Biophysics	FCEN0116	Theory	3-0-0	Nil

Objective

- Learn the structures of biological molecules
- To understand the concept of structural analysis
- Learn the techniques for analysis and determination of structure of biomolecules.

Course Outcome

- To introduce the theories and concepts of biophysics of biomolecules which are considered important in biotechnology applications

Evaluation Systems

	Component	% of Marks	Method of Assessment
Internal Examination	Internal Theory	30	Written examination
	Assignment	5	Report or Presentation + Learning Record
	Attendance	5	Based on class attended
External Examination	External Theory	60	Written examination
Total		100	

Course outline

Module: I

Structures of Biological macromolecules: Levels of structures in proteins, nucleic acids and polysaccharides - primary, secondary, tertiary and quaternary structures

Module: II

Conformational analysis of proteins: Polypeptide chain geometries, internal rotation angles, Ramachandran plot, potential energy calculations, forces that determine protein structure – hydrogen bonding

Module: III

Hydrophobic interactions, ionic interactions, disulphide bonds – prediction of protein structure.

Module: IV

Conformational analysis of Nucleic acid: General characteristics of nucleic acid structure – geometric Glycosidic bond – rotational isomers, ribose puckering–backbone rotation angles and steric hindrances – forces stabilizing ordered forms – base pairing and base stacking.

Module V

Techniques for the study of Biological structures, Electron Microscopy, Ultracentrifuge, Viscometry

Module VI

Molecular –sieve chromatography, electrophoresis, NMR and EPR. X-Ray crystallography

Module VII

X-ray fiber diffraction, light scattering, Neutron scattering

Text Books:

Biophysical Chemistry, Cantor and Schimmel, part I and II, W.H. Freeman and co 1997.

Reference Books:

1. Physical Biochemistry : David Friefelder, 5th Ed, PHI
2. Physical Biochemistry : Kensal E van Holde. PHI

Session Plan

Topic coverage and Internal Test	No. of Sessions (in hrs.)	Activity (lecture, tutorial, lab practice, field studies/field-trip, Workshop etc.)	Assignment (project, assignment, field study, seminar, etc.)	Suggested Reading (Book, Video, Online source, etc.)
Module I				
Levels of structures in proteins	2	lecture, tutorial	assignment	Book, Video, Notes
nucleic acids and polysaccharides	2			
primary, secondary, tertiary and quaternary structures	2			
Module II				
Polypeptide chain geometries,	2	lecture, tutorial	assignment	Book, Video, Notes
internal rotation angles, Ramachandran plot,	2			
potential energy calculations	2			

forces that determine protein structure – hydrogen bonding	2			
Module III		lecture, tutorial	assignment	Book, Video, Notes
Hydrophobic interactions,	2			
ionic interactions, disulphide bonds	2			
prediction of protein structure.	2			
Module IV		lecture, tutorial	assignment	Book, Video, Notes
General characteristics of nucleic acid structure – geometric	2			
Glycosidic bond – rotational isomers	2			
ribose puckering– backbone rotation angles and steric hindrances	2			
forces stabilizing ordered forms – base pairing and base stacking.	2			
Module V		lecture, tutorial	assignment	Book, Video, Notes
Techniques for the study of Biological structures	2			
Electron Microscopy, Ultracentrifuge	2			
Viscometry	1			
Module VI		lecture, tutorial	assignment	Book, Video, Notes
Molecular–sieve chromatography	2			
Electrophoresis	2			
NMR and EPR.	2			
X-Ray crystallography	1			
Module VII		lecture, tutorial	assignment	Book, Video,

X-ray fiber diffraction	2			Notes
light scattering	2			
Neutron scattering	1			
Total (hrs)	45			

Biosafety, Bioethics, IPR & Patents

Subject Name	Code	Type of course	T-P-PJ	Prerequisite
Biosafety, Bioethics, IPR & Patents	FCEN0117	Theory	2-0-0	Nil

Objective

- To introduce the biosafety regulations and ethical concepts in biotechnology
- To emphasize on IPR issues and need for knowledge in patents in biotechnology

Course Outcome

- This course creates awareness on the Biosafety, bioethics, Intellectual property rights and patenting of biotechnological processes.

Evaluation Systems

	Component	% of Marks	Method of Assessment
Internal Examination	Internal Theory	30	Written examination
	Assignment	5	Report or Presentation + Learning Record
	Attendance	5	Based on class attended
External Examination	External Theory	60	Written examination
Total		100	

Course outline

Module: I

Bioethics: Bioethics – Necessity of Bioethics, different paradigms of Bioethics – National & International. Ethical issues against the molecular technologies.

Module: II

Biosafety: Biosafety– Introduction to biosafety and health hazards concerning biotechnology.

Module: III

Good Laboratory Practices :Introduction to the concept of containment level and Good Laboratory Practices (GLP) and Good Manufacturing Practices (GMP).

Module IV

Introduction to Patent: Objectives of the patent system - Basic principles and general requirements of patent law biotechnological inventions.

Module V

Patent Laws:Introduction to Indian Patent Law. World Trade Organization and its related intellectual property provisions.

Module VI

Intellectual/Industrial property and its legal protection in research, design and development. Patenting in Biotechnology, economic, ethical and depository considerations.

Module VII

Intellectual Property Rights:Intellectual property rights-TRIP- GATT-International conventions patents and methods of application of patents Legal implications-Biodiversity and farmer rights.

Text Books:

1. Singh K, Intellectual Property rights on Biotechnology, BCIL, New Delhi
2. Regulatory Framework for GMOs in India (2006) Ministry of Environment and Forest, Government of India, New Delhi

Reference Books:

1. Beier, F.K., Crespi, R.S. and Straus, T. Biotechnology and Patent protection-Oxford and IBH Publishing Co. New Delhi.
2. Sasson A, Biotechnologies and Development, UNESCO Publications.

Session Plan

Topic coverage and Internal Test	No. of Sessions (in hrs.)	Activity (lecture, tutorial, lab practice, field studies/field-trip, Workshop etc.)	Assignment (project, assignment, field study, seminar, etc.)	Suggested Reading (Book, Video, Online source, etc.)
Module I		lecture, tutorial	assignment	Book, Video, Notes
Bioethics – Necessity of Bioethics,	1			
different paradigms of Bioethics – National & International	2			
Ethical issues against the molecular technologies	1			
Module II		lecture, tutorial	assignment	Book, Video, Notes
Biosafety– Introduction to biosafety	1			

health hazards concerning biotechnology.	2			
Module III		lecture, tutorial	assignment	Book, Video, Notes
Introduction to the concept of containment level	1			
Good Laboratory Practices (GLP) and Good Manufacturing Practices (GMP).	2			
Module IV		lecture, tutorial	assignment	Book, Video, Notes
Objectives of the patent system	2			
Basic principles and general requirements of patent law biotechnological inventions.	2			
Module V		lecture, tutorial	assignment	Book, Video, Notes
Introduction to Indian Patent Law	2			
World Trade Organization and its related intellectual property provisions	2			
Module VI		lecture, tutorial	assignment	Book, Video, Notes
Intellectual/Industrial property and its legal protection in research, design and development.	2			
Patenting in Biotechnology, economic, ethical and depository considerations	2			
Module VII		lecture, tutorial	assignment	Book, Video, Notes
Intellectual property rights-TRIP	1			
GATT-International conventions patents and methods of application of patents	2			
Legal implications-Biodiversity and farmer rights.	1			
Total (hrs)	30			

Earth System Science

Course Title	Code	Type of course	T-P-PJ	Prerequisite
Earth System Science	FCEN0111	Theory	3- 0 - 0	Nil

Objective:

<ul style="list-style-type: none"> ● To make the students have a clear knowledge on : ● Space Science ● Earth Dynamics ● Geological Oceanography ● Geological bodies and structure ● Hydrogeology ● Glaciology ● Earth's Atmosphere ● Biosphere ● Natural Resources

Course Outcome:

<ul style="list-style-type: none"> ● Students will be able to understand the earth's interior, its composition, various dynamic processes, oceanography, hydrogeology, glaciology, structural geology earth's atmosphere, biosphere and the natural resources. ● A clear understanding of the basics of geology as a prerequisite for mining engineering.

Evaluation System

	Component	% of Marks	Method of Assessment
Internal Examination	Internal Theory	30	Written examination
	Assignment	5	Report or Presentation + Learning Record
	Attendance	5	Based on class attended
External Examination	External Theory	60	Written examination
Total		100	

Course outline:

Module: I

Space Science: Solar System, Age of the Earth, Origin of Solar system. Meteors and Meteorites.

Earth Dynamics: Interior of the Earth, Composition of the Earth, Seismic waves, Seismograph, Plate Tectonics, Basics of Earthquake Engineering, Landslides, Volcanoes.

Module: II

Geological Oceanography: Sea waves, Tides, Ocean currents, Geological work of seas and oceans, Tsunami and its causes, Warning system and mitigation

Hydrogeology: Water table, Aquifer, Groundwater fluctuations and groundwater composition, Hydrologic cycle.

Module: III

Glaciology: Glacier types, Different type of glaciers, Landforms formed by glacier.

Geological bodies and their structures: Rock, mineral, batholiths, dyke, sill, fold, fault, joint, unconformity.

Module: IV

Earth's Atmosphere: Structure and composition of atmosphere, Atmospheric circulation, Geological work of wind, Greenhouse effect and global warming, Carbon dioxide sequestration.

Module: V

Steps to maintain clean and pollution free atmosphere with governing laws, precautionary measures against disasters.

Module: VI

Biosphere: Origin of life, Evolution of life through ages, Geological time scale, biodiversity and its conservation.

Module VII

Natural Resources: Renewable and non-renewable resources, Mineral and fossil fuel resources and their Geological setting, mining of minerals and conservation, effect of mining on surface environment.

Reference Book

1. W Kenneth Hamblin; Eric H Christiansen "Earth's dynamic systems" Publisher: Upper Saddle River, N.J. : Prentice Hall, Pearson Education
2. Jon P Davidson; Walter E Reed; Paul M Davis "Exploring earth: An introduction to physical geology" Upper Saddle River, NJ : Prentice Hall

Text Book:

1. Michael C Jacobson "Earth System Science: from biogeochemical cycles to global changes" London [England] ; San Diego, California : Academic Press

Session Plan:

Topic coverage and Internal Test	No. of Sessions (in hrs.)	Activity (lecture, tutorial, lab practice, field studies/field-trip, Workshop etc.)	Assignment (project, assignment, field study, seminar, etc.)	Suggested Reading (Book, Video, Online source, etc.)
Solar System, Age of the Earth	1	Lecture	assignment	book
Origin of Solar system. Meteors and Meteorites	1	lecture	assignment	book
Interior of the Earth, Composition of the Earth,	1	lecture	assignment	book
Seismic waves, Seismograph, Plate Tectonics,	1	Lecture	assignment	book
Basics of Earthquake Engineering,	1	lecture	assignment	book
Landslides, Volcanoes.	1	lecture	assignment	book
Sea waves, Tides, Ocean currents	2	lecture	assignment	book
Geological work of seas and oceans	1	lecture	assignment	book
Tsunami and its causes, Warning system and mitigation.	1	lecture	assignment	book
Water table, Aquifer,	1	lecture	assignment	book
Groundwater fluctuations and groundwater composition	1	lecture	assignment	book
Hydrologic cycle.	1	lecture	assignment	book
Glacier types, Different type of glaciers,	1	lecture	assignment	book
Landforms formed by glacier.	1	lecture	assignment	book
Rock, mineral	1	lecture	assignment	book
batoliths, dyke, sill,	1	lecture	assignment	book

fold, fault,	1	lecture	assignment	book
Structure and composition of atmosphere,	1	lecture	assignment	book
Atmospheric circulation	1	lecture	assignment	book
Geological work of wind,	1	lecture	assignment	book
Greenhouse effect and global warming	1	lecture	assignment	book
Carbon dioxide sequestration.	1	lecture	assignment	book
Steps to maintain clean and pollution free atmosphere with governing laws,	1	lecture	assignment	book
Precautionary measures against disasters.	1	lecture	assignment	book
Origin of life	1	lecture	assignment	book
Evolution of life through ages,	1	lecture	assignment	book
Geological time scale,	1	lecture	assignment	book
Biodiversity and its conservation.	1	lecture	assignment	book
Renewable and non-renewable resources,	1	lecture	assignment	book
Mineral and fossil fuel resources and their geological setting,	2	lecture	assignment	book
mining of minerals and conservation,	2	lecture	assignment	book
effect of mining on surface environment	1	lecture	assignment	book
Total (hrs)	35			

Introduction to Mining

Course Title	Code	Type of course	T-P-PJ	Prerequisite
Introduction to Mining	FCEN0112	Theory	3-0-0	Nil

Objective:

- Mines
- Types of mining methods
- Mineral deposits
- Types of mineral deposits
- Mine life cycle
- Overview of surface mining
- Overview of underground mining
- Transport system in mines
- Ventilation in mines
- Illumination in mines
- Support system in mines

Course Outcome

- Students will be able to understand about mines, different types of mining methods and mineral deposits.
- A clear understanding of the basics of mining engineering.

Evaluation System

	Component	% of Marks	Method of Assessment
Internal Examination	Internal Theory	30	Written examination
	Assignment	5	Report or Presentation + Learning Record
	Attendance	5	Based on class attended
External Examination	External Theory	60	Written examination
Total		100	

Course outline

Module: I

Mining: Definition and economic importance; Mine – definition, different types and classification;
 Mine life cycle,

Module: II

Mineral deposit-different types and their classification, Modes of entry to a mine- shaft, incline, decline, adit and box-cut.

Module: III

Overview of surface mining: Types of surface mines, unit operations, basic bench geometry,

Module: IV

Applicability&limitations, advantages and disadvantage

Module: V

Overview of underground mining: Different coal mining methods and their applicability & limitations

Module VI

Different metal mining methods and their applicability & limitations;

Module VII

Basic concepts of transportation, ventilation, illumination and support in underground mines.

Text Book:

1. D J Deshmukh “Elements of mining technology” Publisher: Ramdaspath, Nagpur : Vidyasewa Prakashan,

Reference Book.

1. Howard L Hartman; Jan M Mutmansky “Introductory mining engineering” Publisher: New York : John Wiley & Sons, 2002

Session Plan

Topic coverage and Internal Test	No. of Sessions (in hrs.)	Activity (lecture, tutorial, lab practice, field studies/field-trip, Workshop etc.)	Assignment (project, assignment, field study, seminar, etc.)	Suggested Reading (Book, Video, Online source, etc.)
Definition and economic importance of mining	1	lecture	assignment	book
Mine – definition, different types and classification	2	lecture	Assignment, field study	book

Mine life cycle	1	lecture	assignment	book
Mineral deposit – different types and their classification	2	lecture	Assignment, field study	book
Mineral resources of India	2	lecture	assignment	book
Modes of entry to a mine – shaft	1	lecture	Assignment, field study	book
	1	lecture	assignment	book
incline, decline, adit and box-cut.	1	lecture	assignment	book
Overview of surface mining : definition	1	lecture	assignment	book
Types of surface mines,	1	lecture	assignment	book
Unit operation	1	lecture	assignment	book
basic bench geometry	2	lecture	Assignment, field study	book
applicability & limitations	1	lecture	assignment	book
advantages & disadvantage	1	lecture	assignment	book
Overview of underground mining : definition	1	lecture	assignment	book
Different coal mining methods and their applicability & limitations	2	lecture	Assignment, field study	book
Different metal mining methods and their applicability & limitations	2	lecture	assignment	book
Basic concepts of transportation	1	lecture	Assignment, field study	book
ventilation	1	lecture	assignment	book
illumination and support in underground mines	2	lecture	assignment	book
Total	27Hrs.			

Mine Development

Course Title	Code	Type of course	T-P-PJ	Prerequisite
Mine Development	FCEN0113	Theory	3 0 0	Nil

Objective:

<ul style="list-style-type: none"> ● To make the students have knowledge on : ● Opening-up of Deposits ● Vertical and Inclined Shafts ● Shaft Sinking Operations ● Insets ● Mechanized Sinking ● Shaft Boring ● Special Attributes ● Main Haulage Drifts and Tunnels ● High Speed Drifting/Tunneling ● Recent Developments ● Layouts
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Course Outcome:

<ul style="list-style-type: none"> ● Students will be able to understand the choice of mode of entry their applicability, Number and disposition. ● Students will be able to understand vertical and Inclined Shafts ● Students will be able to understand methods and equipment of shaft boring. ● Students will be able to understand main Haulage Drifts and Tunnels. ● Students will be able to understand layouts of pit-top and pit-bottom, coal Handling Plant, Bunkers and Railway Sidings

Evaluation System

	Component	% of Marks	Method of Assessment
Internal Examination	Internal Theory	30	Written examination
	Assignment	5	Report or Presentation + Learning Record
	Attendance	5	Based on class attended
External Examination	External Theory	60	Written examination
Total		100	

Course outline

Module: I

Opening-up of Deposits: Choice of mode of entry- adit, shaft, decline and combined mode, their applicability, number and disposition.

Vertical and Inclined Shafts: Location, shape, size, and organization of shaft sinking, construction of shaft collar, shaft fittings.

Module: II

Shaft Sinking Operations: Ground breaking and muck disposal- tools and equipment, lining; ventilation, lighting and dewatering; sinking in difficult and water-bearing ground.

Module III

Insets: Design, excavation and lining.

Mechanized Sinking: Simultaneous sinking and lining; slip - form method of lining; high speed sinking.

Module IV

Shaft Boring: Methods and equipment.

Special Attributes: Widening and deepening of inclined and vertical shafts; staple shafts, raised shafts.

Module V

Main Haulage Drifts and Tunnels : Purpose, shape, size and location; excavation ground breaking, muck disposal, ventilation and supporting.

Module VI

High Speed Drifting/Tunneling : Application of mechanized methods; road headers and tunnel boring machines.

Module VII

Recent Developments in shaft sinking and drifting/tunnelling. Layouts of pit-top and pit-bottom, Coal Handling Plant, Bunkers and Railway Sidings

Text Book

1. D J Deshmukh "Elements of mining technology" Publisher: Ramdaspath, Nagpur : Vidyasewa Prakashan,
2. R Agor "A text book of surveying and leveling" Author:., Publisher: Delhi : Khanna Publication

Reference Book

1. B C Punmia; Arun Kumar Jain; A K Jain "Surveying. Vol.I" , Author:., Publisher: New Delhi Laxmi Publications

Alak De "Plane surveying" Publisher: S. Chand & Co

Session Plan

Topic coverage and Internal Test	No. of Sessions (in hrs.)	Activity (lecture, tutorial, lab practice, field studies/field-trip, Workshop etc.)	Assignment (project, assignment, field study, seminar, etc.)	Suggested Reading (Book, Video, Online source, etc.)
Choice of mode of entry-adit, shaft, decline and combined mode, their applicability, number and disposition.	3	lecture	Assignment, field study	book
Location, shape, size, and organization of shaft sinking, construction of shaft collar, shaft fittings.	4	lecture	assignment	book
Ground breaking and muck disposal- tools and equipment, lining; ventilation, lighting and dewatering; sinking in difficult and water-bearing ground.	4	lecture	assignment	book
Insets : Design, excavation and lining.	2	lecture	assignment	book
Simultaneous sinking and lining; slip - form method of lining; high speed sinking. Shaft Boring : Methods and equipment.	4	lecture	assignment	book
Main Haulage Drifts and Tunnels : Purpose, shape, size and location; excavation ground breaking, muck disposal, ventilation and supporting	4	lecture	assignment	book
Application of mechanized methods; road headers and tunnel boring machines.	3	lecture	Assignment, field studies	book

Recent Developments in shaft sinking and drifting/tunneling. Layouts of pit-top and pit-bottom, Coal Handling Plant, Bunkers and Railway Sidings	4	lecture	assignment	book
Total Hrs	28			

Mine Surveying - I

Course Title	Code	Type of course	T-P-PJ	Prerequisite
Mine Surveying - I	FCEN0114	Theory	3- 0- 0	Nil

Objective

- To make the students have knowledge on :
- Surveying
- Angular Measurement
- Leveling
- Total Station
- Plane Table Surveying
- Contours

Course Outcome

- Students will be able to understand the classification and principles of surveying
- Students will be able to understand linear measurement.
- Students will be able to understand angular measurement
- Students will be able to understand leveling instruments types, Leveling staves, Underground leveling

Evaluation System

	Component	% of Marks	Method of Assessment
Internal Examination	Internal Theory	30	Written examination
	Assignment	5	Report or Presentation + Learning Record
	Attendance	5	Based on class attended
External Examination	External Theory	60	Written examination
Total		100	

Course outline

Module: I

Surveying: Definition, objective, classification and principles of surveying.

Module: II

Linear Measurement: Instruments for measuring distances; ranging and taping survey lines; Chain surveying – principle, field work, off-sets, booking and plotting, obstacles in taping.

Module: III

Angular Measurement: Bearing of lines; Rectangular coordinate system; Essentials of the micro-optic

Theodolite; Measurement of horizontal and vertical angles; Temporary and permanent adjustments;

Module: IV

Theodolite traversing; Computation of co-ordinates; Adjustment of traverse; Temporary and permanent adjustments.

Module: V

Leveling : Definition & terminology; Leveling instruments types - tilting, auto set and digital levels; Leveling staves; Different types of leveling - differential, profile, crosssectional and reciprocal leveling; Booking and reduction methods; Underground leveling; Temporary and permanent adjustments of levels.

Module: VI

Total Station: Principle of electronic measurement of distance and angles; construction and working with Total Station; Errors; Application and recent developments in Total Station.

Module VII

Plane Table Surveying: Methods Contours: Concepts; Characteristics of contour; Contour Interval; Methods of contouring and uses of contours.

Session Plan

Topic coverage and Internal Test	No. of Sessions (in hrs.)	Activity (lecture, tutorial, lab practice, field studies/field-trip, Workshop etc.)	Assignment (project, assignment, field study, seminar, etc.)	Suggested Reading (Book, Video, Online source, etc.)
Surveying : Definition, objective, classification and principles of surveying.	3	Lecture	Assignment, field studies	book
Linear Measurement: Instruments for measuring distances; ranging and taping survey lines; Chain surveying – principle, field work, off-sets, booking and plotting, obstacles in taping.	4	Lecture	Assignment, field studies	book

Angular Measurement : Bearing of lines; Rectangular coordinate system; Essentials of the micro-optic theodolite; Measurement of horizontal and vertical angles; Temporary and permanent adjustments; Theodolite traversing; Computation of co-ordinates; Adjustment of traverse; Temporary and permanent adjustments.	5	Lecture	Assignment, field studies	book
Leveling : Definition & terminology; Leveling instruments types - tilting, auto set and digital levels; Leveling staves; Different types of leveling - differential, profile, crosssectional and reciprocal leveling; Booking and reduction methods; Underground leveling; Temporary and permanent adjustments of levels.	6	Lecture	Assignment, field studies	book
Total Station : Principle of electronic measurement of distance and angles; construction and working with Total Station; Errors; Application and recent developments in Total Station.	5	Lecture	Assignment, field studies	book
Plane Table Surveying : Methods Contours : Concepts; Characteristics of contour; Contour Interval; Methods of Contouring and uses of contours.	4	Lecture	Assignment, field studies	book
Total Hrs	27			

Workshop Practice

Course Title	Code	Type of course	T-P-PJ	Prerequisite
Workshop Practice	ENFC0201	Practice	0-2-0	Nil

Objective

- To provide the students hands-on-experience on manufacturing processes like fitting, carpentry, plumbing, casting, turning, joining and machining.

Course Outcome

- Students will be able to choose manufacturing technique for a given product and can perform simple operations.

Evaluation Systems

Internal Examination	Component	% of Marks	Method of Assessment
	Internal Practice	50 (40+10)	Lab work + Learning Record
External Examination	External Practice	50	Lab work
Total		100	

Course Outline

Experiment 1 : Workshop Safety Practice, Use of Personal Protective Equipment.

Fitting:

Experiment 2: Marking & Sizing of a 5mm thick Rectangular Plate with given dimensions using Scriber, Caliper, Steel Rule, Hack Saw & Holding Vice.

Experiment 3 : Preparing an Open V Fitting Joint.

Plumbing:

Experiment 4 : Use of Pipe Vice, Wrench, Tap and Die to make External Threads in ½”PVC Pipe for Basic Pipe Fittings and to do a Leak Test.

Experiment 5 : Fabrication of a Rectangular Loop using basic Pipe Fittings.

Experiment 6 : Fitting of Flow Measurement Water Meter.

Casting:

Experiment 7 : Sand Mold Preparation with Pattern for Casting Aluminum .

Experiment 8 : Casting of Aluminum Spur Gear.

Welding:

Experiment 9: Safety to Connect a Welding Transformer, Tools and SMAW Arcing.

Experiment 10: Oxy Acetylene 3 Types of Flames & Torch Brazing.

Experiment 11: Preparation of a Study Stool of Square Section. (4 student in a group)

Turning:

Experiment 12: Aligning a 20mm Cylindrical Job in Conventional Lathe, Use of Dial Gauge.

Experiment 13: Facing and Plain Turning of 20mm M.S Stock.

Electrical & Electronic:

Experiment 14: Domestic & Staircase Wiring Circuit Practice.

Experiment 15: PCB: Designing and Making of Simple Circuits.

Experiment 16: Measurement Power Consumption by Incandescent, CFL and LED Lamps.

Experiment 17: Use of Transducer and Sensors, Strain Gauge, Photovoltaic Cell.

Reference**Text Books:**

1. Elements of Workshop Technology, S.K. HazraChaudhary, A.K. HazraChaudhary, N. Roy, Vol. 1 & 2, 2007, 14th Edition, Media Promoters and Publishers Private Limited, India.
2. Workshop Technology, Volume 1 & 2, Chapman, W A J, Arnold, E, 2005, 4th Edition, CBS Publishers, India.

Reference Books:

1. Electrical Wiring & Estimating, S.L. Uppal, 2003, 5th Edition, Khanna Publishers.

.Session Plan

Topic coverage and Internal Test	No. of Sessions (in hrs.)	Activity (lecture, tutorial, lab practice, field studies/field-trip, Workshop etc.)	Assignment (project, assignment, field study, seminar, etc.)	Suggested Reading (Book, Video, Online source, etc.)
Demonstration of Various Safety Practice, Measuring Tools and Equipments used in Workshop.	3	Job Working in groups	Group Assignment and Evaluation.	HazraChaudhary, S K, HazraChaudhary and Chapman, W A J, Arnold, E, Workshop Technology

Preparing an Open V Fitting Joint	3	Job Working in groups	Group Assignment and Evaluation.	HazraChaudhary, Chapman, W A J, Arnold, E, Workshop Technology S K, HazraChaudhary
Use of Pipe Vice, Wrench, Tap and Die to make external threads in ½”PVC pipe for basic pipe fittings and to do a leak test	3	Job Working in groups	Group Assignment and Evaluation	HazraChaudhary, S K, HazraChaudhary and Chapman, W A J, Arnold, E, Workshop Technology
Fabrication of a Rectangular Loop using Basic Pipe Fittings	3	Job Working in groups	Group Assignment and Evaluation.	HazraChaudhary, S K, HazraChaudhary
Fitting of Flow Measurement Water Meter	3	Job Working in groups	Group Assignment and Evaluation.	HazraChaudhary, S K, HazraChaudhary
Sand Mold Preparation with Pattern for Casting Aluminum	3	Job Working in groups	Group Assignment and Evaluation.	HazraChaudhary, S K, HazraChaudhary
Casting of Aluminum Spur Gear	3	Job Working in groups	Group Assignment and Evaluation.	HazraChaudhary, S K, HazraChaudhary
Safety to Connect a Welding Transfer, Tools and SMAW Arcing	3	Job Working in groups	Group Assignment and Evaluation.	HazraChaudhary, S K, HazraChaudhary
Oxy Acetylene 3 Types of Flames & Torch Brazing	3	Job Working in groups	Group Assignment and Evaluation.	HazraChaudhary, S K, HazraChaudhary
Preparation of a Study Stool of Square Section	3	Job Working in groups	Group Assignment and Evaluation.	HazraChaudhary, S K, HazraChaudhary

Aligning a 20mm Cylindrical Job in Conventional Lathe, use of Dial Gauge	3	Job Working in groups	Group Assignment and Evaluation.	HazraChaudhary, S K, HazraChaudhary
Facing and Plain Turning of 20mm M.S Stock.	3	Job Working in groups	Group Assignment and Evaluation.	HazraChaudhary, S K, HazraChaudhary
Domestic & Staircase Wiring Circuit Practice	3	Job Working in groups	Group Assignment and Evaluation.	HazraChaudhary, S K, HazraChaudhary
PCB : Designing and Making of Simple Circuits	3	Job Working in groups	Group Assignment and Evaluation.	HazraChaudhary, S K, HazraChaudhary
Measurement Power Consumption by Incandescent, CFL and LED lamps	3	Job Working in groups	Group Assignment and Evaluation.	HazraChaudhary, S K, HazraChaudhary and Chapman, W A J, Arnold, E, Workshop Technology
Use of Transducer and Sensors, Strain Gauge, Photovoltaic Cell	3	Job Working in groups	Group Assignment and Evaluation.	HazraChaudhary, S K, HazraChaudhary
Total (hrs)	48			

Geometric Modeling Lab

Course Title	Code	Type of course	T-P-PJ	Prerequisite
Geometric Modeling Lab	ENFC0202	Practice	0-2-0	Nil

Objective

- To impart knowledge to students on conceptual design, 3D modeling, surface modeling and drafting through hands-on-practice mode using CATIA.
- To impart requisite knowledge and skills to the students on developing 3D assembly drawings and exploded views using CATIA.

Course Outcome

- Students will be able to study, understand and interpret engineering drawings used in industry
- Students will be able to use CATIA for creation of 3D models, assembly drawings and exploded view

Evaluation Systems

Internal Examination	Component	% of Marks	Method of Assessment
	Internal Practice	50 (40+10)	Lab work + Learning Record
External Examination	External Practice	50	Lab work
Total		100	

Course outline

Module: I (20 Hrs)

Part Modeling: Creation of Simple Solids, Parametric Modeling, Booleans and Functional Modeling, Rendering

Module: II (20 Hrs)

Assembly Modeling: Simple Assembly, Constraints, Digital Mockup

Module: III (20 Hrs) :

Drafting & Surface Modeling: Creation of Layout, Conversion of Part drawing to projection views, detailed drawing. Creation of Surfaces, Simple Surface Models, Converting Surface Models to Part Drawing.

(**Note:** All of the topics will be through learn by doing and laboratory mode.
Platform is CATIA)

MECHANICAL/CIVIL/ ELECTRICAL BRANCH STUDENTS ARE REQUIRED
TO DO PROJECTS RELATED TO THEIR OWN BRANCH

Text Books:

Geometrical Modelling, M.E. Morteson

Reference Books:

CAD CAM, M.P. Groover

Online Source:

Session Plan

(Total 12 experiments out of 17 to be conducted)

Sl. No.	Topic coverage and Internal Test	No. of Sessions (in hrs.)	Activity (lecture, tutorial, lab practice, field studies/field-trip, Workshop etc.)	Assignment (project, assignment, field study, seminar, etc.)	Suggested Reading (Book, Video, Online source, etc.)
1	Assembly of Quick Acting Hold Down Clamp	3	Lab practice		
2	Modeling parts of Quick Acting Hold Down Clamp Assembly	6	Lab practice		
3	Assembly of Pneumatic FRL	3	Lab practice		
4	Modeling parts of Pneumatic FRL Assembly	6	Lab practice		
5	Assembly of Roller Guide	3	Lab practice		
6	Modeling Parts of Roller Guide Assembly	6	Lab practice		
7	Assembly of Electrical Tower	3	Lab practice		
8	Modeling parts of Electrical Tower Assembly	6	Lab practice		
9	Assembly of Hitch Mount	3	Lab practice		
10	Modeling parts of Hitch mount Assembly	6	Lab practice		
11	Assembly of Trombon	3	Lab practice		

12	Modeling parts of Trombon Assembly	6	Lab practice		
13	Drafting all the parts of two Assemblies	6	Lab practice		
14	Production of Detailed Drawing of two Assemblies	6	Lab practice		
15	Surface Modeling of Automobile Tail Lamp	6	Lab practice		
16	Surface Modeling of Automobile Bonnet	6	Lab practice		
17	Conversion of Surface Model of Tail Lamp to Part Model	3	Lab practice		
Total (hrs)		60			

Introduction to Robotics

Course Title	Code	Type of course	T-P-PJ	Prerequisite
Introduction to Robotics	ENFC0203	Practice	0-2-0	Geometric Drawing

Objectives

- To Provide An Overview To Students On Various Types of Industrial Robots and Their Configurations.
- To Educate The Students on Use Of DELMIA To Carryout Simulation Exercises of Various Types of Robotic Arms Suiting to Specific Applications.

Course Outcome

- Students Will Have Knowledge and Skill To Program Industrial Robots For Performing Various Tasks.
- Students Will Be Able To Undertake Simulation Exercises Of Various Types Of Robotic Arms As A Pre-Requisite Leading To A Safe, Cost Effective, Reliable And Optimum Design.

Evaluation Systems

Internal Examination	Component	% of Marks	Method of Assessment
	Internal Practice	50 (40+10)	Lab work + Learning Record
External Examination	External Practice	50	Lab work
Total		100	

List of Experiments (45 Hours)

DELMIA: Simulated Models of Various Types Industrial Robots & Its Architecture.

DELMIA: Simulation of Activities Like: Pick and Place, Coordinated Movement, Spot Welding and Arc Welding.

DELMIA: Designing Own Robotic Arm with Insight to Robot Kinematics.

- i) A Prismatic Robotic Arm.
- ii) A Revolute Joint Robotic Arm.
- iii) Articulated Robotic Arm
- iv) Spherical Robotic Arm

Robot Programming: Use of Brabofor Pick and Place Actions.

An Understanding of Different Sensors, Their Operation and Application. Demonstration of Use of Sensors for At Least 3 Applications of Robot.

Commanding A Robot To Achieve Tasks On The Basis Of Sensor Information, A Description Of Motors, And How Their Velocity Is Set, And Other Robotic Actuators.

Reference

Text Books :

M.P. Groover, Industrial Robotics, Second Edition, TMH Publishers.

S.R. Deb and S. Deb, Robotics Technology and Flexible Automation, Second Edition, TMH Publishers.

Reference Books :

Y Koren, Robotics for Engineers, TMH Publishers.

Online Source:

Session Plan

Sl. No	Topic coverage and Internal Test	No. of Sessions (in hr)	Activity	Assignment	Suggested Reading (Book, Video, Online source, etc.)
1	Demonstration of various robotic arms available in DELMIA	3	Lab Demonstration	Collection of tutorials related various Robotic Arms	DELMIA help file
2	Robotic architecture. Demonstration of prismatic, revolute and SCARA	6	Lab Demonstration	Development of Robotic Arm in DELMIA & Demonstration of Application.	DELMIA help file
3	Robotic architecture. Demonstration of articulated robotic arm and Spherical robotic arm	3	Lab Demonstration	Development of Robotic Arm in DELMIA & Demonstration of Application.	DELMIA help file

4	Demonstration of application in spot welding and arc welding	3	Lab Demonstration	Development of Robotic Arm in DELMIA & Demonstration of application.	DELMIA help file
5	Demonstration of application in assembly line operation.	3	Lab Demonstration	Development of robotic arm in DELMIA & Demonstration of application.	DELMIA help file
6	Robotic Programming practice to do pick and place action.	3	Lab practice	Development of programs to do other actions like writing on the white board, Erasing the same with wiper. At least 3 such Activities	Brabo Manual
7	Demonstration of assignment Exercises	3	Lab practice	Recording of all assignments	BraboManual
8	Demonstration of application of sensors, At least 3 sensor based applications	3	Lab practice	Identifying different types of sensors that can be used in robot arm application	
9	Demonstration of use of sensors	3	Lab practice		
10	Demonstration of sensors to actuate motors and its speed control	3	Lab Practice		
11	Demonstration of sensors to actuate motors and its speed control	6	Lab Practice	A Mini project of designing to making a movement to robotic arm	

12	A mini Project Demonstration	6			
	Total (hours)	45			

3D Modelling

Course Title	Code	Type of course	T-P-PJ	Prerequisite
3D Modelling	ENFC0204	Practice	0-2-0	Nil

Objective

- The course covers modeling conceptual design, 3D modeling, Views and documentation of building drawing

Course Outcome

- 3D Solid Model and drawing
- 3D Building Model

Evaluation Systems

Internal Examination	Component	% of Marks	Method of Assessment
	Internal Practice	50 (40+10)	Lab work + Learning Record
External Examination	External Practice	50	Lab work
Total		100	

Course outline

Module I (12 Hrs)

Elements of planning building, fundamentals of Building Information Modelling (BIM). Generation of 2D (plan, section and elevation) and 3D modelling with detailed specification and dimensioning of the following using AutoCAD, Revit Architecture and CATIA :

Practice Session 1 : Generation of 3D modelling with detailed specification and dimensioning of a (G+20) multi-storeyed building with same floor plans using Revit Architecture and CATIA.

Practice Session 2 : Generation of elevation for with detailed specification and dimensioning of a multi-storeyed building with same floor plans using AutoCAD for (practice session 1).

Practice Session 3 : Generation of section for with detailed specification and dimensioning of a multi-storeyed building with same floor plans using AutoCAD, Revit Architecture and CATIA (practice session 1).

Module II (36 Hrs)

Practice Session 4 : Generation of 3D modelling with detailed specification and dimensioning of a (G+20) multi-storeyed building with varying floor plans using Revit Architecture and CATIA.

Practice Session 5 : Generation of elevation for with detailed specification and dimensioning of a multi-storeyed building with varying floor plans using AutoCAD (practice session 4).

Practice Session 6 : Generation of section for with detailed specification and dimensioning of a multi-storeyed building with varying floor plans using AutoCAD, Revit Architecture and CATIA (practice session 4).

Practice Session 7 : Generation of 3D modelling with detailed specification and dimensioning of a (G+5) shopping complex using Revit Architecture and CATIA.

Practice Session 8 : Generation of elevation for with detailed specification and dimensioning of a (G+5) shopping complex using AutoCAD (practice session 7).

Practice Session 9 : Generation of section for with detailed specification and dimensioning of a (G+5) shopping complex using AutoCAD, Revit Architecture and CATIA (practice session 7).

Practice Session 10 : Generation of 3D modelling with detailed specification and dimensioning of a (G+4) hospital building using Revit Architecture and CATIA.

Practice Session 11 : Generation of elevation for with detailed specification and dimensioning of a (G+4) hospital building using AutoCAD (practice session 10).

Practice Session 12 : Generation of section for with detailed specification and dimensioning of a (G+4) hospital building using AutoCAD, Revit Architecture and CATIA (practice session 10).

Module III (12Hrs)

Practice Session 13 : Generation of 3D modelling with detailed specification and dimensioning of a (G+4) hostel building using Revit Architecture and CATIA.

Practice Session 14 : Generation of elevation for with detailed specification and dimensioning of a (G+4) hostel building using AutoCAD (practice session 13).

Practice Session 15 : Generation of section for with detailed specification and dimensioning of a (G+4) hostel building using AutoCAD, Revit Architecture and CATIA (practice session 13).

Reference

Drawing book A-series.

Drawing book B-series

Session Plan

Topic coverage and Internal Test	No. of Sessions (in hrs.)	Activity (lecture, tutorial, lab practice, field studies/field-trip, Workshop etc.)	Assignment (Project, assignment, field study, seminar, etc.)	Suggested Reading (Book, Video, Online source, etc.)
Module I				
Generation of 3D modelling with detailed				

specification and dimensioning of a (G+20) multi-storeyed building with same floor plans using Revit Architecture and CATIA.	4	practice	assignment	
Generation of elevation for with detailed specification and dimensioning of a multi-storeyed building with same floor plans using AutoCAD for (practice session 1).	4	practice	assignment	
Generation of section for with detailed specification and dimensioning of a multi-storeyed building with same floor plans using AutoCAD, Revit Architecture and CATIA (practice session 1).	4	practice	assignment	
Sub-Total (hrs)	12			
Module II				
Generation of 3D modelling with detailed specification and dimensioning of a (G+20) multi-storeyed building with varying floor plans using Revit Architecture and	4	practice	assignment	

CATIA.				
Generation of elevation for with detailed specification and dimensioning of a multi-storeyed building with varying floor plans using AutoCAD (practice session 4).	4	practice	assignment	
Generation of section for with detailed specification and dimensioning of a multi-storeyed building with varying floor plans using AutoCAD, Revit Architecture and CATIA (practice session 4).	4	practice	assignment	
Generation of 3D modelling with detailed specification and dimensioning of a (G+5) shopping complex using Revit Architecture and CATIA.	4	practice	assignment	
Generation of elevation for with detailed specification and dimensioning of a (G+5) shopping complex using AutoCAD (practice session 7).	4	practice	assignment	
Generation of section for with detailed specification and dimensioning of a (G+5)	4	practice	assignment	

shopping complex using AutoCAD, Revit Architecture and CATIA (practice session 7).				
Generation of 3D modelling with detailed specification and dimensioning of a (G+4) hospital building using Revit Architecture and CATIA.	4	practice	assignment	
Generation of elevation for with detailed specification and dimensioning of a (G+4) hospital building using AutoCAD (practice session 10).	4	practice	assignment	
Generation of section for with detailed specification and dimensioning of a (G+4) hospital building using AutoCAD, Revit Architecture and CATIA (practice session 10).	4	practice	assignment	
Sub-Total (hrs)	36			
Module III				
Generation of 3D modelling with detailed specification and dimensioning of a (G+4) hostel building using Revit Architecture and CATIA.	4	practice	assignment	
Generation of elevation for with detailed specification and dimensioning of a (G+4) hostel building using	4	practice	assignment	

AutoCAD (practice session 13).				
Generation of section for with detailed specification and dimensioning of a (G+4) hostel building using AutoCAD, Revit Architecture and CATIA (practice session 13).	4	practice	assignment	
Sub-Total (hrs)	12			
Total (hrs)	60			

Electrical Workshop Practice

Course Title	Code	Type of course	T-P-PJ	Prerequisite
Electrical Workshop Practice	ENFC0205	Practice	0-2-0	Nil

Objective

- To develop skills for troubleshooting of electrical wiring and appliances at household level

Course Outcome

- Enhances the skill of operating electrical instruments, hand tools and power tools.
- Comprehend the safety measures required to be taken while using the tools.
- Solving Electrical Problems at domestic level.

Evaluation Systems

Internal Examination	Component	% of Marks	Method of Assessment
	Internal Practice	50 (40+10)	Lab work + Learning Record
External Examination	External Practice	50	Lab work
Total		100	

Course outline

Lists of Experiments

1. To study safety precautions for electrical engineering, draw the electrical symbol and general electrical house wiring.
2. To study the various types of accessories and tools. Working of fuse and circuit breaker.
3. To setup a series, parallel and staircase wiring using the given lamps.
4. To study Earth-wire connection and Earth-wire measurement in electrical wiring.
5. To set-up residential house wiring using switches, socket, fuse, junction box, energy meter etc.
6. Study of Multimeter, voltmeter, ammeter, wattmeter (both AC&DC)
7. Connection & fault analysis in Domestic appliances (Fan, electric iron)
8. Connection & fault analysis in Domestic appliances (Air Condition)
9. Connection & fault analysis in Domestic appliances (fluorescent tube)
10. Study of Industrial wiring in the workshop and study of bimetallic relay.
11. Study of a 11/4 KV transformer substation
12. Concept of efficiency (Star rating) of electrical appliances

Session Plan

Topic coverage and Internal Test	No. of Sessions (in hrs.)	Activity (lecture, tutorial, lab practice, field studies/field-trip, Workshop etc.)	Assignment (project, assignment, field study, seminar, etc.)	Suggested Reading (Book, Video, Online source, etc.)
To study safety precautions for electrical engineering, draw the electrical symbol and general electrical house wiring.	4	Lab Practice	Experiment Result & Viva	
To study the various types of accessories and tools. Working of fuse and circuit breaker.	4	Lab Practice	Experiment Result & Viva	
To setup a series, parallel and staircase wiring using the given lamps.	4	Lab Practice	Experiment Result & Viva	
To study Earth-wire connection and Earth-wire measurement in electrical wiring.	4	Lab Practice	Experiment Result & Viva	
To set-up residential house wiring using switches, socket, fuse, junction box, energy meter etc.	8	Lab Practice	Experiment Result & Viva	
Study of Multimeter, voltmeter, ammeter, wattmeter (both AC&DC)	4	Lab Practice	Experiment Result & Viva	
Connection & fault analysis in Domestic appliances (Fan, electric iron)	4	Lab Practice	Experiment Result & Viva	
Connection & fault analysis in Domestic appliances (Air Condition)	4	Lab Practice	Experiment Result & Viva	
Connection & fault analysis in Domestic appliances (fluorescent tube)	4	Lab Practice	Experiment Result & Viva	
Study of Industrial wiring in the workshop and study of bimetallic relay.	4	Field Studies	Viva	
Study of a 11/4 KV transformer substation	4	Field Studies	Viva	
Concept of Star rating of electrical appliances	4	Lab Practice	Experiment Result & Viva	
Total : 52 Hours				

Mine Surveying –I Lab

Course Title	Code	Type of course	T-P-PJ	Prerequisite
Mine Surveying - Lab	FCEN0214	Practice	0-2-0	Nil

Objective:

- To make the students have practical knowledge on :
- Linear measuring instruments & carrying out Chain Surveying
- Carrying out Compass Traversing
- Vernier theodolite
- Tilting level & carrying out Fly Leveling
- Auto level & carrying out Profile Leveling

Course Outcome:

- Enhances the skill of operating electrical instruments, hand tools and power tools.
- Comprehend the safety measures required to be taken while using the tools.
- Solving Electrical Problems at domestic level.

Evaluation System

Internal Examination	Component	% of Marks	Method of Assessment
	Internal Practice	50 (40+10)	Lab work + Learning Record
External Examination	External Practice	50	Lab work
Total		100	

Course outline

Module I

Study and sketch the linear measuring instruments & carrying out Chain Surveying Prismatic Compass and carrying out Compass Traversing; Vernier theodolite & angle measurement by Repetition Method; Angle measurement by Reiteration Method using Micro-optic theodolite; Study and sketch of a Tilting level & carrying out Fly Leveling; Study and sketch of Auto level & carrying out Profile Leveling; Study and sketch of 1" Theodolite and angle measurement; Plane Table Surveying by Radiation Method and Contouring; Study and sketch of Total Station and measurement of angles, distance and determination of coordinates and RL using Total Station; Preparation of grid and plotting the field data.

Session Plan

Topic coverage and Internal Test	No. of Sessions (in hrs.)	Activity (lecture, tutorial, lab practice, field studies/field-trip, Workshop etc.)	Assignment (project, assignment, field study, seminar, etc.)	Suggested Reading (Book, Video, Online source, etc.)
Study and sketch the linear measuring instruments & carrying out Chain Surveying	3	lab practice	assignment, field study	book
Prismatic Compass and carrying out Compass Traversing	3	lab practice	assignment, field study	book
Vernier theodolite & angle measurement by Repetition Method; Angle measurement by Reiteration Method using Micro-optic theodolite;	6	lab practice	assignment, field study	book
Study and sketch of a Tilting level & carrying out Fly Leveling; Study and sketch of Auto level & carrying out Profile Leveling;	6	lab practice	assignment, field study	book
Study and sketch of 1" Theodolite and angle measurement; Plane Table Surveying by Radiation Method and Contouring	6	lab practice	assignment, field study	book
Study and sketch of Total Station and measurement of angles, distance and determination of coordinates and RL using Total Station; Preparation of grid and plotting the field data.	6	lab practice	assignment, field study	book
Total Hrs	30			

Aerodynamics Laboratory

Course Title	Code	Type of course	T-P-PJ	Prerequisite
Aerodynamics Laboratory	ENFC0208	Practice	0-2-0	Nil

Objective

<ul style="list-style-type: none"> To Predict Different Aerodynamic Propulsion in Aero Applications
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Course Outcome

<ul style="list-style-type: none"> Ability to Use the Fundamental Dynamics Principles in Aircraft Applications.
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Evaluation Systems

Internal Examination	Component	% of Marks	Method of Assessment
	Internal Practice	50 (40+10)	Lab work + Learning Record
External Examination	External Practice	50	Lab work
Total		100	

1. List of Experiments

1. Application of Bernoulli's Equation – venturimeter and orifice meter.
2. Frictional loss in laminar flow through pipes.
3. Frictional loss in turbulent flow through pipes.
4. Calibration of a subsonic Wind tunnel.
5. Determination of lift for the given airfoil section.
6. Pressure distribution over a smooth circular cylinder.
7. Pressure distribution over a rough circular cylinder.
8. Pressure distribution over a symmetric aerofoil.
9. Pressure distribution over a cambered aerofoil.
10. Flow visualization studies in subsonic flows.
11. Calculation of drag over smooth cylinder
12. Calculation of drag over rough cylinder

List of Equipment for a Batch of 30 Students

S.N	Name of Equipment	Quantit	Experiment No.
1	Venturimeter	1	1
2	Orificemeter	1	1
3	Pipe friction apparatus	1	2, 3
4	Subsonic Wind tunnel	1	4, 5, 6, 7, 8, 9, 10, 11, 12
5	Models (aerofoil, rough and smooth cylinder, flat plate)	1	5, 6, 7, 8, 9

Engineering Metrology and Measurements

Course Title	Code	Type of course	T-P-PJ	Prerequisite
Engineering Metrology and Measurements	ENFC0401	Theory + Practice	1-2-0	Nil

Course Objective

- To Make Students Familiar with the Measuring Systems, and the Standard of Measurements. Learns about Basic Measurement Devices.
- Understanding the Basic Measurement Systems in the Real Time Engineering Applications.
- Enables Students to Work in Quality Control and Quality Assurances Divisions Industries.

Course Outcomes

- Selecting Suitable Measuring Instruments for Basic and Typical Applications in the Industries.
- Analyze Measurement Requirement.
- Can Choose Transducer & Sensors for Products.

Evaluation System

Internal Examination	Component	% of Marks	Method of Assessment
	Internal Theory	20	Written examination
	Internal Practice	30(20+10)	Lab work + Learning Record
External Examination	External Theory	30	Written examination
	External Practice	20	Lab work
Total		100	

Course Outline

Module: I (6 Hours)

Introduction to Metrology; Importance and Need for Measurements and Metrology; Need for Inspection; Precision & Accuracy; Errors in Measurement.

Practice : (Laboratory Mode- Learn by Doing)

Calibration of Measuring Instruments Using Slip Gauge Blocks.

Module: II (9 Hours)

Limit System; Limits Fits & Tolerances; Allowances; Hole Basis & Shaft Basis Systems; Interchangeability; Gauge Design. (Class room Teaching and videos)

Practice : (Laboratory Mode- Learn by Doing)

1. Introduction to Metrology Laboratory (Steel Rule, Tape, Right Angle, Protractor, Surface Plate).
2. Gauges- Filler, Radius, Thread, Wire, Snap & GO-NOGO.

Module: III (9 Hours)

Standards of Measurement; Dial Indicators; Vernier Apparatus; Micrometers; Comparators (Mechanical, Electrical, Pneumatic).

Practice : (Laboratory Mode- learn by Doing)

3. Vernier Caliper- Inside, Outside, Depth Measurement & Height Gauge.
4. Micrometers, Outside, Inside Micrometer & Depth Micrometer.
5. Three Points Bore Micrometer

Module: IV (10 Hours)

Measurement of Angles & Tapers using Bevel Protractor; Angle Gauges; Sine Bars; Flatness Spirit Level & Surface Plate.

Practice: (Laboratory Mode- learn by Doing)

6. Sine Bar/Bevel Protractor-Measurement of Angles.
7. Flatness Test Using Sprit Level.
8. Use of Dial Indicators-in-lathe.

Module: V (9 Hours)

Gear Tooth Metrology; Inspection & Alignment Tests. Transducers; Variable Resistance Transducer; LVDT; Comparative Transducer; Piezoelectric Transducer; Photo Voltaic Cells; Devices for Pressure Measurement- Dead Weight Tester; Bourdon Tube Pressure Gauge; Diaphragm and Bellow Gauges.(Topics will be covered by explaining and fallowed by practice mode)

Practice: (Laboratory Mode- Learn by Doing)

9. Gear Tooth Metrology, Inspection & Alignment Tests.

Module: VI (10 Hours)

Low Pressure Measurements; Force Measuring Using Proving Rings; Torque Measuring Using Dynamometers; Strain Measurements; Profile Projector; Tool Maker's Microscope; Optical Flats; Laser Interferometers; Autocollimators.

Practice: (Laboratory Mode- Learn by Doing)

10. Optical Flat Use & Surface Plate Test Using Spirit Level & Dial Gauge.
11. Measurement of Template Using Profile Projector.

Module: VII (12 Hours)

Assessment of Surface Roughness; Machining Symbols for Surface Finish; Measuring Instruments; Tally-Surf; Screw Thread Measurement- Terminology; Precision Instruments Based on Laser Principles- Laser Interferometer Application; Coordinate Measuring Machine (CMM).

Practice: (Laboratory Mode- Learn by Doing)

12. Surface Finish by Taylor's Apparatus –LVDT.
13. Measurement of Tool angle in Tool Maker's Microscope.
14. Repeat Laboratory-1 or Test.
(50% of the topics will be covered by “Learn by Doing” principle and few video presentations)

Reference:**Text books :**

1. Gupta, I C, A Text Book of ENGINEERING METROLOGY.2016. 8th Edition, Reprint, Dhanpat Rai Publication, New Dehi-110002
2. Narayana, K L, Engineering Metrology.2014. Third Edition, Scitech Publication(India) Privet Limited

Reference Books:

3. Mahajan, M, A Text Book of Metrology. 2010. DhanpatRai& Co (P) Ltd,ISBN 13 : 978-817700051

Session Plan

Topic coverage and Internal Test	No. of Sessions (in hrs.)	Activity (lecture, tutorial, lab practice, field studies/field-trip, Workshop etc.)	Assignment (Project, assignment, field study, seminar, etc.)	Suggested Reading (Book, Video, Online source, etc.)
Module I				
Introduction to metrology Importance and need for measurements and metrology	1	lecture	Assignment	https : //www.youtube.com/watch?v=xcvNl1HHY9o https : //www.youtube.com/watch?v=qXhOWXShH1w Mahajan, M, A Text Book of Metrology. 2010. DhanpatRai& Co (P) Ltd,ISBN 13 : 978-817700051
Need for Inspection	1	lecture	Assignment	https : //www.youtube.com/watch?v=YYrnjEo90fs Mahajan, M, A Text Book of Metrology. 2010. DhanpatRai& Co (P) Ltd,ISBN 13 : 978-817700051

Precision & Accuracy	1	lecture	Assignment	https : //www.youtube.com/watch?v=b38hFWvEjwI Mahajan, M, A Text Book of Metrology. 2010. DhanpatRai& Co (P) Ltd,ISBN 13 : 978-817700051
Errors in Measurement	1	lecture	Assignment	https : //www.youtube.com/watch?v=cGdbQeRSYTc Mahajan, M, A Text Book of Metrology. 2010. DhanpatRai& Co (P) Ltd,ISBN 13 : 978-817700051
Practice				
1.Calibration of measuring Instruments using slip gauge blocks	2	practice		
Module II				
Limit System, Limits Fits & Tolerances	2	lecture	Assignment	https : //www.youtube.com/watch?v=zxyERl8KnnM&list=PL0uwpDY0Y8Q2aoPhDuEZLI1PVuKKUGb90 https : //www.youtube.com/watch?v=zxyERl8KnnM&list=PL0uwpDY0Y8Q2aoPhDuEZLI1PVuKKUGb90&index=1 Mahajan, M, A Text Book of Metrology. 2010. DhanpatRai& Co (P) Ltd,ISBN 13 : 978-817700051
Allowances, Hole Basis & Shaft Basis Systems, Interchangeability	1	lecture	Assignment	https : //www.youtube.com/watch?v=AP_T7hf5Wv0&list=PL0uwpDY0Y8Q2aoPhDuEZLI1PVuKKUGb90&index=4 Mahajan, M, A Text Book of Metrology. 2010. DhanpatRai& Co (P) Ltd,ISBN 13 : 978-817700051

Design of Gauges- GO, NOGO	2	lecture	Assignment	https : //www.youtube.com/watch?v=uNOZ TmhsH1w https : //www.youtube.com/watch?v=mZH Hdim3hOY Mahajan, M, A Text Book of Metrology. 2010. DhanpatRai& Co (P) Ltd,ISBN 13 : 978-817700051
Practice				
2.Introduction to Metrology Laboratory(1hr) + Steel Rule, Tape, Right Angle Protractor, Surface Plate	2	Practice	field study	
3.Gauges- Filler ,Radius, Thread, Wire, Snap, GO- NOGO	2	Practice	field study	
Module III				
Standards of Measurement	1	lecture	Assignment	Mahajan, M, A Text Book of Metrology. 2010. DhanpatRai& Co (P) Ltd,ISBN 13 : 978-817700051
Dial Indicators, Vernier caliper &Micrometer	1	lecture	Assignment	https : //www.youtube.com/watch?v=FqSJh Y_lctc https : //www.youtube.com/watch?v=vkPlz malvN4 https : //www.youtube.com/watch?v=StBc5 6ZifMs Mahajan, M, A Text Book of Metrology. 2010. DhanpatRai& Co (P) Ltd,ISBN 13 : 978-817700051

Comparators Mechanical, Electrical, Pneumatic	1	lecture	Assignment	Mahajan, M, A Text Book of Metrology. 2010. Dhanpat Rai & Co (P) Ltd, ISBN 13 : 978-817700051
Practice				
Slip Caliper- inside, outside, depth measurement, Height Gauge	2	Practice	Field Study	
5. Micrometers, Outside & Inside Micrometer, Depth Micrometer	2	Practice	Field Study	
6. Three point Bore Micrometer	2	Practice	Field Study	
Module IV				
Angular Measurements Measurement of Angles & Tapers using Bevel Protractor, Angle Gauges, Sine Bars	3	lecture	Assignment	https : //www.youtube.com/watch?v=oJFUI _FHlio https : //www.youtube.com/watch?v=F7uC EeipdCw https : //www.youtube.com/watch?v=u- PLC3uKICM
Spirit Level, Surface Plate	1	lecture	Assignment	https : //www.youtube.com/watch?v=H- F2C5F78aw
Practice				
7. Sine Bar/Bevel Protractor- Measurement of Angles	2	Practice		

8.Flatness test using Sprit Level	2	Practice		
9.Use of Dial Indicators-in –Lathe.	2	Practice		
Module V				
Gear Tooth Metrology	2	lecture	Assignment	https : //www.youtube.com/watch?v=fb278 VIHICU
Inspection &Alignment Tests	1	lecture	Assignment	https : //www.youtube.com/watch?v=utZVv 7QvRt8
Transducers, Variable Resistance Transducer, LVDT, comparative transducer, piezoelectric transducer, photo voltaic cells.	2	lecture	Assignment	https : //youtu.be/vuVFbKxsds
Devices for pressure measurement- dead weight tester, bourdon tube pressure gauge, diaphragm and bellow gauges.	1	lecture	Assignment	
Practice				
ar Tooth Metrology, Inspection & Alignment tests	3	Practice		
Module VI				
Low Pressure Measurements	1	lecture	Assignment	
Force Measuring Using Proving	2	lecture	Assignment	

Rings. Torque Measuring Using Dynamometers, Strain Measurements				
Profile Projector, Tool Maker's Microscope, Optical Flats, application.	1	lecture	Assignment	https : //www.youtube.com/watch?v=HGO9GXaeZFc https : //www.youtube.com/watch?v=hqsVXA5S2xM https : //www.youtube.com/watch?v=5JE7BV-XkSk
Laser Interferometers	1	lecture	Assignment	https : //www.youtube.com/watch?v=UA1qG7Fjc2A
Autocollimators	1	lecture	Assignment	https : //www.youtube.com/watch?v=XHEywuzl9sA
Practice				
tical Flat Use & Surface Plate test using Spirit Level & Dial Gauge	2	Pratice	Field study	
12.Measurement of template using Profile Projector	2	Practice	Field Study	
Module VII				
Assessment of Surface Roughness, Machining Symbols for	1	lecture	Assignment	https : //www.youtube.com/watch?v=omhoWIs2d-M

Surface Finish, Measuring Instruments, Tally-Surf,				https : //www.youtube.com/watch?v=VyeP ASErr5Q
Screw Thread Measurement- Terminology, Determination of Effective Diameter Using Two, three Wire Method	2	lecture	Assignment	https : //www.youtube.com/watch?v=N4pjg JMmk3A https : //www.youtube.com/watch?v=LjQf6 ISFISg
Coordinate measuring machine (CMM)	1	lecture	Assignment	https : //www.youtube.com/watch?v=844Ui RBVx1Y
Practice				
11.Surface Finish by Taylor's Apparatus	2	Practice	field study	
13.Measurement of Tool angle in Tool Maker's Microscope	2	Practice	Field Study	
14.Repeat Laboratory-1	2	Practice	field study	
15. Repeat Laboratory-2	2	Practice	field study	
Total Hours	65			

Basic Fluid Mechanics

Course Title	Code	Type of course	T-P-PJ	Prerequisite
Basic Fluid Mechanics	ENFC0402	Theory + Practice	2-1-0	Nil

Objective

- To make students understand flow characteristics and different types of flow and application of dimensional analysis, different flow and velocity measuring device.

Course Outcome

- Understand flow characteristics and different types of flow
- Understand kinematics and dynamics of flow
- Understand about application of dimensional analysis

Evaluation Systems

Internal Examination	Component	% of Marks	Method of Assessment
	Internal Theory	20	Written examination
	Internal Practice	30(20+10)	Lab work + Learning Record
External Examination	External Theory	30	Written examination
	External Practice	20	Lab work
Total		100	

Course outline

Module I Fluid kinematics (9 Hours)

Types of flow, Continuity equation (in one, two & three dimension), velocity and acceleration, streamline, streakline, path line, velocity potential function and stream function, types of motion (Linear Translation and all deformations, rotation and vorticity, vortex flow.

Experiments:

1. Demonstration of different types of flow
2. Pressure Measurement

Module II Fluid Dynamics (7 Hours)

Rate of Flow Or Discharge, Euler's equation of motion along a stream line for ideal flow - Principle of conservation of energy Integration of Euler's equation along a stream line - Bernoulli's equation (**Derivation not to be included for external Examination**) - Practical applications of Bernoulli's Principle - Kinematics of free jets.

Experiments:

3. Bernoulli's experiment
4. Characteristics of free jet

Module III Principle of conservation of momentum (5 Hours)

Impulse momentum equation. Application of momentum principle for force on pipe bends and reducers. Angular momentum principle and its applications (Numerical problems on angular momentum principle not included. Only fundamental concepts.)

Experiments :

5. Impact of jet

Module IV Laminar Flow and Turbulent Flow : (6 Hours)

Reynolds's Experiment, Laws of Laminar and Turbulent Friction, HagenPoiseulle Equation for laminar flow through pipe (**Derivation not to be included for external Examination**), Darcy-Weisbach Equation for Turbulent flow through pipe (**Derivation not to be included for external Examination**)

Experiments :

6. Pipe friction
7. Reynolds's no calculation and identification of laminar and turbulent flow

Module V Flow through Pipes (8 Hours)

Loss of Energy-Friction loss & Minor losses, HGL&TEL, Pipes in series and Parallel, Equivalent Length of pipe, Power transmission through pipes and nozzle, Hydro dynamically smooth & rough boundaries, Moody's Diagram.

Experiments :

8. HGL& TEL through simulation
9. Hardy Cross Method

Module VI Dimensional Analysis and Similitude : (5 Hours)

Fundamental and derived units, Dimensional formulae for various geometric, kinematic and dynamic parameters. Rayleigh and Buckingham' methods for arriving group of dimensionless parameters. Similarity laws - Reynolds, Froude, Mach Laws. Geometric, Kinematic and Dynamic similarities. Distorted Models.

Module VI Flow Measurement(18 Hours)

Flow through small orifice, Mouthpiece, Time of Emptying tanks. Velocity Measurement using Pitot tube, Prandtl tube, Flow measurement in pipes-Flow Meters-orifice Plate-Flow Nozzle Meter, Venturi Meter, Flow rate Measurement in channel- Weir and Notches.

Experiments :

10. Flow Measurement through V-Notch
11. Flow Measurement through Venturi Meter
12. Flow Measurement through Small Orifice
13. Flow Measurement through Orifice Meter
14. Flow Measurement through Rota meter
15. Flow Measurement through Pitot Tube

LIST OF THE EXPERIMENT THROUGH SIMULATION : -

1. Bernoulli's Equation
2. Venturi Meter
3. Orifice Meter
4. Reynolds's Experiment
5. Impact Of Jet
6. Discharge through Weir.
7. Mouth Piece

All this Experiment can be done using the link given below

<http://eerc03-iiith.virtual-labs.ac.in/index.php?section=Introduction>

http://vlab.co.in/ba_labs_all.php?id=7

E-content:

Text Books:

1. Fluid mechanics : A.K.JAIN, Khanna publishers

Reference Books:

1. Hydraulics and Fluid mechanics : P.N.MODI & S.M.SETH
2. Fluid Mechanics and Hydraulic Machines by R. K. Bansal,

Online Source:

Video Links : -

Bernoulli Equation : <https://www.youtube.com/watch?v=brN9citH0RA>

<https://www.youtube.com/watch?v=bC8v6hlXnSk> <https://www.youtube.com/watch?v=UJ3-Zm1wbIQ>

<https://www.youtube.com/watch?v=oUd4WxjoHKY> <http://www.efm.leeds.ac.uk/CIVE/FluidsLevel1/Unit03/T4.html>

<http://www.efm.leeds.ac.uk/CIVE/FluidsLevel1/Unit03/T4.html>

Flow Measurement : Venturi Meter Fabrication : <https://www.youtube.com/watch?v=Zpux9MvvDmw>

Venturi Effect : <https://www.youtube.com/watch?v=H3TcLoapJBo>

<https://www.youtube.com/watch?v=H3TcLoapJBo>

<http://www.wermac.org/specials/venturiflowmeter.html> **Flow over Weirs** : <https://www.youtube.com/watch?v=oXYHe-DGyVE>

<https://www.youtube.com/watch?v=oXYHe-DGyVE> **Flume demo** : <https://www.youtube.com/watch?v=awsnbnljy78>

<https://www.youtube.com/watch?v=awsnbnljy78> **Weirs** : https://www.youtube.com/watch?v=Ax38XN_XqCU

https://www.youtube.com/watch?v=Ax38XN_XqCU

V-Notch : <https://www.youtube.com/watch?v=2dZtIn7CUos>

Reynolds Experiment :

<https://www.youtube.com/watch?v=1wNmtle6qkE>

https://www.youtube.com/watch?v=0ThQ_nD97hY

Laminar Flow in a Pipe

[youtube=<http://www.youtube.com/watch?v=KqqOb30jWs&NR=1>]

Turbulent Flow in a Pipe

[youtube=<http://www.youtube.com/watch?v=NplrDarMDF8&NR=1>]

Session Plan

Topic coverage and Internal Test	No. of Sessions (in hrs.)	Activity (lecture, tutorial, lab practice, field studies/field-trip, Workshop etc.)	Assignment (Project, assignment, field study, seminar, etc.)	Suggested Reading (Book, Video, Online source, etc.)
MODULE-1 FLUID KINEMATICS				
Types of flow, Continuity equation (in one, two & three dimension) video on types of flow	2	Lecture		
velocity and acceleration, streamline, streakline, path line	1	Lecture		
Velocity potential function and stream function, types of motion (Linear Translation and all deformations) rotation and vorticity, vortex flow.	2	Lecture		Video
Demonstration of different types of flow	2	Practice		
Pressure Measurement	2	Practice		
MODULE-2 FLUID DYNAMICS				
Rate of Flow Or Discharge, Euler's equation of motion along a stream line for ideal flow - Principle of conservation of energy Integration of Euler's equation along a stream line - Bernoulli's equation	1+2	Lecture+ Practice		
Practical applications of Bernoulli's Principle - Kinematics of free jets. Bernoulli's Principle	2+2	Lecture+ Practice		Video

MODULE-3 PRINCIPLE OF CONSERVATION OF MOMENTUM				
Impulse momentum equation. Application of momentum principle for force on pipe bends and reducers	2+2	Lecture+ Practice		
Angular momentum principle and its applications (Numerical problems on angular momentum principle not included. Only fundamental concepts.)	1	Lecture		
MODULE-4 LAMINAR FLOW & TURBULENT FLOW				
Reynolds's Experiment, Laws of Laminar and Turbulent Friction	1+2	Practice		Video
Hagen Poiseulle Equation for laminar flow through pipe, Darcy-Weisbach Equation for Turbulent flow through pipe	1+2	Lecture+ Practice		
MODULE-5 FLOW THROUGH PIPES				
Loss of Energy-Friction loss & Minor losses, HGL&TEL	1+2	Lecture+ Practice		
Pipes in series and Parallel, Equivalent Length of pipe	1+2	Lecture+ Practice		
Power transmission through pipes and nozzle	1	Lecture		
Hydrodynamically smooth & rough boundaries, Moody's Diagram.	1	Lecture		

MODULE-6 DIMENSIONAL ANALYSIS				
Fundamental and derived units, Dimensional formulae for various geometric, kinematic and dynamic parameters.	1	Lecture		
Rayleigh and Buckingham' methods for arriving group of dimensionless parameters.	2	Lecture		
Similarity laws - Reynolds, Froude, Mach Laws.Geometric, Kinematic and Dynamic similarities.Distorted Models.	2	Lecture		
MODULE-7 FLOW MEASUREMENT IN PIPES AND CHANNELS				
Flow through small orifice,MouthPiece,Time of Emptying tanks.	2+4	Lecture+ Practice		
Velocity Measurement using pitottube ,Prandtl tube	2+2	Lecture+ Practice		
Flow measurement in pipes-Flow Meters-orifice Plate-Flow Nozzle Meter,Venturimeter	2+4	Lecture+ Practice		
Flow rate Measurement in channel- Weir and Notches.	2+2	Lecture+ Practice		
Total (hrs.)	60			

Basic Surveying

Subject Name	Code	Type of course	T-P-PJ	Prerequisite
Basic Surveying	ENFC0403	Theory & Practice	2-1-0	Nil

Objective

- To make students able to understand the measurement techniques, equipment used in land surveying using Dumpy level, Theodolite and Total station.

Course Outcome

- Apply math, science, and technology in surveying activities.
- Measure horizontal distances across clear landscape and across obstacles.
- Prepare contour maps using Theodolite and Total station for projects(Road, Railway and water shade)

Evaluation Systems

Internal Examination	Component	% of Marks	Method of Assessment
	Internal Theory	20	Written examination
	Internal Practice	30(20+10)	Lab work + Learning Record
External Examination	External Theory	30	Written examination
	External Practice	20	Lab work
Total		100	

Module-I (2HRS)

Historical survey practice : Introduction to surveying : Classification, Basic Principle, List of Instruments used in surveying.

Module-II (8HRS)

Leveling: Use of dumpy level and leveling staff. Temporary and Permanent adjustment of dumpy level, Curvature and refraction error, types of leveling, reciprocal leveling, leveling difficulties and common errors.

Experiments:

1. Calculation of RL using HI and Rise and fall method.
2. Longitudinal and cross sectional Leveling
3. Check Leveling

Module--III (11HRS)

Theodolite: Use of theodolite, description, uses and adjustments – temporary and permanent, measurement of horizontal and vertical angles.

Experiments :

4. Theodolite traversing, checks and closing errors, balancing a traverse, adjustment of bearings, computation of area of closed traverse.
5. Measurement of Inaccessible points.

Module--IV (13Hrs)

Total station: Introduction to Total station, Functions, working principles of total station applications, Use of all parts and all options inside the machines.

Experiments:

6. Basic operation, setting up the instrument
7. Measurement of angle and Measurement of Distance
8. Setting up instrument station, Co-ordinate system
9. Traverse adjustment (With help of software)
10. Area calculation using Total station

Module--V (6Hrs)

Contouring: Characteristics, methods and types of contouring.

Experiments:

11. Preparation of contour map using total station and surfer software.

Module--VI (10HRS)

Curves: Types of curves, Properties– simple, compound, reverse and transition curve.

Experiments:

12. Setting out of different curves (simple, compound, reverse and transition) using Total Station.

Module -VI (10HRS)

Setting out of work using Total station.

Experiments:

13. Setting out of Building
14. Setting out of culvert.

Text Books:

1. Surveying Vol I & II, III B C Purnima, Laxmi Publication.
2. Surveying, volume 1&2 BY S.K.Duggal, TMH publisher.

Reference Books:

1. Surveying & Levelling by T.P Kanitkar & V S Kulkarni

Online Source :

<https://www.youtube.com/watch?v=-JgCfsouiu0>

<https://www.youtube.com/watch?v=grvdEYmjSPc>

[https://www.youtube.com/watch?v=A-kf1oX_xJ0&t=796s,](https://www.youtube.com/watch?v=A-kf1oX_xJ0&t=796s)

<https://www.youtube.com/watch?v=XsxJD79MR0s>

<https://www.youtube.com/watch?v=eRiSShpqm3U>

[**https://www.youtube.com/watch?v=hISmKTEfgXc**](https://www.youtube.com/watch?v=hISmKTEfgXc)

[**https://www.youtube.com/watch?v=zZL9MNsmSWo**](https://www.youtube.com/watch?v=zZL9MNsmSWo)

<https://www.youtube.com/watch?v=aqN8uDJoXFA&t=2s>

[**https://www.youtube.com/watch?v=50jrYYKKUCA**](https://www.youtube.com/watch?v=50jrYYKKUCA)

<https://www.youtube.com/watch?v=Yy-8e3sCr0U>

https://www.youtube.com/watch?v=pVgDyh_YBcI

https://www.youtube.com/watch?v=rCLKEYD0_KA

<https://www.youtube.com/watch?v=PZ7oUmD5DnU>

Online Source :

<https://www.youtube.com/watch?v=-JgCfsooiu0>)
<https://www.youtube.com/watch?v=grvdEYmjSPc>)
https://www.youtube.com/watch?v=A-kf1oX_xJ0&t=796s.
<https://www.youtube.com/watch?v=XsxJD79MR0s>)
<https://www.youtube.com/watch?v=eRiSShpqm3U>
<https://www.youtube.com/watch?v=hISmKTEfgXc>
<https://www.youtube.com/watch?v=zZL9MNsmSwo>
<https://www.youtube.com/watch?v=aqN8uDJoXFA&t=2s>
<https://www.youtube.com/watch?v=50jrYYKKUCA>
<https://www.youtube.com/watch?v=Yy-8e3sCr0U>)
https://www.youtube.com/watch?v=pVgDyh_YBcI.
https://www.youtube.com/watch?v=rCLKEYD0_KA.
<https://www.youtube.com/watch?v=PZ7oUmD5DnU>

Lesson Plan

Module I

Topic coverage and Internal Test	No. of Sessions (in hrs.)	Activity (lecture, tutorial, lab practice, field studies/field-trip, Workshop etc.)	Assignment (Project, assignment, field study, seminar, etc.)	Suggested Reading (Book, Video, Online source, etc.)
Historical survey practice : Introduction to surveying : Classification, Basic Principle, List of Instruments used in surveying.	2	Lecture	Assignment	https://www.youtube.com/watch?v=-JgCfsooiu0)
Total (hrs.)	2			

Module-II

Topic coverage and Internal Test	No. of Sessions (in hrs.)	Activity (lecture, tutorial, lab practice, field studies/field-trip, Workshop etc.)	Assignment (Project, assignment, field study, seminar, etc.)	Suggested Reading (Book, Video, Online source, etc.)

Levelling : Use of dumpy level and levelling staff. Temporary and Permanent adjustment of dumpy level, Calculation of RL by HI and rise and fall method. Curvature and refraction error, types of levelling, reciprocal levelling, levelling difficulties and common errors.	2	lecture	Assignment	https : //www.youtube.com/watch?v=grvdEYmjSPc
Experiments : Calculation of RL using HI and Rise and fall method.	2	practice, field studies	field study	https : //www.youtube.com/watch?v=grvdEYmjSPc
Longitudinal and cross sectional levelling Check Levelling	4	practice, field studies	field study	https : //www.youtube.com/watch?v=grvdEYmjSPc
Total (hrs.)	8			

Module III

Topic coverage and Internal Test	No. of Sessions (in hrs.)	Activity (lecture, tutorial, lab practice, field studies/field-trip, Workshop etc.)	Assignment (Project, assignment, field study, seminar, etc.)	Suggested Reading (Book, Video, Online source, etc.)
Theodolite : Use of theodolite, description, uses and adjustments – temporary and permanent, measurement of horizontal and vertical angles.	2	(lecture, lab practice, field studies)	Assignment	https : //www.youtube.com/watch?v=A-kf1oX_xJ0&t=796s . https : //www.youtube.com/watch?v=XsxJD79MR0s)

<p>Theodolite traversing, checks and closing errors, balancing a traverse, adjustment of bearings, computation of area of closed traverse. Experiments : Theodolite traversing, checks and closing errors, balancing a traverse, adjustment of bearings, computation of area of closed traverse.</p>	3+2	Lecture ,lab practice, field studies)	Field study	<a href="https://www.youtube.com/watch?v=A-
kf1oX_xJ0&t=796s">https : //www.youtube.com/watch?v=A- kf1oX_xJ0&t=796s , https : //www.youtube.com/watch?v=XsxJD79MR0s)
<p>Measurement of Inaccessible points using theodolite. Experiments : Measurement of Inaccessible points.</p>	2+2	(lab practice, field studies)	Field study	https : //www.youtube.com/watch?v=eRiSShpgm3U)
Total (hrs.)	11			

Module IV

Topic coverage and Internal Test	No. of Sessions (in hrs.)	Activity (lecture, tutorial, lab practice, field studies/field-trip, Workshop etc.)	Assignment (Project, assignment, field study, seminar, etc.)	Suggested Reading (Book, Video, Online source, etc.)
Total station : Introduction to Total station, Functions, working principles of total station applications, Use of all parts and all options inside the machines. Electronic data recording & total station operation	3	Lecture	Assignment	<u>(https : //www.youtube.com/watch? v=hISmKTEfgXc)</u>
Experiments : 6. Basic operation, setting up the instrument 7. Measurement of angle and Measurement of Distance 8. Setting up instrument station, Co-ordinate system 9. Traverse adjustment (With help of software) 10. Area calculation using Total station	10	practice, field studies	field study	<u>https : //www.youtube.com/watch? v=hISmKTEfgXc</u> <u>https : //www.youtube.com/watch? v=zZL9MNsmSWo</u> <u>https : //www.youtube.com/watch? v=zZL9MNsmSWo</u>
Total (hrs.)	13			

Module V

Topic coverage and Internal Test	No. of Sessions (in hrs.)	Activity (lecture, tutorial, lab practice, field studies/field-trip, Workshop etc.)	Assignment (Project, assignment, field study, seminar, etc.)	Suggested Reading (Book, Video, Online source, etc.)
Contouring : Characteristics, methods and types of contouring	1	lecture	assignment	<u>https : //www.youtube.com/watch?v=50jrYYKKUCA</u>
Preparation of contour map using total station and surfer software Experiments : 11. Preparation of contour map using total station and surfer software.	5	lecture, lab practice, field studies	assignment, field study	<u>https : //www.youtube.com/watch?v=50jrYYKKUCA</u>
Total (hrs.)	6			

Module V

Topic coverage and Internal Test	No. of Sessions (in hrs.)	Activity (lecture, tutorial, lab practice, field studies/field-trip, Workshop etc.)	Assignment (Project, assignment, field study, seminar, etc.)	Suggested Reading (Book, Video, Online source, etc.)

Curves : Types of curves, Properties–simple, compound, reverse and transition curve. Experiments : 12. Setting out of different curves (simple, compound, reverse and transition) using Total Station.	10	lecture, tutorial, field studies	assignment, field study	https : //www.youtube.com/watch?v=aqN8uDJoXFA&t=2s https : //www.youtube.com/watch?v=hISmKTEfgXc
Total (hrs.)	10			

Module VI

Topic coverage and Internal Test	No. of Sessions (in hrs.)	Activity (lecture, tutorial, lab practice, field studies/field-trip, Workshop etc.)	Assignment (Project, assignment, field study, seminar, etc.)	Suggested Reading (Book, Video, Online source, etc.)
Setting out of work using Total station. Experiments : 13. Setting out of Building 14. Setting out of culvert.	10	lecture, tutorial, field studies	assignment, field study	https : //www.youtube.com/watch?v=XPbWIp56zxY
Total (hrs.)	10			

Basic Electrical Engineering

Course Title	Code	Type of course	T-P-PJ	Prerequisite
Basic Electrical Engineering	ENFC0404	Theory & Practice	2-1-0	Nil

Objective

- Impart a basic knowledge of electrical quantities such as current, voltage, power, energy and frequency in the analysis of basic D.C. and A.C.
- Develop selection skill to identify the type of generators or motors required for particular application and highlight the importance of transformers in transmission and distribution of electric power.

Course Outcome

- Understand concept of electrical circuit and magnetic circuit configurations
- Understand fundamentals of single and three phase A.C circuits,
- Understand wiring schedule for residential, office and industrial loads, concept of earthing and will be acquainted with Distribution Transformer and LT lines to understand the fundamentals of distribution system.

Evaluation Systems

Internal Examination	Component	% of Marks	Method of Assessment
	Internal Theory	20	Written examination
	Internal Practice	30(20+10)	Lab work + Learning Record
External Examination	External Theory	30	Written examination
	External Practice	20	Lab work
Total		<i>100</i>	

Module I

Introduction to Electrical Engineering : Essence of electricity, Electric field; electric current, potential and potential difference, E.M.F, electric power, ohm's law, basic circuit components, Ideal and Practical Sources, Source Conversion, Induced EMF, Energy Stored in Inductor & Capacitor.

Practice:

1. Understanding working principle of DC potential (Lead-Acid battery). Specific gravity of electrolyte. Charging process of battery. Modern DC cells.
2. Plotting the V-I Characteristics of Incandescent lamp.

Module II

DC Networks : Laws and Theorems applicable to DC networks (KCL & KVL, Node voltage & Mesh current analysis, Delta-Star & Star-Delta conversion, Superposition principle, Thevenin's & Norton theorem), Transients in R-L and R-C circuits with DC excitation, Simple problems.

Practice:

3. Verification of Thevenin's theorem, Superposition and Nodal analysis (by experimental setup)
4. Verification of KCL and KVL in series and parallel circuits.
Observing current rise/fall due to transience in DC circuits in Oscilloscope.

Module III

Introduction to Electromagnetism : Magnetic Circuits, B-H curve, Permeability, Reluctance, Solution of simple magnetic circuits, Hysteresis and Eddy current loss. Methods of preventing such losses. Solenoids and field coils. Application of solenoids in different circuits in Automobiles in electrical protection Working principle of MCBs. Use of field coils in machines and instruments. Galvanometer.

Module IV**Practice:**

5. Study of operation of solenoids.
6. Study of operation of MCBs
7. Study of operation of field coils in machines.
8. Observation of generation of magnetic flux for different input current in a coil and plotting BH Curve.

Practice: Applications of electromagnetism.

9. Observing working of a coil, a Galvanometer.
10. Measurement of iron loss in a core from BH curve by using CRO
11. Observing Induction of Electro Motive Force in a DC generator with D.C Shunt Generator.

Module V

Single-Phase AC Circuits : Single-phase EMF Generation, Waveform and Phasor Representation, Average and Effective value of sinusoids, Peak factor & Form factor, Complex Impedance and Power using j-operator, Power factor.

Practice:

12. Connection & Measurement of power consumption of a fluorescent lamp/LED.
13. Calculation of current, voltage, power & power factor of series RLC circuit excited by 1- \emptyset A.C Supply.

Module VI

Three-Phase AC Circuits: Comparison between single-phase and three-phase systems, Three-phase EMF Generation, Line and Phase quantities in star and delta networks, Power and its measurement in three-phase balanced circuits.

Practice:

15. Measurement of power and power factor in a 3- \emptyset AC circuit by two wattmeter
16. Single-Phase Transformers : Construction and principle of operation, EMF Equation, Transformation ratio, Practical and Ideal transformers
Calculation of No-Load losses of a 1- \emptyset Transformer.

Module VII

Only Practice

17. Domestic Wiring; Switch Boards, Distribution boxes

18. Workshop wiring : Study of the wiring of electrical machine lab.

19. Concept of Earthing.

Reference

Text Books:

1. D C Kulshrestha, “Basic Electrical Engineering”, Tata Mc-Graw Hill Education
2. P K Sathpathy “Basic Electrical Engineering” Oxford

Reference Books :

1. Hughes, “Electrical & Electronic Technology”, Ninth Edition (Revised by J Hiley, K Brown, and I Smith), Pearson Education,

Session Plan

Topic coverage and Internal Test	No. of Sessions (in hrs.)	Activity (lecture, tutorial, lab practice, field studies/field-trip, Workshop etc.)	Assignment (project, assignment, field study, seminar, etc.)	Suggested Reading (Book, Video, Online source, etc.)
Introduction to Electrical Engineering : Essence of electricity, Electric field; electric current, potential and potential difference.	1	Lecture	Assignment	Book
Emf, electric power, ohm’s law	1	Lecture	Assignment	Video
basic circuit components, Ideal and Practical Sources	1	Lecture	Assignment	Book
Source Conversion	1	Lecture	Assignment	Book
Induced EMF	1	Lecture	Assignment	Book
Energy Stored in Inductor & Capacitor	1	Lecture	Assignment	Book
DC Networks : Laws and Theorems applicable to DC networks (KCL & KVL)	4	Practice	Experiments	Book
Node voltage	1	Lecture	Assignment	Book
Mesh current analysis	1	Lecture	Assignment	Book
Delta-Star & Star-Delta conversion	1	Lecture	Assignment	Book
Superposition principle	2	Practice	Experiments	Book

Thevenin's & Norton theorem	4	Practice	Experiments	Book
Transients in R-L and R-C circuits with DC excitation	2	Lecture	Assignment	Book
Simple problems	1	Tutorial	Assignment	Book
Magnetic Circuits : Introduction to Electromagnetism, B-H curve	1	Lecture	Assignment	Book
Permeability, Reluctance, Solution of simple magnetic circuits	1	Lecture	Assignment	Book
Hysteresis and Eddy current loss	1	Lecture	Assignment	Book
D.C. Machines : Construction	2	Practice	Experiments	Book
Classification and Principle of operation of DC machines, EMF equation of DC generator	1	Lecture	Assignment	Video
Speed Equation of DC Motor	4	Practice	Experiments	Book
Single-Phase AC Circuits : Single-phase EMF Generation, Waveform and Phasor Representation	2+1	Lecture (using videos) and Practice	Experiments	Video
Average and Effective value of sinusoids, Peak factor & Form factor	2	Lecture	Assignment	Video
Complex Impedance and Power using j-operator, Power factor.	2	Lecture	Assignment	Video
Three-Phase AC Circuits : Comparison between single phase and three-phase systems, Three-phase EMF Generation	2	Lecture	Assignment	Video
Line and Phase quantities in star and delta networks, Power and its measurement in three-phase balanced circuits.	1	Lecture	Assignment	Book
Single-Phase Transformers : Construction and principle of operation.	1+2	Lecture and Practice	Experiments	Book
EMF Equation, Transformation ratio	2	Lecture	Assignment	Book
Practical and Ideal transformers	1+2	Practice	Experiments	Book
Induction Motors :	2+2	Lecture and	Experiments	Book

Introduction to Three-phase and Single-phase Induction Motors, Concept of Slip		Practice		
Concept of Slip, Slip-Torque characteristics	1	Lecture	Assignment	Book
Measuring Instruments : Introduction, PMMC Ammeters and Voltmeters with extension of range	2	Lecture	Assignment	Book
Moving-Iron Ammeters and Voltmeters	1	Lecture	Assignment	Book
Dynamometer type Wattmeter, Energy meter	4	Practice	Experiments	Book
Domestic Wiring; Switch Boards, Distribution boxes	2	Practice	Experiments	
Workshop wiring : Study of the wiring of electrical machine lab.	2	Practice	Experiments	
Concept of Earthing.	2	Practice	Experiments	
Total- 68 Hours (Theory- 35 hours, Practice- 33hours)				

Electrical Machines

Course Title	Code	Type of course	T-P-PJ	Prerequisite
Electrical Machines	ENFC0405	Theory & Practice	2-1-0	Nil

Objective

- To introduce the students about principles of electromagnetism applied to AC & DC Machines and its importance.

Course Outcome

- Able to distinguish the constructional similarity and dissimilarity between various machines.
- Able to test and certify the machines as per BIS
- Able to select appropriate transformer and electrical machines
- Able to develop selection skill to identify the type of generators or motors required for particular application.

Evaluation Systems

Internal Examination	Component	% of Marks	Method of Assessment
	Internal Theory	20	Written examination
	Internal Practice	30(20+10)	Lab work + Learning Record
External Examination	External Theory	30	Written examination
	External Practice	20	Lab work
Total		100	

Course outline

Module: I

D.C. Machines: Construction, Classification and Principle of operation of DC machines, EMF equation of DC generator, Dc Motor Characteristics, Speed Equation of DC Motor. Characteristic for Speed Armature Current, Torque Armature Current and Speed Torque of (i) Separately Excited DC Motor, (ii) DC Shunt Motor, (iii) DC Series Motor, and (iv) DC Compound Motor, Comparison between Different types of DC Motors and their Application. (Lecture & practice)

Practice:

- Determination of OCC (Open Circuit Characteristics) of D.C Shunt Generator.
- Starting & Speed Control of D.C Shunt motor by (i) Field flux control method & (ii) armature voltage control method.

Module: II

Single-Phase Transformers: Construction and principle of operation, EMF Equation, Transformation ratio, Practical and Ideal transformers, Transformer losses, Brief idea on Transformer Phasor diagram and transformer rating

Practice:

- Calculation of No-Load losses of a 1-Ø Transformer.

Module: III

Three Phase Transformers: Three-phase transformer connections- Star-star, Two Single-Phase Transformers connected in Open Delta (V-Connection) and their rating, T-Connection (Scott Connection) of Two Single-Phase Transformers to convert Three-Phase balanced supply to Two-Phase balanced supply. Delta-delta, Star-delta, Delta-star, Zig-zag connections. Scott connection, Open delta connection. Auto Transformers

Module IV

Three Phase Induction Machines

Constructional Features of Squirrel Cage Rotor type and Slip Ring/Wound Rotor type of Induction Motors, Principle of Operation, and Slip Speed.

Practice:

4. Determination of Efficiency, Plotting of Torque-Slip Characteristics of Three Phase Induction motor by Brake Test.

Module: V

Three Phase Synchronous Generators: Synchronous Generator Construction (both Cylindrical Rotor and Salient Pole type), The Speed of Rotation of a Synchronous Generator, Induced voltage in A.C. Machines

Module: VI

Three Phase Synchronous Motors : Basic Principles of Motor operation, Construction, Starting Synchronous Motors, induction motor and Synchronous Motors, Synchronous Motor Ratings, Applications of synchronous motors(Class room teaching)

Module: VII

Single Phase Induction Motors: Starting of Single Phase Induction Motors, Speed Control of Single Phase Induction Motors, Circuit Model. Other types of Motors : Reluctance Motors.(Class room teaching)

Practice:

5. Determination of parameter of a single phase induction motor and study of

(a) Capacitor start induction motor

(b) Capacitor start and capacitor run induction motor

Text Books:

1. Electrical Machines – D P Kothari and I J Nagrath – Tata McGraw Hill.

Reference Books:

1. Electrical Machinery – P S Bimbhra – Khanna Publishers.

2. Electrical Machines - P. K. Mukherjee, S. Chakravarti, Dhanpat Rai & Sons

Session Plan

Topic coverage and Internal Test	No. of Sessions (in hrs.)	Activity (lecture, tutorial, lab practice, field studies/field-trip, Workshop etc.)	Assignment (project, assignment, field study, seminar, etc.)	Suggested Reading (Book, Video, Online source, etc.)
D.C. Machines : Construction	2	Lecture	Assignment	Book
Classification and Principle of operation of DC machines, EMF equation of DC generator	3	Lecture	Assignment	Video
Speed Equation of DC Motor	2	Practice	Experiments	Book
Characteristic for Speed Armature Current, Torque Armature Current	2	Lecture	Assignment	Book
Comparison between Different types of DC Motors and their Application.	1	Lecture	Assignment	Book
Speed Torque of (i) Separately Excited DC Motor, (ii) DC Shunt Motor, (iii) DC Series Motor, and (iv) DC Compound Motor	2	Lecture	Assignment	Book
Determination of OCC (Open Circuit Characteristics) of D.C Shunt Generator.	2	Practice	Experiments	Book
Starting & Speed Control of D.C Shunt motor by (i) Field flux control method & (ii) armature voltage control method.	2	Practice	Experiments	Book
Single-Phase Transformers : Construction and principle of operation, EMF Equation, Transformation ratio, Practical and Ideal transformers, Transformer losses, Brief idea on Transformer Phasor diagram and transformer rating	2	Lecture	Assignment	Book
Calculation of No-Load losses of a 1- \emptyset Transformer.	3	Practice	Experiments	Book
Three Phase Transformers : Three-phase transformer connections- Star-star	1+2	Lecture (using videos) and Practice	Experiments	Video

Two Single-Phase Transformers connected in Open Delta (V-Connection) and their rating,	2	Lecture	Assignment	Video	
T-Connection (Scott Connection) of Two Single-Phase Transformers to convert Three-Phase balanced supply to Two-Phase balanced supply.	2	Lecture	Assignment	Video	
Delta-delta, Star-delta, Delta-star, Zig-zag connections.	2	Lecture	Assignment	Video	
Scott connection, Open delta connection.	5	Practice	Experiments	Book	
Auto Transformers.	1	Lecture	Experiments	Book	
THREE PHASE INDUCTION MACHINES : Constructional Features of Squirrel Cage Rotor type and Slip Ring/Wound Rotor type of Induction Motors,	2	Lecture	Assignment	Book	
Principle of Operation, Slip Speed	1	Lecture	Assignment	Video	
THREE PHASE SYNCHRONOUS GENERATORS : Synchronous Generator Construction (both Cylindrical Rotor and Salient Pole type),	2+2	Lecture Practice	+	Experiments	Book
The Speed of Rotation of a Synchronous Generator, Induced voltage in A.C. Machines	3	Lecture	Assignment	Book	
THREE PHASE SYNCHRONOUS MOTORS Basic Principles of Motor operation, Construction	2+1	Lecture Practice	&	Assignment	Book
Starting Synchronous Motors, induction motor and Synchronous Motors, Synchronous Motor Ratings, Applications of synchronous motors(Class room teaching)	2	Lecture	Assignment	Book	
SINGLE PHASE INDUCTION MOTORS : Starting of Single Phase Induction Motors, Speed Control of Single Phase Induction Motors, Circuit Model. Other types of Motors : Reluctance Motors.	3+6	Lecture Practice	and	Experiments	Book

Determination of parameter of a single phase induction motor and study of (a)Capacitor start induction motor (b) Capacitor start and capacitor run induction motor				
Total : 57 Hours (Theory- 35 hours, Practice- 25 hours)				

Introduction to Automation

Course Title	Code	Type of course	T-P-PJ	Prerequisite
Introduction to Automation	ENFC0406	Theory & Practice	2-1-0	Nil

Objective

- | |
|--|
| <ul style="list-style-type: none"> To provide knowledge levels needed for PLC programming and operating. To train the students to develop a relay based control circuit. |
|--|

Course Outcome

- | |
|--|
| <ul style="list-style-type: none"> Gain knowledge on Programmable Logic Controllers Understand different types of Devices to which PLC input and output modules are connected Provide the knowledge about understand various types of PLC registers |
|--|

Evaluation Systems

Internal Examination	Component	% of Marks	Method of Assessment
	Internal Theory	20	Written examination
	Internal Practice	30(20+10)	Lab work + Learning Record
External Examination	External Theory	30	Written examination
	External Practice	20	Lab work
Total		100	

Module -: I (5 Hours)

Introduction to Automation

What is Automation, Brief history of Automation, Automation Uses, Automation - PLC Basics, Mechanical relays versus PLC, PLC Architecture, Functions of various blocks, and working principle of PLC?

Module: II (8 Hours)

PLC Hardware & Terminology

Various Types of Addressing Used within a PLC, PLC Programming input instructions

Practice:

Study of hardware of PLC.

Module: III (9Hours)

Programming PLC's

Differences between Types of Programming, construction of PLC ladder diagrams, Controlling Program Flow in a Ladder Logic Program.

Practice:

Basic programming using ladder logic program

Module: IV (11 Hours)

Timers and Counters

What is timers & Counters, Use of timers and counters within a ladder logic program, Basic concepts of function blocks.

Practice:

Study of latching and unlatching of motor.

Module: V (7 Hours)

PLC Communication

What are the common types of data communications and their characteristics and use of Ethernet TCP/IP protocol.

Practice:

Sequential operation.

Module: VI (5 Hours)

Introduction to SCADA

Introduction and SCADA Basics. Importance of SCADA in Industrial Automation.

Module: VII (15 Hours)

Basic operation of SCADA

Basic operations related to SCADA. How to work on windows property.

Practice:

Basic window property concepts of SCADA.

Session Plan

Topic coverage and Internal Test	No. of Sessions (in hrs.)	Activity (lecture, tutorial, lab practice, field studies/field-trip, Workshop etc.)	Assignment (project, assignment, field study, seminar, etc.)	Suggested Reading (Book, Video, Online source, etc.)
MODULE I (Introduction To Automation) (Theory- 5 hours)				
What is Automation, Brief history of Automation	1	Lecture	Assignment	Text Book 1
Automation Uses, Automation - PLC Basics	1	Lecture	Assignment	Text Book 1
Mechanical relays versus PLC, PLC Architecture	1	Lecture	Assignment	Text Book 1
Functions of various blocks, working principle of PLC.	2	Lecture	Assignment	Text Book 1
MODULE II (PLC Hardware & Terminology) (Theory- 04 hours, Practice - 04 hours)				
Various Types of Addressing Used within a PLC	2	Lecture	Assignment	Text Book 1
PLC Programming input instructions	2	Lecture	Assignment	Text Book 1
Study of hardware of PLC.	4	Practice	Result of Experiments and Viva	Text Book 1
MODULE III (Programming PLC's) (Theory- 4 hours, Practice –05 hours)				
Differences between Types of Programming	2	Lecture	Assignment	Text Book 1
Construction of PLC ladder diagrams. Controlling Program Flow in a Ladder Logic Program.	2	Lecture	Assignment	Text Book 1
Basic programming using ladder logic program	5	Practice	Result of Experiments and Viva	Text Book 1

MODULE IV(Timers and Counters) (Theory- 06 hours, Practice –05 hours)				
What is timers & Counters,	4	Lecture	Assignment	Text Book 1
Use of timers and counters within a ladder logic program, Basic concepts of function blocks.	2	Lecture	Assignment	Text Book 1
Study of latching and unlatching of motor.	5	Practice	Result of Experiments and Viva	Text Book 1
MODULEV(PLC Communication) (Theory- 02 hours, Practice –05 hours)				
What are the common types of data communications and their characteristic sand use of Ethernet TCP/IP protocol.	2	Lecture	Assignment	Text Book 1
Sequential operation	5	Practice	Result of Experiments and Viva	Text Book 1
MODULE VI(Introduction To SCADA) (Theory- 5 hours)				
Introduction and SCADA Basics	3	Lecture	Assignment	Text Book 1
How to work on windows property	2	Lecture		Text Book 1
MODULE VII(Basic operation of SCADA) Theory- 04 hours, Practice –11 hours)				
Basic operations related to SCADA	2	Lecture	Assignment	Text Book 1
How to work on windows property	2	Lecture	Assignment	Text Book 1
Basic window property concepts of SCADA.	11	Practice	Result of Experiments and Viva	Text Book 1
Total- 60 Hours (Theory- 30 hours Practice-30 hours)				

Introduction to Web Technology

Course Title	Code	Type of course	T-P-PJ	Prerequisite
Introduction to Web Technology	ENFC0407	Theory & Practice	2-1-0	Nil

Objective

- This course is intended to teach the basics involved in publishing content on the World Wide Web. This includes the fundamentals of how the Internet and the Web function, a basic understanding of graphic production with a specific stress on creating graphics for the Web and general grounding introduction to more advanced topics such as programming scripting. This will also explore expose students to the basic tools and applications used in Web publishing.

Course Outcome

- Students may also create web pages using XHTML and Cascading Style Sheets. Build dynamic web pages using JavaScript (Client side programming).
- Create XML documents and Schemas. Build interactive web applications using AJAX.

Evaluation Systems

Internal Examination	Component	% of Marks	Method of Assessment
	Internal Theory	20	Written examination
	Internal Practice	30(20+10)	Lab work + Learning Record
External Examination	External Theory	30	Written examination
	External Practice	20	Lab work
Total		<i>100</i>	

Module : I (5 hrs)

What is Web? What is WWW, Web site - Static and Dynamic web site, Web application - Client-server, Web development Technologies- Html, CSS, Js, XML, Servlet & JSP, PHP and Ajax.

Module : II (7 hrs)

Introduction to Html, Html structure, Html Editors, Html element/tag & attributes, Designing simple page - Html tag, Head tag, Body tag; More Html tags - Anchor tag, Image tag, Table tag, List tag, Frame tag, Div. tag, Html forms - Input type, Text area, Select, Button.

Module : III (5 hrs)

Introduction to CSS, Syntax, Selectors, Embedding CSS to Html, Formatting fonts, Text & background color, Borders & boxing

Module : IV (6 hrs)

Introduction to JS, Embedding JS into Html, Variables, Data types, Operators, Conditional statements, Looping statements, Strings, Arrays, Math Object, Date Object, Functions, Objects, Event Handling.

Module : V (3 hrs)

Introduction to XML, Difference b/w Html & XML, XML editors

Module : VI (3 hrs)

XML Elements & Attributes XML DTD, XML Schema

Module : VII (4 hrs)

XML Schema, XML DOM

E-content : LMS Content

Reference Books :

1. HTML, XHTML & CSS Bible, Brian Pfaffenberger, Steven M.Schafer, Charles White, Bill Karow- Wiley Publishing Inc, 2010 .
2. HTML Black Book by Steven Holzner 2011
3. Web Design with HTML, CSS, JavaScript and jQuery Set by Jon Duckett.
4. Beginning Java Script with DOM scripting and Ajax By Christian Heilmann- Apress Publisher, 2010.
5. Learning PHP & My SQL, Michele Davis, Jon Philips- O'Reilly Publisher, 2009.
6. PHP Cook book By : David Sklar, Adam Trachtenberg- O'Reilly Publisher, 2008

Introduction to Web Technology Lab List of Programs :

1. Create a simple web page using HTML
2. Create and HTML page with a table and a set of ordered and unordered list.
3. Use CSS in the above web page
4. Design a web page for a company XYZ
5. Develop a static web page that shows basic animation
6. Develop a web page for an audio company
7. Develop a dynamic web page
8. Develop a dynamic web page using DHTML and CSS
9. Consider a company ABC which is into selling movie CDs. Develop a web page for the company.
10. Create a web site in which you can navigate from one page to another
11. Create a dynamic web page for a college
12. Organize a set of data using XML

Session Plan

Topic coverage and Internal Test	No. of Sessions (in hrs.)	Activity (lecture, tutorial, lab practice, field studies/field-trip, Workshop	Assignment (project, assignment, field study, seminar, etc.)	Suggested Reading (Book, Video, Online source, etc.)

		etc.)		
Module-I (Total Theory = 5 Hours)				
What is Web?, What is WWW, Web site - Static and Dynamic web site,	2	Class Room Teaching+ PPT	Assignment	Book,Online Sources,SLM
Web application - Client-server, Web development Technologies- Html, CSS, Js, XML, Servlet & JSP, PHP and Ajax.	3	Class Room Teaching+ PPT	Assignment	Book,Online Sources,SLM
Module II (Total Theory = 7 Hour /Practical= 8 Hour)				
Introduction to Html, Html structure, Html, Editors, Html element/tag & attributes, Designing simple page - Html tag, Head tag, Body tag; More Html tags - Anchor tag, Image tag, Table tag, List tag	3+4	Class Room Teaching+ PPT+Practical	Assignment	Book,Online Sources,SLM
Frame tag, Div tag ; Html forms - Input type, Text area, Select , Button.	3+4	Class Room Teaching+ PPT+Practical	Assignment	Book,Online Sources,SLM
Module III (Total Theory = 5 Hours / Practical= 7 Hours)				
Introduction to CSS, Syntax, Selectors	2+3	Class Room Teaching+ PPT+Practical	Assignment	Book,Online Sources,SLM
Embedding CSS to Html, Formatting fonts, Text & background colour, Borders & boxing.	3+4	Class Room Teaching+ PPT+Practical	Assignment	Book,Online Sources,SLM
Module-IV (Total Theory= 6 hour / Practical = 7 Hour)				
Introduction to JS, Embedding JS into Html, Variables, Data types	2	Class Room Teaching+ PPT+Practical	Assignment	Book,Online Sources,SLM

Operators, Conditional statements, Looping statements, Strings, Arrays, Math Object, Date Object, Functions, Objects	2+5	Class Room Teaching+ PPT+Practical	Assignment	Book,Online Sources,SLM
Event Handling	2+2	Class Room Teaching+ PPT	Assignment	Book,Online Sources,SLM
Module-V (Total Theory= 3 Hour/ Practical = 1 Hour)				
Introduction to XML, Difference b/w Html & XML	3+1	Lecture	Assignment	Book,Online Sources,SLM
Module-VI (Total Theory= 3 Hour/ Practical = 1 Hour)				
XML editors, XML Elements. XML Schema	3+1	Class Room Teaching+ PPT+Practical	Assignment	Book,Online Sources,SLM
Module-VII (Total Theory = 4 Hour/ Practical = 0 Hour)				
XML Schema, XML DOM	4	Class Room Teaching + PPT + Practical	Assignment	Book, Online Sources, SLM
Total (hrs)	Total = 57 Hours (Theory 33 Hours + Practical 24 Hours)			

Information Security-I

Course Title	Code	Type of course	T-P-PJ	Prerequisite
Information Security-I	FCEN 0408	Theory & Lab	2-1-0	Nil

Objective

- Get a clear understanding of Types of Threats, Vulnerabilities, Risks and various terminologies in Information Security.
- Understand C I A of Security and Ease of Use Triangle in Information Security
- Understand Access Controls and Physical security measures to safeguard the Assets
- Understand System And Server Security And Internet Security
- Understand Cyber Law and its need

Course Outcome

- Students will understand the importance of CIA Traid (Confidentiality, Integrity and Availability) and advantage of Security
- The student will be able to safeguard their Assets

Evaluation Systems

Internal Examination	Component	% of Marks	Method of Assessment
	Internal Theory	20	Written examination
	Internal Practice	30(20+10)	Lab work + Learning Record
External Examination	External Theory	30	Written examination
	External Practice	20	Lab work
Total		100	

Module: I INTRODUCTION (7 Hours)

Security Definition, Why Security, Security and its need, Current Trends and Statistics, Basic Terminology, The C I A of Security the Relation : Security functionality and Ease of Use Triangle

Module : II USER IDENTITY AND ACCESS MANAGEMENT (4 Hours)

User identity and Access Management : Authentication, Account Authorization, Validation, Access Control and Privilege management.

Module : III HASHING AND CRYPTOGRAPHY (6 Hours)

Hashing and Cryptography- Encryption and Decryption

Module : IV SYSTEM AND SERVER SECURITY (9 Hours)

System Security, Desktop & Server Security, Firewalls, Password cracking Techniques, Key-logger, viruses and worms, Malwares & Spy wares, Windows Registry

Module : V INTERNET SECURITY (5 Hours)

Internet Security : LAN Security, Email Security, Hacking attacks, preventive measures

Module : VI RISK ASSESSMENT (6 Hours)

Vulnerability Assessment, Penetration Testing, Risk Assessment, Threat, Vulnerability

Module : VII CYBER LAWS (3 Hours)

Cyber Laws – India Context

E-content : LMS Content

Text Books :

Information Systems Security : Security Management, Metrics, Frameworks And Best Practices - Nina Godbole, ISC2 Press, 2010

Mark Stamp's Information Security : Principles and Practice (WIND) Paperback – 2009 by Deven N. Shah, Wiley (2009)

Information Security Risk Analysis - Thomas R. Peltier, Third Edition, Pub : Auerbach, 2012

Information Security : The Complete Reference by Mark Rhodes-Ousley, McGraw Hill Education; Second edition (1 May 2013)

Cyber Security by Nina Godbole, Sunit Belapure, Wiley, 2011

Online Sources :

http://www.cengage.com/resource_uploads/downloads/1111138214_259146.pdf

http://www.eecs.yorku.ca/course_archive/2013-4/F/4482/CSE4482_01_Introduction_2013_posted.pdf

<http://iso-27001-2013.blogspot.in/2015/05/information-security-professionals.html>

<https://www.sans.org/reading-room/whitepapers/services/identity-access-management-solution-1640>

<http://searchsecurity.techtarget.com/definition/access-control>

<http://searchsecurity.techtarget.com/definition/access-control>

<http://www.slideshare.net/ColMukteshwarPrasad/cyber-law-crime-m>

ftp://mail.im.tku.edu.tw/Prof_Liang/IRM/10%20An%20Introduction%20to%20Factor%20Analysis%20of%20Information%20Risk.pdf

http://www.wciapool.org/pdf/Tab_5_10_Immutable_Laws_of_Security.pdf

<https://www.sans.org/reading-room/whitepapers/basics/vulnerability-assessment-421>

Session Plan

Topic coverage and Internal Test	No. of Sessions (in hrs.)	Activity (lecture, tutorial, lab practice, field studies/field-trip, Workshop etc.)	Assignment (project, assignment, field study, seminar, etc.)	Suggested Reading (Book, Video, Online source, etc.)
MODULE 1 : Introduction (Theory- 7 hours, Practice- 8 hours)				
Security Definition, Why Security, Security and its need	2	Lecture	Assignment	Book, Online source, SLM
Current Trends and Statistics, Basic Terminology	2	Lecture	Assignment	Book, Online source, SLM
The C I A of Security the Relation : Security functionality and Ease of Use Triangle	3	Lecture	Assignment	Book, Online source, SLM
System Security Configuration in Windows 7 I & II	2	Practice	Experiments	Online source, Video
DOS attacks and its prevention	2	Practice	Experiments	Online source, Video
Password Based Authentication Process	2	Practice	Experiments	Online source, Video
Service Management of Windows 7 for prevention of attacks.	2	Practice	Experiments	Online source, Video
MODULE II USER IDENTITY AND ACCESS MANAGEMENT (Theory- 4 hours)				
User identity and Access Management : Authentication, Account Authorization	2	Lecture	Assignment	Book, Online source

Validation, Access Control and Privilege management.	2	Lecture	Assignment	Book, Online source
MODULE III HASHING AND CRYPTOGRAPHY(Theory- 6 hours, Practice- 3 hours)				
Hashing	2 + 1	Lecture + Practice	Experiment	Book, Online source
Cryptography- Encryption and Decryption	4	Lecture	Assignment	Book, Online source
Event logger analysis	2	Practice	Experiment	Book, Online source
Module IV SYSTEM AND SERVER SECURITY (Theory- 9 hours, Practice- 7 hours)				
System Security, Desktop & Server Security	2	Lecture	Assignment	Book,Online ,SLM
Firewalls	2+2	Lecture + Practice	Experiment	Book,Online ,SLM
Password cracking Techniques	2+2	Lecture + Practice	Experiment	Book,Online ,SLM
Key-logger	1+2	Lecture + Practice	Experiment	Book,Online ,SLM
viruses and worms, Malwares & Spy wares	1	Lecture	Assignment	Book,Online ,SLM
Windows Registry	1+1	Lecture + Practice	Experiment	Book,Online ,SLM
Module V INTERNET SECURITY (Theory- 5 hours, Practice- 0 hours)				
LAN Security	2	Lecture	Assignment	Book,Online,SLM
Hacking attacks, preventive measures	2	Lecture	Assignment	Book,Online,SLM
Security on E-mail	1	Lecture	Assignment	Book,Online,SLM
Module VI INTERNET SECURITY (Theory- 6 hours, Practice-2 hours)				
Vulnerability Assessment	2 +2	Lecture + Practice	Experiment	Book,Online ,SLM
Penetration Testing	2	Lecture	Assignment	Book,Online,SLM

Risk Assessment	1	Lecture	Assignment	Book,Online,SLM
Threat, Vulnerability	1	Lecture	Assignment	Book,Online,SLM
Module VII Cyber Law (Theory- 3 hours)				
Cyber Laws – Indian Context.	2	Lecture	Assignment	Book,Online,SLM
Importance of Cyber Law	1	Lecture	Assignment	Book,Online,SLM
Total (hrs) : 60 Hours (Theory- 40 hours, Practice- 20 hours)				

Programming in C

Course Title	Code	Type of course	T-P-PJ	Prerequisite
Programming in C	ENFC0409	Theory & Practice	2-1-0	Nil

Objective

- To provide basic knowledge of programming tools and techniques.
- To familiarize the programming environment and syntax of C programming.
- To understand the working of basic programming constructs.

Course Outcome

- The students will able to apply programming skills to problem solving.
- The student will able to write 150 to 200 line programs without any error.

Evaluation Systems

Internal Examination	Component	% of Marks	Method of Assessment
	Internal Theory	20	Written Examination
	Internal Practice	30 (20+10)	Lab Work + Learning Record
External Examination	External Theory	30	Written Examination
	External Practice	20	Lab Work
Total		100	

Course outline

Module I :Problem Solving Techniques (10Hours)

Problem solving techniques : Algorithm, flow chart; Structure of C program, Character set, Identifiers, Keywords, Data Types, Constants and Variables, Input-output statements, relational and logical operators, increment and decrement operators, conditional operator, bit-wise operators, assignment operators, expressions, type conversions, conditional expressions, precedence and order of evaluation.

Module II : Control Structures (7Hours)

Statements and blocks, if and switch statements, loops : -while, do-while and for statements, break, continue, goto.

Module III : Array(7Hours)

Arrays-concepts, declaration, definition, accessing elements, two-dimensional and multi-dimensional arrays, applications of arrays.

Module IV : Functions(15 Hours)

Designing structured programs Functions, parameter passing, user defined functions, recursive functions, storage classes- extern, auto, register, static, scope rules.

Module V : Pointern (15 Hours)

Pointers- concepts, initialization of pointer variables, pointers and function arguments, address arithmetic, Character pointers and functions, pointers to pointers, pointers and multidimensional arrays, dynamic memory management functions, command line arguments.

Module VI : Structures(11Hours)

Derived types-structures-declaration, definition and initialization of structures, accessing structures, nested structures, arrays of structures, structures and functions, pointers to structures, self referential structures, unions,

Module VII : Files (10Hours)

Typedef, bit fields, C program examples. Input and output–concept of a file, text files and binary files, streams, standard I/O, Formatted I/O, file I/O operations.

Text Books :

1. E. Balaguruswamy “Programming in C”, Tata McGraw Hill 3rd Edition
2. Y. Kanetkar, “Let us C”, BPB Publications-9th edition.

Reference Books :

1. H. Scheldt, “C The Complete Reference”, Tata McGraw Hill
2. B.W. Kernighan & D.M. Ritchie, "C Programming Language", PHI.
3. Gotterfried, Schaum Series-“C Programming”.

Session Plan

Topic coverage and Internal Test	No. of Sessions (in hrs.)	Activity (lecture, tutorial, lab practice, field studies/field-trip, Workshop etc.)	Assignment (project, assignment, field study, seminar, etc.)	Suggested Reading (Book, Video, Online source, etc.)
Module I 5 hrs lectures + 3 hrs practice				
Problem solving techniques : Algorithm Problem solving techniques : flow chart	1	lecture	assignment	Book
Structure of C program Character set, Identifiers Keywords, Data Types, Constants and Variables, Input-output statements	1+1	lecture, quiz	assignment	Book

Relational and logical operators, increment and decrement operators	1	lecture	assignment	Book
Conditional operator, bit-wise operators, assignment operators	1+2	lecture, practice	assignment	Book
Expressions, type conversions Conditional expressions, precedence and order of evaluation	1	lecture		Book
Module II 4 hrs lectures + 5 hrs practice				
Statements and blocks, if and switch statements	2+1	lecture, practice	assignment	Book
loops : -while, do-while	1+2	lecture, practice	assignment	Book
for statements, break, continue, goto	1+2	lecture, practice	assignment	Book
Module III 5 hrs lectures + 5 hrs practice				
Arrays-concepts Declaration, definition, accessing elements, programs	1+2	lecture, practice, quiz	assignment	Book
two-dimensional arrays multi-dimensional arrays	2+2	lecture, practice	assignment	Book
applications of arrays	2+1	lecture, practice	assignment	Book
Module IV 5 hrs lectures + 4 hrs practice				
Designing structured programs : -Functions	1	lecture, practice	assignment	Book
parameter passing, user defined functions	2+2	lecture, practice	assignment	Book
recursive functions	1+1	lecture,	assignment	Book

		practice		
storage classes-extern, auto, register, static, scope rules	1+1	lecture, practice	assignment	Book
Module V 5 hrs lectures + 4 hrs practice				
pointers-concepts, initialization of pointer variables	1	lecture	assignment	Book
pointers and function arguments, address arithmetic, Character pointers and functions	2+2	lecture, practice	assignment	Book
pointers to pointers, pointers and multidimensional arrays	1+1	lecture, practice	assignment	Book
dynamic memory management functions, command line arguments	1+1	lecture, practice	assignment	Book
Module VI 6 hrs lectures + 5 hrs practice				
Derived types-structures-declaration, definition and initialization of structures, accessing structures	2+2	lecture, practice	assignment	Book
nested structures, arrays of structures	2+1	lecture, practice	assignment	Book
pointers to structures, self referential structures	1+1	lecture, practice	assignment	Book
unions	1+1	lecture, practice	assignment	Book
Module VII 4 hrs lectures + 6 hrs practice				
Typedef, bit fields Input and output–concept of a	2+2	lecture, practice	assignment	Book

file, text files and binary files, streams				
standard I/O, Formatted I/O	1+2	lecture, practice	assignment	Book
file I/O operations	1+2	lecture, practice	assignment	Book
Total (hrs)	34+32			

Desktop Operating System (Windows 10)

Course Title	Code	Type of course	T-P-PJ	Prerequisite
Desktop Operating System (Windows 10)	ENFC0410	Theory & Practice	2-1-0	FCEN0119 Operating System Building Blocks

Objective

- To install and configure Windows 10 enterprise.
- Configure networks, security settings in Windows 10 enterprise.

Course Outcome

- Student will able to install windows 10 enterprise.
- Student will able to configure devices, security settings, firewall in Windows 10 enterprise.

Evaluation Systems

Internal Examination	Component	% of Marks	Method of Assessment
	Internal Theory	20	Written examination
	Internal Practice	30(20+10)	Lab work + Learning Record
External Examination	External Theory	30	Written examination
	External Practice	20	Lab work
Total		100	

Module : I Installing, upgrading and managing Windows (4 Hrs.)

Gathering hardware devices, preparing to install windows, upgrading and migrating, Clean and Image based installation, Configuring Application Compatibility

Module : II Windows Features ,device drivers and disk managemnt (4 Hrs.)

Administrating windows features, Disk management, and installing and configuring device drivers.

Module : III File Access, Printers with Windows (4 Hrs.)

Introduction to Authentication and Authorization, Managing file access, Shared Folders, File compression, file archiving, managing printers

Module : IV Network connectivity with Windows (4 Hrs.)

Connecting windows client with server, configuring ipv4 & ipv6 connectivity, Implementing APIPA, Introduction to Name resolution, troubleshooting network issues, Overview of wireless network, configuring wireless network.

Module : V Securing, Optimizing and maintaining windows Client (5 Hrs.)

Overview of local security management, local security policy settings, EFS and Bitlocker, Application restrictions, UAC, Windows Firewall, Windows Defender.

Module : VI Configuring Browser and Mobile Computing in Windows (3 Hrs)

Administrating IE8, Configure Mobile computer and device settings

Module : VII Configuring Remote Access in windows (4 Hrs.)

Remote desktop, remote assistance, direct access, branch cache.

LAB EXERCISES : ANY TEN LABS

Navigating and Customizing the User Interface

Navigating the Windows 10 User Interface

Configuring Start

Configuring the Desktop

Installing Windows 10

Upgrading Windows 7 to Windows 10

Migrating User Settings

3 .Configuring Windows 10

Using the Settings App

Using Control Panel

Using Windows Power Shell

Using GPOs

Synchronizing Settings with One Drive

Connecting a Microsoft Account

Synchronizing Settings between Devices

Configuring Network Connectivity

Verifying and Testing IPv4 Settings

Configuring Automatic IPv4 Settings

Configuring and Testing Name Resolution

Managing Storage

Adding a Disk

Creating a Simple Volume

Compressing a Folder

Enabling Disk Quotas

Creating a Storage Space

Configuring and Managing Permissions and Shares

Creating, Managing, and Sharing a Folder

Using Conditions to Control Access and Effective Permissions

Installing and Managing a Printer

Managing and Using a Printer

Configuring Windows 10 Web Browsers

Configuring and Using Microsoft Edge

Configuring and Using Internet Explorer

Data Security

Using EFS

Using Bit Locker

Device Security

Creating Security Policies

Testing Security Policies

Configuring UAC Prompts

Configuring and Testing AppLocker

Network Security
 Creating and Testing Inbound Rules
 Creating and Testing Outbound Rules
 Creating and Testing Connection Security Rules
 Configuring Windows Defender
 Troubleshooting and Recovery
 Managing Device Drivers
 Using File History to Recover Files
 Using Previous Versions to Recover Files
 Recovering a Device with a Restore Point
 Using the Advanced Start-up Options to Recover a Device

Reference

E-content : www.krackin.com

Text Books :

1. Milan Milenkovic, “Operating Systems”, TATA McGraw Hill, 2009
2. Andrew Bettany, Andrew Warren, “Installing and Configuring Windows 10” , Microsoft Press, 2016D. Irtegov, “Operating Systems Fundamentals”, Charles River Media, 2002
1. Microsoft Official Academic Course, “Installing and Configuring Windows 10 Lab Manual”, Microsoft Press, 2017

Online Source : Microsoft academy, [http : //technet.microsoft.com](http://technet.microsoft.com)

Session Plan

Topic coverage and Internal Test	No. of Sessions (in hrs.)	Activity (lecture, tutorial, lab practice, field studies/field-trip, Workshop etc.)	Assignment (project, assignment, field study, seminar, etc.)	Suggested Reading (Book, Video, Online source, etc.)
Module : I Lecture=4 Lab Practice=2				
Installing, upgrading and managing Windows 10 : Gathering hardware devices, preparing to install windows.Up grading and migrating, Clean and Image based installation.Configuring Application Compatibility,	4+2	Lecture, lab practice	experiment	Book, Online source
Module : II Lecture=4 Lab Practice=4				

Configuring Application Compatibility, administrating windows features, Disk management, and installing and configuring device drivers.	4+4	Lecture, lab practice	experiment	Book, Online source
Module : III Lecture=4 Lab Practice=3				
Introduction to Authentication and Authorization, Managing file access, Shared Folders, File compression, file archiving, managing printers	2+1	Lecture, lab practice	Experiment	Book, Online source
File compression, file archiving, managing printers.	2+2	Lecture, lab practice	Experiment	Book, Online source
Module : IV Lecture=4 Lab Practice=2				
Connecting windows client with server, configuring ipv4 & ipv6 connectivity, Implementing APIPA.	2+1	Lecture, lab practice	Experiment	Book, Online source
Introduction to Name resolution, troubleshooting network issues, Overview of wireless network, configuring wireless network.	2+1	Lecture, lab practice	Experiment	Book, Online source
Module : V Lecture=5 Lab Practice=3				
Securing, Optimizing and maintaining windows 10 Client : Overview of local security management	1	Lecture		Book, Online source
local security policy settings.	1+1	Lecture, lab practice	Experiment	Book, Online source
EFS and Bit locker, Application restrictions. UAC,.	2+1	Lecture, lab practice	Experiment	Book, Online source

Windows Firewall. Windows Defender	1+1	Lecture, lab practice	Experiment	Book, Online source
Module : VI Lecture=3 Lab Practice=2				
Configuring Mobile Computing and Remote Access in windows 10 : Configure Mobile computer and device settings.	3+2	Lecture, lab practice	Experiment	Book, Online source
Module : VII Lecture=3 Lab Practice=2				
Remote desktop, remote assistance, direct access, branch cache.	3+2	Lecture, lab practice	Experiment	Book, Online source
Total (hrs)	46			

Principles of Biochemistry

Course Title	Code	Type of course	T-P-PJ	Prerequisite
Principles Of Biochemistry	FCEN0408	Theory & Practice	3-2-0	Nil

Objective

- To study the structure and properties of carbohydrates.
- Discuss the structure, properties and reactions of proteins and amino acids
- Discuss the structure, properties of fats and lipids
- To study the composition, structure and functions of nucleic acids

Course Outcome

- Aims at providing an elementary knowledge of bio molecules and its application

Evaluation Systems

Internal Examination	Component	% of Marks	Method of Assessment
	Internal Theory	20	Written examination
	Internal Practice	30(20+10)	Lab work + Learning Record
External Examination	External Theory	30	Written examination
	External Practice	20	Lab work
Total		<i>100</i>	

Course outline

Module : I

Biochemical Organization

Scope of clinical biochemistry, component of the cell, structure and biochemical functions, membrane structure and functions, transport through biological cell membrane

Module : II

Bioenergetics

Concept of free energy, determination of change in free energy from equilibrium constant and reduction potential, bioenergetics and biological oxidation – general concept of oxidation and reduction

Module : III

Electron transport chain, oxidative phosphorylation, uncouplers and theories of biological oxidation and oxidative phosphorylation.

Module : IV

Carbohydrates :

Classification, properties. Starch, glycogen, dextrin, inulin, cellulose, metabolism of carbohydrates, gluconeogenesis, glycogenolysis, glycolysis. Citric acid cycle and its biological significance, role of sugar in nucleotide biosynthesis and pentose phosphate pathway.

Module : V

Lipids :

Classification, properties. sterols, essential fatty acids, eicosanoids, phospholipids, sphingolipids, metabolism of lipids, oxidation of fatty acids, α, β - oxidation and biosynthesis of ketone bodies, cholesterol, porphyrin biosynthesis, metabolism of bile pigments.

Module : VI

Amino acids and nucleic acids :

Classification, properties, biosynthesis of amino acids and proteins, essential amino acids, metabolism of amino acids and proteins, Nitrogen balance, genetic code, nucleic acids, and structure of DNA and RNA, purine biosynthesis and pyrimidine biosynthesis.

Module : VII

Macromolecules, Vitamins, Hormones, Enzymes

Physical and chemical properties, structure of haemoglobin, immunoglobulins and nucleoprotein, classification and their properties, occurrence, functions, requirements, deficiency manifestations and role of vitamins as coenzyme, chemical nature and properties, hormones, Nomenclature, enzyme kinetics, Michelles-Menten equation, classification and their properties, mechanism of action, enzyme inhibition, coenzyme significance and enzymes of clinical importance.

LIST OF EXPERIMENTS (Any 8)

1. pH measurements and preparation of buffers.
2. Qualitative tests for Carbohydrates.
3. Estimation of sugars.
4. Estimation of proteins by Lowry's method / Biuret method.
5. Estimation of cholesterol by Zak's method.
6. Determination of saponification number of lipids.
7. Estimation of Amino acids.
8. Separation of amino acids - Thin layer chromatography.
9. Separation of sugars - Paper chromatography
10. Biochemical estimation of DNA /RNA using Spectrophotometer

Text Books :

1. Biochemistry by Jeremy M.Berg, John L.Tymozko, Lubert Stryer, Fifth edition, W.H.Freeman and Company, 1514 pages.
2. Thomas M. Devlin. Textbook of Biochemistry with clinical correlations. Wiley Liss Publishers

Reference Books :

1. Burtis & Ashwood W.B. Tietz Textbook of Clinical chemistry. Saunders Company
2. Lubert Stryer W.H. Biochemistry. Freeman and company, New york.
3. Donald Voet & Judith G. Voet. Biochemistry. John Wiley and Sons, Inc.

Session Plan

Topic coverage and Internal Test	No. of Sessions (in hrs.)	Activity (lecture, tutorial, lab practice, field studies/field-trip, Workshop etc.)	Assignment (project, assignment, field study, seminar, etc.)	Suggested Reading (Book, Video, Online source, etc.)
Module I		lecture, tutorial, lab practice	assignment	Book, Video, Online source
Scope of clinical biochemistry	2			
component of the cell,	1			
membrane structure and functions, transport through biological cell membrane	2			
structure and biochemical functions	1			
Module II		lecture, tutorial, lab practice	assignment	Book, Video, Online source
Concept of free energy,	1			
determination of change in free energy from equilibrium constant and reduction potential,	2			
bioenergetics and biological oxidation	2			
general concept of oxidation and reduction	2			
Module III		lecture, tutorial, lab practice	assignment	Book, Video, Online source
Electron transport chain,	1			
oxidative phosphorylation, uncouplers	1			
theories of biological oxidation	1			
oxidative phosphorylation.	2			
Module IV		lecture,	assignment	Book, Video,

classification, properties. starch, glycogen, dextrin, inulin, cellulose	2	tutorial, lab practice		Online source
metabolism of carbohydrates, gluconeogenesis, glycogenolysis,	1			
glycolysis. citric acid cycle and its biological significance	1			
role of sugar in nucleotide biosynthesis and pentose phosphate pathway	2			
Module V		lecture, tutorial, lab practice	assignment	Book, Video, Online source
Classification, properties. sterols, essential fatty acids, eicosanoids	1			
phospholipids, sphingolipids	1			
metabolism of lipids, oxidation of fatty acids	2			
α, β - oxidation and biosynthesis of ketone bodies	1			
cholesterol, porphyrin biosynthesis	1			
metabolism of bile pigments.	1			
Module VI		lecture, tutorial, lab practice	assignment	Book, Video, Online source
Classification, properties, biosynthesis of amino acids and proteins,	2			
essential amino acids, metabolism of amino acids and proteins,	2			
Nitrogen balance, genetic code, nucleic acids, and structure of DNA and RNA,	1			
purine biosynthesis and pyrimidine biosynthesis.	2			

Module VII		lecture, tutorial, lab practice	assignment	Book, Video, Online source
Physical and chemical properties, structure of haemoglobin, immunoglobulins and nucleoprotein	2			
classification and their properties, occurrence, functions, importance	2			
requirements, deficiency manifestations and role of vitamins as coenzyme, chemical nature and properties,	1			
hormones, Nomenclature, enzyme kinetics,	1			
Michelles-Menten equation, classification and their properties,	2			
mechanism of action, enzyme inhibition, coenzyme significance and enzymes of clinical	1			
Total (hrs)	45+20			

Cell Biology

Course Title	Code	Type of course	T-P-PJ	Prerequisite
Cell Biology	FCEN0409	Theory & Practice	3-2-0	Nil

Objective

- To study cell structure and functions of organelle functions
- Exposure on transportations through cell membrane
- To focus on different receptors and model of signaling
- To introduce the concept of cell signaling

Course Outcome

- The course is aimed to make the student understand the basic concept of cell structure, membrane, cellular functions of different types of cell, modes of cellular signaling and signal amplification

Evaluation Systems

Internal Examination	Component	% of Marks	Method of Assessment
	Internal Theory	20	Written examination
	Internal Practice	30(20+10)	Lab work + Learning Record
External Examination	External Theory	30	Written examination
	External Practice	20	Lab work
Total		<i>100</i>	

Course outline

Module : I

Cell Structure and function

Origin and evolution of cells, molecular composition of cells, central role of enzymes, metabolic energy, biosynthesis of cell constituents, cell membrane

Module : II

Nucleus, Endoplasmic reticulum, Golgi apparatus and Lysosomes, Bioenergetics and Metabolism – Mitochondria, chloroplasts, Peroxisomes.

Module : III

Cell Division

Cell cycle – Mitosis, Meiosis, Molecules controlling cell cycle

Module : IV

Extra cellular matrix, role of matrix in cell enthore : Gap junctions, Tight junctions, Plasmodesmata.

Module : V**Transport across cell membrane**

Passive and Active Transport, Permeases, Ion channels, ATP pumps. Na^+ / K^+ / Ca^{2+} pumps uniport, symport antiporter system. Ligand gated / voltage gated channels, Agonists and Antagonists.

Module : VI**Signal Transductions**

Receptors – extracellular signaling, Cell surface / cytosolic receptors and examples, Different classes of receptors autocrine / paracrine / endocrine models, Secondary messengers molecules.

Module : VII

The Development and causes of cancer, tumour viruses, oncogenes, prevention and treatment

LIST OF EXPERIMENTS (Any 8)

1. Microscopic study of cell and cell organelles
2. Cell fractionation
3. Fixation, Dehydration, embedding and sectioning of tissues
4. Histology of extracellular matrix
5. Quantitative analysis of lipid classes by TLC
6. Isolation of microtubules
7. Isolation of actin and Myosin filaments
8. Isolation of Mitochondria
9. Nuclear staining
10. Stages of cell cycle.

Text Books :

1. The Cell : A molecular approach by Geoffrey M. Cooper. ASM Press, Pages : 673

Reference Books :

1. Molecular Biology of the Cell Edition 4, Roberts, Keith Alberts, Bruce Johnson, Alexander Raff, Martin Walter, Peter Lewis, Julian, Garland
2. Molecular Cell Biology, Lodish, Harvey Krieger, Monty Kaiser, Chris A. Berk, Arnold, W H Freeman & Co

Session Plan

Topic coverage and Internal Test	No. of Sessions (in hrs.)	Activity (lecture, tutorial, lab practice, field studies/field-trip, Workshop etc.)	Assignment (project, assignment, field study, seminar, etc.)	Suggested Reading (Book, Video, Online source, etc.)
Module I		lecture, tutorial, lab practice,	assignment	Book, Video, Notes
Origin and evolution of cells	2			
molecular composition of cells, cell membrane	1			
central role of enzymes, metabolic energy, biosynthesis of cell constituents	2			
Module II		lecture, tutorial, lab practice,	assignment	Book, Video, Notes
Nucleus, Endoplasmic reticulum	2			
Golgi apparatus and Lysosomes	2			
Bioenergetics and Metabolism	2			
Mitochondria chloroplasts	1			
Peroxisomes	1			
Module III		lecture, tutorial, lab practice,	assignment	Book, Video, Notes
Cell cycle – Mitosis	2			
Meiosis	2			
Molecules controlling cell cycle	1			
Module IV		lecture, tutorial, lab	assignment	Book, Video, Notes
Extra cellular matrix, role of matrix in cell enthore	2			

Gap junctions	1	practice,		
Tightjunctions, Plasmodesmata.	1			
Module V		lecture, tutorial, lab practice,	assignment	Book, Video, Notes
Passive and Active Transport,.	2			
Permeases, Ion channels,	2			
ATP pumps. Na ⁺ / K ⁺ / Ca ²⁺ T pumps uniport,	2			
Symport antiporter system	1			
Ligand gated / voltage gated channels	1			
Agonists and Antagonists	1			
Module VI		lecture, tutorial, lab practice,	assignment	Book, Video, Notes
Receptors – extracellular signaling	2			
Cell surface / cytosolic receptors and examples,	2			
Different classes of receptors antocrine / paracrine / endocrine models	1			
Secondary messengers molecules	2			
Module VII		lecture, tutorial, lab practice,	assignment	Book, Video, Notes
The Development and causes of cancer	2			
tumour viruses, oncogenes,	1			
prevention and treatment	2			
Total (hrs)	45+20			

Programming for Problem Solving- Java

Course Title	Code	Type of course	T-P-PJ	Prerequisite
Programming for Problem solving- Java	ENFC0412	Theory + Practice	1-2-0	Nil

Objective

- Learn problem solving using object-oriented concepts
- Implement object oriented programming using Java
- Analyze several alternative solutions to determine the best approach
- Create job opportunities in java application development area

Course Outcome

- Able to use object oriented concept to solve problems
- Write an error free program of minimum 200 lines of code.
- Acquire java coding skill which helps students in getting jobs in different IT firms

Evaluation Systems

	Component	% of Marks	Method of Assessment
Internal Examination	Internal Theory	20	Written examination
	Internal Practice	30(20+10)	Lab work + Learning Record
External Examination	External Theory	30	Written examination
	External Practice	20	Lab work
Total		100	

Projects :

1. Simple Currency Converter
2. Designing a Calculator
3. Generating the mark sheet of a student
4. Create a phone directory and search a number
5. Create a tic tac toe game
6. Developing a library maintenance system
7. Desktop applications
8. Exam System (Without Database)
9. Create Country MAP and Different banners

Course outline

Module: I (10Hrs) :

Problem Solving Techniques: Ask Questions, Look for things that are familiar, solve by analogy, Means-Ends Analysis, Divide and Conquer, The building block approach, Merging solutions, Mental Block : The Fear of Starting, Object Oriented Problem Solving, and Case Study.

Programming: Programming Language, Skeleton, Compilation, Interpretation, and Execution of Program.

Object-Oriented Programming : Object Oriented Concepts, Java Programming Environment, Feature of Java, Elements of Java Program : Identifier, Naming Conventions, Build-in Type, Variable, Operators, Control Statements, Loops, Typecasting, Arrays,

Module : II(15 Hrs)

Classes : Concept of Objects and Classes, Using Methods, Local Variables, Instance Variables, Constructor, Overloading Constructor, Overloading Methods, Garbage Collection, The Finalize Method, Static, Final and this Keyword.

Inheritance and Polymorphism: Basics, Access Modifier, The super Keyword, Method Overriding, Dynamic Method Dispatch, Abstract Classes, Inner Classes.

Module :III (10 Hrs) :

Packages : Packages, Access Protection, Importing Package

Interfaces : Interface, Implementing Interfaces.

Module :IV (10 Hrs) :

String Handling : String, String Buffer, String Builder.

Exception Handling : Fundamentals, Checked and Unchecked Exceptions, Using Try, Catch, Multiple Catches, Throw, Throws, Finally, Java's Built-In Exceptions, User-Defined Exception.

Module :V (10 Hrs) :

Multi-Threading : Java Thread Lifecycle Model, Thread Priorities, Synchronization, Creating Threads, Using Different Thread Methods, Wrapper Classes, Clone (java.lang), Collection API, Vectors (java.util).

Module-VI (10 Hrs) :

Java.IO : I/O Streams, Serialization

AWT : AWT Classes, Window Fundamental, Component, Container, Panel, Window, Frame, Canvas, Control Fundamentals, Layout Managers.

Module :VII (10 Hrs) :

Event Handling : Delegation Event Model, Event Classes, Event Listener Interfaces, and Adapter Classes, Handling Events by Extending AWT Components.

Text Books:

1. Mark Lassoﬀ, Java Programming for Beginners, Packt Publishing Limited, October 2017
2. Walter Savitch, “Java-An Introduction to Problem Solving & Programming”, 8th edition, Pearson, 2017
3. Herbert Schildt, “Java Complete Reference”, 10th edition, in McGraw-Hill Education, 2017

Reference Books:

1. Dr. Edward Lavieri, Peter Verhas, Mastering Java 9, Packt Publishing Limited, October 2017
2. Nell Dale, Chip Weems, “Programming and problem solving with Java”, in Jones and Bartlett, 2008
3. Bhave&. Patekar, “Programming with Java” in Pearson Education, 2008
4. H.M. Deitel& Paul J. Deitel, “Java How to Program” in PHI, 9th Edition, 2012

Online Source :

javatpoint.com,

[http : //www.corejavaguru.com](http://www.corejavaguru.com)

[https : //www.w3schools.in/java-tutorial/](https://www.w3schools.in/java-tutorial/)

Session Plan

Topic coverage and Internal Test	No. of Sessions (in hrs.)	Activity (lecture, tutorial, lab practice, field studies/field-trip, Workshop etc.)	Assignment (project, assignment, field study, seminar, etc.)	Suggested Reading (Book, Video, Online source, etc.)
Problem Solving Techniques : Ask Questions, Look for things that are familiar,	4	Lecture		Book

solve by analogy, Means-Ends Analysis, Divide and Conquer, The building block approach, Merging solutions, Mental Block : The Fear of Starting, Object Oriented Problem Solving, and Case Study				
Installation of JDK,Configure runtime environment and Visualizing Java programming Environment (architecture)	1+1	Practice		
What is Programming, Programming Language, Skeleton, Compilation, Interpretation, and Execution of Program	1	Lecture	Assignment	Book
Constructing skeleton of Java Program, Object Oriented Concepts, Java Programming Environment, Feature of Java	2+2	Lecture, Practice	Assignment	Book
Share and execute India Map & CUTM Banner Sharing and Execute Calculator program	2	Practice	Assignment	

Elements of Java Program : Identifier, Naming Conventions, Build-in Type, Variable, Operators, more example	2	Practice	Assignment	Book
Conditional statement, looping statement,	2	Practice	Assignment	Book
Sharing and Execute calculate grade of students	2	Practice		
Concept of Objects and Classes, Using Methods, Local Variables, Instance Variables, Constructor, Overloading Constructor With Examples	2+2	Lecture, Practice	Assignment	Book
Overloading Methods, Garbage Collection, The Finalize Method, Static, Final and this Keyword	2	Practice	Assignment	Book
Sharing and Execute area of shapes	1	Practice		
Inheritance and Polymorphism : Basics, Access Modifier, The super Keyword, Method Overriding, Dynamic Method Dispatch	1+2	Lecture, Practice	Assignment	Book
Abstract Classes, Inner Classes	1+2	Lecture, Practice	Assignment	Book

ToDo list where you can calculate the completed task vs. pending tasks.	1	Practice		
Packages, Access Protection, Importing Package, Interface, Implementing Interfaces	1+4	Lecture, Practice	Assignment	Book
StringHandling : String, StringBuffer, StringBuilder	1+2	Lecture, Practice	Assignment	Book
Create a phone directory and search for a number.	1	Practice		
Excepting Handling : Fundamentals, Checked and Unchecked Exceptions, Using Try, Catch, Multiple Catches, Throw, Throws, Finally, Java's Built-In Exceptions, User-Defined Exception	1+4	Lecture, Practice	Assignment	Book
Create a tic tac toe game	1	Practice		

java.io : I/O streams, Serialization	1+4	Lecture, Practice	Assignment	Book
Producer/Consumer Problem	1	Practice		
Multi-Threading : Java Thread Lifecycle Model, Thread Priorities, Synchronization, Creating Threads, using Different Thread Methods	1+2	Lecture, Practice	Assignment	Book
Wrapper Classes, Clone (java.lang), Collection API, Vectors (java.util)	1+2	Lecture, Practice	Assignment	Book
Developing a library maintenance system.	1	Practice		
Event Handling : Delegation Event Model, Event Classes, Event Listener Interfaces, and Adapter Classes, Handling Events by Extending AWT Components	1+2	Lecture, Practice	Assignment	Book
AWT : AWT Classes, Window Fundamental, Component, Container, Panel, Window, Frame, Canvas, Control Fundamentals, Layout Managers	2+6	Lecture, Practice	Assignment	Book
Total (Hrs)	75	(Theory -24 hrs + Practice –51 hrs =75)		

Database Management System

Course Title	Code	Type of course	T-P-PJ	Prerequisite
Database Management System	ENFC0414	Theory + Practice	1-2-0	Nil

Objective

- Introduce the fundamental concepts of database systems & their importance in practical life and the basic concepts necessary for designing, using and implementing database systems & applications
- Make the students understand the principles behind relational database management systems, including the database environment, the relational model, relational languages, develop simple SQL queries
- Create job opportunities in database design, development and administration.

Course Outcome

- Demonstrate the underlying concepts of database technology, identify the appropriate data model for the given problem
- Write SQL queries for performing database operations
- Design, implement and normalize a relational model for a given problem domain
- Obtain skills in designing, developing and administrating the relational database.

Evaluation Systems

Internal Examination	Component	% of Marks	Method of Assessment
	Internal Theory	20	Written examination
	Internal Practice	30(20+10)	Lab work + Learning Record
External Examination	External Theory	30	Written examination
	External Practice	20	Lab work
Total		100	

Module: I

General introduction to database systems; Database - DBMS distinction, approaches to building a database, data models, database management system, three-schema architecture of a database, challenges in building a DBMS, various components of a DBMS.

File Based Systems and Database Systems : File Based Approach, Database Systems, File-oriented Systems vs. Database Systems Database Approach : Database, Database Management System (DBMS), Components of DBMS Environment, Advantages and Disadvantages of DBMS Roles in Database Environment : Database Users, Database Administrators(DBA)

Module: II

Database System Architecture: Three Level Architecture, External Level, Conceptual Level, Internal Level, Schemas, Mappings, Instances, Data Independence, Data Abstraction
E/R Model - Conceptual data modeling - motivation, entities, entity types, various types of attributes, relationships, relationship types, E/R diagram notation, examples.

Module: III

Relational Data Model: Concept of relations, schema-instance distinction, keys, referential integrity and foreign keys, relational algebra operators : selection, projection, cross product, various types of joins, division, example queries, tuple relation calculus, domain relational calculus, converting the database specification in E/R notation to the relational schema.

Module: IV

Database installation procedure: Database table creation & insertion of values Database Languages : SQL - DDL, DML, TCL, DCL

SQL - Introduction, data definition in SQL, table, key and foreign key definitions, update behaviors. Querying in SQL - basic select-from-where block and its semantics, nested queries - correlated and uncorrelated, notion of aggregation, aggregation functions group by and having clauses, embedded SQL.

Data Definition Language : Creating a Database, Table Operations (Create, Alter, Drop, Truncate, Comment and Rename), Creating and Removing an Index

Data Manipulation Language : Using different DML commands (Insert, Delete, Update, and Select), Sorting Results (Order By), Aggregate Functions, Join, Grouping Results (Group By)

Data Control Language & Transaction Control Language : Using different DCL commands (Grant, Revoke) & using different TCL commands (Commit, Rollback and Savepoint).

Module: V

Dependencies and Normal forms - Importance of a good schema design, problems encountered with bad schema designs, motivation for normal forms, dependency theory - functional dependencies, Armstrong's axioms for FD's, closure of a set of FD's, minimal covers, definitions of 1NF, 2NF, 3NF and BCNF, decompositions and desirable properties of them, algorithms for 3NF and BCNF normalization, multi-valued dependencies and 4NF, join dependencies and definition of 5NF.

Module :VI

Data Storage and Indexes - file organizations, primary, secondary index structures, various index structures - hash-based, dynamic hashing techniques, multi-level indexes, B+ trees.

Terminologies of Relational Model : Relational Data Structure, Relational Keys, Representing Relational Database Schema Integrity Constrains and Views : Nulls, Entity Integrity, Referential Integrity, General Constraints, Views, Purpose of Views

Module: VII

Transaction processing and Error recovery - concepts of transaction processing, ACID properties, concurrency control, locking based protocols for CC, error recovery and logging, undo, redo, undo-redo logging and recovery methods.

PL/SQL : SQL vs PL/SQL, Practice different basic PL/SQL programs

Text Book:

1. Raghuram Ramakrishnan, Johames Gerkhe “ Data Base Management Systems, Mc Graw Hill
2. Gaurav Gupta, Sarika Gupta “ Data Base Management Systems” Khanna Book Publisher

Electronics and its Application

Course Title	Code	Type of course	T-P-PJ	Prerequisite
Electronics and Its Application	ENFC0415	Theory & Practice	2-1-0	Nil

Objective

- The objective of this course is to provide a good understanding on the components used in today's electronics circuits and systems.

Course Outcome

- Describe active and passive components and their application.
- Explain the Working principle of different types of sensor and their application.
- Design and simulate deferent electronic circuits using software tools(ORCAD/MULTISIM/MATLAB)

Evaluation Systems

Internal Examination	Component	% of Marks	Method of Assessment
	Internal Theory	20	Written Examination
	Internal Practice	30(20+10)	Lab Work + Learning Record
External Examination	External Theory	30	Written Examination
	External Practice	20	Lab Work
Total		100	

Course Outline

Module I: RECENT TRENDS IN ELECTRONIC APPLICATION

(9 Hours)

Theory

a. Smart Electronics : Few Case Studies

- Wearable Electronic Devices / Wearable Technology
- Home Automation
- Driverless Car / Self-driving Car
- Inside a Smart Phone

b. Electronics in Transdisciplinary Applications

- Automotive
- Space
- Underwater
- Medical
- Mining
- Manufacturing

- Industrial Automation
- Robotics
- Agriculture
- Entertainment

c. New Trends

- Green Electronics
- Organic Electronics
- Bio-Electronics
- Nano Electronics
- Polymer Electronics
- Molecular Electronics

Practice

1. Familiarization with different components inside a smart phone

Module II: ELECTRONIC MANUFACTURING

(11 Hours)

Theory

Electronic Manufacturing:

- a. Semiconductor devices
- b. Integrated Circuits (IC)
- c. System-on-Chip (SoC)
- d. System-in-Package (SiP)
- e. Network on Chip (NoC)
- f. Printed Circuit Board (PCB)
- g. Single layer PCB, Double layer PCB, Multi-Layer PCB
- h. Aluminum Backed PCB
- i. 3D Printed PCB

Practice

2. Familiarization with different ICs.
3. Familiarization with PCB design software.
4. Familiarization with 3-D printer.

Module III: COMPONENTS FOR ELECTRONIC CIRCUITS

(12 Hours)

Theory

a. Passive Components :

Resistor, potentiometer, capacitor, inductor, connectors, switches and relays.

b.Active Components :

PN junction diode, Zener diode, Photo diode, Light Emitting Diode (LED), Bipolar Junction Transistor (BJT) and Field Effect Transistor (FET)

Practice:

5. Familiarization with different Components - Resistor, Potentiometer, Capacitor, Inductor, Connectors, switches & Relays. Measurement of Resistance and Capacitance.
6. Application of PN junction diode, Zener Diode
7. Application of LED and photodiode
8. Application of BJT and FET

Module IV: SENSOR & ACTUATOR**(4 Hours)****Theory****a. Sensors : Types and Applications**

- Analog Sensors
- Digital Sensors
- Special Sensors

b. Actuators

- Types of Actuators
- Applications

Practice

9. Familiarization with all types of available sensors.

Module V:SENSOR APPLICATION**(8 Hours)****Theory**

- a. Sensors and Smart Sensors
- b. Reading Sensor Input
- c. Sensor Wiring
- d. Understanding sensors and its application
 - **Infrared Reflectance Sensor.**
 - **Resistance Temperature Detectors**
 - **Temperature Sensor (LM35, Thermistor)**
 - **Motion Sensor**
 - **Limit Switch/Sensor**
 - **Touch Sensor Circuit**

Practice:

10. Sensor Wiring
11. Application of any of the above sensors.

Module VI:VOLTAGE REGULATOR & AMPLIFIER**(8 Hours)****Theory**

Assembling and Testing (Hardware/Multisim) for Different Circuits (Any one from each category by different groups)

a.Voltage Regulator

- Linear Regulators (LM723,78XX,79XX)
- Switching Regulators (LM2676)
- SMPS
- Hybrid Regulators

b.Amplifier

- Voltage Amplifier
- Current Amplifier
- Power Amplifier

Practice

12. Design of a voltage divider circuit
13. Design of an amplifier

Module VII: SWITCH & OSCILLATOR

(8 Hours)

Theory

Assembling and Testing (Hardware/Multisim) for Different Circuits (Any one from each category by different groups)

Switch

- Relay
- Diode as a Switch
- Transistor as a Switch

Oscillator

- Harmonic Oscillator
- Voltage Controlled Oscillator

Practice

12. Design of a switch
13. Design of an oscillator circuit

Practice will be through hardware implementation and software simulation using Multisim / OrCad PSpice/ Matlab.

Reference : -

Text Books :

1. Ian Sinclair and John Dunton, "Practical Electronics Handbook", 6th Edition, Elsevier.
2. J. Hughes, "Practical Electronics : Components and Techniques", O'Reilly Media, 2015.
3. Basic Principle, Donald A. Neamen, "Semiconductor Physics and Devices", TMH publication

Reference Books :

1. Principles of electronics, V K Meheta, Rohit Meheta, S Chand publication

Session Plan

Topics	No. of Sessions (in hrs.)	Activity	Assignment	Suggested Reading
Module-I [7 hrs. Lecture + 2 hrs. Practice]				
Smart Electronics : Few Case Studies Wearable Electronic Devices Wearable Tech Home Automation Driverless Car / Self-driving Car	2	Lecture		Online source
Inside a Smart Phone [Familiarization with different components inside a smart phone]	2	Practice		Online source
Electronics in Transdisciplinary Applications : Automotive Space Underwater	1	Lecture		Online source
Medical Mining Manufacturing	1	Lecture		Online source
Industrial Automation Robotics Agriculture	1	Lecture		Online source
Green Electronics Organic Electronics Bio-Electronics	1	Lecture		Reference Book-1 + Online reference
Nano Electronics Polymer Electronics Molecular Electronics	1	Lecture		Reference Book-1 + Online reference
Module-II [5 hrs. Lecture+6 hrs. Practice]				
Electronic Manufacturing				
Semiconductor devices [Overview only]	1	Lecture		Text Book-3
Integrated Circuits (IC) [Familiarization with all	2	Practice		Text Book-3

available ICs in Lab]				
System on Chip (SoC), System on Package, Network on Chip [Overview and advantage]	1	Lecture		Text Book-3
Single layer PCB, Double layer PCB, Multi-Layer PCB, Aluminum Backed PCB [Overview of design software and application]	4	2hr. Lecture+ 2 hrs. Practice		Text Book-2 Chapter 15
3D Printed PCB	3	1hr. Lecture +2hrs. Practice		Text Book-2 Chapter 15
Module-III [4hrs. Lecture+8 hrs. Practice]				
Passive Components : Resistor, Potentiometer, capacitor, Inductor, Connectors, switches & Relays. [Definition, Function and Application]	4	2hrs. Lecture+ 2hrs. Practice		Text Book-2 Chapter 8 & 9, Text Book-1 Chapter 5
Active Components : PN junction diode, Zener diode, Photo diode, LED, BJT & FET [Function and application]	8	2hrs. Lecture+ 6 hrs. Practice		Text Book-2 Chapter 8 &9 , Text Book-1 Chapter 5
Module-IV [2hrs. Lecture+2 hrs. Practice]				
Sensors : - Types and Applications Analog Sensors Digital Sensors Special Sensors [Overview, Types and Applications]	3	1 hr. Lecture+ 2 hrs. Practice		Text Book-1 Chapter 8
Actuators : - Types of Actuators Applications	1	Lecture		Text Book-1 + online reference
Module-V [4hrs. Lecture+4 hrs. Practice]				
Sensors and Smart Sensors [overview]	1	Lecture		Text Book-1 + online reference
Reading Sensor Input, Sensor Wiring	3	1hr. Lecture + 2 hrs. Practice		Text Book-1 + online reference
• Infrared Reflectance Sensor	4	2hrs. Lecture +		Text Book-1 +

<ul style="list-style-type: none"> • Resistance Temperature Detectors • Temperature Sensor (LM35, Thermistor) • Motion Sensor • Limit Switch/Sensor • Touch Sensor Circuit <p>[Each group will practice any one of the above]</p>		2 hrs. Practice		online reference
Module-VI [4hrs. Lecture+4 hrs. Practice]				
Voltage Regulator Linear Regulators (LM723, 78XX, 79XX) Switching Regulators (LM2676) SMPS, Hybrid Regulators	4	2hrs. Lecture + 2hrs. Practice		Reference Book-1 + Online reference
Amplifier : Voltage Amplifier, Current Amplifier, Power Amplifier	4	2hrs. Lecture + 2hrs. Practice		Reference Book-1 + Online reference
Module-VII [4hrs. Lecture+4 hrs. Practice]				
Switch Relay, Diode as a Switch, Transistor as a Switch	4	2hrs. Lecture + 2hrs. Practice		Reference Book-1 + Online reference
Oscillator Harmonic Oscillator Voltage Controlled Oscillator	4	2hrs. Lecture + 2hrs. Practice		Reference Book-1 + Online reference
Total (hrs.)	60	29 hr. Lecture + 31 hrs. Practice		

Electronic Devices

Course Title	Code	Type of course	T-P-PJ	Prerequisite
Electronic Devices	ENFC0416	Theory + Practice	2-1-0	Nil

Objective

- The objective of this subject is to provide in-depth understanding on construction and characteristics of three major components of electronics-diode, BJT, FET.

Course Outcome

- Learn the construction and characteristics of different semiconductor devices.
- Design different rectifier, voltage regulator circuit and Filters.
- Design and analysis of different amplifier circuits.

Evaluation Systems

Internal Examination	Component	% of Marks	Method of Assessment
	Internal Theory	20	Written examination
	Internal Practice	30(20+10)	Lab work + Learning Record
External Examination	External Theory	30	Written examination
	External Practice	20	Lab work
Total		100	

Course Outline

Module I: INTRODUCTION

(4 Hours)

Theory

Various properties of conductor, semiconductor and insulator, n-type and p-type semiconductors. Formation of PN junction, depletion region, drift and diffusion.

Module II: SEMICONDUCTOR DIODE

(8 Hours)

Theory

Open-circuited, forward bias and reverse bias of p-n junction diode, Diode equation, Volt-ampere characteristics of p-n junction diode (forward and reverse bias), Temperature dependence of VI characteristic, Transition and Diffusion capacitances.

Practice

- Volt-Ampere characteristics of a Forward bias PN Diode.
- Volt-Ampere characteristics of a Reverse bias PN Diode.

Module III: SEMICONDUCTOR DIODE**(5 Hours)****Theory**

Breakdown mechanisms in semiconductor (Avalanche and Zener breakdown), Zener diode characteristics, LED and photo diode.

Practice

3. Volt-Ampere characteristics of a Zener Diode

Module IV: RECTIFIERS, FILTERS AND REGULATORS**(11 Hours)****Theory**

Half wave rectifier, full wave rectifier and ripple factor. Application of p-n diode as clipper and clamper. Simple circuit of a regulator using Zener diode, series and shunt voltage regulators.

Practice

4. Implementation of half wave rectifier. Tracing of waveforms, measurement of DC load voltage, AC load voltage and ripple factor values
5. Implementation of full wave rectifier. Tracing of waveforms, measurement of DC load voltage, AC load voltage and ripple factor values
6. Implementation of clipper circuits using PN-junction diode. Tracing of waveforms at the clipper circuits output.

Module V: TYPES OF FILTER**(10 Hours)****Theory**

Inductor filter, Capacitor filter, L- section filter, PI- section filter, Multiple L- section and Multiple PI-section filter.

Practice

7. Implementation of clamper circuits using PN-junction diode. Tracing of waveforms at the clamper circuits output.
8. Design and implementation of a capacitor Filter.
9. Design and implementation of Voltage Regulator using Zener diode

Module VI: BJT CONSTRUCTION AND CHARACTERISTICS**(12 Hours)****Theory**

Bipolar Junction Transistor (BJT), Types, Construction and it's working principle., Transistor as an amplifier, Detailed study of currents in a Transistor, VI characteristics of transistor in Common Base (CB), Common Emitter (CE) and Common collector (CC) configurations; Comparison of CE, CB and CC transistor configuration. Relation between Alpha, Beta & Gamma.

Practice

10. Plot and verify VI Characteristics of BJT in CB configuration.
11. Plot and verify VI Characteristics of BJT in CC configuration.
12. Plot and verify VI Characteristics of BJT in CE configuration.

Module VII: MOSFET CONSTRUCTION & CHARACTERISTICS (10 Hours)**Theory**

MOSFET –Types, Construction, working Principle, characteristics (Enhancement and depletion mode), Symbols of MOSFET, VI characteristics of CS, CD and CG configuration; Introduction to SCR and UJT; Thermal run away and thermal stability

Practice

13. Plot and verify VI Characteristics of FET in CS configuration.
14. Plot and verify VI Characteristics of FET in CD configuration.
15. Plot and verify VI Characteristics of FET in CG configuration.

Practice will be done through hardware implementation and software simulation using OrCAD PSpice/ Multisim/ LTspice.

Text Book

1. R.L. Boylestad and Louis Nashelsky, “Electronic Devices and Circuits”, Pearson/Prentice Hall, 11th Edition, 2013.

Reference Books

1. J. Millman, C. C. Halkias, and Satyabrata Jit, “Electronic Devices and Circuits” ,Tata McGraw Hill, 4th Edition, 2015.
2. Prof G S N Raju, “Electronic Devices and Circuits”, I K International Publishing House Pvt. Ltd, 2008.

Session Plan

Topics	No. of Sessions (in hrs.)	Activity	Assignment	Suggested Reading
Module I [4 hrs. Lecture]				
Various properties of Conductor, Semiconductor & Insulator, n and p – type semiconductors, Formation of PN junction	2	Lecture	Assignment-1.1	Text Book-1
Depletion region, Drift and diffusion	1	Lecture	Assignment-1.2	Text Book-1
Diode equation	1	Lecture	Assignment-1.3	Text Book-1

Module II [4 hrs. Lecture + 4 hrs. Practice]				
Volt-ampere characteristics of p-n diode (Forward and Reverse bias)	4	Practice		Text Book-1 and Lab Manual
Temperature dependence of VI characteristic, Transition and Diffusion capacitances,	2	Lecture	Assignment-2.1	Text Book-1
Breakdown Mechanisms in Semiconductor (Avalanche and Zener breakdown)	2	Lecture	Assignment-2.2	Text Book-1
Module III [3 hrs. Lecture + 2 hrs. Practice]				
Zener diode characteristics	2	Practice		Text Book-1 and Lab Manual
LED and photo diode	3	Lecture	Assignment-3.1	Text Book-1
Module IV [5 hrs. Lecture + 6 hrs. Practice]				
Half wave rectifier	1	Lecture	Assignment-4.1	Text Book-1
Implementation of half wave rectifier. Tracing of waveforms, measurement of DC load voltage, AC load voltage and ripple factor values	2	Practice		Lab Manual
Full wave rectifier	1	Lecture	Assignment-4.2	Text Book-1
Ripple factor	1	Lecture	Assignment-4.3	Text Book-1
Implementation of full wave rectifier. Tracing of waveforms, measurement of DC load voltage, AC load voltage and ripple factor values	2	Practice		Lab Manual
Application of p-n diode as clipper	2	Lecture	Assignment-4.4	Text Book-1
Implementation of clipper circuits using PN-junction diode. Tracing of waveforms at the clipper circuits output.	2	Practice		Lab Manual
Module V [4 hrs. Lecture + 6 hrs. Practice]				
Clamper	1	Lecture	Assignment-5.1	Text Book-1

Implementation of clamper circuits using PN-junction diode. Tracing of waveforms at the clamper circuits output.	2	Practice		Lab Manual
Types of filter, Inductor filter, Capacitor filter, L- section filter, PI- section filter, Multiple L- section and Multiple PI-section filter.	1	Lecture	Assignment-5.2	Text Book-1
Design and implementation of a capacitor Filter.	2	Practice		Lab Manual
Simple circuit of a regulator using Zener diode	1	Lecture	Assignment-5.3	Text Book-1
Design and implementation of Voltage Regulator using Zener diode	2	Practice		Lab Manual
Series and shunt voltage regulators	1	Lecture	Assignment-5.4	Text Book-1
Module-VI [6 hrs. Lecture + 6 hrs. Practice]				
Bipolar Junction Transistor, Types, Construction & it's working principle	2	Lecture	Assignment-6.1	Text Book-1
Transistor as an amplifier, Detailed study of currents in a Transistor	2	Lecture	Assignment-6.2	Text Book-1
VI Characteristics of transistor in Common Base (CB) configurations	2	Practice		Text Book-1
VI Characteristics of transistor Common collector (CC) configurations	2	Practice		Text Book-1
VI Characteristics of transistor Common Emitter (CE) configurations	2	Practice		Text Book-1
Comparison of CE, CB and CC transistor configuration. Relation between Alpha, Beta & Gamma	2	Lecture	Assignment-6.3	Text Book-1
Module VII [4 hrs. Lecture + 6 hrs. Practice]				
MOSFET –Types, construction, working principle	2	Lecture	Assignment-7.1	Text Book-1
Characteristics of MOSFET (enhancement and depletion mode). Symbols of MOSEET	1	Lecture	Assignment-7.2	Text Book-1

VI Characteristics of CS, configuration	2	Practice		Text Book-1
VI Characteristics of CD configuration	2	Practice		Text Book-1
VI Characteristics of CG configuration	2	Practice		Text Book-1
Introduction to SCR and UJT. Thermal run away and thermal stability	1	Lecture	Assignment-7.3	Text Book-1
Total (hrs.)	60	30hrs. Lecture + 30hrs. Practice		

Sensors and IOT

Course Title	Code	Type of Course	T-P-PJ	Prerequisite
Sensors and IOT	ENFC0417	Theory & Practice	2-1-0	NIL

Objective

- To teach how 'Internet of Things' works, how the Protocols Function, familiarization with different Sensors and their Working, how a Hardware Communicates with Internet and the way it Exchange Necessary Data Through Internet.

Course Outcome

- Students will gain knowledge on how 'Internet of Things' can be utilized and how different Sensors can help in making the System to Operate Effectively and Smartly.
- Students will develop skill in Designing Portable, Ease of Access, Smart, Effective and Efficient Systems to meet the need of Modern Society by using IOT and various Sensors.

Evaluation Systems

	Component	% of Marks	Method of Assessment
Internal Examination	Internal Theory	20	Written Examination
	Internal Practice	30(20+10)	Lab Work + Learning Record
External Examination	External Theory	30	Written Examination
	External Practice	20	Lab Work
Total		100	

Course Outline

Module I : SENSORS & IOT

(15 Hours)

Theory

What is Sensor? Types of Sensors, URM 37 Sensor (Ultrasonic Sensor), Electro-Mechanical Switches, IR, PIR, Laser, Accelerometers, MQ2, MQ3, Temperature and Humidity Sensors (DHT-11), Stress Sensors, LoadSensors, Force Sensors, Wi-Fi modules

What is IOT, What Device makes it to IOT, IOT Platforms, What IOT means for the Developer, Challenges of IOT

Practice

- Interfacing and Testing the Ultrasonic Module, Relay and Infra-Red Module
- Interfacing and Testing PIR, Laser LED, and Accelerometer
- Interface the LPG Sensor, Monoxide Sensor, Temperature and Humidity Sensor
- Interfacing and Testing Stress Sensor, Load Sensor, Force Sensor, Wi-Fi Modules

Module II: ARDUINO ENVIRONMENT, WEB CONNECTIVITY (12 Hours)

Theory

Introduction to Arduino, setting up the Arduino Development Environment, Options for Internet Connectivity with Arduino, Interacting with Basic Sensors, Interacting with Basic Actuators, Configuring your Arduino Board for the IOT

Practice

5. Installing the Arduino IDE
6. Learning the steps to Interface the Controller Board to the System through the Interface
7. Connecting the Arduino to the Internet
8. Interacting of various Sensors to the Internet through the Controller Board
9. Interfacing Actuators to the Controller Board and Control through the Internet

Module III: DATA EXTRACTION (5 Hours)

Theory

Grabbing the Content from a Web Page, Sending Data to the Web, Troubleshooting Basic Arduino Issues

Practice

10. Extracting Data from a Web Page
11. Sending Data to a Web Page

Module IV: INTERNET DATA MONITORING (10 Hours)

Theory

Introduction, Internet of Things Platforms for Arduino, Posting the Sensor Data Online, Retrieving your Online Data, Securing your Online Data, Monitoring Sensor Data from a Web based Dashboard, Monitoring several Arduino Boards at once, Troubleshooting Issues with Web Data Monitoring

Practice

12. Posting the data to the Internet through Internet on-line
13. Monitor the Sensor output from a remote computer through Internet
14. Parallel Monitoring multiple Controller Boards connected to the Internet

Module V:WEB SERVICES

(7 Hours)

Theory

Introduction, Discovering the Temboo Platform, Tweeting from an Arduino Board, Posting updates on Facebook, Automation with IFTTT, Sending Push Notifications

Practice

15. Posting an update to Facebook
16. Sending a Push notification through the Controller by Internet

Module VI: INTERACTING WITH WEB SERVICES

(15 Hours)

Theory

Sending Text Message Notifications, Storing data on Google Drive, Troubleshooting issues with Web Services

Practice

17. Sending a Text Notification through Internet
18. Control Light and Fan via Internet. (prototyped as LEDs)
19. Operate a DC Motor and Servo Motor to Simulate the opening and closing of door

Module VII:MACHINE-TO-MACHINE INTERACTIONS

(11 Hours)

Theory

Introduction, Types of IoT Interaction, Basic local M2M Interactions, Cloud M2M with IFTTT, M2M Alarm System, Automated Light Controller, Automated Sprinkler Controller, Troubleshooting basic M2M Issues

Practice

20. Operate the Smoke Detector from Internet
21. Extract the reading of Temperature, Humidity and Monitoring through Internet
22. Automating the Control of Light, Sprinkler
23. Operate the Robot through Internet which has facility of Communication to and fro through Web and the Sensor Data

Text Books :

1. Marco Schwartz,“Internet of Things with Arduino Cookbook”, Packt Publishing Ltd, 2016,ISBN 978-1-78528-658-2.
2. Arshdeep Bahga, Vijay Madisetti, “Internet of Things- A Hands on Approach”, Universities Press, 2015.

Reference :

1. Neil Cameron, “Arduino Applied: Comprehensive Projects for Everyday Electronics”, Apress Publication, 2019, ISBN-13(pbk):978-1-4842-3959-9, ISBN-13(electronic):978-1-4842-3960-5
2. Marco Schwartz, “Internet of Things with Arduino Yun: Projects to help you build a world of smarter things”, Packt Publishing Ltd, 2014, ISBN:978-1-78328-800-7

Online Resource

1. <https://www.arduino.cc/reference/en>. [Viewed on 14-06-2019]

Session Plan :

Topics	No. of Sessions (in hrs.)	Activity	Assignment	Suggested Reading
Module I [3 hrs. Lecture + 12 hrs. Practice]				
What is Sensor? Types of Sensors	1	Lecture	Assignment 1.1	Text Book(TB)-1, Reference Book(RB)-1
URM 37 Sensor (Ultrasonic Sensor), Electro-Mechanical Switches, IR	1	Lecture	Assignment 1.2	TB-1, RB-1
Interfacing and Testing the URM 37, Relay, IR Module	4	Practice		TB-1
PIR, Laser, Accelerometers, MQ2, MQ3, Temperature and Humidity Sensors (DHT-11)	1	Lecture	Assignment 1.3	TB-1, RB-1
Interfacing and Testing PIR, Laser, Accelerometer, MQ2, MQ3, DHT-11	4	Practice		RB-1
Stress Sensors, LoadSensors, Force Sensors, Wi-Fi Modules	1	Lecture	Assignment 1.4	TB-1, RB-1
Interfacing and Testing stress Sensor, Load Sensor, force Sensor, Wi-Fi modules	4	Practice		TB-1
Background, What is IOT, What device makes it to IOT, IOT platforms, What IOT means for the Developer.	1	Lecture	Assignment 1.5	TB-1,
Module II [2 hrs. Lecture + 10 hrs. Practice]				
Introduction, Setting up the Arduino Development Environment.	2	Practice		TB-1

Interacting of various Sensors to the Internet through the Controller Board.	4	Practice		TB-1
Interacting with basic actuators, Configuring your Arduino Board for the IoT.	4	Practice		
Module III [1 hrs. Lecture + 4 hrs. Practice]				
Grabbing the content from a Web page, sending data to the Web, Troubleshooting basic Arduino issues.	1	Lecture	Assignment 3.1	TB-2 RB-1,2
Extracting data from a Web page.	2	Practice		TB-2
Sending data to a Web page.	2	Practice		
Module IV [2 hrs. Lecture + 8 hrs. Practice]				
Introduction, Internet of Things platforms for Arduino	1	Lecture	Assignment 4.1	TB-2 RB-1,2
Posting the Sensor data online, retrieving your online data, and Securing your online data, Monitoring Sensor data from a Web-based dashboard.	4	Practice		TB-2 RB-1,2
Monitoring several Arduino Boards at once, Troubleshooting issues with Web data Monitoring.	1	Lecture	Assignment 4.2	TB-2 RB-1,2
Parallel Monitoring multiple Controller Boards connected to the Internet.	4	Practice		TB-2 RB-1,2
Module V [3 hrs. Lecture + 4 hrs. Practice]				
Introduction, Discovering the Temboo platform, Tweeting from an Arduino Board. Tweeting from an Arduino Board	2	Lecture	Assignment 5.1	TB-2
Posting updates on Facebook, Automation with IFTTT, Sending push notifications.	1	Lecture	Assignment 5.2	TB-2
Posting updates on Facebook, Sending push notifications	4	Practice		TB-2
Module VI [1 hrs. Lecture +14 hrs. Practice]				
Sending text message notifications, Storing data on Google Drive.	2	Practice		

Troubleshooting issues with Web services.	1	Lecture	Assignment 6.1	Text Book-1, Reference Book-1,2
Control Light & Fan from the Internet.	4	Practice		
Remote Controlled door (opening & closing) using servo Motor.	4	Practice		
Smoke detector and Remote Control room temperature from Internet.	2	Practice		
Extract the reading of Temperature, Humidity and Monitoring through Internet.	2	Practice		
Module VII [3 hrs. Lecture + 8 hrs. Practice]				
Introduction, Types of IoT interaction, Basic local M2M interactions.	1	Lecture	Assignment 7.1	Text Book-1, Reference Book-1,2
Cloud M2M with IFTTT, M2M alarm system, Troubleshooting basic M2M issues.	1	Lecture	Assignment 7.2	Text Book-1, Reference Book-1,2
Automated light Controller, Automated sprinkler Controller,	4	Practice		
Introduction, choosing a robotic platform, Building a mobile robot, Configuring your mobile robot, Basic robot Control, Using distance Sensors, Controlling your robot from anywhere, Troubleshooting basic robotic issues.	1	Lecture	Assignment 7.3	Text Book-1, Reference Book-1,2
Operate the robot through Internet which has facility of communication to and fro through Web and the Sensor data.	4	Practice		
Total (hrs.)	75	15 hrs. Lecture + 60 hrs. Practice		

Problem Solving and Programming

Course Title	Code	Type of course	T-P-PJ	Prerequisite
Problem Solving and Programming	ENFC0418	Theory +Practice	1-2-0	Nil

Objective:

- To introduce programming through Visual programming tool - SCRATCH
- To teach problem solving through Flow charting tool - RAPTOR
- To elucidate problem solving through python programming language
- To introduce function-oriented programming paradigm through PYTHON
- To train in development of solutions using modular concepts
- To teach practical Python solution patterns
- To enhance the problem analysis capability and problem solving techniques

Course Outcome:

- Develop a program controlled by a loop.
- Experiment with “costumes” to change the appearance of sprites
- Perform Input, Output Operations using scratch
- Perform computation using common mathematical formulas.
- Develop programs by passing messages between sprites.
- Build Mobile apps using App Inventor
- Select flowchart symbols for solving problems.
- Develop basic flowcharts for performing Input, Output and Computations
- Solve numerical problems using Raptor
- Analyze the different computational problems and give programmatic solutions.

Evaluation Systems

	Component	% of Marks	Method of Assessment
Internal Examination	Internal Theory	20	Written Examination
	Internal Practice	30 (20+10)	Lab Work + Learning Record
External Examination	External Theory	30	Written Examination
	External Practice	20	Lab Work
Total		100	

Course Outline

Module I : SCRATCH (10 Hours)

Introduction to programming concepts with scratch, Scratch environment, sprites looks and motion, Angles and directions, repetition and variation, changing costumes, adding background, Input/Output, variables and operators. Working with sounds and sprite communication and

creating stories, App Generation.

Module II : RAPTOR (10 Hours)

RAPTOR: Flow chart symbols, Input/Output, Assignment, operators, conditional if, repetition, function and sub charts.

Module III : Programming Languages (9 Hours)

Various types of Programming Languages(PL), Types of PL, Characteristics of PL, Syntax, Semantics, Pragmatics Analysis Procedure based languages : General features, Data types, Abstract Data Types (ADT), Structuring, Syntax, Semantics, RAM model of computation, Example : C language

Module IV : Object Oriented Concepts (10 Hours)

Object based languages: Concepts of objects, Class vs ADT, control structures, methods, General features-inheritance, polymorphism, derived classes & information hiding, Example : C++ and Java, Difference with C.

Module V : Programming Concepts (12 Hours)

Logic programming: Predicate calculus- Logical operators, Propositional forms, Rules of inference, Logical equivalence, Quantification, Wellformed formula, Disproofs; Prolog- Syntax, Lists, Operators and arithmetic, Control, i/o, data structures. Functional programming : Lisp- Control constructs, List processing, Files and i/o, Generic functions, Objects,Exceptions.

Module VI : PYTHON Basic concepts (12 Hours)

Python – Numbers, Strings, Variables, operators, expressions, statements, String operations, Math function calls, Input/Output statements, Conditional If, while and for loops, User defined Functions, parameters to functions, recursive functions, Turtle Graphics.

ModuleVII : PYTHON Data Structures (12 Hours)

Lists, Tuples, Dictionaries, Strings, Files and their libraries.Beautiful Idiomatic approach to solve Turtle Bar Chart, Event Driven programming. Key press events, Mouse events, timer events.

Online Resources

- 1.<https://www.cse.msu.edu/~stockman/ITEC/Scratch/BGC2011Scratch-Rev1.pdf>
<https://nostarch.com/scratchplayground> [Viewed on Dt- 13-06-2019]
- 2.<https://raptor.martincarlisle.com/>[Viewed on Dt- 13-06-2019]
3. <http://www.ict.ru.ac.za/Resources/cspw/thinkcspy3/thinkcspy3.pdf>[Viewed on Dt- 13-06-2019]
- 4.https://zhanxw.com/blog/wp-content/uploads/2013/03/BeautifulCode_2.pdf [Viewed on Dt- 13-06-2019]

Data Structures

Course Title	Code	Type of course	T-P-PJ	Prerequisite
Data Structures	ENFC0419	Theory +Practice	2-1-0	Nil

Objective

- Understand and implement linear, nonlinear datastructures
- Implement various searching and sorting techniques.

Learning outcome

- Acquire the knowledge about linear, non-linear datastructures.
- Able to implement various searching and sorting techniques.

Evaluation Systems

Internal Examination	Component	% of Marks	Method of Assessment
	Internal Theory	20	Written examination
	Internal Practice	30(20+10)	Lab work + Learning Record
External Examination	External Theory	30	Written examination
	External Practice	20	Lab work
Total		100	

Course outline

Module I (10 Hrs)

Definition, Classification of data structures: primitive and non-primitive, Elementary data organization, Time and space complexity of an algorithm (Examples)

Module II

(10 hrs)

Stack Definition, Array representation of stack, Operations on stack: Infix, prefix and postfix notations, Conversion of an arithmetic expression from Infix to postfix, Applications of stacks.

Module III

(10 hrs)

Queue: Definition, Array representation of queue, Types of queue: Simple queue, Circular queue, Double ended queue (De-queue), Priority queue, Operations on all types of Queues

Module IV**(15 Hrs)**

Definition, Components of linked list, Representation of linked list, Advantages and disadvantages of linked list. Types of linked list: Singly linked list, doubly linked list, Circular linked list, Operations on singly linked list: creation, insertion, deletion, search and display.

Module V**(15 Hrs)**

Definition : Tree, Binary tree, Complete binary tree, Binary search tree, Tree terminology: Root, Node, Degree of a node and tree, Terminal nodes, Non-terminal nodes, Siblings, Level, Edge, Path, depth, Parent node, ancestors of a node. Binary tree: Array representation of tree, Creation of binary tree. Traversal of Binary Tree: Preorder, In-order and post-order, Binary search tree, AVL tree.

Module VI (14 Hrs)

Basic Sorting and Searching Techniques: Sequential search: Iterative and Recursive methods, Binary search: Iterative and Recursive methods, Comparison between sequential and binary search. Sort: General background and definition, Bubble sort, Selection sort, Insertion sort, Merge sort, Quick sort, Radix sort, heap sort.

Module VII(10 Hrs)

Graphs, Graph terminology, Application of Graphs, Depth First search, Breadth First search, Topological sort.

Text Books:

- . Tenenbaum, Data Structures Using C. Pearson Education, Seventh Impression, 2009
- .. Kamthane: Introduction to Data Structures in C. Pearson Education . Third Impression, 2009

Reference

1. Lipschutz: Schaum's outline series Data structures with C Tata McGraw-Hill Indian Edition 2011
2. Weiss, Data Structures and Algorithm Analysis in C, II Edition, Pearson Education, 2001.

Online Source:

1. [http://nptel.ac.in/courses/Webcourse-contents/IIT- %20Guwahati/data_str_algo/frameset.htm](http://nptel.ac.in/courses/Webcourse-contents/IIT-%20Guwahati/data_str_algo/frameset.htm)
2. <https://www.cs.utexas.edu/users/djimenez/utsa/cs1723/lecture2.html>

Switching Theory & Logic Design

Course Title	Code	Type of course	T-P-PJ	Prerequisite
Switching Theory & Logic Design	ENFC0420	Theory + Practice	2-1-0	Nil

Objective:

- The Objective of this Subject is to Provide Good Understanding on Digital Logic and Different Combinational and Sequential Circuits Design and their Implementations.

Course Outcome:

- Understand different number representation and conversion between different representations.
- Design various logic gate and simplify different Boolean equations.
- Design and analyze various combinational circuits.
- Understand the design of sequential circuits in terms of Algorithmic State Machines

Evaluation Systems:

Internal Examination	Component	% of Marks	Method of Assessment
	Internal Theory	20	Written Examination
	Internal Practice	30(20+10)	Lab Work + Learning Record
External Examination	External Theory	30	Written Examination
	External Practice	20	Lab Work
Total		100	

Course Outline

Module I: NUMBER SYSTEMS AND CODES (3 Hours)

Number Systems, Base Conversion Methods, Complements of Numbers, Codes- Binary Codes, Binary Coded Decimal Code and its Properties, Module Distance Codes, Alphanumeric Codes, Error Detecting and Correcting Codes.

Module II: BOOLEAN ALGEBRA AND LOGIC MINIMIZATION (9 Hours)

Basic Theorems and Properties, Switching Functions, Canonical and Standard Form, Algebraic Simplification of Digital Logic Gates, Properties of XOR Gates, Universal Gates, Multilevel NAND/NOR realizations

Module III: LOGIC MINIMIZATION AND COMBINATIONAL CIRCUIT DESIGN (13 Hours)

Introduction, The Minimization with theorem, The Karnaugh Map Method, Five and Six Variable Maps, Prime and Essential Implications, Don't Care Map Entries, Using the Maps for Simplifying, Tabular Method Partially Specified Expressions, Multi-output Minimization, Minimization and Combinational Design, Arithmetic Circuits, Comparator, Multiplexers, Code

Converters, Wired Logic, Tristate Bus System, Practical Aspects related to Combinational Logic Design, Hazards and Hazard Free Relations.

Module IV: SEQUENTIAL CIRCUIT DESIGN (9 Hours)

Introduction, Basic Architectural Distinctions Between Combinational and Sequential Circuits, The Binary Cell, Fundamentals of Sequential Machine Operation, The Flip-Flop, The D-Latch & Flip-Flop, The “Clocked T” Flip-Flop, The “ Clocked J-K” Flip-Flop, Design of a Clocked Flip-Flop, Conversion From One Type of Flip-Flop to Another, Timing and Triggering Consideration, Clock Skew

Module V: REGISTER AND COUNTER (10 Hours)

Introduction, State Diagram, Analysis of Synchronous Sequential Circuits, Approaches to the Design of Synchronous Sequential Finite State Machines, Design Aspects, State Reduction, Design Steps, Realization Using Flip-Flops Counters – Design of Single Mode Counter, Ripple Counter, Ring Counter, Shift Register, Shift Register Sequences, Ring Counter Using Shift Register.

Module VI: FINITE STATE MACHINE (8 Hours)

Finite State Machine-Capabilities and Limitations, Mealy and Moore Models-Minimization of Completely Specified and Incompletely Specified Sequential Machines, Partition Techniques, and Merger Chart Methods-Concept of Minimal Cover Table.

Module VII: ALGORITHMIC STATE MACHINES (8 Hours)

Salient Features of the ASM Chart-Simple Examples-System Design Using Data Path and Control Subsystems-Control Implementations-Examples of Weighing Machine and Binary Multiplier.

Text Book

1. M.Morris Mano., “Digital Design”, Pearson Education, 4th Edition.
2. Zvi Kohavi & Niraj K. Jha, “Switching and Finite Automata Theory”, 3rd Edition, Cambridge.

Reference Book

1. Kumar, A.A., Fundamentals of digital circuits. PHI Learning Pvt. Ltd,2014.
2. Jain, R.P. and Floyd, T.L., Digital fundamentals, Dorling Kindersley Pvt Ltd, 2009.
3. Donald, P.L., Albert, P.M., Goutam. Saha, Malvino, A.P. and Saha, G.K., Digital Principles & Applications. Tata McGraw-Hill, 2010.

Operating Systems

Course Title	Code	Type of course	T-P-PJ	Prerequisite
Operating Systems	ENFC0422	Theory + Practice	1-2-0	Nil

Course Objective

- Provide knowledge about the services rendered by operating systems
- Present details discussion on processes, threads and scheduling algorithms
- Discuss various file-system design and implementation issues
- Provide good insight on various memory management techniques
- Expose the students with different techniques of handling deadlocks
- Familiarize students with the basics of linux operating system and perform administrative tasks on Linux servers
- Provide skills in operating system abstraction, mechanism and implementation of operating system concepts

Course Outcome:

- Understand operating system structure and functions, services and system calls
- Differentiate between preemptive, non-preemptive and real time CPU scheduling
- Understand how to achieve mutual exclusion in uniprocessor systems
- IPC outcome
- Demonstrate the ability to implement various memory management techniques
- Illustrate various demand paging techniques.
- Understand file systems in various operating systems
- Analyse different disk scheduling algorithms
- Understand various schemes available for achieving system protection and system security
- Acquire skill in administrating Linux system

Evaluation Systems

	Component	% of Marks	Method of Assessment
Internal Examination	Internal Theory	20	Written examination
	Internal Practice	30(20+10)	Lab work + Learning Record
External Examination	External Theory	30	Written examination
	External Practice	20	Lab work
Total		100	

Course Outline

Module :I

Introduction:(8hrs)

Architecture, Goals & Structures of O.S, Basic functions, Interaction of O. S. & hardware architecture, System calls, Batch, multiprogramming. Multitasking, time sharing, parallel, distributed & real -time O.S.

Module: II

Process Management: (13hrs)

Process Concept, Process states, Process control, Threads, Uni- processor Scheduling: Types of scheduling : Preemptive, Non preemptive, Scheduling algorithms : FCFS, SJF, RR, Priority, Thread Scheduling, Real Time Scheduling. System calls like ps, fork, join, exec family, wait.

Module :III(12hrs)

Concurrency control :

Concurrency : Principles of Concurrency, Mutual Exclusion : S/W approaches, H/W Support, Semaphores, pipes, Message Passing, signals, Monitors, Classical Problems of Synchronization : Readers-Writers, Producer Consumer, and Dining Philosopher problem. Deadlock :Principles of deadlock, Deadlock Prevention, Deadlock Avoidance, Deadlock Detection, System calls like signal,kill.

Module :IV

Memory Management : (12hrs)

Memory Management requirements, Memory partitioning : Fixed and Variable Partitioning, Memory Allocation : Allocation Strategies (First Fit, Best Fit, and Worst Fit), Fragmentation, Swapping, and Paging. Segmentation, Demand paging

Module V

Virtual Memory :(8hrs)

Concepts, management of VM, Page Replacement Policies (FIFO, LRU, Optimal, Other Strategies), Thrashing.

Module :VI

I/O management & Disk scheduling : (8hrs)

I/O Devices, Organization of I/O functions, Operating System Design issues, I/O Buffering, Disk Scheduling (FCFS, SCAN, C-SCAN, SSTF), RAID, Disk Cache.

Module :VII

Inter Process Communication :(10hrs)

Basic Concepts of Concurrency, Cooperating process, Advantage of Cooperating process, Bounded- Buffer - Shared-Memory Solution, Inter- process Communication (IPC), Basic Concepts of Inter-process Communication and Synchronization.

Text Book:

Operating System Concepts by Abraham Silberschatz , Peter B. Galvin , Wiley Publication

Big Data Analytics

Course Title	Code	Type of course	T-P-PJ	Prerequisite
Big Data Analytics	ENFC0423	Theory +Practice	1-2-0	Nil

Course Objective

- Learn understand and practice big data analytics approaches with the study of modern computing big data technologies and focus on industry application
- Conceptualize and summarize big data computing technologies machine learning, trivial data vs big data and scale of the approaches.
- Gain essential skills in data storage, process and data analysis

Course Outcome:

- Identify the characteristics of data set and compare trivial data and big data for various applications
- Recognize and implement different ways of selecting parameters and integrate with the mathematical and statistical tools
- Acquires skills in big data applications.

Evaluation Systems

	Component	% of Marks	Method of Assessment
Internal Examination	Internal Theory	20	Written examination
	Internal Practice	30(20+10)	Lab work + Learning Record
External Examination	External Theory	30	Written examination
	External Practice	20	Lab work
Total		100	

Course Outline

Module: I Introduction to Big Data(10 hrs)

Big Data-definition, Characteristics of Big Data (Volume, Variety, Velocity, Veracity, Validity), Importance of Big Data, Patterns for Big Data Development, Data in the Warehouse and Data in Hadoop.

Module: II Introduction to Hadoop (10 hrs)

Hadoop- definition, Understanding distributed systems and Hadoop, Comparing SQL databases and Hadoop, Understanding MapReduce, Counting words with Hadoop—running your first program, History of Hadoop, Starting Hadoop - The building blocks of Hadoop, NameNode, DataNode, Secondary NameNode, JobTracker and Task Tracker.

Module: IIIMapReduce(10 hrs)

A Weather Dataset, Analyzing the Data with Unix Tools, Analyzing the Data with Hadoop, Scaling Out, Hadoop Streaming, Hadoop Pipes, Developing a MapReduce Application - The Configuration API, Configuring the Development Environment, Running Locally on Test Data, Running on a Cluster, Tuning a Job, MapReduce Workflows.

Module: IVHDFS(13 hrs)

Components of Hadoop -Working with files in HDFS, Anatomy of a MapReduce program, Reading and writing the Hadoop Distributed File system -The Design of HDFS, HDFS Concepts, The Command-Line Interface, Hadoop Filesystem, The Java Interface, Data Flow, Parallel Copying with distcp, Hadoop Archives

Module: VMapReduce Programming(12 hrs)

Writing basic Map Reduce programs - Getting the patent data set, constructing the basic template of a Map Reduce program, Counting things, Adapting for Hadoop's API changes, Streaming in Hadoop, Improving performance with combiners.

Module : VI MapReduce Advanced Programming (10 hrs)

Advanced MapReduce - Chaining MapReduce jobs, joining data from different sources, creating a Bloom filter, Passing job-specific parameters to your tasks, probing for task-specific information, Partitioning into multiple output files, Inputting from and outputting to a database, keeping all output in sorted order.

Module: VIIGraph Representation in MapReduce(10 hrs)

Modeling data and solving problems with graphs, Shortest Path Algorithm, Friends-of-Friends Algorithm, PageRank Algorithm, Bloom Filter, Parallelized Bloom filter creation in MapReduce, Map-Reduce semi-join with Bloom filters.

Text Books:

1. Anil Maheswari, “ Big Data” TMH Publication
2. Thomas Erl, Wajid Khattak, Paul Buchler “ Big Data Fundamentals: Concepts, Drivers & Techniques Prentice Hall

Block Chain & Smart Contracts

Course Title	Code	Type of course	T-P-PJ	Prerequisite
Block Chain & Smart Contracts	EN FC0424	Theory +Practice	1-1-0	Nil

Course Objective

- This course aims to provide conceptual understanding of the function of Block chains as a method of securing distributed ledgers, how consensus on their contents is achieved, and the new applications that they enable
- It covers the technological underpinnings of block chain operations as distributed data structures and decision making systems, their functionality and different architecture types.
- Able to build the career in block chain application development

Course Outcome :

- Understand the structure of a blockchain and why/when it is better than a simple distributed database
- Analyze the incentive structure in a blockchain based system and critically assess its functions, benefits and vulnerabilities
- Evaluate the setting where a blockchain based structure may be applied, its potential and its limitations
- Analyze to what extent smart and self-executing contracts can benefit automation, governance, transparency and the Internet of Things (IOT)
- Attain awareness of the new challenges that exist in monetizing businesses around blockchains and smart contracts.
- Acquires skills in design and program smart contracts and decentralized applications

Evaluation Systems

Internal Examination	Component	% of Marks	Method of Assessment
Internal Examination	Internal Theory	20	Written examination
	Internal Practice	30(20+10)	Lab work + Learning Record
External Examination	External Theory	30	Written examination
	External Practice	20	Lab work
Total		100	

Course Outline

Module I

Introduction to Distributed system, Challenges in Centralized networks. Fundamentals of cryptography, Introduction to Hashing Algorithms, Family of SHA Algorithms and its applications. Course overview and logistics Bitcoin The big picture of the industry – size,

growth, structure, players. The key terms that are used. Bitcoin versus Cryptocurrencies versus Blockchain, Distributed Ledger Technology (DLT). Strategic analysis of the space – who are the major players (Block chain platforms, regulators, application providers, etc.) Bitcoin, HyperLedger, Ethereum, Litecoin, Zcash. Etc. The major application : currency, identity, chain of custody.

Module: II

Introduction to blockchain, Blockchain eco system, Introduction to consensus algorithms and its importance, Proof of work, Proof of stake. Mining, Rewards, Forking – hard and soft .Types of blockchain – Public, private, permissioned, permissionless.

Module: III

Smart contract – Writing a simple smart contract – deploying a contract. Applications of smart contracts – real time use cases in Banking & Insurance, Supplychain management.

Module: IV

Cryptocurrency, Introduction to tokens – Security Token, Utility token and payment tokens, ERC 20 and ERC 721. Case study on token usage in gaming and e-commerce industry. Creating our own virtual currency using smart contracts. Scaling Blockchain – reading and writing data. Differentiate nodes, sparse data and Merkle trees. Fixing on the fly – fixes to current implementations : Layer 2 solutions (Lightning and Ethereum state channels.) Bitcoin scaling debate (Segwit2x etc.). The realities of hard forks for scaling, and bugs.

Module: V

Case study on Blockchains – Ethereum, Hyperledger and EOS. Blockchain Dynamics, Public and private blockchains, Hard and soft forks, Sharding Side chains, Distributed Virtual Machines, Smart Contracts, Oracles

Module: VI

Basics of contract law. Smartcontracts and their potential Trust in Algorithms, the impact on society. How existing legal systems could be integrated? OpenZeplin, OpenLaw.

Module: VII

Assets (fiat currencies, property, equity, securities). Supply and demand. Inflation and deflation Valuations and bubbles. Cyrptoconomics – moving beyond its use in verifying the blockchain– motivating participants, creating investment funds, storing value Creating and using tokens and coins.

Text Book:

1. Melanie Swan “ Block Chain Blue Print for new economy” Keilly Publication
2. Tiana Laurence “ Block Chain for Dummies” Wiley Publication
3. Debajani Mohanty “ Block Chain” BPB Publication

Product Development

Course Title	Code	Type of course	T-P-PJ	Prerequisite
Product Development	ENFC0601	Practice + Project	0-2-1	Nil

Objectives

- To educate the students on various stages of development of design of a product beginning from intent-to-actual design.
- Educate the students on usage of design software like ENOVIA, SIMULIA.

Course Outcome

- Students will have knowledge and skills to undertake design projects through making design decisions and evolve design of a product using the theoretical knowledge and hands-on-experience provided on design software.

Evaluation Systems

	Component	% of Marks	Method of Assessment
Internal Examination	Internal Practice	50(40+10)	Lab Work + Learning Record
	Internal Project	50	Project Work
External Examination	External Practice	50	Lab Work
	External Project	50	Project Work + Report
Total		200	

Course Outline

Module : I (08 Hours)

Intent, Impact, Import & Use of Core Mechanical Principles for Concept Design, Engineering Design, Problems Engineering can Solve, How to Identify Opportunities for Design, Needs Assessment & Problem Definition.

Module : II (10 Hours)

Defining Requirements & Problem Definition, Analytical Process Hierarchical Analysis, Developing Possible Design Solutions, Making Design Decisions.

Module : III (08 Hours)

Introduction to CAD Process through 3D Experience Free Modeling, Modeling & Managing Subassemblies in the Robot

Module : IV PLM through ENOVIA(09 Hours)

Modeling a Lathe Machine.Introduction to PLM through ENOVIA, Steps Involved in Controlling the Product Updates in ENOVIA.

Module : V (20 Hours)

Introduction to FEA in Industry, Pre-Processing Using SIMULIA.

Module : VI (15 Hours)

Understanding the Mathematical Modeling for Product in Physical Behavior

Module :VII (15 Hours)

Introduction to Design of Experiments, How to Use SIMULIA to Make an Incremental Design Decision.Type of Engineering Analysis.

E-content: Peer Learning Experience by Dassault Systemes.

Text Books:

1. Chitale, A K, Product Design & Manufacturing, 2013, 6th Edition, PHI publication, India.
2. Ulrich, K T, Eppinger, S D, Product Design & Development, 2016, 5th edition, Tata McGraw-Hill Companies, Inc.

Reference Books:

1. Kumar, P, Product Design - Creativity, Concepts & Usability, 2011, 2nd Edition, PHI publication, India.

Session Plan

Topic coverage and Internal Test	No. of Sessions (in hours.)	Activity (lecture, tutorial, lab practice, field studies/field-trip, Workshop etc.)	Assignment (project, assignment, field study, seminar, etc.)	Suggested Reading (Book, Video, Online source, etc.)
Module-I				
Intent, Impact, Import, Use of core Mechanical Principles for concept Design, What is Engineering Design, Problems Engineering can solve, How to	08	Tutorial	Project	

identify opportunities for design, Needs Assessment & Problem Definition,				
Module-II				
Defining requirements & Problem Definition, Analytical Process Hierarchical Analysis, Developing a possible design Solutions, Making Design Decisions.	10	Tutorial	Project	
Module-III				
Introduction to CAD Process through 3D Experience free modeling, Modeling & managing subassemblies in the Robot,	08	Tutorial , Practice	Project	
Module-IV				
Modeling a Lathe Machine. Introduction to PLM through ENOVIA, Steps involved in controlling the product updates in ENOVIA.	09	Tutorial , Practice	Project	
Module-V				
Introduction to FEA in Industry, Pre-processing using SIMULIA, Understanding the Mathematical modeling for Product in physical behavior, Introduction to design of experiments, How to use SIMULIA to make a incremental design decision. Type of Engineering analysis. Projects such as Disc Brake analysis by DOE, Door trim Substrate by DOE, MBD of Suspension by DOE.	20	Practice, tutorial	Project	
Module-VI				
Consumer Sentimental Analysis, Behavior Loyalty Metric, Emotional Loyalty Metric, Understanding decision making dashboards in NetVibes,	15	Lecture, Practice	Project	
Interpreting the Real time social data, Creation of different metric for business condition in Net Vibes, Automate Business logic to respond.	15	Lecture, Practice	Project	
Total (hours)	85			

Artificial Intelligence Tools, Techniques and Application

Course Title	Code	Type of course	T-P-PJ	Prerequisite
Artificial intelligence Tools, Techniques and Application	ENFC0603	Practice + Project	0-2-1	Nil

Objective

- Introduce fundamental concepts in AI
- Demonstrate the capability to create simple AI applications using Natural Language Processing, Audio engineering & Speech, Computer Vision, pattern recognition and machine learning.
- Present various modeling and formulation techniques to solve problems using AI techniques.
- Introduce state-of-art AI tools and techniques to solve various problems faced by Engineers in design and analysis.

Course Outcome:

- Understand the importance of AI.
- Explain the concepts of Natural Language Processing.
- Understand concepts of Machine Learning algorithms and their limitations.
- Compare different Machine Learning Algorithms
- Summarize applications of Speech Recognition and Synthesis.
- Develop the applications of, Computer Vision and Image Processing.

Evaluation Systems

	Component	% of Marks	Method of Assessment
Internal Examination	Internal Practice	50(40+10)	Lab Work + Learning Record
	Internal Project	50	Project Work
External Examination	External Practice	50	Lab Work
	External Project	50	Project Work + Report
Total		200	

Course Outline

Module :I Introduction to Artificial Intelligence(10 hrs)

Basics of AI.Applications of AI. Advanced search, Constraint satisfaction problems, Knowledge representation & reasoning, Non-standard logics, Uncertain and probabilistic reasoning

Conceptual introduction to **Machine Learning: Introduction** to Neural Networks, Supervised, Unsupervised, and Semi-Supervised Learning, Deep Learning, Reinforcement Learning, LinearRegression.

Module :II Conceptual introduction to Natural Language Processing : (10 hrs)

Natural language Understanding, Sentiment Analysis, Segmentation and recognition.Conceptual introduction to **Speech Recognition &Synthesis: Speech Fundamentals**, Speech Analysis,Speech Modeling, Speech Recognition, Speech Synthesis, Text-to-Speech

Module : III Conceptual introduction to Image Processing & Computer Vision : (10 hrs)

Introduction to Image processing, Image Noise, Removal of Noise from Images, Color Enhancement, Segmentation, Edge Detection, Optical Character Recognition, Feature Detection & Recognition

Module :IV BOT Technologies and Virtual Assistants : (10 hrs)

Chatbots: Introduction to a Chatbot, Architecture of a Chatbot. NLP in the cloud, NL Interface, How to Build a Chatbot, Transformative user experience of chatbots, Designing elements of a chatbot, Best practices for chatbot development. NLP components.NLP wrapper to chatbots.Audiobots and Musicbots.

Virtual Assistants :Architecture of a Virtual Assistant.

Module :V Image Processing & Computer Vision : (10 hrs)

Image - Definition and Tagging.Classification of images.Tagging.Image formation, Deep Learning algorithms for Object detection & Recognition. Face recognition, Instance recognition, Feature detection and matching, Segmentation, Recognition Databases and test sets Applications -- Feature extraction, Shape identification. Fane detection,.

Applications :Automation, Agriculture[Crop and Soil Monitoring, Grading farm produce, Predictive Analytics], Retail and Retail Security[Amazon Go], Autonomous vehicles,

Module: VI Reinforcement Learning(10 hrs)

Introduction to Reinforcement Learning, Game Playing [Deep Blue in Chess, IBM Watson in Jeopardy, Google's DeepMind in AlphaGo], Agents and Environment, Action-Value Function, Deep ReinforcedLearning

Module :VII Smart Applications (10 hrs)

Smart Manufacturing, Smart Agriculture, Smart Healthcare, Smart Education, Smart Grids,

Smart Transportation and Autonomous Vehicles, Smart Homes, Smart Cities

Text Books:

2. Prateek Joshi, Artificial Intelligence with Python, 1st Edition, Packt Publishing Limited, January 2017.
3. Stuart J.Russell, Peter Norving, Artificial Intelligence, Pearson Publishing, 2015

Note: 14 hrs will be assigned for Project.

Cloud Computing and its Applications Using Linux OS

Course Title	Code	Type of course	T-P-PJ	Prerequisite
Cloud Computing and its Applications using Linux	ENFC0602	Practice + Project	0-2-1	Nil

Course Objective

- To learn how to use Cloud Services.
- To implement Virtualization
- Apply Map-Reduce concept to applications.
- To build Private Cloud.
- Broadly educate to know the impact of engineering on legal and societal issues involved.

Course Outcome

- Analyze the Cloud computing setup with it's vulnerabilities and applications using different architectures.
- Design different workflows according to requirements and apply map reduce programming model.
- Apply and design suitable Virtualization concept, Cloud Resource Management and design scheduling algorithms.
- Acquires the skills in accessing cloud Storage systems and Cloud security and develop cloud application

Evaluation Systems

Internal Examination	Component	% of Marks	Method of Assessment
	Internal Practice	50(40+10)	Lab Work + Learning Record
	Internal Project	50	Project Work
External Examination	External Practice	50	Lab Work
	External Project	50	Project Work + Report
Total		200	

Course Outline

Module: I Introduction to User Permissions (10 Hours)

Users, Groups and Permissions, Using the bash Shell, Std. I/O and Pipes, Text Editor, Basic System Configuration Tools, Investigating and Managing Processes, Configuring the Bash Shell, Finding and Processing Files, Network Clients.

Module: II Basics Commands of OS (15 Hours)

Basic Commands & OS Basics, browsing root and various directories, ext3 and ext4 file system, chmod, chgrp, bash, set, shell basics, less, more, tail, head, sort, cut, grep, awk, sed, tr, etc., vi, ps, kill, top, jobs, shell scripting – branching, looping, find, locate and advanced find, network related scripts, cron, tar, and additional tools

Module: III File System Management (10 Hours)

Package Management, Kernel Services, and System Services, File system Management, User Administration, Network Configuration, Installation, and Troubleshooting, Minor Project for develop a file system, System Performance and Security, Web Service and website configuration,

Module: IV Commands of Linux (10 Hours)

Rpm , yum, apt-get, lspci, lsmod, systemctl services, chkconfig, creating partition, format and mount, LVM useradd, userdel, groupadd, groupdel, passwd, chage, acl, raid, iscsi etc, Basic Installation and Configuration Breaking SU passwd, services check Electronic Mail Services, Account Management, Design and develop a network using packet tracer. Cloud Computing

Module: V Introduction to Cloud (10 Hours)

Introduction to Cloud, Amazon EC2 and EBS, Amazon S3, RRS, Auto Scaling and load distribution in AWS, Route53, AWS VPC, IAM. Services and resources life cycle, AWS Architecture and Design, Cloud Migration and Implementation

Module: VI Introduction to Kali Linux(15 Hours)

Using Kali Linux - Footprinting and Reconnaissance - FP Terminology, What is FP, Why FP, Objectives of FP, Types of Threats, FP through Search Engines, Competitive Intelligence Gathering, Footprinting using google hacking WHOIS Lookup, DNS Information, Network FP, Traceroute, FP through Social Engineering, Pen Testing, FP Countermeasures. DN Analyzer Pro, Web Data Extractor.

Social Engineering : What is SE, Types of SE, Human-based, Computer-based and Mobile based SE, SE Countermeasures.

Module: VII Networking Concepts**(15 Hours)**

Scanning Networks : Identifying hosts, ports and services, Scanning Methodology, Checking Live Systems, Ping Sweep, Check for Open Ports, Scanning Techniques, scanning beyond IDS, Banner Grabbing, Scan for Vulnerability, Draw Network Diagrams, Prepare Proxies, Pen Testing. Sniffing: Wiretapping, Packet Sniffing, CAM Table, MAC Flooding Tool : macof -i eth0, Yersinia, DHCP Packet Format, Starvation Attack Tool. Rogue DHCP Server Attack ARP, ARP Spoofing Techniques, ARP Spoofing Attack, and Wireshark.

Online Resources

<https://www.aws.training/>

<https://www.aws.educate/>

Problem Solving Using Python

Course Title	Code	Type of course	T-P-PJ	Prerequisite
Problem Solving Using Python	ENFC0901	Theory +Practice	1-2-0	Nil

Objective:

- Learn core Python scripting elements such as variables and flow control structures.
- Understand the concepts of file I/O.
- Plot data using appropriate Python visualization libraries such as Numpy, Matplotlib and SciPy etc.
- To enhance the problem analysis capability and problem solving techniques using python

Course Outcome:

- Able to use object oriented concept to solve problems.
- To quickly and easily draw plot or visualize the information through visualization technique.
- Write an error free program of minimum 200 lines of code.
- Acquire python coding skill which helps students in getting jobs in different IT firms

Evaluation Systems

Internal Examination	Component	% of Marks	Method of Assessment
	Internal Theory	20	Written examination
	Internal Practice	30(20+10)	Lab work + Learning Record
External Examination	External Theory	30	Written examination
	External Practice	20	Lab work
Total		<i>100</i>	

Course Outline

Module I : Familiarization of Python (12 Hours)

Features and Installation, Setting up Path, Working with Python Basic Syntax, Variable and Data types, Basic operators, Numbers, Array, Tuples, Dictionary, Date and Time. **String Manipulation** :Accessing Strings, Basic Operations, String slices.

List :Accessing lists, Operations, Working with lists List (Functions).

Decision Making Statement :Boolean Expressions, if-else Statement, Nested if Else Statement, elif Statement, Switch Statement. **Iteration Statement** :The while Statement, for Statement, Nested Loops, Break and Continue statement.

Module II : Functions Operation (10 Hours)

Types of Function, Function Arguments, Passby reference vs value, Recursion Function. Files Operation : Create Text & Binary Files, Different modes of opening a file, Reading and Writing into Files, FilePositions.

Module III : NumPy (10 Hours)

Arrays, Array indexing, Data types, Array math operation, Sequences, Repetitions and Random number, Broadcasting, Polynomial, unique items and the counts.

Module IV : Functional Programming (12 Hours)

Lists, Tuples, Dictionaries, Strings, stacks, queues, lambda function, Standard library functions, multithreading.

Module V : SciPy (12 Hours)

Numpy VS SciPy, File input/output, Special Function, Linear Algebra, Operation, Interpolation, Optimization and fit, Statistics and random numbers, Numerical Integration, Fast Fourier transforms, Image manipulation.

Module VI : GUI Programming (08 Hours)

Example GUI Program, Environment Variables, Label, Message Widget, Text Area, Button, Radio Button, CheckBox, Listbox/ DropDown Box, Frames, Menu Widget, Menu Button Widget, Scrollbar, Forms, Sliders, Database access, Sending email.

Module VII: Data Visualization (11 Hours)

Visualization Libraries, Data frame : Data types, Attributes, methods (mean(), median(), std(), var(), cor(), min()/ max(), describe()), groupby method, Selecting Column, Filtering, Selecting row and column, Missing values, Data read from excel, CSV and txt file. **Plotting using Matplotlib** :Basic plot(), Histogram, Bar Plot, Box Plots, Area Plot, Scatter Plot, PieChart.

Text Books:

1. Fabrizio Romano, Learn Python Programming - Second Edition, Packt Publishing Limited, June 2018
2. Mark Lutz , Learning Python, O'Reilly 5th edition
3. Robert Johansson, Numerical Python, Apress 2nd edition
4. Kirthi Raman, Mastering Python Data Visualization, PACKT publishing 2015

Reference Books:

1. Wes McKinney , "Python for Data Analysis, O'Reilly 2nd edition 2017
5. SciPy and NumPy , Eli Bressert,O'Reilly 1st edition

Online Source:

1. Michael Dawson, Python Programming for the Absolute Beginner, Premier Press (ebook)
2. J.R. Johansson, Introduction to scientific computing with Python (<http://www-star.st-and.ac.uk/~pw31/CompAstro/IntroToPython.pdf>)

Object Oriented Programming Using Java

Course Title	Code	Type of course	T-P-PJ	Prerequisite
Object Oriented Programming using Java	ENFC0902	Theory + Practice + Project	1-1-1	Nil

Objective:

- To learn why Java is useful for the design of desktop and web applications.
- To learn how to implement object-oriented designs with Java.
- To identify Java language components and how they work together in applications.
- To design and program stand-alone Java applications.
- To learn how to design a graphical user interface (GUI) with Java Swing.
- To understand how to use Java APIs for program development.

Course Outcome:

- Able to understand the use of OOPs concepts.
 - Able to solve real world problems using OOP techniques.
 - Able to understand the use of abstraction.
 - Able to understand the use of Packages and Interface in java.
 - Able to develop and understand exception handling, multithreaded applications with synchronization.
- Able to **design** GUI based applications and **develop** applets for web applications.

Evaluation Systems

Internal Examination	Component	% of Marks	Method of Assessment
	Internal Theory	40 (30+5+5)	Written examination + Assignment + Attendance
	Internal Practice	50 (40+10)	Lab Work
	Internal Project	50	Project Work
External Examination	External Theory	60	Written examination
	External Practice	50	Lab Work
	External Project	50	Project Work + Report
Total		300	

Course Outline

Module:I Problem Solving Techniques & OOP(10 hrs)

Problem Solving Techniques: Ask Questions, Look for things that are familiar, solve by analogy, MeansEnds Analysis, Divide and Conquer, The building block approach, Merging solutions, Mental Block : The Fear of Starting, Object Oriented Problem Solving, and Case Study. Programming: Programming Language, Skeleton, Compilation, Interpretation, and Execution ofProgram.

Object-Oriented Programming: Object Oriented Concepts, Java Programming Environment,

Feature of Java, Elements of Java Program : Identifier, Naming Conventions, Build-in Type, Variable, Operators, Control Statements, Loops, Typecasting, Arrays,

Module : II Class & Characteristics of OOPs (12 hrs)

Classes : Concept of Objects and Classes, Using Methods, Local Variables, Instance Variables, Constructor, Overloading Constructor, Overloading Methods, Garbage Collection, The Finalize Method, Static, Final and this Keyword. Inheritance and Polymorphism : Basics, Access Modifier, The super Keyword, Method Overriding, Dynamic Method Dispatch, Abstract Classes, Inner Classes.

Module :III Package and Interface (12 hrs)

Packages : Packages, Access Protection, Importing Package Interfaces : Interface, Implementing Interfaces.

Module :IV String Handling and Exception Handling (10 hrs)

StringHandling : String, String Buffer, String Builder. Excepting Handling :Fundamentals, Checked and Unchecked Exceptions, Using Try, Catch, MultipleCatches, Throw, Throws, Finally, Java’s Built-In Exceptions, User-Defined Exception.

Module-V :Multi-Threading (10 hrs)

Multi-Threading : Java Thread Lifecycle Model, Thread Priorities, Synchronization, Creating Threads, Using Different Thread Methods, Wrapper Classes, Clone (java.lang), Collection API, Vectors(java.util).

Module-VI:Java.IO and AWT (10 hrs)

Java.IO : I/O Streams, Serialization AWT : AWT Classes, Window Fundamental, Component, Container, Panel, Window, Frame, Canvas, Control Fundamentals, Layout Managers.

Module: VIIEvent Handling(10 hrs)

Event Handling : Delegation Event Model, Event Classes, Event Listener Interfaces, and Adapter Classes, Handling Events by Extending AWT Components

Text Books:

1. Walter Savitch, “Java-An Introduction to Problem Solving& Programming”, 8th edition, in Pearson, 2017.
2. Herbert Schildt, “Java Complete Reference”, 10th edition, in McGraw-Hill Education, 2017.

Reference Books:

1. Bhavé & Patekar, “Programming with Java” in Pearson Education, 2008.
2. H.M. Deitel & Paul J. Deitel, “Java How to Program” in PHI, 9th Edition, 2012.

Online Source:

jvatpoint.com,

<http://www.corejavaguru.com>

<https://www.w3schools.in/java-tutorial/>

Web Technologies

Course Title	Code	Type of course	T-P-PJ	Prerequisite
Web Technologies	ENFC0903	Theory + Practice + Project	1-1-1	Nil

Objective:

- Understand client server architecture and able to use the skills for web project development
- Create job opportunities as a web developer.

Course Outcome:

- Develop a static, interactive and well-formed webpage using JavaScript, CSS3 and HTML5
- Use PHP7 to improve accessibility of a web document.
- Gain necessary skills for designing and developing web applications

Evaluation Systems

Internal Examination	Component	% of Marks	Method of Assessment
	Internal Theory	40 (30+5+5)	Written examination + Assignment + Attendance
	Internal Practice	50 (40+10)	Lab Work
	Internal Project	50	Project Work
External Examination	External Theory	60	Written examination
	External Practice	50	Lab Work
	External Project	50	Project Work + Report
Total		300	

Course Outcome

Module: I HTML5:(10 hrs)

Editors, Attributes, Head, Meta, Body, Style, Paragraphs, Headings, Bold, Line Breaks, Horizontal Rule, Upload, Textarea, Charset, URL Encoding, XHTML, Semantics, Migration, Syntax, Canvas, SVG, Audio, Video, API's, Geolocation, Drag/Drop, Local Storage, Web Workers, App Cache

Module:II CSS3 (10 hrs)

Introducing CSS3,What is CSS3?,The History of CSS, Browser Support, Selectors and Pseudo Classes, Attribute Selectors, The Target Pseudo-Class, UI Element States Pseudo- Classes, Negation Pseudo-Class, Structural Pseudo-Classes, Fonts and Text Effects, Fonts on the Web, Font Services, Gradients, Rounded Corners, Box Shadow, Transitions, Transforms, and Animations, Transitions and Transforms, Transitions.

Module:III Java Script, XML (12 hrs)

Basics, Functional programming, Object oriented programming, Client-side applications, Server-side applications, Design patterns and Idioms, Popularframeworks.
XML Basics, SAX, DOM, Xpath, Digester, XUL, SOAP, WSDL

Module:IV PHP (12 hrs)

Introduction to PHP,Installation of PHP and mySql,PHP configuration in IIS & Apache Web Server and features of PHP,Writing PHP,How PHP code is parsed,Embedding PHP and HTML,Executing PHP and viewing in Browser,Data types,Operators,PHP variables : static and global variables,Comments in PHP,Control Structures,Condition statements,If...Else Switch,? Operator,Loops,While,Break Statement,Continue,Do... While,For,For each,Exit, Die, Return,Arrays in PHP

Module: V Advanced PHP(10 hrs)

Working With Data Form Element, Input Elements, Validating The User Input, Passing Variables Between Pages, Passing Variables Through A Get,Passing Variables Through A Post, Passing Variables Through A Request,Functions,Handling Sessions And Cookies, Concept Of Session, Starting Session,Modifying Session Variables, Unregistering And Deleting Session Variable,Concept Of Cookies,Handling Of Cookies, Introduction Of MySQL, Types Of Tables In Mysql,Query In Mysql : Select, Insert, Update, Delete,Truncate,Alias,Order By,Database Connectivity Of Php With Mysql

Module: VI Mysqli(10 hrs)

Data Definition Statements, Data Manipulation Statements, Transactional and Locking Statements, Replication Statements, Prepared SQL Statement Syntax, Compound-Statement Syntax, Database Administration Statements, Utility Statements, Connection with PHP and Mysql using PDOs

Module: VII CMS (10 hrs)

BootStrap, Joomla, Wordpress, Drupal with project implementation

Text Books

1. HTML 5 Black Book (Covers CSS3, JavaScript, XML, XHTML, AJAX, PHP, jQuery) 2Ed By DT Editorial Services.
2. [Web Technologies: HTML, JAVASCRIPT, PHP, JAVA, JSP, ASP.NET, XML and Ajax, Black Book: HTML...](#) by Kogent Learning Solutions Inc.
3. MySQL(TM): The Complete Reference,Vikram Vaswani
4. PHP: The Complete Reference,Steven Holzner
5. Beginning HTML5 and CSS 3, Copyright © 2012 by Richard Clark, Oli Studholme, Christopher Murphy and Divya Manian.

Software Engineering using Agile

Course Title	Code	Type of course	T-P-PJ	Prerequisite
Software Engineering using Agile	ENFC0904	Theory + Practice + Project	1-1-1	Nil

Objective

- Explain the phases of Software Development.
- Teach the customer requirement gathering techniques.
- Familiarize with Agile software development methods.
- Demonstrate the testing techniques.
- Teach Software Design techniques
- Learn the skill principles and practices associated with agile development methods

Course Outcome:

- List the steps involved in software development.
 - Interpret the myths of software.
 - Analyze various software process models
 - Explain agile software development model
 - Identify the functional and non-functional requirements for software development
 - Analyse user requirements for a software
- Apply agile software development model (L3)
 Identify different requirement modeling strategies (L2)
 Design UML Diagrams for the given problem (L6)

Evaluation Systems

	Component	% of Marks	Method of Assessment
Internal Examination	Internal Theory	40 (30+5+5)	Written examination + Assignment + Attendance
	Internal Practice	50 (40+10)	Lab Work
	Internal Project	50	Project Work
External Examination	External Theory	60	Written examination
	External Practice	50	Lab Work
	External Project	50	Project Work + Report
Total		300	

Course Outline

Module: I Software Engineering Process: (10 hrs)

The Nature of Software, The Unique Nature of WebApps, Software Engineering, The Software Process, Software Engineering Practice, Software Myths, How It All Starts. A Generic Process Model, Process Assessment and Improvement, Prescriptive Process Models, Specialized Process Models, The Unified Process, Personal and Team Process Models, Process Technology.

Module: II Agility(10 hrs)

What Is Agility?, Agility and the Cost of Change, What Is an Agile Process?, Extreme Programming (XP), Other Agile Process Models, A Tool Set for the Agile Process, Software Engineering Knowledge , Core Principles, Principles That Guide Each Framework Activity, Requirements Engineering, Establishing the Groundwork, Eliciting Requirements, Developing Use Cases, Building the Requirements Model, Negotiating Requirements, Validating Requirements.

Module: III UML Models (12 hrs)

Requirements Analysis, Scenario-Based Modeling, UML Models That Supplement the Use Case, Data Modeling Concepts, Class-Based Modeling, Requirements Modeling Strategies, Flow-Oriented Modeling, Creating a Behavioral Model, Patterns for Requirements Modeling, Requirements Modeling for WebApps.

Module: IV Software Design (12 hrs)

Design within the Context of Software Engineering, The Design Process, Design Concepts, The Design Model, Software Architecture, Architectural Genres, Architectural Styles, Assessing Alternative Architectural Designs, Architectural Mapping Using Data Flow.

Module: VSoftware Design

What Is a Component?, Designing Class-Based Components, Conducting Component-Level Design, Component-Level Design for WebApps, Designing Traditional Components, Component-Based Development.

Module: VI Software Interface (10 hrs)

The Golden Rules, User Interface Analysis and Design, Interface Analysis, Interface Design Steps, WebApp Interface Design, Design Evaluation, A Strategic Approach to Software Testing, Strategic Issues, Test Strategies for Conventional Software, Test Strategies for Object-Oriented Software, Test Strategies for WebApps, Validation Testing, System Testing.

Module: VII Software Testing (10 hrs)

The Art of Debugging, Software Testing Fundamentals, Internal and External Views of Testing, White-Box Testing, Basis Path Testing

Internet of Things

Course Title	Code	Type of course	T-P-PJ	Prerequisite
Internet of Things	ENFC1407	Workshop	0-2-0	Nil

Objective

- Introduce the fundamental concepts of IoT and physical computing
- Expose the student to a variety of embedded boards and IoT Platforms
- Create a basic understanding of the communication protocols in IoT communications.

Course Outcome:

- Explain IOT architecture.
- Interpret the design principles that govern connected devices
- Summarize the roles of various organizations for IOT
- Explain the basics of microcontrollers
- Outline the architecture of Arduino
- Acquire skills to develop applications using Arduino

Evaluation Systems

	Component	% of Marks	Method of Assessment
Internal Examination	Internal Practice	100	Workshop
	Total	100	

Course Outline

Module: I

The Internet of Things : An Overview; The Flavour of the Internet of Things; The “Internet” of “Things”; The Technology of the Internet of Things; Enchanted Objects; Who is Making the Internet of Things?; Design Principles for Connected Devices; Calm and Ambient Technology; Privacy; Keeping Secrets; Whose Data Is It Anyway?; Web Thinking for Connected Devices; Small Pieces, Loosely Joined; First-Class Citizens On The Internet; Graceful Degradation ; Affordances

Module: II

Embedded Computing Basics; Microcontrollers; System-on-Chips; Choosing Your Platform; Arduino; Developing on the Arduino; Some Notes on the Hardware; Openness;

Module: III

Raspberry Pi ; Cases and Extension Boards; Developing on the Raspberry Pi; Some Notes on the Hardware; Openness; Other notable platforms; Mobile phones and tablets; Plug Computing ; Always-on Internet of Things

Module: IV

Internet Principles; Internet Communications : An Overview IP; TCP; The IP Protocol Suite (TCP/IP); UDP ; IP Addresses; DNS ; Static IP Address Assignment ; Dynamic IP

Module: V

Address Assignment; IPv6 ; MAC Addresses ; TCP and UDP Ports An Example : HTTP Ports ; Other Common Ports; Application Layer Protocols- HTTP; HTTPS : Encrypted HTTP ; Other Application Layer Protocols

Module: VI

Getting Started with an API; Mashing Up APIs; Scraping; Legalities; Writing a New API; Clockodillo; Security; Implementing the API; Using Curl to Test; Going Further;

Module: VII

Real-Time Reactions; Polling; Comet; Other Protocols ; MQ Telemetry Transport; Extensible Messaging and Presence Protocol; Constrained Application Protocol

Build Your Own Computer

Course Title	Code	Type of course	T-P-PJ	Prerequisite
Build your Own Computer	ENFC1402	Workshop	0-2-0	Nil

Objective:

- Develop ability to understand the internals of Computer and peripherals
- To have an overall idea about networking concepts and devices
- To have an overall idea about secure computing

Course Outcome:

- Build your computing device
- Troubleshoot various faults in a computer system and network
- Construct small LAN for resource sharing

Evaluation Systems

	Component	% of Marks	Method of Assessment
Internal Examination	Internal Practice	100	Workshop
	Total	100	

Course Outline

Module: I

Firmware upgrades/flash BIOS, BIOS component information, BIOS configurations, Built-in diagnostics, Monitoring. Sizes of cabinet, Expansion slots, RAM slots, CPU sockets, Chipsets, CMOS battery, Power connections and types, Fan connectors, Front/top panel connectors, Bus speeds, Resetbutton.

Module :II

Types of RAM, Single channel vs. dual channel vs. triple channel, RAM compatibility. Sound cards, Video cards, Network cards, USB cards, Firewire cards, Thunderbolt cards, Storage cards, Modem cards, Wireless/cellular cards, TV tuner cards, Video capture cards, Risercards.

Module :III

Display types, Refresh/frame rates, Resolution, Native resolution, Brightness/lumens, Analog vs. digital, Privacy/antiglare filters, Multiple displays, Aspect ratios. Display cable and connector types.

Module :IV

Drives, Magnetic hard disk drives, Hot swappable drives, Solid state/flash drives, RAID types, Tape drive, Media capacity.

Module :V

Socket types – Intel and AMD, Characteristics, Cooling – Heat sink, fans, thermal paste.
Connector type, characteristics and their voltages

Module :VI

Input and Output devices, network cable and connectors, crimping of network cable. Hardware and network troubleshooting. Assembling and disassembling of computer and laptop

Module :VII

Installation of DOS and Non-DOS operating system – Automatic and Manual Configurations

Cloud Computing Application

Course Title	Code	Type of course	T-P-PJ	Prerequisite
Cloud Computing Application	ENFC1403	Workshop	0-2-0	Nil

Objective

- Learn fundamentals of cloud computing
- Learn to build distributed applications and microservices with AWS Step Functions
- Learn step-by-step to setup up AWS platform

Course Outcome

- Setup AWS Account and AWS infrastructure
- Deploying serverless micro services
- Implementing scalability and implementing high availability

Evaluation Systems

	Component	% of Marks	Method of Assessment
Internal Examination	Internal Practice	100	Workshop
	Total	100	

Course outline

Module: I (8 Hrs)

UNDERSTANDING CLOUD BASICS

Defining cloud computing, Introducing public, private, and hybrid clouds, Introducing cloud service models – IaaS, PaaS, and SaaS, Introducing multi-tenancy models, Compare cloud value proposition with conventional models. Understand Global Infrastructure – Region, Availability Zones, Edge Locations; Setting up AWS account, Getting Familiarity with AWS Management Console; Understanding cloud-based workloads

Module: II (10 Hrs)

DESIGNING CLOUD APPLICATIONS

Introducing cloud-based multitier architecture, Designing for multi-tenancy, Understanding cloud applications design principles, Understanding emerging cloud-based application architectures, Estimating your cloud computing costs, A typical e-commerce web application

Module: III (8 Hrs)

INTRODUCING AWS COMPONENTS

AWS components, managing costs on AWS cloud, Application development environments
Setting up the AWS infrastructure

Module: IV (8 Hrs)

DESIGNING FOR AND IMPLEMENTING SCALABILITY

Defining scalability objectives, Designing scalable application architectures, Leveraging AWS infrastructure services for scalability, Evolving architecture against increasing loads, Event handling at scale, setting up Auto Scaling

Module: V (8 Hrs)

DESIGNING FOR AND IMPLEMENTING HIGH AVAILABILITY

Defining availability objectives, Nature of failures, Setting up high availability

Module: VI (8 Hrs)

DESIGNING FOR AND IMPLEMENTING SECURITY

Defining security objectives, Understanding the security responsibilities, Best practices in implementing AWS security, Setting up security

Module: VII (10 Hrs)

DEPLOYING TO PRODUCTION AND GOING LIVE

Managing infrastructure, deployments, and support at scale, Creating and managing AWS environments using CloudFormation, Using CloudWatch for monitoring, Using AWS solutions for backup and archiving, Planning for production go-live activities, Setting up for production

E-content :www.awseducate.com

https://aws.amazon.com/getting-started/use-cases/?awsf.getting-started-content=*default

Text Books :

Aurobindo Sarkar, Amit Shah, Learning AWS - Second Edition, Packt Publishing Limited, February 2018, ISBN 9781787281066

Reference Books:

Vipul Tankariya, AWS Certified SysOps Administrator - Associate Guide, Packt Publishing Limited August 2018, ISBN 9781788990776

John Stamper, Sean Senior, Kevin E. Kelly, Biff Gaut, Tim Bixler, Hisham Baz, Joe Baron, AWS Certified Solutions Architect Official Study Guide, John Wiley & Sons, October 2016, ISBN : 9781119138556

Online Source :

<https://aws.amazon.com/>

<https://www.awseducate.com/faqs?app=3>

Session Plan

Topic coverage and Internal Test	No. of Sessions (in hrs.)	Activity (lecture, tutorial, lab practice, field studies/field-trip, Workshop etc.)	Assignment (project, assignment, field study, seminar, etc.)	Suggested Reading (Book, Video, Online source, etc.)

Defining cloud computing, Introducing public, private, and hybrid clouds	2	Lecture	Assignment	Text Book -1
Introducing cloud Service models – IaaS, PaaS, and SaaS, Introducing multi-tenancy models	2	Lecture	Assignment	T.B-1
Understanding cloud-based workloads, Setting up AWS account	2	Lab Practice	Experiment	T.B-1
Introducing cloud-based multitier architecture, Designing for multi-tenancy	2	Lab Practice	Experiment	T.B-1
Understanding cloud applications design principles, Understanding emerging cloud-based application architectures	2	Lab Practice	Experiment	T.B-1
Estimating your cloud computing costs, A typical e-commerce web application	2	Lab Practice	Experiment	T.B-1
AWS components, Managing costs on AWS cloud	2	Lab Practice	Experiment	T.B-1
Application development environments	2	Lab Practice	Experiment	T.B-1
Setting up the AWS infrastructure	2	Lab Practice	Experiment	T.B-1
Defining scalability objectives, Designing scalable application architectures	4	Lab Practice	Experiment	T.B-1
Leveraging AWS infrastructure services for scalability	4	Lab Practice	Experiment	T.B-1
Evolving architecture against increasing loads	2	Lab Practice	Experiment	T.B-1
Event handling at scale , Setting up Auto Scaling	4	Lab Practice	Experiment	T.B-1
Defining availability objectives, Nature of failures, Setting up high availability	6	Presentation, Lab Practice	Assignment, Experiment	T.B-1

Defining security objectives, Understanding the security responsibilities	3	Lab Practice	Experiment	T.B-1
Best practices in implementing AWS security, Setting up security	4	Lab Practice	Experiment	T.B-1
Managing infrastructure, deployments, and support at scale	3	Lab Practice	Experiment	T.B-1
Creating and managing AWS environments using CloudFormation	3	Lab Practice	Experiment	T.B-1
Using CloudWatch for monitoring	2	Lab Practice	Experiment	T.B-1
Using AWS solutions for backup and archiving	2	Lab Practice	Experiment	T.B-1
Planning for production go-live activities, Setting up for production	3	Lab Practice	Experiment	T.B-1
Total (hrs)	60			

The following colour represents the syllabus revision, skill, employability and entrepreneurship.

Green : Skill

Pink : Employability

Sky : Entrepreneurship

Centurion University of Technology and Management Odisha

Choice Based Credit System

Course Structure & Syllabus

	Course Title	Typ	(Cr	Prereq	C	C	C	C	C	C	C	P	P	P
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BASKET - IV



CENTURION UNIVERSITY OF TECHNOLOGY AND MANAGEMENT

School of Engineering & Technology

2018

Course Structure

Basket – IV Electronics and Electrical Engineering

ELCC 0101	Transmission & Distribution	Theory	3	Nil	H	H	H	M	H	M	M	H	H	H
ELCC 0102	Power System Operation & Control	Theory	3	Nil	H	H	H	L	M	M	M	M	H	L
ELCC 0103	Distributed Generation & Micro Grid	Theory	2	Nil	H	M	M	L	M	M	H	M	H	H
EECC 0101	Soft Computing Techniques - I	Theory	2	Nil	H	H	H	L	M	H	L	H	H	L
ELCC 0202	Electrical Circuit Drawing (Using Auto CAD)	Practice	2	Nil	H	H	L	L	H	H	L	H	H	H
ELCC 0401	Network Theory	Theory + Practice	3	Nil	H	H	H	M	H	M	L	H	H	M
EECC 0409	Electronic Measurement & Instrumentation	Theory + Practice	3	Nil	H	M	M	L	H	M	H	H	H	L
ELCC 0403	Linear Integrated Circuits & Application	Theory + Practice	3	Nil	H	H	H	L	M	M	H	M	M	M
EECC 0405	Power Electronics	Theory + Practice	5	Nil	H	H	M	L	H	H	M	H	H	M
EECC 0402	Micro Controllers for Industrial Application	Theory + Practice	4	Nil	H	H	H	M	H	H	M	H	H	L

	(PIC)														
ELCC 0406	Control System	The ory + Prac tice	5	Nil	H	H	H	L	M	H	L	M	H	L	
ELCC 0407	Microproces sor and its Interfacing	The ory + Prac tice	2	Nil	H	H	H	M	H	H	M	H	H	L	
ECCC 0402	Digital Electronic Circuits	The ory + Prac tice	4	Nil	H	H	H	L	H	H	L	H	H	L	
ECCC 0404	Digital Signal Processing	The ory + Prac tice	4	Nil	H	H	H	L	H	H	M	H	H	L	

Transmission & Distribution

Course Title	Code	Type of course	T-P-P	Prerequisite
Transmission & Distribution	ELCC0101	Theory	3-0-0	Nil

Objective

- To make the students conversant with all the important aspects of overhead transmission and distribution system.

Course Outcome

- Understand the structure, components, calculations and design of transmission and distribution line parameters.
- Design power system components for a specified system and application

Evaluation Systems

	Component	% of Marks	Method of Assessment
Internal Examination	Internal Theory	30	Written examination
	Assignment	5	Report or Presentation + Learning Record
	Attendance	5	Based on class attended
External Examination	External Theory	60	Written examination
Total		100	

Course Outline

Module I: Transmission Line Parameters-Resistance and Inductance (10 hours)

Theory

Resistance: Series impedance of transmission line, Types of conductors, Resistance, Tabulated Resistance value, Skin and Proximity effects, **Inductance:** Inductance of a conductor due to Internal Flux, Flux linkages between two points External to an Isolated Conductor, Inductance of a Single-phase Two-wire Line, Flux Linkages of One Conductor in a group, Inductance of composite conductor lines, The use of tables, Inductance of Three-phase Lines with Equilateral Spacing, Inductance of Three-phase Lines with Unsymmetrical Spacing, Inductance calculations for Bundled Conductor

Module II: Capacitance of Transmission Lines (6 hours)

Theory

Electric field of a long, straight conductor, The potential Difference between Two Points Due to a Charge, Capacitance of a Two wire Line, , Capacitance of Three-phase Lines with Equilateral

Spacing, Capacitance of Three-phase Lines with Unsymmetrical Spacing, Effect of Earth on the Capacitance of Three-phase Transmission line, capacitance calculation for bundled conductors, Parallel-circuit Three-phase Lines.

Module III: Performance Of Transmission Lines (14 hours)

Theory

Current and Voltage Relations on a Transmission Line, Representation of Lines, Short Transmission Line, Medium Length Line, Long Transmission Line, Equivalent Circuit of a long Transmission Line, Ferranti effect , Power flow through a Transmission Line, Reactive compensation of Transmission Line, Transmission Line Transients, Travelling waves, Reflections, Direct current Transmission

Module IV: Overhead Line Insulators (3 hours)

Theory

Types of Insulators, String efficiency and Methods for improvement of string efficiency.

Module V: Mechanical Design Of Overhead Transmission Lines (3 hours)

Theory

Sag and Tension Calculations- with equal and unequal heights of towers, Effect of Wind and Ice on weight of Conductor.

Module VI: Corona (3 hours)

Theory

Description of the phenomenon, factors affecting corona, critical voltages and power loss, Radio Interference

Module VII: Distribution (6 hours)

Theory

Comparison of various Distribution Systems, AC three-phase four-wire Distribution System, Types of Primary Distribution Systems, Types of Secondary Distribution Systems, Voltage Drop in DC & AC Distributors, Kelvin’s Law & Limitations.

Text Books:

1. John J. Grainger and W. D. Stevenson, “Power System Analysis,” Tata McGraw-Hill, 2003.
2. M..L. Soni, , P.V.Gupta, , U.S.Bhatnagar, and A .Chakrabarthy, “A Text Book on Power System Engineering” DhanpatRai& Co Pvt. Ltd.

Session Plan

Topics	No. of Sessions (in hrs.)	Activity	Assignment	Suggested Reading

Module – I :Transmission Line Parameters-Resistance and Inductance (10 hours)				
Series impedance of transmission line: Types of conductors, Resistance, Tabulated Resistance value,	1	Lecture	-	TB 1 4.1,4.2,4.3
Skin Effect and Proximity effect	1	Lecture	Assignment 1.2	
Inductance of a conductor due to Internal Flux,	1	Lecture	Assignment 1.3	TB 1 4.4
Flux linkages between two points - External to an Isolated Conductor,	1	Lecture	Assignment 1.4	TB 1 4.5
Inductance of a Single-phase Two wire Line	1	Lecture	Assignment 1.5	TB 1 4.6
Flux Linkages of One Conductor in a group,	1	Lecture	Assignment 1.6	TB 1 4.7
Inductance of composite conductor lines, The use of tables,	1	Lecture	Assignment 1.7	TB 1 4.8,4.9
Inductance of Three-phase Lines with Equilateral Spacing,	1	Lecture	Assignment 1.8	TB 1 4.10
Inductance of Three phase Lines with Unsymmetrical Spacing	1	Lecture	Assignment 1.9	TB 1 4.11
Inductance calculations for Bundled Conductor.	1	Lecture	Assignment 1.10	TB 1 4.12
Module – II Capacitance of Transmission Lines (6 hours)				
Capacitance of Transmission Lines: Electric field of a long straight conductor	1	Lecture	Assignment 2.1	TB 1 5.1
The potential Difference between Two Points Due to a Charge,	1	Lecture	Assignment 2.2-2.4	TB 1 5.2
Capacitance of a Two wire Line,	1	Lecture	Assignment 2.5-26	TB 1 5.3
Capacitance of Three-phase Lines with Equilateral Spacing,	1	Lecture	Assignment 2.7-2.9	TB 1 5.4
Capacitance of Three-phase Lines with Unsymmetrical Spacing,	1	Lecture	Assignment 2.10-2.12	TB 1 5.5
Effect of Earth on the Capacitance of Three-phase Transmission line	1	Lecture	Assignment 2.13-2.15	TB 1 5.6
Module – III Performance Of Transmission Lines (14 hours)				
Performance of transmission lines: Representation of Lines,	1	Lecture	Assignment 3.1	TB 1 6.1
Short Transmission Line,	1	Lecture	Assignment 3.2-3.5	TB 1 6.2
Medium Length Line: End condenser method	1	Lecture	Assignment 3.6	TB 1 6.3.1
Nominal T method	1	Lecture	Assignment	TB 1

			3.7-3.10	6.3.2
Nominal Pie Method	1	Lecture	Assignment 3.11-3.15	TB 1 6.3.3
Long Transmission Line: Rigorous method of solving long transmission line	2	Lecture	Assignment 3.16-3.18	TB 1 6.4
Equivalent Circuit of a long Transmission Line, Equivalent T circuit	2	Lecture	Assignment 3.19	TB 1 6.5
Equivalent Circuit of a long Transmission Line, Equivalent pie circuit	2	Lecture		TB 1 6.6
Ferranti effect, Power flow through a Transmission Line,	1	Lecture	Assignment 3.20	TB 1 6.7,6.8
Reactive compensation of Transmission Line, Transmission Line Transients, Travelling waves	2	Lecture		TB 1 6.9
Module – IV Overhead Line Insulators (3 hours)				
Insulators: Types of Insulators,	1	Lecture	Assignment 4.1-4.3	TB 2 11.1,11.2
String efficiency calculation	1	Lecture	Assignment 4.4-4.8	TB 2 11.3,11.5
Methods for improvement of string efficiency	1	Lecture	Assignment 4.9-4.12	TB 2 11.6
Module – V Mechanical Design Of Overhead Transmission Lines (3 hours)				
Mechanical Design of Overhead Transmission Lines: Sag Calculations with equal heights of towers	1	Lecture	Assignment 5.1-5.6	TB 2 12.1,12.3
Sag Calculations with unequal heights of towers	1	Lecture	Assignment 5.7-5.10	TB 2 12.4
Effect of Wind & Ice on weight of Conductor,	1	Lecture	Assignment 5.11-5.15	TB 2 12.6,12.7
Module – VI Corona (3 hours)				
Corona: Description of the phenomenon	1	Lecture	Assignment 6.1	TB 2 15.1,15.2
Factors affecting corona	1	Lecture	Assignment 6.2	TB 2 15.3
critical voltages and power loss, Radio Interference	1	Lecture	Assignment 6.3-6.6	TB 2 15.4,15.5
Module – VII Distribution (6 hours)				
Distribution: Comparison of various distribution systems AC three-phase four-wire Distribution System,	1	Lecture	Assignment 7.1-7.4	TB 2 18.1,18.2
Types of Primary Distribution	1	Lecture	Assignment	TB 2

Systems, Types of Secondary Distribution Systems			7.5-7.6	18.3,18.4
Voltage Drop in DC Distributors,	2	Lecture	Assignment 7.7-7.15	TB 2 18.5,18.6
Voltage Drop in AC Distributors,	1	Lecture	Assignment 7.16-7.20	TB 2 19.1-4
Kelvin's Law & Limitations	1	Lecture	Assignment 7.21-7.25	TB 2 7.5
Total (hrs)= 45Hours (Theory- 45 hours + Practice-0 hours)				

Power System Operation and Control

Course Title	Code	Type of course	T-P-P	Prerequisite
Power System Operation and Control	ELCC0102	Theory	3-0-0	Nil

Objective

- To learn the basic control technique involved in power system operation
- To provide a solid foundation in mathematical and engineering fundamentals required to control the governing system in turbine models

Course Outcome

- Make Economic operation of power system and importance of LFC
- Analyze thermal and hydro power plant operation in meeting the load demand optimally
- Analyze single area load frequency control and two area load frequency control

Evaluation Systems

	Component	% of Marks	Method of Assessment
Internal Examination	Internal Theory	30	Written examination
	Assignment	5	Report or Presentation + Learning Record
	Attendance	5	Based on class attended
External Examination	External Theory	60	Written examination
Total		100	

Course Outline

Module I :Load Flow Studies (3 hours)

Theory

Network model formulation, Y bus formation (MATLAB) and singular matrix transformation

Module II : Load Flow Solution

(9 hours)

Theory

Load flow problem , Gauss Seidel (GS) method, Newton-Raphson method (NR) (Polar, Rectangular form), Decoupled, Fast Decoupled load flow and comparison, Concept of DC loads flow.(Topics on Gauss Seidel (GS) method, Newton-Raphson method (NR) and Y bus formation

Module III : Economic System Operation

(8 hours)

Theory

Generator operating cost, input-output, Heat rate and IFC curve, Constraints in operation, Coordinate equation, Exact coordinate equation, B_{mn} coefficients, transmission loss formula, Economic operation with limited fuel supply and shared generators, Economic exchange of power between the areas. Optimal unit commitment (MATLAB/SciLab) and reliability considerations

Module IV : Automatic Generation and control (6 hours)

Theory

Load frequency control problem, Thermal Governing system and transfer function, Steam Turbine and Power system transfer function, isolated power system static and dynamic response.

Module V : Load Frequency Control (6 hours)

Theory

Two area load frequency control, static and dynamic response, Frequency biased Tie line Bias control- implementation and effect, Implementation of AGC, AGC in restructured power system(media presentation), under frequency load shedding, GRC, Dead band and its effect.

Module VI : Power System Stability (6 hours)

Theory

Types of Stability Study, Dynamics of synchronous machine, Power angle equation, Node elimination technique, Simple Systems, Steady state stability, Transient stability

Module VII : Equal Area Criteria (7 hours)

Theory

Equal area criteria and its applications, Numerical solution of swing equation, Modified Euler's method.(MATLAB/SciLab)

Text Books

1. W.D. Stevenson., G. J. Grainger. "Elements of Power System."Mc-Graw-Hill Publication
2. Kothari. D. P, Nagrath. I. J., "Modern Power System Analysis," TMH Publication, Third Edition, 2008
3. Olle.I.Elgerd, "Electric energy systems theory-An introduction", Tata McGrawHill publishing Ltd, New Delhi,2008

Reference Books

1. P.Venkatesh, B.V. Manikandan,"Electrical Power Systems," PHI Publication
2. Kimbark E W, "Power System Stability," Volume I, and III, Wiley Publication.
3. HadiSaadat, "Power System Analysis," TMH Publication ,Second Edition, 2002

Session Plan

<i>Topic coverage and Internal Test</i>	<i>No. of Sessions (in hrs.)</i>	<i>Activity</i>	<i>Assignment</i>	<i>Suggested Reading</i>

Module I : Load Flow Studies (Theory-3 hours, Practice-0)				
Load Flow Studies: Network model formulation,	01	Lecture	Assignment 1.1	TB- 1 Ch-7.1
Y bus formation and singular matrix transformation	02	Lecture	Assignment 1.1	TB- 1 Ch-7.3
Module II: Load Flow Solution (Theory-9 hours, Practice-0)				
Load flow problem, Gauss Seidel (GS) method	03	Lecture	Assignment 1.2	TB- 1 Ch-9.2
Newton-Raphson method (NR) (Polar, Rectangular form)	04	Lecture	Assignment 1.2	TB- 1 Ch-9.3
Decoupled, Fast Decoupled load flow and comparison. Concept of DC loads flow.	02	Lecture	Assignment 1.2	TB- 1 Ch-9.7
Module III : Economic System Operation (Theory-8 hours, Practice-0)				
Generator operating cost: input-output, Heat rate and IFC curve	02	Lecture	Assignment 2.1	TB- 1 Ch-13
Constraints in operation, Coordinate equation, Exact coordinate equation	01	Lecture	Assignment 2.1	TB- 1 Ch-13
Bmn coefficients, transmission loss formula	01	Lecture	Assignment 2.1	TB- 1 Ch-13
Economic operation with limited fuel supply and shared generators, Economic exchange of power between the areas.	02	Lecture	Assignment 2.1	TB- 1 Ch-13
Optimal unit commitment and reliability considerations	02	Lecture	Assignment 2.1	TB- 1 Ch-13
Module IV: Automatic Generation and control (Theory-6 hours, Practice-0)				
Automatic Generation and control:	01	Lecture	Assignment 2.2	TB- 3 Ch-4
Load frequency control problem	01	Lecture	Assignment 2.2	TB- 3 Ch-4
Thermal Governing system and transfer function	01	Lecture	Assignment 2.2	TB- 3 Ch-4
Steam Turbine and Power system transfer function, Isolated power system:-static and dynamic response , PI control and implementation.	03	Lecture	Assignment 2.2	TB- 3 Ch-4
Module V : Load Frequency Control (Theory-6 hours, Practice-0)				
Two area load frequency control, static and dynamic response,	02	Lecture	Assignment 2.3	TB- 3 Ch-5
Frequency biased Tie line Bias control-implementation and effect, Implementation of AGC	02	Lecture	Assignment 2.3	TB- 3 Ch-5
AGC in restructured power system, under	01	Lecture	Assignment	TB- 3

frequency load shedding			2.3	Ch-5
GRC, Dead band and its effect	01	Lecture	Assignment 2.3	TB- 3 Ch-5
Module VI : Power System Stability (Theory-6 hours, Practice-0)				
Types of Stability Study, Dynamics of synchronous machine	02	Lecture	Assignment 3.1	TB- 1 Ch-16
Power angle equation	01	Lecture	Assignment 3.1	TB- 1 Ch-16
Node elimination technique	01	Lecture	Assignment 3.1	TB- 1 Ch-16
Simple Systems, Steady state stability, Transient stability,	02	Lecture	Assignment 3.1	TB- 1 Ch-16
Module VII : Equal Area Criteria (Theory-7 hours, Practice-0)				
Equal area criteria and its applications	03	Lecture	Assignment 3.2	TB- 1 Ch-16
Numerical solution of swing equation	02	Lecture	Assignment 3.2	TB- 1 Ch-16
Modified Euler's method	02	Lecture	Assignment 3.2	TB- 1 Ch-16
Total (hrs)= 45Hours (Theory- 45 hours + Practice-0 hours)				

Distributed Generation & Micro Grid

Course Title	Course Code	Course Type	T-P-Pr	Prerequisite
Distributed Generation & Micro Grid	ELCC0103	Theory	2-0-0	Nil

Objective

- To make students understand the integration between renewable sources with Micro-Grid

Course Outcome

- Understand the concepts behind distributed generation
- Understand the integration technique in micro grid

Evaluation Systems

Internal Examination	Component	% of Marks	Method of Assessment
	Internal Theory	30	Written examination
	Assignment	5	Report or Presentation + Learning Record
	Attendance	5	Based on class attended
External Examination	External Theory	60	Written examination
Total		100	

Course Outline

Module I: Introduction

(5 hrs)

Theory

Conventional power generation: advantages and disadvantages, Non-conventional energy (NCE) resources: review of Solar PV, Wind Energy systems, Fuel Cells, micro-turbines, biomass, and tidal sources.

Module II: Distributed Generation

(4 hrs)

Theory

Concept of distributed generations, Why integration of distributed generation? Active distribution network. Distributed generation, technology, value of distributed generation, application & issues, distributed resources, distributed capacity, factors of DG growth, general structure

Module III: Supply demand in Electric power grid

(4 hrs)

Theory

Understanding the grid, reliability concept, electric power dynamic demand, need of spinning reserve, local load control

Module IV: Basics of a Micro-Grid**(5 hrs)****Theory**

Concept and definition of micro grid, classification ,need & application of micro-grid, formation of micro grid, typical structure and configuration of a micro grid, AC and DC micro grids, Power Electronics interfaces in DC and AC micro grids.

Module V:DC Micro Grids**(4 hrs)****Theory**

PV sources control, storage control, grid connection control, DC load control, Power balancing principle

Module VI :Control & Operation of Micro Grid**(4 hrs)****Theory**

Modes of operation and control of micro grid: grid connected and islanded mode, Active and reactive power control, protection issues

Module VII: Storage Technologies**(4 hrs)****Theory**

Classification of electrical energy storage, mechanical storage system, batteries, flywheels, super conducting magnetic energy storage, super capacitors.

Text Books

1. Magdi S. Mahmoud, Fouad M. AL-Sunni, “Control and Optimization of Distributed Generation Systems,”
2. Gevork B. Gharehpetian, S. Mohammad Mousavi Aga, “Distributed Generation Systems: Design, Operation and Grid Integration,”

Session Plan

Topics	No. of Sessions (in hrs)	Activity	Assignment	Suggested Reading
Module – I: Introduction [Theory=5 Hrs Practice = 0Hrs]				
Conventional power generation: advantages and disadvantages, Non-conventional energy (NCE) resources: review of Solar PV, Wind Energy systems, Fuel Cells, micro-turbines, biomass, and tidal sources.	5	Lecture	Assignment 1	TB- 2 Ch-1,4,5
Module – II: Distributed Generation[Theory=4 Hrs Practice = 0Hrs]				
Concept of distributed generations, Why integration of distributed generation? Active distribution network. Distributed generation, technology, value of	4	Lecture	Assignment 2	TB- 1 Ch-1.1

distributed generation, application & issues, distributed resources, distributed capacity, factors of DG growth, general structure				
Module – III: Supply demand in Electric power grid [Theory=4 Hrs Practice = 0Hrs]				
Understanding the grid, reliability concept, electric power dynamic demand, need of spinning reserve, local load control	4	Lecture	Assignment 3	TB-1 Ch-1.2
Module – IV: Basics of A Micro-Grid [Theory=5 Hrs Practice = 0Hrs]				
Concept and definition of micro grid, classification ,need & application of micro-grid, formation of micro grid, typical structure and configuration of a micro grid, AC and DC micro grids, Power Electronics interfaces in DC and AC micro grids.	5	Lecture	Assignment 4	TB- 1 Ch-1.3 Ch-3
Module – V:DC Micro Grids [Theory=4 Hrs Practice = 0Hrs]				
PV sources control, storage control, grid connection control, DC load control, Power balancing principle	4	Lecture	Assignment 5	TB- 1 Ch-5
Module – VI :Control & Operation of Micro Grid[Theory=4 Hrs Practice = 0Hrs]				
Modes of operation and control of micro grid: grid connected and islanded mode, Active and reactive power control, protection issues.	4	Lecture	Assignment 6	TB- 1 Ch-6
Module – VII : Storage Technologies[Theory=4 Hrs Practice = 0Hrs]				
classification of electrical energy storage, mechanical storage system, batteries, flywheels, super conducting magnetic energy storage, super capacitors	4	Lecture	Assignment 7	TB- 2 Ch-7
Total (hrs)= 30Hours (Theory- 30 hours + Practice-0 hours)				

Soft Computing Techniques - I

Course Title	Code	Type of course	T-P-Pr	Prerequisite
Soft Computing-I	EECC0101	Theory	2-0-0	Nil

Objective

- To teach the Fuzzy Logic & Systems and Artificial Neural Networks

Course Outcome

- Students will gain knowledge of Artificial Neural Networks and soft computing techniques in classification
- Students will develop skill of optimization technique for particular application

Evaluation Systems

	Component	% of Marks	Method of Assessment
Internal Examination	Internal Theory	30	Written Examination
	Assignment	5	Report or Presentation + Learning Record
	Attendance	5	Based on Class Attended
External Examination	External Theory	60	Written Examination
Total		100	

Course Outline

Module I: Basic Tools of Soft Computing

(04 Hours)

Theory

Basic tools of soft Computing: Introduction, Fuzzy logic, Neural Networks and Evolutionary Computing, Approximations of Multivariate functions, Non – linear Error surface and optimization.

Module II: Fuzzy Logic

(05 Hours)

Theory

Fuzzy logic: Introduction, crisp sets, fuzzy sets, crisp relations; fuzzy relations: Cartesian product of relation – classical relation, fuzzy relations, tolerance and equivalence relations, non-iterative fuzzy sets.

Module III: Membership Functions

(05 Hours)

Theory

Membership functions: features, fuzzification, methods of membership value assignments, Defuzzification: lambda cuts methods, fuzzy arithmetic; fuzzy measures: fuzzy arithmetic, extension

principle, fuzzy measures, measures of fuzziness and fuzzy integrals.

Module IV: Fuzzy Rule Base and Approximate Reasoning (04 Hours)

Theory

Fuzzy rule base and approximate reasoning: truth values and tables, fuzzy propositions, formation of rules-decomposition of rules, aggregation of fuzzy rules and fuzzy reasoning-fuzzy inference systems-overview of fuzzy expert system-fuzzy decision making.

Module V: Neural Networks (04 Hours)

Theory

Neural networks: Single layer networks, supervised learning network, Perceptron, Activation functions, Adalinc- its training and capabilities, weights learning.

Module VI: Multilayer Perceptron (04 Hours)

Theory

Multilayer Perceptron: Error back propagation, generalized delta rule; Radial basis function networks and least square training algorithm.

Module VII: Unsupervised Learning Networks (04 Hours)

Theory

Unsupervised learning networks: Kohonen self – organizing map and learning vector quantization networks; Recurrent neural networks, Simulated annealing neural networks; Adaptive neuro-fuzzy information; systems (ANFIS).

Text Books

1. J. S. R. Jang, C. T.Sun& E. Mizutani, “Neuro-Fuzzy and Soft Computing”, PHI-2013.
2. Satish Kumar, “Neural Networks: A Classroom Approach”, TMH Education-2014.

Reference Books

1. S. Rajasekaran & G.A. VijayaLaxmiPai, “Neural Networks Fuzzy Logic & Genetic Algorithms, Synthesis & Applications”, Prentice Hall-2006.
2. S.N. Sivanandan& S.N. Deepa, “Principle of Soft Computing”, Wiley India Edition-2010.

Session Plan

Topics	No. of Sessions (in hrs.)	Activity	Assignment	Suggested Reading
Module I: Basic Tools of Soft Computing (04 Hours)				
Basic tools of soft Computing: Introduction, Fuzzy logic, Neural Networks	1	Lecture	Assignment No.1.1	Text Book (TB)-1 Chapter (CH)-1
Evolutionary Computing	1	Lecture	Assignment No. 1.2	TB-1 CH- 1
Approximations of Multivariate functions	1	Lecture	Assignment	TB-1 CH- 1

			No. 1.3	
Non – linear Error surface optimization.	1	Lecture	Assignment No. 1.4	TB-1 CH- 1
Module II: Fuzzy Logic(05 Hours)				
Fuzzy logic: Introduction, crisp sets, fuzzy sets, crisp relations and fuzzy relations	2	Lecture	Assignment No. 2.1-2.3	RB-1 CH- 6
Cartesian product of relation – classical relation, fuzzy relations, tolerance and equivalence relations	2	Lecture	Assignment No. 2.4-2.5	RB-1 CH- 6
Non-iterative fuzzy sets.	1	Lecture	Assignment No. 2.6	RB-1 CH- 6
Module III: Membership Functions (05 Hours)				
Membership functions: features, fuzzification, methods of membership value assignments	1	Lecture	Assignment No. 3.1-3.2	RB-1 CH- 7
Defuzzification: lambda cuts methods, fuzzy arithmetic and fuzzy measures	2	Lecture	Assignment No. 3.3-3.4	RB-1 CH- 7
Fuzzy arithmetic, extension principle, fuzzy measures, measures of fuzziness, fuzzy integrals	2	Lecture	Assignment No. 3.5-3.7	RB-1 CH- 7
Module IV: Fuzzy Rule Base and Approximate Reasoning (04 Hours)				
Fuzzy rule base and approximate reasoning: truth values and tables, fuzzy propositions, formation of rules-decomposition of rules, aggregation of fuzzy rules	2	Lecture	Assignment No. 4.1-4.2	RB-1 CH- 7
Fuzzy reasoning-fuzzy inference systems-overview of fuzzy expert system-fuzzy decision making.	2	Lecture	Assignment No. 4.3	RB-1 CH- 7
Module V: Neural Networks (04 Hours)				
Neural networks: Single layer networks, supervised learning network	2	Lecture	Assignment No. 5.1	RB-1 CH- 1
Perceptron; Activation functions; Adalinc- its training and capabilities, weights learning	2	Lecture	Assignment No. 5.2-5.3	RB-1 CH- 1
Module VI: Multilayer Perceptron (04 Hours)				
Multilayer perceptrons: Errorbackpropagation,	2	Lecture	Assignment No. 6.1-6.2	RB-1 CH-

generalized delta rule				3.1-3.2
Radial basis function networks and least square training algorithm.	2	Lecture	Assignment No. 6.3	RB-1 CH-3.1-3.2
Module VII: Unsupervised Learning Networks (04 Hours)				
Unsupervised learning networks: Kohonen self – organizing map and learning vector quantization networks	1	Lecture	Assignment No. 7.1	TB-1 CH-11.3
Recurrent neural networks, Simulated annealing neural networks	1	Lecture	Assignment No. 7.2-7.3	TB-1 CH-11.7
Adaptive neuro-fuzzy information; systems (ANFIS).	2	Lecture	Assignment No. 7.4	TB-1 CH-12.1-12.2
Total (hrs)= 30Hours (Theory- 30 hours + Practice-0 hours)				

Electrical Circuit Drawing (AutoCAD)

Course Name	Code	Type of course	T-P-Pr	Prerequisite
Electrical Circuit Drawing (AutoCAD)	ELCC0202	Practice	0-2-0	Nil

Objective

<ul style="list-style-type: none"> To teach the 2D Design of Electrical-System-Layout drawing using AutoCAD
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Course Outcome

<ul style="list-style-type: none"> Students will know the use of AutoCAD Software. Students will develop skill of designing generalized electrical Machine blueprints

Evaluation Systems

Internal Examination	Component	% of Marks	Method of Assessment
	Internal Practice	50 (40+10)	Lab Work + Learning Record
External Examination	External Practice	50	Lab Work
Total		100	

Lists of Experiments (60 Hours)

1. Introduction to AutoCAD Electrical, Drawing Files, Electrical Components and Wires
2. Symbol creation
3. General lay out of a power system network
4. Simple house wiring (1-phase): light and fan
5. Simple house wiring (3-phase): light, fan, AC, geezer and 3-phase motor
6. Agricultural pump-set wiring (star-delta) with panel wiring
7. Workshop panel wiring for machine lab
8. Four wheeler electrical wiring
9. Forklift wiring harness
10. Substation lay out drawing with 4 incomer and 4 outgoing (Khordha Substation or nearby substation)
11. CIT new substation layout (Schneider) or JITM Substation
12. Differential protection of transformer
13. Layout drawing of a power plant
14. Layout drawing of a Electrical Automation system

Reference Books

Randy H. Shih, "AutoCAD 2013 Tutorial- First Level: 2D Fundamentals", SDC Publication, 2013.

Session Plan

Topics	No. of Sessions (in hrs.)	Activity	Assignment	Suggested Reading
Introduction to AutoCAD Electrical, Drawing Files, Electrical Components and Wires.	8	Practice	Designing	Reference Book (RB)
Symbol creation.	4	Practice	Designing	RB
General lay out of a power system network.	4	Practice	Designing	RB
Simple house wiring (1-phase): light and fan.	4	Practice	Designing	RB
Simple house wiring (3-phase): light, fan, AC, geezer and 3-phase motor.	4	Practice	Designing	RB
Agricultural pump-set wiring (star-delta) with panel wiring.	4	Practice	Designing	RB
Workshop panel wiring for machine lab.	4	Practice	Designing	RB
Four wheeler electrical wiring.	4	Practice	Designing	RB
Forklift wiring harness.	4	Practice	Designing	RB
Substation lay out drawing with 4 incomer and 4 outgoing (Khordha Substation or nearby substation)	4	Practice	Designing	RB
CIT new substation layout (Schneider) or JITM Substation.	4	Practice	Designing	RB
Differential protection of transformer.	4	Practice	Designing	RB
Layout drawing of a power plant.	4	Practice	Designing	RB
Layout drawing of a Electrical Automation system.	4	Practice	Designing	RB
Total- 60 Hours				

Network Theory

Course Title	Code	Type of course	T-P-Pr	Prerequisite
Network Theory	ELCC0401	Theory & Practice	2-1-0	Nil

Objective

- To deliver problem solving skills on circuits through the application of techniques and principles to common circuit problems.

Course Outcome

- Gain knowledge about the various components, theorems, parameters related to a circuit
- Get the skill of circuit solving and can analyze different types of circuits.

Evaluation Systems

Internal Examination	Component	% of Marks	Method of Assessment
	Internal Theory	20	Written examination
	Internal Practice	30(20+10)	Lab work + Learning Record
External Examination	External Theory	30	Written examination
	External Practice	20	Lab work
Total		<i>100</i>	

Course Outline

Module I: Network Topology

(7 hours)

Theory

Graph of a network, Concept of tree, Incidence matrix, Tie-set matrix, Cut-set matrix, Formulation and solution of network equilibrium equations on loop and node basis

Module II: Network Theorems

(9 hours)

Theory

Substitution theorem, Reciprocity theorem, Maximum power transfer theorem, Tellegen's theorem, Millman's theorem, Compensation theorem

Practice

- Verification of Reciprocity theorem
- Verification of Tellegen's theorem
- Verification of Millman's theorem
- Verification of Maximum power transfer theorem
- Verification of Compensation theorem

Module III: Coupled Circuits

(8 hours)

Theory

Coupled Circuits, Dot Convention for representing coupled circuits, Coefficient of coupling, Series and parallel resonant circuits: Band Width and Q-factor

Practice

6. Self-inductance, mutual inductance and coefficient of coupling to be determined for a 1- \emptyset transformer representing coupled circuit.
7. Frequency response of a series and parallel resonant circuit by laboratory set up.

Module IV: Network Laplace Transform

(8 hours)

Theory

Application of Laplace transform: Circuit Analysis (Steady State and Transient)

Practice

8. AC and DC transient response analysis for RL,RC and RLC circuits

Module V: Two Port Network

(10 hours)

Theory

Z, Y, ABCD and h-parameters, Reciprocity and Symmetry, Interrelation of two-port parameters, Interconnection of two-port networks.

Practice

9. Determination of Z parameters
10. Determination of Y parameters
11. Determination of h parameters
12. Determination of ABCD parameters

Module VI: Fourier Series

(8 hours)

Theory

Fourier series, Fourier analysis and evaluation of coefficients, Steady state response of network to periodic signals, Fourier transform and convergence, Fourier transform of some functions

Module VII: Filters

(10 hours)

Theory

Brief idea about network filters (Low pass, High pass, Band pass and Band elimination) and their frequency response

Practice

13. Design and frequency response analysis of Low Pass filter
14. Design and frequency response analysis of High Pass filter
15. Design and frequency response analysis of Band Pass filter
16. Design and frequency response analysis of Band elimination filter

Text Books:

1. A K Chakraborty, "Network Theory," DhanpatRai Publication.
2. M.H.Hayt and JR.J.E.Kemmerly, "Engineering Circuit Analysis," Tata McGraw Hill
3. Alexander &Sadiku "Fundamentals of Electric Circuits," Tata McGraw Hill.

Session Plan

Topics	No. of Sessions	Activity	Assignment	Suggested Reading
Module – I: Network Topology (Theory- 7 hours, Practice- 0 hours)				
Graph of a network, Concept of tree, Incidence matrix	2	Lecture	Assignment-1 (Question No 1 to 5)	Text Book(TB) 1- Chapter(C H)-16.1 to16.5
Tie-set matrix, Cut-set matrix	3	Lecture	Assignment-1 (Question No 6 to 8)	TB1-CH-16.6 to16.10
Formulation and solution of network equilibrium equations	2	Lecture	Assignment-1 (Question No 9 to 10)	TB1-CH-16.16
Module – II: Network Theorems (Theory- 4 hours, Practice- 5 hours)				
Substitution theorem	1	Lecture	Assignment-2 (Question No 1 to 3)	TB1-CH-6.8
Reciprocity theorem	2	1hr Lecture +1hr Practice	Assignment-2 (Question No 4,5)	TB1-CH-6.7
Maximum power transfer theorem	2	1hr Lecture +1hr Practice	Assignment-2 (Question No 6 to 9)	TB1-CH-6.5
Tellegen's theorem,	1	Practice	Result of Experiments and Viva	TB1-CH-6.10
Millman's theorem	1	Practice	Result of Experiments and Viva	TB1-CH-6.6
Compensation theorem	2	1hr Lecture +1hr Practice	Assignment-2 (Question No 10 to12)	TB1-CH-6.9
Module – III: Coupled Circuits (Theory- 1 hours, Practice- 7 hours)				
Dot Convention for representing coupled circuits	1	Lecture	Assignment-3 (Question No 1 to 3)	TB1-CH-11.7
Coefficient of coupling	2	Practice	Result of Experiments and Viva	TB1-CH-11.4
Series resonant circuits	2	Practice	Assignment-3 (Question No 4 to 8)	TB1-CH-11.8
Parallel resonant circuits	2	Practice	Assignment-3	TB1-CH-

			(Question No 9 to 12)	11.9
Band Width and Q-factor	1	Practice	Assignment-3 (Question No 13,14)	TB1-CH-11.9
Module – IV: Network Laplace Transform (Theory- 6 hours, Practice- 2 hours)				
Introduction to Laplace Transform	1	Lecture	Assignment-4 (Question No 1 to 4)	TB1-CH-9.1 to 9.3
Laplace transform of some basic functions	1	Lecture	Assignment-4 (Question No 5 to 8)	TB1-CH-9.4 to 9.5
Laplace transform of periodic functions	1	Lecture	Assignment-4 (Question No 9 to 11)	TB1-CH-9.6
Inverse Laplace transform	1	Lecture	Assignment-4 (Question No 12 to 16)	TB1-CH-9.9
Application of Laplace transform	1	Lecture		TB1-CH-9.8
Circuit Analysis (Steady State and Transient)	3	1hr Lecture + 2 hrs Practice	Result of Experiments and Viva	TB1-CH-9.10-9.11
Module – V: Two Port Network(Theory- 2 hours, Practice- 8 hours)				
Z -Parameter	2	Practice	Assignment-5 (Question No 1 to 6)	TB1-CH-12.6
Y- parameter	2	Practice	Assignment-5 (Question No 7 to 11)	TB1-CH-12.7
ABCD Parameter	2	Practice	Assignment-5 (Question No 12 to 15)	TB1-CH-12.9
H-Parameter	2	Practice	Assignment-5 (Question No 16 to 18)	TB1-CH-12.8
Reciprocity and Symmetry, Interrelation of two-port parameters	1	Lecture	Assignment-5 (Question No 17 to 19)	TB1-CH-12.10-12.11
Interconnection of two-port networks	1	Lecture	Assignment-5 (Question No 20 to 22)	TB1-CH-12.13
Module – VI: Fourier Series (Theory-8 hours, Practice- 0 hours)				
Fourier analysis and evaluation of coefficients	2	Lecture	Assignment-6 (Question No 1 to 4)	TB1-CH-15.1 to 15.4
Fourier analysis of periodic signals	2	Lecture	Assignment-6 (Question No 5 to 8)	TB1-CH-15.6 to 15.8
Fourier transform and convergence	2	Lecture	Assignment-6 (Question No 9,10)	TB1-CH-15.10

Fourier transform of some functions	2	Lecture	Assignment-6 (Question No 11 to 14)	TB1-CH-15.11
Module – VII: Filters(Theory-2 hours, Practice- 8 hours)				
Brief idea about network filters	2	Lecture		TB1-CH-19.1 to 19.7
Frequency response of Low pass filters	2	Practice	Result of Experiments and Viva	TB1-CH-19.8,19.10
Frequency response High pass filters	2	Practice	Result of Experiments and Viva	TB1-CH-19.12
Frequency response Band pass filters	2	Practice	Result of Experiments and Viva	TB1-CH-19.14
Frequency response Band elimination filters	2	Practice	Result of Experiments and Viva	TB1-CH-19.16
Total (hrs)= 60 (Theory- 30 hours + Practice-30 hours)				

Electronic Measurement & Instrumentation

Course Title	Code	Type of course	T-P-P	Prerequisite
Electronic Measurement & Instrumentation	EECC0409	Theory & Practice	2-1-0	Nil

Objective

- To teach the students about various types of instruments their operation working of different electronic instruments viz. signal generators, signal analyzers, recorders and measuring equipment .

Course Outcome

- Gain knowledge to identify the various electronic instruments based on their specifications for carrying out a particular task of measurement.
- Gain skill to use various types of signal generators, signal analyzers for generating and analyzing various real-time signals.

Evaluation Systems

Internal Examination	Component	% of Marks	Method of Assessment
	Internal Theory	20	Written examination
	Internal Practice	30(20+10)	Lab work + Learning Record
External Examination	External Theory	30	Written examination
	External Practice	20	Lab work
Total		<i>100</i>	

Module I : Basics of Measurements (3 Hours)

Theory

Accuracy, Precision, resolution, reliability, repeatability, validity, Errors and their analysis.

Module II: Temperature measurement (12 Hours)

Theory

Introduction to Temperature Measurement Non electrical type temperature sensor: Bimetallic Strip. Electrical type temperature sensors: Thermistor, RTD, Principles, Types, Selection of RTD's and signal conditioning circuits. Thermocouples, Principle, Types, Selection, Standard table of Thermocouples and signal conditioning circuits. Measurement of temperature using Diodes. IC temperature Transducer using LM35 and AD590.

Practice

- Study of types of Thermocouple and characteristics of Thermocouple.
- Study of RTD and characteristics of RTD
- Temperature sensing using Diodes. Using LM35 and AD590 as temperature sensor
- Study of ON OFF control using temperature controller using Thermocouple and RTD.

Module III : Pressure Measurement (7 Hours)

Theory

Introduction to pressure measurement, Pressure Standards, Conventional Pressure sensors, Electrical and Electronic pressure transducers. Introduction to Calibration and Calibration of Pressure Gauge.

Practice:

5. Finding error in the given pressure gauge with respect to Digital Gauge
6. Finding error in the given pressure gauge with respect to Dead Weight Tester.

Module IV: Displacement measurement (10 Hours)

Theory

Introduction to displacement measurement. Potentiometer Sensor, Types, Construction, Operation and Errors. LVDT, Principle, Operation and Application. Inductive Proximity Switch. Digital Encoder: Contact, Magnetic and Optical Encoder. Rotational Displacement/Angular position : Using optical Encoder and Signal Conditioning circuits.

Practice:

7. To determine output characteristics of LVDT and measure displacement using LVDT.
8. Familiarization of Inductive Proximity, Capacitive Proximity, IR and Reed Switch.

Module V: Converters and Flow measurement (7 Hours)

Theory

Converters: Voltage to Frequency Converter and Frequency to Voltage Converter

Force, weight and flow measurement: Introduction to force, weight and flow measurement. Strain gauge and its function, Load Cell, principle and operation of load cell. Flow measurement using Orifice plate.

Practice:

9. V to F Converter using ICL 8038 F to V Converter using LM2907.
10. Measurement of load by using Load cell Expansion Method.
11. Measurement of load by using Load cell Compression method.

Module VI: Signal Analyzers (9 Hours)

Theory

AF, HF Wave Analyzers, Harmonic Distortion, Heterodyne wave Analyzers, Spectrum Analyzers, Power Analyzers, Capacitance-Voltage Meters, Oscillators.

Signal Generators: AF, RF Signal Generators, Sweep Frequency Generators, Pulse and Square wave Generators, Function Generators, Arbitrary Waveform Generator, Video Signal Generators, and Specifications.

Practice:

12. Analyse sine/square wave in frequency domain using spectrum analyser.
13. To study block wise construction of an Function Generator.

Module VII: Oscilloscopes (12 Hours)

Theory

CRT, Block Schematic of CRO, Time Base Circuits, Lissajous Figures, CRO Probes, High Frequency CRO Considerations, Delay lines, Applications: Measurement of Time, Period and

Frequency Specifications. Special Purpose Oscilloscopes: Dual Trace, Dual Beam CROs, Sampling Oscilloscopes, Storage Oscilloscopes, Digital Storage CROs.

Practice:

- 14. Measure voltage, frequency and phase using CRO.
- 15. Demonstrate features of digital storage oscilloscope.
- 16. Measure Unknown frequency using Lissajous patterns.

Text Books:

1. A K Sawhney, "A Course in Electrical and Electronic Measurements and Instrumentation," Dhanpat Rai & Co
2. H.S. Kalsi, "Electronic Instrumentation," TMH, 2nd Edition 2004.

REFERENCE BOOKS:

David A. Bell, "Electronic Instrumentation and Measurements" Oxford Univ. Press, 1997

Session Plan

Topics	No. of Sessions (in hrs.)	Activity	Assignment	Suggested Reading
Module – I : Basics of Measurements (THEORY-3 HRS)				
Basics of Measurements: Accuracy, Precision, resolution, reliability, repeatability, validity, Errors and their analysis.	3	Lecture	Assignment 1.1-1.5	Text Book (TB) 1-Chapter (CH) -1 and CH 3
Module – II : Temperature measurement (THEORY-4 HRS & PRACTICE-8 HRS)				
Temperature measurement: Introduction to Temperature Measurement, Non electrical type temperature sensor: Bimetallic Strip. Electrical type temperature sensors: Thermistor, RTD, Principles, Types, Selection of RTD's and signal conditioning circuits. Thermocouples, Principle, Types, Selection, Standard table of Thermocouples and signal conditioning circuits. Measurement of temperature using Diodes. IC temperature Transducer using LM35 and AD590.	4	Lecture	Assignment 1.6-1.10	TB 1-CH 13
✓ Study of types of Thermocouple	8	Practice	<i>Result of</i>	

<p>and characteristics of Thermocouple.</p> <p>✓ Study of RTD and characteristics of RTD</p> <p>✓ Temperature sensing using Diodes. Using LM35 and AD590 as temperature sensor</p> <p>✓ Study of ON OFF control using temperature controller using Thermocouple and RTD.</p>			<i>Experiments and Viva</i>	
Module – III :Pressure Measurement(THEORY-3 HRS & PRACTICE-4 HRS)				
Pressure Measurement:Introduction to pressure measurement, Pressure Standards, Conventional Pressure sensors, Electrical and Electronic pressure transducers. Introduction to Calibration and Calibration of Pressure Gauge.	3	Lecture	Assignment 1.11-1.13	TB 1-CH 18
<p>✓ Finding error in the given pressure gauge with respect to Digital Gauge</p> <p>✓ Finding error in the given pressure gauge with respect to Dead Weight Tester.</p>	4	Practice	<i>Result of Experiments and Viva</i>	
Module – IV : Displacement measurement(THEORY-6 HRS & PRACTICE-4 HRS)				
Displacement Measurement: Introduction to displacement measurement. Potentiometer Sensor, Types, Construction, Operation and Errors. LVDT, Principle, Operation and Application. Inductive Proximity Switch. Digital Encoder: Contact, Magnetic and Optical Encoder. Rotational Displacement/Angular position : Using optical Encoder and Signal Conditioning circuits.	6	Lecture	Assignment 1.14-1.16	TB 1-CH 25
✓ To determine output characteristics of LVDT and measure displacement using LVDT.	4	Practice	<i>Result of Experiments and Viva</i>	TB 1-CH 25

✓ Familiarization of Inductive Proximity, Capacitive Proximity, IR and Reed Switch.				
Module – V : Converters and Flow measurement(THEORY-3 HRS & PRACTICE-4 HRS)				
Converters:Voltage to Frequency Converter and Frequency to Voltage Converter Force, weight and flow measurement:Introduction to force, weight and flow measurement. Strain gauge and its function, Load Cell, principle and operation of load cell. Flow measurement using Orifice plate.	3	Lecture	Assignment 1.17-1.20	TB 1-CH 26
✓ V to F Converter using ICL 8038 F to V Converter using LM2907 ✓ Measurement of load by using Load cell Expansion Method ✓ Measurement of load by using Load cell Compression method	4	Practice	<i>Result of Experiments and Viva</i>	
Module – VI: Signal Analyzers(THEORY-5 HRS & PRACTICE-4 HRS)				
Signal Analyzers:AF, HF Wave Analyzers, Harmonic Distortion, Heterodyne wave Analyzers, Spectrum Analyzers, Power Analyzers, Capacitance-Voltage Meters, Oscillators. Signal Generators: AF, RF Signal Generators, Sweep Frequency Generators, Pulse and Square wave Generators, Function Generators, Arbitrary Waveform Generator, Video Signal Generators, and Specifications	5	Lecture	Assignment 1.21-1.25	TB 1-CH 28
✓ Analyse sine/square wave in frequency domain using spectrum analyser. ✓ To study block wise construction of an Function Generator	4	Practice	<i>Result of Experiments and Viva</i>	
Module – VII: Oscilloscopes (THEORY-6 HRS & PRACTICE-6 HRS)				

Oscilloscopes: CRT, Block Schematic of CRO, Time Base Circuits, Lissajous Figures, CRO Probes, High Frequency CRO Considerations, Delay lines, Applications: Measurement of Time, Period and Frequency Specifications. Special Purpose Oscilloscopes: Dual Trace, Dual Beam CROs, Sampling Oscilloscopes, Storage Oscilloscopes, Digital Storage CROs.	6	Lecture	Assignment 1.26-1.28	TB 1-CH 21
<ul style="list-style-type: none"> ✓ Measure voltage, frequency, phase and modulation index (trapezoidal method) using CRO. ✓ Demonstrate features of digital storage oscilloscope. ✓ Measure Unknown frequency using Lissajous patterns. 	6	Practice	<i>Result of Experiments and Viva</i>	TB 1-CH 21
Total (hrs)= 60 (Theory- 30 hours + Practice-30 hours)				

Linear Integrated Circuit and its Application

Course Title	Code	Type of course	T-P-P (Credit)	Prerequisite
Linear Integrated Circuit And its Application	ELCC0403	Theory + Practice	2-1-0	Nil

Objective

<ul style="list-style-type: none"> To make the students understand how to design a circuit using different ICs(Opamp, 555 Timer, PLL etc)
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Course Outcome

<ul style="list-style-type: none"> On successful completion of this course, students will be able to: Understand how to Design a linear circuit for different application.

Evaluation Systems

Internal Examination	Component	% of Marks	Method of Assessment
	Internal Theory	20	Written examination
	Internal Practice	30(20+10)	Lab work + Learning Record
External Examination	External Theory	30	Written examination
	External Practice	20	Lab work
Total		<i>100</i>	

Course Outline

Module I: Operational Amplifier And its Characteristics

(6Hours)

Theory

Operational Amplifier: Introduction, basic information of Op-Amp, The ideal operational amplifier. **Operational amplifier characteristics:** introduction, DC characteristics, AC characteristics, analysis of datasheet of an Op-amp.

Practice

- Study of Op-Amp.
- Study and design of a simple circuit using Op-Amp.

Module II: Operational Amplifier applications

(12 Hours)

Theory

Operational Amplifier applications: Introduction, basic op-amp applications, instrumentation amplifier, AC amplifier, V to I & I to V converter, sample and hold circuits, log and anti-log amplifier, multiplier and divider, differentiator, integrator, electronic analog computation

Practice

- Design a Summing Amplifier, Subtractor
- Design a Sample and hold circuits
- Design Multiplier and divider, differentiator, integrator

Module III: Comparators and waveform generator

(10 Hours)

Theory

Comparators and waveform generator: introduction, comparator, regenerative comparator, square wave generator, mono stable multivibrator, triangular wave generator, sine wave generator.

Practice:

6. Design a Regenerative comparator
7. Design a Square wave generator
8. Design a Mono stable multi-vibrator
9. Design a Triangular wave generator

Module IV: Voltage regulator And Active filter

(10Hours)

Theory

Voltage regulator: introduction, series op-amp regulator, IC voltage regulators, 723 general purpose regulators. **Active filter:** Introduction, RC active filter.

Practice

10. Design of voltage regulator circuit using 78XX.
11. Design of voltage regulator circuit using 723IC.
12. Design of Active filter
13. Design of RC active filter

Module V : 555 Timer

(7 Hours)

Theory

555 Timer: Introduction, description of functional diagram, monostable operation, astable operation

Practice

14. Design of Monostablemultivibrator using 555.
15. Design of Astablemultivibrator using 555.

Module VI: Phase locked Loop

(9 Hours)

Theory

Phase locked Loop: Introduction, basic principle, phase detector/comparator, VCO, LPF, monolithic PLL

Practice

16. Design of PLL using Op-Amp
17. Design of Phase comparator using Op-Amp.

Module VII: D-A & A-D converter

(8 Hours)

Theory

D-A & A-D converter: Introduction, Basic DAC Techniques, A-D converter.

Practice

18. Design DAC.
19. Design ADC

Text Books

1. D.RoyChoudhary, SheilB.Jani, 'Linear Integrated Circuits', II edition, New Age, 2003.

Reference Books

1. Fiore,"Opamps& Linear Integrated Circuits Concepts & Applications",Cengage,2010.
2. Floyd ,Buchla,"Fundamentals of Analog Circuits, Pearson, 2013.
3. Jacob Millman, Christos C.Halkias, 'Integrated Electronics - Analog and Digital circuits system',Tata McGraw Hill, 2003.
4. Robert F.Coughlin, Fredrick F. Driscoll, 'Op-amp and Linear ICs', PHI Learning, 6th edition,2012.
5. RamakantA.Gayakward, 'Op-amps and Linear Integrated Circuits', IV edition, Pearson Education, 2003 / PHI. 2000.

Session Plan

Topic	No. of Sessions	Activity	Assignment	Suggested Reading
Module I: Operational Amplifier And its Characteristics (6 Hours)				
Operational Amplifier: Introduction, basic information of Op-Amp, The ideal operational amplifier. Operational amplifier characteristics: introduction, DC characteristics, AC characteristics, analysis of datasheet of an Op-amp.	2	Lecture	Assignment 1.1-1.3	TB-1 Ch-2,3
Study of Op-Amp.	2	Practice		TB-1 Ch-2
Study and design of a simple circuit using Op-Amp.	2	Practice		TB-1 Ch-2
Module II: Operational Amplifier applications (12 Hours)				
Operational Amplifier applications: Introduction, basic op-amp applications, instrumentation amplifier	3	Lecture+ Practice	Assignment 1.1-1.2	TB-1 Ch-4
AC amplifier, V to I & I to V converter, sample and hold	3	Lecture+	Assignment 1.3-	TB-1 Ch-4

circuits		Practice	1.4	
Log and anti-log amplifier, multiplier and divider	3	Lecture+ Practice	Assignment 1.5	TB-1 Ch-4
Differentiator, integrator, electronic analog computation	3	Lecture+ Practice	Assignment 1.6	TB-1 Ch-4
Module III: Comparators and waveform generator (10 Hours)				
Comparators and waveform generator: introduction, comparator, regenerative comparator	3	Lecture+ Practice	Assignment 3.1- 3.2	TB-1 Ch-5
Square wave generator	2	Lecture+ Practice	Assignment 3.3	TB-1 Ch-5
Mono stable multivibrator	2	Lecture+ Practice	Assignment 3.4	TB-1 Ch-5
Triangular wave generator, sine wave generator.	3	Lecture+ Practice	Assignment 3.5	TB-1 Ch-5
Module IV: Voltage regulator (10 Hours)				
Voltage regulator: introduction, series op-amp regulator, IC voltage regulators	3	Lecture+ Practice	Assignment 4.1- 4.2	TB-1 Ch-6
723 general purpose regulators	3	Lecture+ Practice	Assignment 4.3	TB-1 Ch-6
Active filter: Introduction	2	Lecture+ Practice	Assignment 4.4	TB-1 Ch-7
RC active filter	2	Lecture+ Practice	Assignment 4.5	TB-1 Ch-7
Module V : 555 Timer (7 Hours)				
555 Timer: Introduction, description of functional diagram	3	Lecture+ Practice	Assignment 5.1	TB-1 Ch-8
Monostable operation	2	Lecture+ Practice	Assignment 5.2	TB-1 Ch-8

Astable operation	2	Lecture+ Practice	Assignment 5.3	TB-1 Ch-8
Module VI :Phase locked Loop (9 Hours)				
Phase locked Loop: Introduction, basic principle	3	Lecture+ Practice	Assignment 6.1	TB-1 Ch-9
Phase detector/comparator, VCO, LPF	3	Lecture+ Practice	Assignment 6.2	TB-1 Ch-9
Monolithic PLL	3	Lecture+ Practice	Assignment 6.3	TB-1 Ch-9
Module VII: D-A & A-D converter (8 Hours)				
D-A & A-D converter: Introduction	2	Lecture+ Practice	Assign ment 7.1	TB-1 Ch-10
Basic DAC Techniques,	3	Lecture+ Practice	Assignment 7.2	TB-1 Ch-10
A-D converter.	3	Lecture+ Practice	Assignment 7.3	TB-1 Ch-10
Total- 60 Hours				

Power Electronics

Course Title	Code	Type of course	T-P-Pr	Prerequisite
Power Electronics	EECC0405	Theory + Practice	3-2-0	Nil

Objective

- To make the students meet industry requirement for power electronic engineers, adequate practical knowledge on power semiconductor devices, converters and their control techniques for typical applications in motor drives

Course Outcome

- Apply their knowledge of the electrical characteristics of power semiconductor devices, to select power semiconductor devices for a range of applications.
- Understand the basic topology of converters, inverters and power supplies and design calculations for drive and power converter applications, and understand the approximations used.

Evaluation Systems

Internal Examination	Component	% of Marks	Method of Assessment
	Internal Theory	20	Written examination
	Internal Practice	30 (20+30)	Lab work+ Learning Record
External Examination	External Theory	30	Written examination
	External Practice	20	Lab work
<i>Total</i>		100	

Course outline

Module I: Power semiconductor devices

(12 Hours)

Theory

Power semiconductor devices: Introduction (difference between general semiconductor devices and Power semiconductor devices), characteristics and specifications of Power semiconductor switches, control characteristics of power semiconductor devices, Comparisons between different types of Power devices, Use of Power semiconductor devices in power electronic circuit, Different types of power electronics circuits.

Practice

- Study of switching characteristics of Power semiconductor device.

2. Study and design of a simple power electronics circuit.

Module II Power Diode And Diode rectifier

(14

Hours)

Theory

Power Diode: Power Diode characteristics, power diode types, freewheeling diode

Diode rectifier: Introduction, single phase half wave rectifiers, single phase full-wave rectifiers with R & RL Load, three phase bridge rectifier.

Practice

3. Study of V-I characteristics of diode.
4. Study of single phase half-wave and full-wave diode rectifier using R & L load.

Module III: Silicon controlled Rectifier

(10 Hours)

Theory

Silicon controlled Rectifier: Introduction, Principle of operation, triggering and firing techniques, Different type of commutation circuits and techniques.

Practice

5. Study of V-I characteristics of silicon controlled rectifier.
6. Study of different methods of triggering of SCR (a) RC-Triggering method (b) UJT-Triggering method.
7. Study of class-A, class-B, class-C, class-D, class-E commutation circuits.

Module IV: Phase controlled Converters

(24 Hours)

Theory

Phase controlled Converters: Introduction, control techniques, single phase half wave controlled converter, single phase full wave controlled converter, single phase semi converter, three phase controlled converters: three pulse converter(M3 Connection), six pulse converters(M6 Connection), three phase fully controlled bridge converter(with R and RL load), three phase semi converter (with R load only)

Practice

8. Study of single phase fully controlled converter using R & L load.
9. Study of single phase semi converter using R - L load.
10. Study of 3-phase bridge converter with R, R-L and D.C motor load with/ without freewheeling diodes.
11. Study of 3-phase semi converter with R, R-L and D.C motor load with/ without freewheeling diodes.

Module V: Chopper and Thyristor Chopper Circuit

(16 Hours)

Theory

Chopper: Introduction, basic chopper classification, basic chopper operation, control strategies, class A, B, C, D, E (principle of operation only) **Thyristor chopper circuit:** Voltage commutated chopper, current commutated chopper, load commutated chopper

Practice

12. Study of different types of chopper.

Module VI: Inverter

(10 Hours)

Theory

Inverter: classification of inverter, single phase half bridge voltage source inverters, single phase full bridge inverter, three phase inverter (180 degree and 120 degree conduction mode) with R Load.

Practice

13. Study of three phase bridge inverter(180 degree & 120 degree)
14. Study of IGBT based 3-ph voltage source inverter.

Module VII: Basic series inverter**(19 Hours)****Theory**

Basic series inverter: circuit analysis, design aspect, modified series inverter, parallel inverter, single phase SCR bridge inverter.

Practice

15. Study of parallel inverter.
16. Study of series inverter.
17. Study of single phase bridge inverter.

Text Book:

1. M H Rashid, "Power Electronics: Circuits, Devices and Applications" 3rd Edition, Pearson
2. MD Singh & K B Khanchandani, "Power electronics", Tata McGraw-Hill

Reference Books:

1. J. Vithayathil, "Power Electronics: Principles and Applications", TMH Edition
2. Mohan, Undeland and Robbins, "Power Electronics: Converters, Applications and Design" Wiley Student Edition.

Session Plan

<i>Topic</i>	<i>No. of Sessions</i>	<i>Activity</i>	<i>Assignment</i>	<i>Suggested Reading</i>
Module I: Power semiconductor devices (12 Hours)				
Power semiconductor devices, types of power electronic circuit, Comparisons of power devices	2	Lecture	Assignment 1.1	TB1(ch-1,5-9,20-22)TB2(ch-5,247-249)
Control characteristics of power devices Characteristics and specifications of switches,	6	Lecture+ Practice	Assignment 1.2	TB1(ch-1,10-19)
Design of power electronics equipment	4	Practice	Assignment 1.3	TB1(ch-1,23-24)
Module II Power Diode And Diode rectifier (14 Hours)				
Diode characteristics	3	Lecture+ Practice	Assignment 2.1	TB1(ch-2,33-34)
Power diode types	1	Lecture	Assignment 2.2	TB1(ch-2,38-39)
freewheeling diode	1	Lecture	Assignment 2.3	TB1(ch-2,56-57)
Diode rectifier: introduction, single phase half wave rectifiers	3	Lecture+ Practice	Assignment 2.4	TB1(ch-3,68-69)
Single phase full wave rectifier	3	Lecture+	Assignment	TB1(ch-3,68-

with R and RL Load		Practice	2.5	69)
Three phase bridge rectifier	3	Lecture+ Practice	Assignment 2.6	TB1(ch-3,92-100)
Module III: Silicon controlled Rectifier (10 Hours)				
Silicon controlled Rectifier: Introduction, Principle of operation	2	Lecture	Assignment 3.1	TB2(ch-2,17-18)
Triggering and firing techniques	4	Lecture+ Practice	Assignment 3.2	TB2(ch-3,71-75)
Different type of commutation circuits and techniques.	4	Lecture+ Practice	Assignment 3.3	TB2(ch-7,-311-312)
Module IV: Phase controlled Converters (24 Hours)				
Phase controlled Converters: Introduction, control techniques	1	Lecture	Assignment 4.1	TB2(ch-6,258-262)
single phase half wave controlled rectifier,	3	Lecture+ Practice	Assignment 4.2	TB2(ch-6,263-272)
Single phase full wave controlled rectifier	3	Lecture+ Practice	Assignment 4.3	TB2(ch-6,272-290)
Single phase semiconverter	4	Practice	Assignment 4.4	TB2(ch-6,291-301)
Three phase controlled converters	1	Lecture	Assignment 4.5	TB2(ch-6,307-308)
Three pulse converter(M3 Connection)	3	Lecture+ Practice	Assignment 4.6	TB2(ch-6,308-322)
Six pulse converters(M6 Connection)	3	Lecture+ Practice	Assignment 4.7	TB2(ch-6,323-328)
Three phase fully controlled bridge converter(with R and RL load)	3	Lecture+ Practice	Assignment 4.8	TB2(ch-6,329-345)
Three phase semiconverter (with R load only)	3	Lecture+ Practice	Assignment 4B.9	TB2(ch-6,346-358)
Module V: Chopper And Thyristor chopper circuit (16 Hours)				
Chopper: Introduction, basic chopper classification	2	Lecture	Assignment 5.1	TB2(ch-8,434-436)
Basic chopper operation, control strategies	8	Lecture+ Practice	Assignment 5.2	TB2(ch-8,444-447)
Thyristor chopper circuit: Voltage commutated chopper	2	Lecture	Assignment 5.3	TB2(ch-8,481-495)

Current commutated chopper	2	Lecture	Assignment 5.4	TB2(ch-8,496-505)
Load commutated chopper	2	Lecture	Assignment 5.5	TB2(ch-8,496-505)
Module VI: Inverter (10 Hours)				
Classification of inverter, single phase half bridge voltage source inverters	2	Lecture	Assignment 6.1	TB2(ch-9,535-544)
Single phase full bridge inverter, three phase inverter(180 and 120 conduction mode) with R Load	8	Lecture+ Practice	Assignment 6.2	TB2(ch-9,545-550)TB1(ch-6,237-247)
Module VII: Basic series inverter(19 Hours)				
Basic series inverter circuit analysis	1	Lecture	Assignment 7.1	TB2(ch-9,594-605)
Basic series inverter design aspect	5	Lecture+ Practice	Assignment 7.2	TB2(ch-9,594-605)
Modified series inverter	1	Lecture	Assignment7.3	TB1(ch-8,253-261)
Parallel inverter	6	Lecture+ Practice	Assignment 7.4	TB2(ch-9,609-614)
Single phase SCR bridge inverter	6	Lecture+ Practice	Assignment 7.5	TB2(ch-9,615-642)
Total- 105 Hours				

Microcontroller for Industrial Applications (PIC)

Course Name	Code	Type of course	T-P-P	Prerequisite
Micro Controllers for Industrial Application (PIC)	EECC0402	Theory +Practice	2-2-0	Nil

Objective

- To make the students understand how to activate PIC Micro-controller using assembly language and embedded C.

Course Outcome

- On successful completion of this course, students will be able to write a PIC Microcontroller by assembly language and Embedded-C programming.

Evaluation Systems

Internal Examination	Component	% of Marks	Method of Assessment
	Internal Theory	20	Written examination
	Internal Practice	30(20+10)	Lab work + Learning Record
External Examination	External Theory	30	Written examination
	External Practice	20	Lab work
Total		<i>100</i>	

Course outline

Module I: Introduction to Microcontroller

(8 hours)

Theory

Introduction to Microcontroller: Introduction, Microcontroller versus microprocessors, CISC Vs RISC, Pipelining, Assembly Language vs Embedded C

Module II: PIC Microcontroller PIC16C6X/7X Architecture and Organization (10hours)

Theory

PIC Microcontroller PIC16C6X/7X Architecture and Organization:

Overview and Features, PIC16C6X/7X, PIC Reset Actions, PIC Oscillator Connections, PIC Memory Organization

Module III: PIC16C6X/7X in Assembly Language

(27 hours)

Theory

PIC16C6X/7X in Assembly Language

PIC 16C6X/7X Instructions, Addressing Modes, I/O Ports, Interrupts in PIC 16C61/71, PIC 16C61/71 Timers, PIC 16C71 ADC.

Practice:

- Create delay using 'decfsz' instruction
- Selecting Register Bank and loading value in specific Register.
- PORT A Initialization
- External Interrupt Programming
- AD Conversion

Module IV:PIC 16F8XX Flash Microcontrollers(5 hours)

Theory

PIC 16F8XX Flash Microcontrollers: Introduction, Pin Diagram of 16F8XX, STATUS Register, OPTION_REG Register, Power Control Register (PCON), PIC 16F8XX Program Memory, PIC 16F8XX Data Memory, DATA EEPROM and Flash Program EEPROM

Module V:PIC 16F8XX Flash Microcontrollers in Embedded C (9 hours)

PIC 16F8XX Flash Microcontrollers in Embedded C:Interrupts in 16F877, I/O Ports(94 -99), Timers(108-113)

Practice:

6. Initializing and operating I/O Port
7. Stopwatch
8. Set-up counter using timer 0

Module VI:PIC 16F877

(19 hours)

Theory

PIC 16F877Capture/Compare/PWM (CCP) Modules in PIC 16F877, Master Synchronous Serial Port (MSSP) Module

Practice:

9. Initialize CCP1 module in capture mode
10. Initialize CCP1 module in compare mode
11. Generate PWM signal using CCP1 module
12. Transmit a byte serially on SDO line using SPI master mode
13. Receive a byte serially on SDO line using SPI master mode
14. Transmit a byte serially on SDO line using SPI slave mode
15. Initializing MSSP module in I2C master mode(including start condition, stop condition, Transmission of address, read and write operation)

Module VII:USART

(12 hours)

Theory

USART: Universal Synchronous Asynchronous Receiver Transmitter (USART), Analog-to-Digital Converter (ADC)

Practice:

16. USART initialization to receive and transmit continuously in asynchronous mode
17. Initialize the AD module

Text Book:

1. Ajay V Deshmukh, “Microcontrollers-Theory and Applications”, , Tata McGraw-Hill Publishing Company Limited, 2005.
2. Richard Barnett, Larry O’Cull, Sarah Cox “Embedded C Programming and the Microchip PIC”, , Thomson Delmar Learning, 2006.

Online Resource

1. <http://microcontrollerslab.com/pic-microcontroller-architecture/> [Viewed on 17/6/2019]
2. http://www.islavici.ro/cursuriold/conducere%20sist%20cu%20calculatorul/PICbook/2_01chapter.htm [Viewed on 17/6/2019]
3. <http://teachers.teicm.gr/kalomiros/Mtptx/e-books/eBook%20-%20PIC%20Programming%20with%20C.pdf> [Viewed on 17/6/2019]

Data Sheet for controller

PIC16F877A <https://www.google.com/url?sa=t&rct=j&q=&esrc=s&source=web&cd=1&cad=rja&uact=8&ved=0ahUKEwjkrG25PzaAhUkSI8KHZHEDmQQFggsMAA&url=http%3A%2F%2Fww1.microchip.com%2Fdownloads%2Fen%2FDeviceDoc%2F39582b.pdf&usg=AOvVaw0fL8Y1WtiFSI3vFnHizLqJ> [Viewed on 17/6/2019]

Session Plan

Topic	No. of Sessions (in hrs.)	Activity	Assignment	Suggested Reading
Module I: Introduction to Microcontroller (8 hours)				
Introduction to Microcontroller: Introduction, Microcontroller versus microprocessors, CISC Vs RISC	4	Lecture	Assignment 1.1	Suggested Links
Pipelining, Assembly Language vs Embedded C	4	Lecture	Assignment 1.2	Suggested Links
Module II: PIC Microcontroller PIC16C6X/7X Architecture and Organization (10 hours)				
PIC Microcontroller PIC16C6X/7X Architecture and Organization: Overview and Features, PIC16C6X/7X, PIC Reset Actions	5	Lecture	Assignment 2.1	Text Book 1 (Pg. No.115-131)
PIC Oscillator Connections, PIC Memory Organization	5	Lecture	Assignment 2.2	Text Book 1 (Pg. No.115-131)
Module III: PIC16C6X/7X in Assembly Language (27 hours)				
PIC16C6X/7X in Assembly Language: PIC 16C6X/7X Instructions, Addressing Modes, I/O Ports in PIC 16C61/71, Interrupts in PIC 16C61/71, PIC 16C61/71 Timers, PIC 16C71 ADC.	3	Lecture	Assignment 3.1	Text Book 1 (Pg. No.132-147)
<ol style="list-style-type: none"> 1. Create delay using 'decfsz' instruction 2. Selecting Register Bank and loading value in specific Register. 3. PORT A Initialization 4. External Interrupt Programming 5. AD Conversion 	24	Practice (MPLA B & Proteus)		Text Book 1 (Pg. No.132-147)
Module IV: PIC 16F8XX Flash Microcontrollers (5 hours)				
PIC 16F8XX Flash Microcontrollers: Introduction, Pin Diagram of 16F8XX, STATUS Register, OPTION_REG Register, Power Control	3	Lecture	Assignment 4.1	Text Book 1 (pg. No.150-165)

Register (PCON),				Data sheet in Suggested link section
PIC 16F8XX Program Memory, PIC 16F8XX Data Memory, DATA EEPROM and Flash Program EEPROM	2	Lecture	Assignment 4.2	Text Book 1 (pg. No.150-165) Data sheet in Suggested link section
Module V: PIC 16F8XX Flash Microcontrollers in Embedded C (9 hours)				
PIC 16F8XX Flash Microcontrollers in Embedded C: Interrupts in 16F877, I/O Ports, Timers,	1	Lecture	Assignment 5.1	Text Book 2 (Pg. No.94-156)
6..Initializing and operating I/O Port 7..Stopwatch 8.Set-up counter using timer 0	8	Practice (MPLAB &Proteus)		
Module VI:PIC 16F877 (19 hours)				
PIC 16F877 Capture/Compare/PWM (CCP) Modules in PIC 16F877, Master Synchronous Serial Port (MSSP) Module,	2	Lecture	Assignment 6.1	Text Book 2 (Pg. No.113-119, Pg. No.123-127, Pg. No.138-149)
8.Initialize CCP1 module in capture mode 9.Initialize CCP1 module in compare mode 10.Generate PWM signal using CCP1 module 11.Transmit a byte serially on SDO line using SPI master mode 12.Receive a byte serially on SDO line using SPI master mode 13.Transmit a byte serially on SDO line using SPI slave mode 14.Initializing MSSP module in I2C master mode(including start condition stop condition	17	Practice (MPLAB &Proteus)		
Module VII:USART (12 hours)				
Universal Synchronous Asynchronous Receiver Transmitter (USART), Analog-to-Digital Converter (ADC)	1	Lecture	Assignment 7.1	Text Book 2 (Pg. No.129-137) (Pg. No.149-156)
15.USART initialization to receive and transmit continuously in asynchronous mode	11	Practice (MPLAB &Proteus)		

16.Initialize the AD module)		Data sheet in Suggested link section
Total- 90 Hours				

Control System

Course Title	Code	Type of course	T-P-Pr	Prerequisite
Control System	ELCC0406	Theory & Practice	3-2-0	Nil

Objective

- To teach the Mathematical Models of Physical Systems, Analysis of System in Time Domain and Frequency Domain & Application of Controllers

Course Outcome

- Students will gain knowledge of Physical Systems, Stability Analysis of System and Controller
- Students will develop skill of designing Automatic Control System and Controller for a particular application

Evaluation Systems

Internal Examination	Component	% of Marks	Method of Assessment
	Internal Theory	20	Written Examination
	Internal Practice	30 (20+10)	Lab Work + Learning Record
External Examination	External Theory	30	Written Examination
	External Practice	20	Lab Work
Total		<i>100</i>	

Course Outline

Module I: Introduction and Mathematical Models of Physical Systems(23 Hours)

Theory

Introduction to Control Systems: Basic Concepts of Control Systems, Open loop and closed loop systems; Mathematical Models of Physical Systems: Differential Equations of Physical Systems, Mechanical Translational Systems, Rotational systems, Electrical Systems, Analogy between Mechanical and electrical quantities, Derivation of Transfer functions, Block Diagram Algebra, Signal Flow Graphs and Mason's Gain Formula; Control Components: D.C. Servomotors, Synchros and Stepper Motors.

Practice: Hardware

- Study of D.C. Servomotors
- Study of AC Servomotor
- Study of Synchros
- Study of Stepper Motors

Module II: Time Response Analysis

(20 Hours)

Theory

Time Response Analysis: Type Test Signals, Time response of first order systems to unit step and unit ramp inputs, Time Response of Second order systems to unit step input, Time Response specifications, Steady State Errors and Static Error Constants of different types of systems.

Practice: Mat lab

5. Standard Test Signals
6. Time response of first order systems to unit step and unit ramp inputs
7. Time Response of Second order systems to unit step input
8. Time Response specifications
9. Simulate a D. C. position control system and obtain its step response

Module III: Stability in Time Domain

(12 Hours)

Theory

Stability in Time Domain: Stability and Algebraic Criteria, concept of stability, Necessary conditions of stability, Hurwitz stability criterion, Routh stability criterion, Application of the Routh stability criterion to linear feedback system and Relative stability by shifting the origin in s-plane.

Practice: Mat lab

10. Study of stable and unstable system.

Module IV: Root Locus Technique

(10 Hours)

Theory

Root Locus Technique: Root locus concepts, Rules of Construction of Root locus and Determination of Roots from Root locus for a specified open loop gain.

Practice: Mat lab

11. Construct the root locus for 2nd, 3rd and 4th order system and analyze its stability (Gain)

Module V: Frequency Response Analysis

(20 Hours)

Theory

Frequency Response Analysis: Frequency domain specifications, correlation between Time and Frequency Response with respect to second order system, Polar plots, Bode plot, Determination of Gain Margin and Phase Margin from Bode plot.

Practice: Mat lab

12. Determine experimentally the frequency response of a 2nd system and evaluation of frequency domain specifications
13. Construct the polar plot for 2nd, 3rd and 4th order system and analyze its stability (PM & GM)
14. Construct the bode plot for 2nd, 3rd and 4th order system and analyze its stability (PM & GM)

Module VI: Stability in Frequency Domain

(10 Hours)

Theory

Stability in Frequency Domain: Principle of argument, Nyquist stability criterion and Application of Nyquist stability criterion for linear feedback system.

Practice: Mat lab

- 15. Construct the Nyquist plot for 2nd, 3rd and 4th order system and analyze its stability (PM & GM)
- 16. Draw the frequency response characteristic of a given lag- lead compensating network

Module VII: Controllers

(10 Hours)

Theory

Controllers: Concept of Proportional, Derivative and Integral Control actions, P, PD, PI and PID controllers.

Practice: Mat lab

- 17. Design of P,PD, PI and PID Controller for 2ndor 3rdorder system
- 18. To study the effect of P, PI, PD and PID controller on step response of a feedback control system
- 19. To design a PI controller and study its effect on steady state error
- 20. Controller Tuning

Text Book

Saeed S. Hasan, “Automatic Control Systems,”Kataria Publication, 9th Edition-2017.

Reference

Nagrath J. and Gopal M., “Control Systems Engineering,” New Age International Publishers, 6th Edition-2017.

Session Plan

Topics	No. of Sessions (in hrs)	Activity	Assignment	Suggested Reading
Module I: Introduction and Mathematical Models of Physical Systems (23 Hours)				
Introduction to Control Systems: Basic Concepts of Control Systems, Open loop and closed loop systems.	03	Lecture	Assignment No. 1.1	Text Book (TB) Chapter (CH)-1
Mathematical Models of Physical Systems: Differential Equations of Physical Systems, Mechanical Translational Systems, Rotational systems, Electrical Systems, Analogy between Mechanical and electrical quantities, Derivation of Transfer functions, Block Diagram Algebra, Signal Flow Graphs and Mason’s Gain Formula.	10	Lecture	Assignment No. 1.2-1.7	TB CH- 1

Control Components: D.C. Servomotors, Synchros and Stepper Motors.	02	Lecture	Assignment No. 1.8	TB CH- 9
1. Study of D.C. Servomotors 2. Study of AC Servomotor 3. Study of Synchros 4. Study of Stepper Motors	08	Practice	Result of Experiments and Viva voce	TB CH- 9
Module II: Time Response Analysis (20 Hours)				
Time response Analysis: Standard Test Signals, Time response of first order systems to unit step and unit ramp inputs, Time Response of Second order systems to unit step input, Time Response specifications, Steady State Errors and Static Error Constants of different types of systems.	08	Lecture	Assignment No. 2.1-2.5	TB CH- 2
5. Standard Test Signals 6. Time response of first order systems to unit step and unit ramp inputs 7. Time Response of Second order systems to unit step input 8. Time Response specifications 9. Simulate a D. C. position control system and obtain its step response	12	Practice	Result of Experiments and Viva voce	
Module III: Stability in Time Domain (12 Hours)				
Stability in time domain: Stability and Algebraic Criteria, concept of stability, Necessary conditions of stability, Hurwitz stability criterion, Routh stability criterion, Application of the Routh stability criterion to linear feedback system, Relative stability by shifting the origin in s-plane	10	Lecture	Assignment No. 3.1-3.5	TB CH- 5
10. Study of stable and unstable system.	02	Practice	Result of Experiments and Viva voce	
Module IV: Root Locus Technique (10 Hours)				
Root locus Technique: Root locus concepts, Rules of Construction of Root locus and Determination of Roots from Root locus for a specified open loop gain.	06	Lecture	Assignment No. 4.1-4.3	TB CH- 5
11. Plot the root locus for 2 nd , 3 rd and 4 th order system and analyze its stability (Gain)	04	Practice	Result of Experiments and Viva voce	
Module V: Frequency Response Analysis (20 Hours)				

Frequency Response Analysis: Frequency domain specifications, correlation between Time and Frequency Response with respect to second order system.	04	Lecture	Assignment No. 5.1-5.2	TB CH- 4
Polar plots	02	Lecture	Assignment No. 5.3-5.5	TB CH- 4
Bode plot, Determination of Gain Margin and Phase Margin from Bode plot.	04	Lecture	Assignment No. 5.6-5.9	TB CH- 4
12. Determine experimentally the frequency response of a second -order system and evaluation of frequency domain specifications. 13. Construct the polar plot for 2 nd , 3 rd and 4 th order system and analyze its stability (PM & GM) 14. Construct the bode plot for 2 nd , 3 rd and 4 th order system and analyze its stability (PM & GM)	10	Practice	Result of Experiments and Viva voce	
Module VI: Stability in Frequency Domain (10 Hours)				
Stability in frequency domain: Principle of argument, Nyquist stability criterion, Application of Nyquist stability criterion for linear feedback system.	04	Lecture	Assignment No. 6.1-6.2	TB CH- 5
15. Construct the Nyquist plot for 2 nd , 3 rd and 4 th order system and analyze its stability (PM & GM). 16. Draw the frequency response characteristic of a given lag-lead compensating network.	06	Practice	Result of Experiments and Viva voce	
Module VII: Controllers (10 Hours)				
Controllers: Concept of Proportional, Derivative and Integral Control actions, P, PD, PI and PID controllers.	02	Lecture	Assignment No. 7.1	TB CH- 11
17. Design of P,PD, PI and PID Controller for 2 nd or 3 rd order system 18. To study the effect of P, PI, PD and PID controller on step response of a feedback control system 19. To design a PI controller and study its effect on steady state error 20. Controller Tuning	08	Practice	Result of Experiments and Viva voce	
Total- 105Hours (Theory- 55 hours Practice-50 hours)				

Microprocessor and its Interfacing

Course Title	Code	Type of course	T-P-P (Credit)	Prerequisite
Microprocessor and its Interfacing	ELCC0407	Theory + Practice	1-1-0	Nil

Objective

- Familiarization with architecture, instruction set and assembly language programming concept of a microprocessor for design of hardware interfacing circuit.

Course Outcome

- Design of microprocessors based systems.
- Analyze and design hardware and software for small digital systems involving microprocessors.

Evaluation Systems

Internal Examination	Component	Marks	Method of Evaluation
	Internal Theory	20	Written examination
	Internal Practice	30 (20+10)	Lab work+ Learning Record
External Examination	External Theory	30	Written examination
	External Practice	20	Lab work
Total		100	

Course Outline

Module I: 8085 Microprocessor Architecture (2 Hours)

Theory

Introduction to Microprocessor, Components of a Microprocessor: Registers, ALU and control & timing, System bus (data,address and control bus), Microprocessor systems with bus organization.

Module II: 8085 Instruction set (11 Hours)

Theory

Assembly Language Programming Basics, Classification of Instructions, Addressing Modes, Writing 8085 assembly language programs with decision, making and looping using, data transfer, logical and branch instructions.

Practice

- Data transfer and Arithmetic Group
- Logical and Branch Group

Module III: Stack and Subroutines (4 Hours)

Theory

Stack & Subroutines stack and machine control groups of instruction set,

Practice:

3. Stack, I/O and Machine Control Group

Module IV: Peripheral device and Interfacing (4 Hours)

Theory

Address space partitioning, memory and I/O interfacing, data transfer schemes

Module V: Interrupts of Intel 8085 (8 Hours)

Theory

Interrupt structure of 8085A microprocessor, processing of vectored and non-vectored interrupts.

Practice:

4. Find the calling location of different Interrupt
5. Solve a pending task (addition) when interrupt occurs

Module VI: Programmable peripheral Interface (Intel-8255) (8 Hours)

Theory

Intel 8255, pin configuration, internal structure of a port bit, modes of operation.

Practice:

6. Operate 8255 in Mode 0,1
7. Operate 8255 in Mode 2

Module VII: Programmable Counter/ Interval Timer (8 Hours)

Theory

Intel 8253, pin configuration, internal block diagram of counter and modes of operation

Practice:

8. Operate 8253 in Mode 0,1
9. Operate 8253 in Mode 3

Text Books

1. B. Ram, Fundamentals of Microprocessor & Microcontrollers, Dhanpat Rai Publication, 7th Edition, 2010.

Online Resources

1. Animated Working of 8085 Microprocessor with addition program: <https://www.youtube.com/watch?v=te5Xe3TgPC4> [Viewed on 13-6-2019]
2. 8085 Interrupt: https://www.youtube.com/watch?v=dc_1MEjMFJc [Viewed on 13-6-2019]
3. 8255 PPI: <https://www.youtube.com/watch?v=JXbkTHKJybw> [Viewed on 13-6-2019]

4. 8253 Timer & Counter: https://www.youtube.com/watch?v=7P_Y8oB9ICQ [Viewed on 13-6-2019]

Session Plan

Topics	No. of Sessions (in hrs)	Activity	Assignment	Suggested Reading
Module I: 8085 Microprocessor Architecture (2 Hours)				
Introduction to Microprocessor, Components of a Microprocessor: Registers, ALU and control & timing, System bus (data, address and control bus), Microprocessor systems with bus organization.	2	Lecture	Assignment 1.1	TB CH-3 Sec 3.1
Module II: 8085 Instruction set (11 Hours)				
Assembly Language Programming Basics	1	Lecture	Assignment 2.1	TB CH-3 Sec 3.2
Classification of Instructions	3	Lecture	Assignment 2.2	TB CH-4 Sec 4.3
Addressing Modes	2	Lecture	Assignment 2.3	TB CH-4 Sec (4.6.1-4.6.4)
8085 assembly language programs with decision, making and looping using, data transfer, logical and branch instructions.	5	Practice		TB CH-6
Module III: Stack and Subroutines (4 Hours)				
stack and machine control groups of instruction set	2	Lecture	Assignment 3.1	TB CH-4 Sec 4.6.5
Stack, I/O and Machine Control Group	2	Practice		TB CH-6
Module IV: Peripheral device and Interfacing (4 Hours)				
Address space partitioning	1	Lecture	Assignment 4.1	TB CH- 7 Sec 7.2
memory and I/O interfacing	1	Lecture	Assignment 4.2	TB CH- 7

				Sec 7.3
data transfer schemes	2	Lecture	Assignment 4.3	TB CH- 7 Sec 7.4
Module V: Interrupts of Intel 8085 (8 Hours)				
Hardware Interrupts	2	Lecture	Assignment 5.1	TB TB CH- 7 Sec 7.5.1
Software Interrupts	2	Lecture	Assignment 5.2	TB TB CH- 7 Sec 7.5.2
Find the calling location of different Interrupt Solve a pending task (addition) when interrupt occurs	4	Practice		
Module VI: Programmable peripheral Interface (Intel-8255) (8 Hours)				
Intel 8255, pin configuration, internal structure of a port bit, modes of operation	3	Lecture	Assignment 6.1	TB TB CH- 7 Sec 7.7
Operate 8255 in Mode 0,1	2	Practice		
Operate 8255 in Mode 2	1	Practice		
Module VII: Programmable Counter/ Interval Timer (8 Hours)				
Programmable Counter/ Interval Timer Intel 8253, pin configuration, internal block diagram of counter and modes of operation	3	Lecture	Assignment 7.1	TB CH 7 Sec (7.11.1- 7.11.2)
Operate 8253 in Mode 0,1	2	Lecture+Practice	Assignment 7.2	TB CH 7 Sec (7.11.3- 7.11.5)
Operate 8253 in Mode 2,3	3	Lecture+Practice	Assignment 7.3	TB CH 7 Sec (7.11.6- 7.11.7)
Total- 45 Hours				

Digital Electronic Circuits

Course Title	Code	Type of course	T-P-P	Prerequisite
Digital Electronic Circuits	ECCC0402	Theory +Practice	3-1-0	Nil

Objective:

- The objective of this subject is to provide a good understanding on digital logic and different combinational and sequential circuits

Course Outcome:

- Student will able to Develop, Analyze, Design and Implement combinational and Sequential Logic Circuits
- Student will able to acquire the skill on Simulating and implementing combinational and Sequential Circuits using Verilog

Evaluation Systems:

Internal Examination	Component	% of Marks	Method of Assessment
	Internal Theory	20	Written Examination
	Internal Practice	30(20+10)	Lab Work + Learning Record
External Examination	External Theory	30	Written Examination
	External Practice	20	Lab Work
Total		100	

Course Outline

Module I: NUMBER SYSTEMS AND CODES

(4 Hours)

Theory

Different number systems: Binary, Octal, Decimal and Hexadecimal, Interpretation of base r system, Number-Base Conversion. Binary Arithmetic, 1's and 2's Complements, subtraction using 2's complement, Signed Binary Numbers. Codes: BCD, Gray, Excess-3, ASCII Character Code, BCD Addition

Module II: BOOLEAN ALGEBRA AND LOGIC MINIMIZATION

(5 Hours)

Theory

Basic Theorems and Properties of Boolean Algebra, Boolean Functions, Complement of a function, Canonical and Standard forms- Minterms, Maxterms, SOP, POS, Conversion between canonical forms. Logic Minimization Techniques: 3, 4, 5 variable K-Map, POS simplification, don't care conditions

Practice

- Study of different digital logic gates
- Simplification of Boolean function, logic minimization and implementation with logic gates

Module III: LOGIC MINIMIZATION

(5 Hours)

Theory

Prime implicants, Essential prime implicants, Quine-McCluskey technique for simplification, Circuit Implementation, NAND and NOR implementation, AND-OR-INVERT, OR-AND-INVERT, Ex-OR function, Parity generation and checking

Practice

3. VERILOG/VHDL Tutorial
4. NAND-NOR implementation of logic circuits

Module IV: ARITHMETIC CIRCUITS

(6 Hours)

Theory

Combinational Circuit- Design and analysis, Code conversion, Binary Adder-Subtractor- Half Adder/ Subtractor, Full Adder/Subtractor, Ripple carry adder, Carry look ahead generator, Adder-Subtractor, BCD Adder, Binary Multiplier, Magnitude Comparator

Practice

5. Design, implement and test of Combinational Circuit- Parity Generator
6. Design, implement and test of Code Converters
7. Design, implement and test of Adders
8. Design, implement and test of Subtractor

Module V: COMBINATIONAL LOGIC

(6Hours)

Theory

Decoders, Function implementation using decoder, Encoders, Multiplexers, function implementation using multiplexer, De-multiplexers

Practice

9. Design, implement and test of Decoder circuits
10. Design, implement and test of LSB/ MSB Priority Encoder
11. Design, implement and test of Multiplexers
12. Design, implement and test of Magnitude Comparator

Module VI: SEQUENTIAL LOGIC

(6 Hours)Theory

Sequential Circuits, Latches-SR, JK, Flip-Flops-JK, D, T, Design and Analysis of Clocked Sequential Circuit, Introduction to FSM, Mealy and Moore Models, Design of sequence detector using both types of FSM;Registers- SISO, SIPO, PIPO and PISO Registers, Universal Shift Register.

Practice

13. Design, implement and test of Flip Flop Circuits
14. Design, implement and test of Shift Register

Module VII: COUNTERS, MEMORY AND PROGRAMMABLE LOGIC (10 Hours)**Theory**

Counter- Asynchronous/Synchronous- Up/Down Counter, Termination of Count (MOD Counter), Ring Counter, Johnson Counter; Memory Characteristics, Memory hierarchy, Different types of memory, Concept of CPLD and FPGA, Programmable Read Only Memory, PLA, PAL, Error Detection and Correction- Hamming Code

Practice

15. Design, implementation and test of Counters

Practice will be through hardware implementation and software simulation using Xilinx.

Text Book

Mano, M.M., “Digital design”, EBSCO Publishing, 2002

Reference Books

1. Kumar, A.A., Fundamentals of digital circuits. PHI Learning Pvt. Ltd, 2014.
2. Jain, R.P. and Floyd, T.L., Digital fundamentals, Dorling Kindersley Pvt Ltd, 2009.
3. Donald, P.L., Albert, P.M., Goutam. Saha, Malvino, A.P. and Saha, G.K., Digital Principles & Applications. Tata McGraw-Hill, 2010.

Session Plan

Topic coverage and Internal Test	No. of Sessions (in hrs.)	Activity	Assignment	Suggested Reading
Module I: Number Systems and Codes (5 hrs. lecture)				
Number System: - Binary, Octal, Decimal, Hexadecimal, Interpretation of base r system	1	Lecture	Assignment-1.1	Text Book-1 Chapter-1
Number-Base Conversion, Binary Arithmetic	1	Lecture	Assignment-1.2	Text Book-1 Chapter-1
1's and 2's Complements, subtraction using 2's complement, Signed Binary Numbers	1	Lecture	Assignment-1.3	Text Book-1 Chapter-1

Codes: - BCD, Gray, Excess-3, ASCII Character Code	1	Lecture	Assignment-1.4	Text Book-1 Chapter-1
BCD Addition	1	Lecture	Assignment-1.5	Text Book-1 Chapter-1
Module II: Boolean Algebra and Logic Minimization (6hrs. lecture+3 hrs. practice)				
Basic Theorems and Properties of Boolean Algebra	1	Lecture	Assignment No- 2.1	Text Book-1 Chapter-2
Boolean Functions, Complement of a Function	1	Lecture	Assignment No- 2.2	Text Book-1 Chapter-2
Canonical and Standard Forms-Minterms, Maxterms, SOP, POS, Conversion between two canonical form	1	Lecture	Assignment No- 2.3	Text Book-1 Chapter-2
Logic Gates	1	Practice		
The map method-3,4,5 variable K-Map	2	Lecture	Assignment No- 2.4	Text Book-1 Chapter-3
Simplification of Boolean function, logic minimization and implementation with logic gates	2	Practice		
POS simplification, Don't care conditions	1	Lecture	Assignment No- 2.5	Text Book-1 Chapter-3
Module III: Logic Minimization(6hrs. lecture+3 hrs. practice)				
Prime Implicants, Essential Prime Implicants	1	Lecture	Assignment No- 3.1	Text Book-1 Chapter-3
Quine-McCluskey Technique for simplification.	1	Lecture	Assignment No- 3.1	Text Book-1 Chapter-3
Circuit Implementation,	1	Lecture	Assignment No- 3.1	Text Book-1 Chapter-3
NAND and NOR implementation,	1	Lecture	Assignment No- 3.1	Text Book-1 Chapter-3
AND-OR-INVERT, OR-AND-INVERT,	1	Lecture	Assignment No- 3.1	Text Book-1 Chapter-3
Ex-OR function, Parity generation and checking.	1	Lecture	Assignment No- 3.1	Text Book-1 Chapter-3
VERILOG/VHDL Tutorial	1	Practice		
NAND-NOR implementation of logic circuits.	2	Practice		
Module IV [6 hrs. lecture+8 hrs. practice]				

Combinational Circuit-Design and Analysis	1	Lecture		Text Book-1 Chapter-4
Design, implement and test of Combinational Circuit- Parity Generator	2	Practice		
Code Conversion Circuits	1	Lecture	Assignment-4.1	Text Book-1 Chapter-4
Design, implement and test of Code Converters	2	Practice		
Binary Adder-Subtractor- Half Adder/Subtractor, Full Adder/Subtractor	2	Lecture	Assignment-4.2	Text Book-1 Chapter-4
Design, implement and test of Adders	2	Practice		
Ripple Carry Adder, Carry Lookahead Generator	1	Lecture	Assignment-4.3	Text Book-1 Chapter-4
Design, implement and test of Subtractor	2	Practice		Lab Manual
Adder-Subtractor, BCD Adder	1	Lecture	Assignment-4.4	Text Book-1 Chapter-4
Module V [6hrs. Lecture+8 hrs. Practice]				
Binary Multiplier	1	Lecture	Assignment-5.1	Text Book-1 Chapter-4
Magnitude Comparator	1	Lecture	Assignment-5.2	Text Book-1 Chapter-4
Design, implement and test of Magnitude Comparator	2	Practice		Lab Manual
Decoders, Encoders	2	Lecture	Assignment-5.3	Text Book-1 Chapter-4
Design, implement and test of Decoder circuits	2	Practice		Lab Manual
Design, implement and test of LSB/ MSB Priority Encoder	2	Practice		Lab Manual
Multiplexers, Demultiplexers	2	Lecture	Assignment-5.4	Text Book-1 Chapter-4
Design, implement and test of Multiplexers	2	Practice		Lab Manual
Module VI [6hrs. Lecture+4 hrs. Practice]				
Sequential Circuits, Latches-SR,JK	1	Lecture	Assignment-6.1	Text Book-1 Chapter-5

Flip-Flops-JK,D,T	1	Lecture	Assignment-6.2	Text Book-1 Chapter-5
Design, implement and test of Flip Flop circuits	2	Practice		Lab Manual
Analysis and Design of Clocked Sequential Circuit	1	Lecture	Assignment-6.3	Text Book-1 Chapter-5
Introduction to FSM, Mealy and Moore Models, Design of sequence detector using both types of FSM.	1	Lecture	Assignment-6.4	Text Book-1 Chapter-5
Registers- SISO, SIPO, PIPO and PISO Registers	1	Lecture	Assignment-6.5	Text Book-1 Chapter-6
Universal Shift Register	1	Lecture	Assignment-6.6	Text Book-1 Chapter-6
Design, implement and test of Shift Register	2	Practice		Lab Manual
Module VII [7hrs. Lecture+3 hrs. Practice]				
Asynchronous/Synchronous-Up/Down Counter	2	Lecture	Assignment-7.1	Text Book-1 Chapter-6
Termination of Count (MOD Counter), Ring Counter, Johnson Counter	2	Lecture	Assignment-7.2	Text Book-1 Chapter-6
Design, implementation and test of Counters	2	Practice		Lab Manual
Memory Characteristics, Memory hierarchy, Different types of memory, Concept of CPLD and FPGA,	2	1 hr. Lecture + 1 hrs. Practice	Assignment-7.3	Text Book-1 Chapter-7
Programmable Read Only Memory, PLA, PAL,	1	Lecture	Assignment-7.4	Text Book-1 Chapter-7
Error Detection and Correction Code - Hamming Code.	1	Lecture	Assignment-7.5	Text Book-1 Chapter-7
Total (hrs.)	70	42 hrs. Lecture + 28 hrs. Practice		

Digital Signal Processing

Course Title	Code	Type of course	T-P-P	Prerequisite
Digital Signal Processing	ECCC0404	Theory +Practice	3-1-0	Nil

Objective

- To teach students the Time Domain to Frequency Domain Conversion for Discrete Time Signal and Digital Filter Design Technique

Course Outcome

- Students will gain the knowledge in handling DSP processor for real time signal processing
- Student will acquire skill on Developing and implementing new algorithm in signal processing

Evaluation Systems

Internal Examination	Component	% of Marks	Method of Assessment
	Internal Theory	20	Written Examination
	Internal Practice	30(20+10)	Lab Work + Learning Record
External Examination	External Theory	30	Written Examination
	External Practice	20	Lab Work
Total		100	

Course Outline

Module I: ANALYSIS OF LTI SYSTEMS USING Z-TRANSFORM (12 Hours)

Theory

The Z-Transform: The Direct Z-Transform, Theinverse Z-Transform, Properties of The Z-Transform, Linearity, Time Shifting, Scaling, Time Reversal, Differentiation, Convolution, Correlation, Accumulation, Rational Z-Transforms: Poles and Zeros, Pole Location And Time-Domain Behavior for Causal Signals, The System Function of a Linear Time-Invariant System

Practice

- Hands on to MATLAB & Simulink
- Signal generation using MATLAB & Simulink
- Analysis of LTI system using MATLAB and Z-transform of signal using MATLAB

Module II: INVERSION OF THE Z-TRANSFORMS (5 Hours)

Theory

The Inversion of the Z-Transform by Power Series Expansion, The Inversion of The Z-Transform by Partial-Fraction Expansion, The One-Sided Z-Transform: Definition and Properties, Analysis and Characterization Of LTI System using Z-Transform, Solution of Difference Equations.

Module III: THE DISCRETE FOURIER TRANSFORM (8 Hours)

Theory

Properties and applications, the discrete Fourier transform, Properties of the DFT: periodicity, linearity, and symmetry properties, relationship of the DFT to other transforms, DFT as a linear transformation, multiplication of two DFT and circular convolution

Practice

4. MATLAB simulation for DFT & IDFT.

Module IV: FAST FOURIER TRANSFORM (10 Hours)

Theory

Efficient Computation of the DFT, FFT Algorithms: Radix-2 FFT Algorithms: Decimation-in-Time (DIT), Decimation-in-Frequency (DIF)

Practice

5. DIT FFT by MATLAB simulation
6. DIF FFT by MATLAB simulation

Module V: DESIGN AND REALIZATION OF DIGITAL FIR FILTERS (14 Hours)

Theory

Design of FIR Filters: Symmetric and Anti-Symmetric FIR Filters, Design of Linear-Phase FIR Filters by Using Windowing Techniques, Design of FIR Filter by Frequency Sampling
Realization of FIR Filter: Recursive and Non-Recursive Structure, Factors Influencing Choice of Structure, Block Diagram Representation of Signal Flow Graph, FIR Filter Structure: Direct Form-I, Direct Form-II, Linear Phase Structure, Frequency Sampling Structure

Practice

7. MATLAB Simulation of FIR filters using windows technique (Rectangular, Hamming and Hanning)
8. MATLAB simulation of LPF and high pass filter by FIR filter

Module VI: DESIGN AND REALIZATION OF DIGITAL IIR FILTERS (14 Hours)

Theory

Design of IIR Filters from Analog Filters (Butterworth Approximation): IIR Filter Design by Impulse Invariance, IIR Filter Design By The Bilinear Transformation, Realization of Digital Filter by using Direct Form-I, Direct Form-II, Cascade Form and Parallel Form Structures.

Practice

9. MATLAB simulation for design of Butterworth filter
10. Design of IIR Butterworth filter from filter specification (both programming & and by using FDA tool box)
11. Design of IIR low pass Butterworth filter using impulse invariant transformation from filter specification

Module VII: DIGITAL SIGNAL PROCESSOR

(12 Hours)

Theory

Introduction, Evolution of Digital Signal Processor, Digital Signal Processor Architecture, Processor Hardware Unit, Fixed Point and Floating Format, Pipelining, Memory Access Scheme, VLIW, TMS320c Family

Practice

12. Signal generation (sine wave, step signal) by using processor
13. Linear convolution by using DSP processor
14. Filter design and implementation by using DSP processor

Text Books

1. V. K. Ingle and J.G. Proakis, J.G, “Digital Signal Processing-A MATLAB Based Approach”, Cengage Learning Publisher
2. S. Salivahanan, A. Vallavaraj and C. Gnanapriya, “Digital Signal Processing”, McGraw-Hill Publication

Reference Book

Tarun K.Rawat, “Digital Signal Processing”, Oxford University Press India

Online Resource

NPTEL Video:<http://nptel.ac.in/courses/117102060> [Viewed on 13-06-2019]

Session Plan

Topic coverage and Internal Test	No. of Sessions (in hrs.)	Activity	Assignment	Suggested Reading
Module-I [6 hrs. Lecture + 6 hrs. Practice]				
The Z-Transform: The Direct Z-Transform,	3	1hr. Lecture + 2 hrs. Practice	Assignment1 QN-1	Text Book-1, Chapter 3
The Inverse Z-Transform,	1	Lecture	Assignment 1 QN-2	Text Book-1, Chapter 3

Properties of the Z-Transform	3	Lecture	Assignment 1 QN-3	Text Book-1, Chapter 3
Introduction to MatLab and Simulink.	2	Practice	Assignment 1 QN-4	Text Book-2, Chapter 15
Standard Signal Generation by MatLab& Simulink	2	Practice	Assignment 1 QN-4	Text Book-2, Chapter 15
Rational Z-Transforms: Poles and Zeros, Pole Location and Time-Domain Behavior for Causal Signals	1	Lecture	Assignment 1 QN-5	Text Book-1, Chapter 3
Module-II [5 hrs. Lecture]				
Inversion of the Z-Transforms: The Inversion of the Z-Transform by Power Series Expansion,	1	Lecture	Assignment 2 QN-1	Text Book-1, Chapter 3
The Inversion of the Z-Transform by Partial-Fraction Expansion	1	Lecture	Assignment 2 QN-2	Text Book-1, Chapter 3
The One-sided Z-Transform: Definition and Properties, Solution of Difference Equations.	3	Lecture	Assignment 2 QN-3	Text Book-1, Chapter 3
Module-III [6 hrs. Lecture+ 2 hrs. Practice]				
Relationship of the DFT to other Transforms	1	Lecture	Assignment 3 QN-1	Text Book-1, Chapter 5
Properties of the DFT: Periodicity problems on Properties of the DFT: Periodicity	1	Lecture	Assignment 3 QN-2	Text Book-1, Chapter 5
Properties of the DFT, Linearity, and Symmetry Properties,	1	Lecture	Assignment 3 QN-3	Text Book-1, Chapter 5
Multiplication of Two DFTs and Circular Convolution	3	1hr. Lecture + 2 hrs. Practice	Assignment 3 QN-4	Text Book-1, Chapter 5
Twiddle factor, The DFT as a Linear transformation Overlap add method, Overlap Save method	2	Lecture	Assignment 3 QN-5	Text Book-1, Chapter 5
Module-IV [6hrs. Lecture + 4 hrs. Practice]				
Fast Fourier Transform Algorithms, Efficient Computation of the DFT, problems on FFT Algorithms: Direct Computation of the DFT	2	Lecture	Assignment 4 QN-1	Text Book-1, Chapter 6
Radix-2 FFT Algorithms: Decimation-In-Time (DIT), problems on Decimation-In-Time	4	2 hrs. Lecture + 2 hrs. Practice	Assignment 4 QN-2	Text Book-1, Chapter 6

Radix-2 FFT Algorithms: Decimation-In-Frequency (DIF), problems on Decimation-In Frequency	4	2 hrs. Lecture + 2 hrs. Practice	Assignment 4 QN-3	Text Book-1, Chapter 6
Module-V [10 hrs. Lecture + 4 hrs. Practice]				
Design of FIR Filters: Symmetric and Ant symmetric FIR Filters	2	Lecture	Assignment 5 QN-4	Text Book-1, Chapter 8
Design of Linear-Phase FIR Filters by using Windows	4	2 hrs. Lecture + 2 hrs. Practice	Assignment 5 QN-5	Text Book-1, Chapter 8
Design of FIR filter By Frequency Sampling Method	4	2 hrs. Lecture + 2 hrs. Practice	Assignment 5 QN-6	Text Book-1, Chapter 8
Realization of FIR Filter: recursive and non-recursive structure, factors influencing choice of structure, Block diagram representation of Signal flow graph	2	Lecture	Assignment 5 QN-7	Text Book-1, Chapter 8
FIR filter structure: Direct form-I, Direct form-II, Linear phase structure, frequency sampling structure.	2	Lecture	Assignment 5 QN-8	Text Book-1, Chapter 7
Module-VI [8 hrs. Lecture + 6 hrs. Practice]				
Implementation of Discrete- TimeSystems, Structure for the Realizationof Discrete-Time Systems	2	Lecture	Assignment 6 QN-1	Text Book-1, Chapter 7
Structure for IIR Systems: Direct Form Structures, Cascade- FormStructures, Parallel-Form Structures	2	Lecture	Assignment 6 QN-2	Text Book-1, Chapter 7
Design of IIR Filters: Design byImpulse Invariance method	4	2 hrs. Lecture + 2 hrs. Practice	Assignment 6 QN-3	Text Book-1, Chapter 8
Design by the Bilinear Transformation	3	1 hrs. Lecture + 2 hrs. Practice	Assignment 6 QN-4	Text Book-1, Chapter 8
Design and realization of IIR Butterworth filter from filter specification	3	1 hrs. Lecture + 2 hrs. Practice	Assignment6 QN-7	Text Book-1, Chapter 8
Module-VII [4 hrs. Lecture + 8 hrs. Practice]				

Introduction, DSP processor memory Architecture	4	2 hrs. Lecture + 2 hrs. Practice	Assignment 7 QN-1	Text Book-2, Chapter 15
Examples of DSP processor, pipelining	1	Lecture	Assignment 7 QN-2	Text Book-2, Chapter 15
First generation TMS320c1x processors, second generation TMS320c2x processors, third generation TMS320c3x processors, fourth generation TMS320c4x processors	3	1 hrs. Lecture + 2 hrs. Practice	Assignment 7 QN-3	Text Book-2, Chapter 15
Filter design and implementation by using DSP processor	4	Practice	Assignment 6 QN-4	Text Book-2, Chapter 15
Total (hrs.)	75	45 hrs. Lecture + 30 hrs. Practice		

The following colour represents the syllabus revision, skill, employability and entrepreneurship.

Green : Skill

Pink : Employability

Sky : Entrepreneurship

Domain- Industrial Automation

Course Code	Course Title	Course Nature	Credits
DEIA0101	General PLC	Theory	2
DEIA0201	Basic Electrical (Automation based) and Panel Designing	Practice	2
DEIA0401	Supervisory Control and Data Acquisition (SCADA)	Theory+ Practice	3
DEIA0402	Micro Range Programmable Logic Controller	Theory+ Practice	3
DEIA0403	Small Range Programmable Logic Controller	Theory+ Practice	3
DEIA0404	Medium Range Programmable Logic Controller	Theory+ Practice	3
DEIA0202	Human Machine Interface (HMI)	Practice	2

DEIA0203	Variable Frequency Drive	Practice	2
DEET0300	Project		6
DEET0800	Internship		4
		Total	30

General PLC

Course Title	Code	Type of course	T-P-PJ	Prerequisite
General PLC	DEIA0101	Theory	2-0-0	Nil

Objective

- To teach the concept of Programmable Logic Controller and the application of the controllers.

Course Outcome

- Students will gain knowledge of Programmable logic controller used in industries.
- Students will develop skill of designing Automatic Control System using PLC.

Evaluation Systems

	Component	% of Marks	Method of Assessment
Internal Examination	Internal Theory	30	Written Examination

	Assignment	5	Report or Presentation + Learning Record
	Attendance	5	Based on Class Attended
External Examination	External Theory	60	Written Examination
Total		100	

Course Outline

Module I: What Is PLC

(4 Hours)

Theory

Definition of PLC. Brief description about PLC. Why to use PLC in industry. How to choose a PLC for industry.

Module-II: Types of PLC

(5 Hours)

Theory

Block Diagram. Functional block diagram of PLC. Detail description of each component of PLC.

- a) Power Supply
- b) CPU & its role
- c) Memory and type
- d) Input & Output Modules and their role
- e) Rack & Slot.

Module-III: Operation of PLC

(3 Hours)

Theory

Input & Output wiring. Signal flow. Internal structure of PLC.

Module-IV: Different PLC Brands

(5 Hours)

Theory

Leading PLC Brands. Different CPUs series. Different groups of PLC.

Module-V: PLC Driver Communication

(4 Hours)

Theory

Discussion on serial & parallel communication.

Description about:-

- a) Protocol.
- b) Standard.
- c) Baud rate.
- d) Bus system.
- e) Time Cycle
- f) Scan time

Module-VI: Programming Languages**(7 Hours)****Theory**

Programming standards. Programming rules. Different programming languages. NO-NC Concept. How to write a program (concept).

Module-VII: Number System**(2 Hours)****Theory**

Brief discussion on number systems and their conversions.

Reference Book

1. Madhuchhanda Mitra and Samarjit Sengupta, "Programmable Logic Controllers and Industrial Automation: An Introduction" 2nd Edition"

Session Plan

Topics	No. of Sessions (in hrs.)	Activity	Assignment	Suggested Reading
Module – 1 (WHAT IS PLC) (Theory- 1 hours)				
Definition of PLC. Description. Compact and modular PLC. Why to use PLC in industry. How to choose a PLC for industry	4	Lecture	Assignment 1.1	Reference Book (RB)
Module – 2 (TYPES OF PLC) (Theory- 5 hours)				
General Block Diagram. Functional block diagram of PLC. Detail description of each component of PLC. a) Power Supply b) CPU & its role c) Memory and type d) Input & Output Modules and their role e) Rack & Slot.	5	Lecture	Assignment 1.2	RB
Module – 3 (OPERATION OF PLC) (Theory- 3 hours)				
Input & Output wiring. Signal flow. Internal structure.	3	Lecture	Assignment 1.3	RB
Module – 4 (PLC BRANDS) (Theory- 4 hours)				
Leading brands of plc. Different CPUs series. Different groups of PLC.	4	Lecture	Assignment 1.4	RB
Module – 5 (PLC DRIVER COMMUNICATION) (Theory- 5 hours)				
Discussion on serial & parallel communication. Description	5	Lecture	Assignment 1.5	RB

about :- a) Protocol. b) Standard. c) Baud rate. d) Bus system. e) Time Cycle f) Scan time				
Module – 6 (PROGRAMMING LANGUAGE) (Theory- 7 hours)				
Programming standards. Programming rules. Different programming software. NO-NC Concept. How to write a program (concept).	7	Lecture	Assignment 1.6	RB
Module – 7 (NUMBER SYSYEMS) (Theory- 2 hours)				
Discussion on number systems and their conversions.	2	Lecture+ Practice	Assignment 1.7	RB
Total- 30 Hours (Theory- 30 hours)				

Basic Electrical (Automation based) and Panel Designing

Course Title	Code	Type of course	T-P-PJ	Prerequisite
Basic Electrical (Automation based) and Panel Designing	DEIA0201	Practice	0-2-0	Nil

Objective

- To teach the concept of Programmable Logic Controller based electrical panel design.

Course Outcome

- Students will gain knowledge of PLC based wiring concept of panel as used in industries.
- Students will develop skill of designing electrical panels.

Evaluation Systems

Internal Examination	Component	% of Marks	Method of Assessment
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	Internal Practice	50 (40+10)	Lab Work + Learning Record
External Examination	External Practice	50	Lab Work
Total		100	

Course Outline

Module-I: Introduction

(1 Hours)

Theory

Fundamentals of electrical and electronic components required for electrical panel designing using PLC.

Module-II: Power Supply

(7 Hours)

Theory

Power Supply Systems, Conversion of 230 Vac to 24 V dc and vice-versa with circuit description, Basic concept of SMPS.

Practice

1. Conversion of 230 Vac to 24Vdc
2. Transformers, diodes and regulator ICs.

Module-III: Basic Industrial Switches & Sensors

(4 Hours)

Theory

Pushbuttons, toggle switches, Limit switch, proximity switch, optical switch, pressure switch, etc

Practice

3. Checking the operations of different Sensors and switches.

Module-IV: RELAY

(10 Hours)

Theory

Basic description of RELAY, Practical uses of relay, Latching using relay, how to switch a 230Vac load using 24Vdc.

Practice

4. Latching and unlatching circuit using relay.
5. Interlocking circuit using relay.
6. Switching of 220Vac devices using (24Vdc).

Module-V: CONTACTOR

(10 Hours)

Theory

Basic description of CONTACTORS and auxiliary contacts, Holding(latching) circuit & interlocking with Aux contacts.

Practice

7. Latching and unlatching circuit using relay & contactor.
8. Interlocking circuit using relay & contactor..
9. Switching of 440Vac devices using PLC's output (24Vdc).

Module-VI: PANEL DESIGNING

(2 Hours)

Theory

Introduction to Control & Power Circuit, Control Wiring with PLC.

Module-VII: STARTER WIRING

(11 Hours)

Theory

Control circuit of starter using PLC, power circuit of starter.

Practice

10. DOL Starter control wiring, power wiring using PLC
11. FWD-REV Starter control wiring, power wiring using PLC
12. STAR-DELTA Starter control wiring, power wiring using PLC

Reference Book

1. Madhuchhanda Mitra and Samarjit Sengupta, "Programmable Logic Controllers and Industrial Automation: An Introduction" 2nd Edition"

Session Plan

Topics	No. of Sessions (in hrs.)	Activity	Assignment	Suggested Reading
Module – 1 (INTRODUCTION) (Theory- 4 hours)				
Fundamentals of electrical and electronic components required for electrical panel designing using PLC	1	Lecture	Assignment 1.1	Reference Book (RB)
Module – 2 (POWER SUPPLY) (Theory- 3 hours + Practice- 4 hours)				
Supply Systems. Conversion of 230 Vac to 24 V dc and vice-versa with circuit description. Basic concept of SMPS. Conversion of 230 Vac to 24Vdc transformers, diodes and regulator ICs	3+4	Lecture+ Practice	Assignment 1.2	RB
Module – 3 (BASIC INDUSTRIAL SWITCHES & SENSORS) (Theory- 2 hours + Practice- 2 hours)				
Pushbuttons, toggle switches, Limit switch, proximity switch, optical switch, pressure switch, etc. Checking the operations of different Sensors and switches	2+2	Lecture+ Practice	Assignment 1.3	RB
Module – 4 (RELAY) (Theory- 2 hours + Practice- 8 hours)				
Basic description of Relay, Practical uses of relay. Latching using relay, How to switch a 230Vac load using 24Vdc. a) Latching and unlatching circuit using relay. b) Interlocking circuit using relay. c) Switching of 220Vac devices using (24Vdc).	2+8	Lecture+ Practice	Assignment 1.4	RB
Module – 5 (COTACTOR) (Theory- 2 hours + Practice- 8 hours)				
Basic description of contactors and auxiliary contacts. Holding (latching) circuit & interlocking with Aux contacts. a) Latching circuit using relay & contactor.	2+8	Lecture+ Practice	Assignment 1.5	RB

b) Interlocking circuit using relay & contactor.. c) Switching of 440Vac devices using PLC's output (24Vdc).				
Module – 6 (PANEL DESIGNING) (Theory- 2 hours)				
Introduction to Control & Power Circuit. Control Wiring with PLC	2	Lecture	Assignment 1.6	
Module – 7 (STARTER WIRING) (Theory- 3 hours + Practice- 8 hours)				
Control circuit of starter using PLC. Power circuit of starter. a) DOL Starter control using PLC, power wiring b) FWD-REV Starter control using PLC, power wiring c) STAR-DELTA Starter control wiring using PLC, power wiring	3+8	Lecture+ Practice	Assignment 1.7	RB
Total- 45 Hours(Theory- 15 hours + Practice- 30 hours)				

Supervisory Control and Data Acquisition (SCADA)

Schneider Wonderware in Touch & RS-VIEW-32

Course Title	Code	Type of course	T-P-PJ	Prerequisite
Supervisory Control and Data Acquisition (SCADA)	DEIA0401	Theory+ Practice	2-1-0	Nil

Objective

- To teach the concept of SCADA, total control system of industry.

Course Outcome

- Students will gain knowledge of SCADA designing.
- Students will develop skill of designing SCADA based control system..

Evaluation Systems

Internal Examination	Component	% of Marks	Method of Assessment
	Internal Theory	20	Written examination
	Internal Practice	30(20+10)	Lab work + Learning Record
External Examination	External Theory	30	Written examination
	External Practice	20	Lab work
Total		<i>100</i>	

Course Outline

Module-I: Introduction to SCADA

(2 Hours)

Theory

Introduction and SCADA Basics, General SCADA theory, Importance of SCADA in Industrial Automation, Benefit of SCADA, DATA ACQUISITION. Leading SCADA Vendors, Architecture of SCADA (Open & Proprietary)

Module-II: Introduction to INTOUCH & RS-VIEW-32

(4 Hours)

Theory

Introduction to InTouch, Basic operations related to Intouch Editor, types of windows, How to Open window, windows property.

Practice

- Basic operation of Intouch SCADA software.

Module-III: TOOLBARS

(5 Hours)

Theory

General Toolbar, New window, Open window, close window, save window, save all, duplicate selection, cut to clipboard, copy, paste, undo and redo.

Practice

2. Operation & utility of general toolbars.

Module-IV: WIZARDS**(15 Hours)****Theory**

Wizard toolbar, Alarm display, Buttons, clock, lights, meter, runtime tools (for alarm monitor), slider, switches, SYMBOL FACTORY, Text Display, Trend, Value Display Fonts, Bold/Italic/Underline, Enlarge/ reduce font, Left/Centre/Right.

Practice

3. Wizard toolbar details, value display, user input.
4. Symbol factory toolbar.
5. Different operational properties

Module-V: INTOUCH & RS-View 32 SCADA FEATURES**(14 Hours)****Theory**

Dynamic graphical display, How to use the dynamic features, Alarms, Real Trend, Historical trend.

Practice

6. Dynamic graphical display.
7. Alarms
8. Real trends / Historical trends

Module-VI: INTOUCH RS-View 32 SCADA FEATURES**(11Hours)****Theory**

Data base connectivity, Report generation, Recipe management, Security.

Practice

9. Data base connectivity
10. Report Generation
11. Recipe Management
12. Security

Module-VII: INTOUCH and RS-View 32 SCADA FEATURES**(9 Hours)****Theory**

Script, Networking, Device connectivity.

Practice

13. Script.
14. Networking
15. Device connectivity.

Reference Book

1. K S Manoj, “Industrial Automation with SCADA: Concepts, Communications and Security”

Session Plan

Topics	No. of Sessions (in hrs.)	Activity	Assignment	Suggested Reading
Module – 1 (INTRODUCTION OF SCADA) (Theory- 2 hours)				
Introduction and SCADA Basics, General SCADA theory, Importance of SCADA in Industrial Automation, Benefit of SCADA, DATA ACQUISITION. Leading SCADA Vendors, Architecture of SCADA (Open & Proprietary).	2	Lecture	Assignment 1.1	Reference Book (RB)
Module – 2 (INTRODUCTION TO INTOUCH) (Theory- 2 hours + Practice- 2 hours)				
Introduction to InTouch & RS-View 32, Basic operations related to Intouch Editor, types of windows, How to Open window, windows property. a) Basic operation of Intouch & RS-View 32 SCADA software.	2+2	Lecture+ Practice	Assignment 1.2	RB
Module – 3 (TOOLBARS) (Theory- 3 hours + Practice- 2 hours)				
General toolbar, New window, Open window, close window, save window, save all, duplicate selection, cut to clipboard, copy, paste, undo and redo. a) Operation of general toolbars.	3+2	Lecture+ Practice	Assignment 1.3	RB
Module – 4 (WIZARDS) (Theory- 9 hours + Practice- 6 hours)				
Wizard toolbar, Alarm display, Buttons, clock, lights, meter, runtime tools (for alarm monitor), slider, switches, Text Display. SYMBOL FACTORY, Trend, Value Display. Fonts, Bold /Italic / Underline, Enlarge / reduce font,	9+6	Lecture+ Practice	Assignment 1.4	RB

Left/Centre/Right. a) Wizard toolbar details, value display, user input. b) Symbol factory toolbar. c) Different operational properties				
Module – 5 (INTOUCH & RS-VIEW FEATURES) (Theory- 4 hours + Practice-10 hours)				
Dynamic graphical display, How to use the dynamic features, Alarms, Real Trend, Historical trend. a) Dynamic graphical display. b) Alarms c) Real trends / Historical trends.	4+10	Lecture+ Practice	Assignment 1.5	RB
Module – 6 (INTOUCH & RS-VIEW FEATURES) (Theory- 5 hours + Practice- 6 hours)				
Data base connectivity, Report generation, Recipe management, Security a) Data base connectivity b) Report Generation c) Recipe Management d) Security	5+6	Lecture+ Practice	Assignment 1.6	RB
Module – 7 (INTOUCH & RS-VIEW FEATURES) (Theory- 5 hours + Practice- 4 hours)				
Script, Networking, Device connectivity. a) Script. b) Networking c) Device connectivity.	5+4	Lecture+ Practice	Assignment 1.7	RB
Total- 60 Hours(Theory- 30 hours + Practice- 30 hours)				

Micro Range Programmable Logic Controller

Course Title	Code	Type of course	T-P-PJ	Prerequisite
Micro range Programmable Logic Controller	DEIA0402	Theory+Practice	2-1-0	Nil

Objective

- To teach the concept of Allen Bradley PLC Control system.

Course Outcome

- Students will gain knowledge of AB PLC Programming & design.
- Students will develop skill of designing PLC based control system..

Evaluation Systems

Internal Examination	Component	% of Marks	Method of Assessment
	Internal Theory	20	Written examination
	Internal Practice	30(20+10)	Lab work + Learning Record
External Examination	External Theory	30	Written examination
	External Practice	20	Lab work
Total		100	

Allen Bradley SLC 500

Course Outline

Module-I: Introduction

(4 Hours)

Theory

Introduction to controller Family, SLC 500 features: Details about CPUs, Memory Organisation, Program files and Data files

Module-II: ARCHITECTURE OF AB CONTROLLERS

(3 Hours)

Theory

Architecture, Rack, slot, channel, full structure description and max expansion.

Module-III: ADDRESSING

(3 Hours)

Theory

Physical I/O addressing (both Digital & Analog), Memory Instructions Addressing like Timer, Counters, Binary, Integers etc.

Module-IV: HARDWARE LINKNING

(4 Hours)

Theory

Hardware linking Using RSLinx, details about protocols AB_DF1-1, TCP-1, EMU-500

Practice

1. Opening of RS-Linx software and setting the parameters.
2. Setting the communication protocol.

Module-V: PROGRAMMING BASICS

(8 Hours)

Theory

Programming concept using Ladder diagram, Basics of Ladder Programming (rung, rail, rules, New rung, Rung branch, XIC, XIO, OTE, OTL, OUT.), NO-NC concept, Logic Gates implementation .

Practice

3. Basic ladder logic programming .
4. NO-NC concept.
5. Digital gate's logic creation.

Module-VI: TIMERS, COUNTER, COMPARE

(18 Hours)

Theory

Timer basics, Detail programming of TON, TOF, RTO, RES with applications.

Basics of Counter, Detail Programming of CTU, CTD, RES with applications.

Basics of comparators, Implementation of LIM, MEQ, EQU, NEQ, LES, GRT, LEQ, GEQ.

Practice

6. TON / TOF / RTO / RES programming
7. CTU / CTD / RES programming
8. LIM, MEQ, EQU, NEQ, LES, GRT, LEQ, GEQ programming

Module-VII: DIFFERENT OPERATIONAL BLOCKS

(20 Hours)

Theory

Compute math block: CPT, ADD, SUB, MUL, DIV, SQR, NEG, TOD, FRD

Move logic block : MOV,MVM, AND, OR, XOR, NOT. CLR.

File shift block : BSL, BSR, SQC, SQL,SQO, FFL,FFU,LFL,LFU

Program control block : JMP,LBL,JSR,MCR

Practice

9. CPT, ADD, SUB, MUL, DIV, SQR, NEG, TOD, FRD
10. MOV,MVM, AND, OR, XOR, NOT. CLR
11. BSL, BSR, SQC, SQL,SQO, FFL,FFU,LFL,LFU
12. JMP,LBL,JSR,MCR

Reference Book

1. Gary D Anderson, “PLC Programming using RS Logix”

Session Plan

Topics	No. of Sessions (in hrs.)	Activity	Assignment	Suggested Reading
Module – 1 (INTRODUCTION) (Theory- 4 hours)				
Introduction to controller Family. SLC 500 features: Details about CPUs, Memory Organisation, Program files and Data files	4	Lecture+ Practice	Assignment 1.1	Reference Book (RB)
Module – 2 (ARCHITECTURE OF CONTROLLERS) (Theory- 3 hours)				
Architecture, Rack, slot, channel, full structure description and max expansion.	3	Lecture+ Practice	Assignment 1.2	RB
Module – 3 (ADDRESSING) (Theory- 3 hours)				
Physical I/O addressing (both Digital & Analog). Memory Instructions Addressing like Timer, Counters, Binary, Integers etc	3	Lecture+ Practice	Assignment 1.3	RB
Module – 4 (HARDWARE LINKING) (Theory- 2 hours + Practice- 2 hours)				
Hardware linking Using RSLinx. Details about protocols AB_DF1-1, TCP-1, EMU-500. a) Opening of RS-Linx software and setting the parameters. b) Setting the communication protocol.	2+2	Lecture+ Practice	Assignment 1.4	RB
Module – 5 (PROGRAMMING BASICS) (Theory- 4 hours + Practice- 4 hours)				
Programming concept using Ladder diagram. Basics of Ladder Programming (rung, rail, rules, New rung, Rung branch. XIC, XIO, OTE, OTL, OUT.), NO-NC concept, Logic Gates implementation. a) Basic ladder logic programming . b) NO-NC concept. c) Digital gate’s logic creation	4+4	Lecture+ Practice	Assignment 1.5	RB
Module – 6 (TIMERS, COUNTER, COMPARE) (Theory- 6 hours + Practice- 12 hours)				

<p>Timer basics, Detail programming of TON, TOF, RTO, RES with applications. Basics of Counter, Detail Programming of CTU, CTD, RES with applications. Basics of comparators, Implementation of LIM, MEQ, EQU, NEQ, LES, GRT, LEQ, GEQ.</p> <p>a) TON / TOF / RTO / RES programming b) CTU / CTD / RES programming. c) LIM, MEQ, EQU, NEQ, LES, GRT, LEQ, GEQ programming</p>	6+12	Lecture+ Practice	Assignment 1.6	RB
Module – 7 (DIFFERENT OPERATIONAL BLOCKS) (Theory- 8 hours + Practice- 12 hours)				
<p>Compute math block: CPT, ADD, SUB, MUL, DIV, SQR, NEG, TOD, FRD. Move logic block : MOV,MVM, AND, OR, XOR, NOT. CLR. File shift block : BSL, BSR, SQC, SQL,SQO, FFL,FFU,LFL,LFU. Program control block : JMP,LBL,JSR,MCR. ANALOG OPERATION Description of analog standards for field signals and SCP instruction implementation in ladder</p> <p>ADDITIONAL STUDIES Forcing of I/Os, Uploading, simulation Device Connectivity with SCADA.</p> <p>a) CPT, ADD, SUB, MUL, DIV, SQR, NEG, TOD, FRD b) MOV,MVM, AND, OR, XOR, NOT. CLR a) BSL, BSR, SQC, SQL,SQO, FFL,FFU,LFL,LFU b) JMP,LBL,JSR,MCR c) Analog communication d) Device connectivity</p>	8+12	Lecture+ Practice	Assignment 1.7	RB
Total- 60 Hours(Theory- 30 hours + Practice- 30 hours)				

Small Range Programmable Logic Controller

Course Title	Code	Type of course	T-P-PJ	Prerequisite
Small range Programmable Logic Controller	DEIA0403	Theory+Practice	2-1-0	Nil

Objective

- To teach the concept of Siemens PLC Control system.

Course Outcome

- Students will gain knowledge of Siemens PLC Programming & design.
- Students will develop skill of designing Siemens PLC based control system.

Evaluation Systems

Internal Examination	Component	% of Marks	Method of Assessment
	Internal Theory	20	Written examination
	Internal Practice	30(20+10)	Lab work + Learning Record
External Examination	External Theory	30	Written examination
	External Practice	20	Lab work
Total		<i>100</i>	

Siemens S7-300

Course Outline

Module-I: INTRODUCTION

(4 Hours)

Theory

Introduction: Siemens Family controllers, S7-200, S7-300, S7-400.

Module-II: ARCHITECTURE OF SIEMENS CONTROLLERS

(3 Hours)

Theory

PLC components like Power Supply, CPU, rail, IM, SM, CP etc Architecture, Rack, slot, channel, full structure description and max expansion.

Module-III: ADDRESSING

(3 Hours)

Theory

Physical I/O addressing (both Digital & Analog), Memory Instructions Addressing like Timer, Counters, Binary, Integers etc.

Module-IV: HARDWARE LINKING

(4 Hours)

Theory

Hardware linking Using Simetic Manager, details about protocols , Linking with PG/PC using MPI and simulation

Practice

1. Opening of Simetic Manager software and setting the parameters.
2. Setting the communication protocol.

Module-V: PROGRAMMING BASICS

(8 Hours)

Theory

Programming concept using Ladder diagram, Basics of Ladder Programming (Network, rail, rules, New network, branch, NO, NC, R-S.), NO-NC concept, Logic Gates implementation .

Practice

3. Basic ladder logic programming .
4. NO-NC concept.
5. Digital gate's logic creation.

Module-VI: TIMERS, COUNTER, COMPARE

(18 Hours)

Theory

Timer basics, Detail programming of timers with applications.
Basics of Counter, Detail Programming of CU, CD with applications.
Basics of comparators and their Implementation

Practice

6. Timer programming
7. CU / CD programming
8. Comparator programming

Module-VII: DIFFERENT OPERATIONAL BLOCKS

(20 Hours)

Theory

Integer block: ADD, SUB, MUL, DIV.
Move logic block : MOV
Program control block : JMP,LBL,MCR
Function, Function block, Data block.

Practice

9. ADD, SUB, MUL, DIV,
10. MOV, JMP,LBL,MCR

Reference Book

1. [EAL COURSE TECH,"SIEMENS S7 BASIC PLC PROGRAMMING"](#)[Print Replica] Kindle Edition,

Session Plan

Topics	No. of Sessions (in hrs.)	Activity	Assignment	Suggested Reading
Module – 1 (INTRODUCTION) (Theory- 4 hours)				
Introduction to controller Family S730 features: Details about CPUs, Memory Organisation, Program files and Data files	4	Lecture	Assignment 1.1	Reference Book (RB)
Module – 2 (ARCHITECTURE OF CONTROLLERS) (Theory- 3 hours)				
Architecture, Rack, slot, channel, full structure description and max expansion.	3	Lecture	Assignment 1.2	RB
Module – 3 (ADDRESSING) (Theory- 3 hours)				
Physical I/O addressing (both Digital & Analog). Memory Instructions Addressing like Timer, Counters, Binary, Integers etc.	3	Lecture	Assignment 1.3	RB
Module – 4 (HARDWARE LINKING) (Theory- 2 hours + Practice- 2 hours)				
Hardware linking Using Simetic manager. Linking with PG/PC using MPI and simulation. a) Opening of Simetic Manager software and setting the parameters. b) Setting the communication protocol.	2+2	Lecture+ Practice	Assignment 1.4	RB
Module – 5 (PROGRAMMING BASICS) (Theory- 4 hours + Practice- 4 hours)				
Programming concept using Ladder diagram. Basics of Ladder Programming (rung, rail, rules, New rung, Rung branch. NO-NC concept, Logic Gates implementation. a) Basic ladder logic programming b) NO-NC concept. c) Digital gate's logic creation	4+4	Lecture+ Practice	Assignment 1.5	RB
Module – 6 (TIMERS, COUNTER, COMPARE) (Theory- 6 hours + Practice- 12 hours)				
Timer basics, Detail programming of timers with applications. Basics of Counter, Detail Programming of CU, CD, with applications. Basics of comparators and their Implementation. a) TON / TOF / RTO programming b) CU / CD programming c) Comparator programming	6+12	Lecture+ Practice	Assignment 1.6	RB

Module – 7 (DIFFERENT OPERATIONAL BLOCKS) (Theory- 8 hours + Practice- 12 hours)				
Compute math block: ADD, SUB, MUL, DIV Move logic block : MOV, AND, OR, XOR, NOT. File shift block Program control block : JMP,LBL,MCR. a) ADD, SUB, MUL, DIV b) MOV, AND, OR, XOR, NOT c) JMP,LBL,JSR,MCR d) FC. FB, DB e) ANALOG OPERATION f) Uploading, simulation Device g) Connectivity with SCADA	8+12	Lecture+ Practice	Assignment 1.7	RB
Total- 60 Hours(Theory- 30 hours + Practice- 30 hours)				

Medium Range Programmable Logic Controller

Course Title	Code	Type of course	T-P-PJ	Prerequisite
Medium range Programmable Logic Controller	DEIA0404	Theory+ Practice	2-1-0	Nil

Objective

- To teach the concept of FESTO & GE-FANUC PLC Control system.

Course Outcome

- Students will gain knowledge of FESTO & GE-FANUC PLC Programming & design.
- Students will develop skill of designing PLC based control system..

Evaluation Systems

Internal Examination	Component	% of Marks	Method of Assessment
	Internal Theory	20	Written examination
	Internal Practice	30(20+10)	Lab work + Learning Record
External Examination	External Theory	30	Written examination
	External Practice	20	Lab work
Total		100	

FESTO PLC, GE-Versamax- Microplus

Course Outline

Module-I: INTRODUCTION (4 Hours)

Theory

Introduction to FESTO & GE Family controllers.

Module-II: ARCHITECTURE OF SIEMENS CONTROLLERS (3 Hours)

Theory

PLC components like Power Supply, CPU, Architecture, full structure description and max expansion.

Module-III: ADDRESSING (3 Hours)

Theory

Physical I/O addressing (both Digital & Analog), Memory Instructions Addressing like Timer, Counters, Binary, Integers etc.

Module-IV: HARDWARE LINKING

(4 Hours)

Theory

Hardware linking Using software, details about protocols, Linking of PLC and computer .

Practice

1. Opening of software and setting the parameters.
2. Setting the communication protocol.

Module-V: PROGRAMMING BASICS

(8 Hours)

Theory

Programming concept using Ladder diagram, Basics of Ladder Programming (rung, rail, rules, New rung, Rung branch, NO, NC, R-S.), NO-NC concept, Logic Gates implementation .

Practice

3. Basic ladder logic programming .
4. NO-NC concept.
5. Digital gate's logic creation.

Module-VI: TIMERS, COUNTER, COMPARE

(18 Hours)

Theory

Timer basics, Detail programming of timers with applications.
Basics of Counter, Detail Programming of CU, CD with applications.
Basics of comparators and their Implementation

Practice

6. Timer programming
7. CU / CD programming
8. Comparator programming

Module-VII: DIFFERENT OPERATIONAL BLOCKS

(20 Hours)

Theory

Integer block: ADD, SUB, MUL, DIV.
Move logic block : MOV
Program control block : JMP,LBL,MCR

Practice

9. ADD, SUB, MUL, DIV,
10. MOV, JMP,LBL,MCR

Reference Book

1. Madhuchhanda Mitra and Samarjit Semgupta, "Programmable Logic Controllers and Industrial Automation: An Introduction 2nd Edition"

Session Plan

Topics	No. of Sessions (in hrs.)	Activity	Assignment	Suggested Reading
Module – 1 (INTRODUCTION) (Theory- 4 hours)				
Introduction to controller Family.Fes features: Details about CPUs, Memo Organisation, Program files and Data files	4	Lecture+ Practice	Assignment 1.1	Reference Book (RB)
Module – 2 (ARCHITECTURE OF CONTROLLERS) (Theory- 3 hours)				
Architecture, Rack, slot, channel, full structure description and max expansion.	3	Lecture+ Practice	Assignment 1.2	RB
Module – 3 (ADDRESSING) (Theory- 3 hours)				
Physical I/O addressing (both Digital & Analog). Memory Instructions Addressing like Timer, Counters, Binary, Integers etc	3	Lecture+ Practice	Assignment 1.3	RB
Module – 4 (HARDWARE LINKNING) (Theory- 2 hours + Practice- 2 hours)				
Hardware linking Using software. Linking with PLC to PC and simulation. a) Opening of software and setting the parameters. b) Setting the communication protocol.	2+2	Lecture+ Practice	Assignment 1.4	RB
Module – 5 (PROGRAMMING BASICS) (Theory- 4 hours + Practice- 4 hours)				
Programming concept using Ladder diagram. Basics of Ladder Programming (rung, rail, rules, New rung, Rung branch. NO-NC concept, Logic Gates implementation. a) Basic ladder logic programming . b) NO-NC concept. c) Digital gate's logic creation	4+4	Lecture+ Practice	Assignment 1.5	RB
Module – 6 (TIMERS, COUNTER, COMPARE) (Theory- 6 hours + Practice- 12 hours)				
Timer basics, Detail programming of timers with applications. Basics of Counter, Detail Programming of CU, CD, with applications. Basics of comparators and their Implementation	6+12	Lecture+ Practice	Assignment 1.6	RB

a) TON / TOF / RTO programming b) CU / CD programming c) Comparator programming				
Module – 7 (DIFFERENT OPERATIONAL BLOCKS) (Theory- 8 hours + Practice- 12 hours)				
Compute math block: ADD, SUB, MUL, DIV. Move logic block : MOV, AND, OR, XOR, NOT. File shift block. Program control block : JMP,LBL,MCR. a) ADD, SUB, MUL, DIV b) MOV, AND, OR, XOR, NOT c) JMP,LBL,JSR,MCR d) ANALOG OPERATION e) Device Connectivity with SCADA	8+12	Lecture+ Practice	Assignment 1.7	RB
Total- 60 Hours (Theory- 30 hours + Practice- 30 hours)				

Human Machine Interface (HMI)

Course Title	Code	Type of course	T-P-PJ	Prerequisite
Human machine Interface (HMI)	DEIA0202	Practice	0-2-0	Nil

Objective

- To teach the concept of Human Machine Interface system.

Course Outcome

- Students will gain knowledge of HMI.
- Students will develop skill of designing HMI based control system..

Evaluation Systems

Internal Examination	Component	% of Marks	Method of Assessment
	Internal Practice	50 (40+10)	Lab Work + Learning Record
External Examination	External Practice	50	Lab Work
Total		100	

Course Outline

Module-I: INTRODUCTION

(2 Hours)

Theory

Introduction Details of Human Machine Interface, HMI Basics, Difference between SCADA & HMI, Requirements, Leading Vendors, Specification of Panel view family, Features, Communication settings in HMI & PC

Module-II: APPLICATION DEVELOPMENT

(2Hours)

Theory

New application development, HMI Screen development, Dashboard, Terminal setting, file transfer

Module-III: WORKING ON SOFTWARE

(6 Hours)

Theory

Introduction to software, tag declaration, tag type, screen type, control, screen, property.

Practice

1. Opening of software and setting the parameters.
2. Setting the communication protocol.

Module-IV: CONTROL WINDOW**(6 Hours)****Theory**

Entry, display, Drawing tools, Advance, Library.

Practice

3. Display & Drawing tools operation and application.
4. Advance Library operation and utility.

Module-V: PROPERTY WINDOW BASICS**(6 Hours)****Theory**

Property window, Appearance, Common, Navigation, Connections, Screen.

Practice :

5. Working of property window.
6. Navigation operation.
7. Connection screen configuration.

Module-VI: DESIGNING OF APPLICATION**(12 Hours)****Theory**

Designing of application, discrete type, Analog type

Practice

8. Discret type display design
9. Analog type display design.

Module-VII: DIFFERENT DYNAMIC DISPLAYS**(11 Hours)****Theory**

Alarm, Trend, Security, Recipe, Device Connectivity,

Practice

10. Alarm, Trend, Security
11. Recipe, Device Connectivity

Reference Book

1. K S Manoj, “Industrial Automation with SCADA: Concepts, Communications and Security”

Session Plan

Topics	No. of Sessions (in hrs.)	Activity	Assignment	Suggested Reading
Module – 1 (INTRODUCTION) (Theory- 2 hours)				
Introduction Details of Human Machine Interface, HMI Basics. Difference between SCADA & HMI, Requirements, Leading Vendors, Specification of Panel view family, Features, Communication settings HMI & PC.	2	Lecture+ Practice	Assignment	Reference Book (RB)
Module – 2 (APPLICATION DEVELOPMENT) (Theory- 2 hours)				
New application development, HMI Screen development, Dashboard, Terminal setting, file transfer	2	Lecture+ Practice	Assignment	RB
Module – 3 (WORKING ON SOFTWARE) (Theory- 2 hours + Practice- 4 hours)				
Introduction to software, tag declaration, tag type. Screen type, control, screen, property. a) Opening of software and setting the parameters. b) Setting the communication protocol.	2+4	Lecture+ Practice	Assignment	RB
Module – 4 (CONTROL WINDOW) (Theory- 2 hours + Practice- 4 hours)				
Entry, display, Drawing tools. Advance Library. a) Display & Drawing tools operation and application. b) Advance Library operation and utility	2+4	Lecture+ Practice	Assignment	RB
Module – 5 (PROPERTY WINDOW BASICS) (Theory- 2 hours + Practice- 4 hours)				
Property window, Appearance, Communication. Navigation, Connections, Screen. a) Working of property window. b) Navigation operation. c) Connection screen configuration.	2+4	Lecture+ Practice	Assignment	RB
Module – 6 (DESIGNING OF APPLICATION) (Theory- 2 hours + Practice- 10 hours)				
Designing of application , Discrete type. Designing of application, analog type. a) Discreet type display design b) Analog type display design.	2+10	Lecture+ Practice	Assignment	RB

Module – 7 (DIFFERENT DYNAMIC DISPLAYS) (Theory- 3 hours + Practice- 8 hours)				
Alarm, Trend, Security. Recipe, Device Connectivity. a) Alarm, Trend, Security b) Recipe, Device Connectivity	3+8	Lecture+ Practice	Assignment	RB
Total- 45 Hours (Theory- 15 hours + Practice- 30 hours)				

Variable Frequency Drive

Course Title	Code	Type of course	T-P-PJ	Prerequisite
Variable Frequency Drive	DEIA0203	Practice	0-2-0	Nil

Objective

- To teach the concept of VFD Controller.

Course Outcome

- Students will gain knowledge of operation of VFD.
- Students will develop skill of designing VFD based control system..

Evaluation Systems

Internal Examination	Component	% of Marks	Method of Assessment
	Internal Practice	50 (40+10)	Lab Work + Learning Record
External Examination	External Practice	50	Lab Work
Total		100	

Course Outline

Module-I: INTRODUCTION TO DRIVES (2 Hours)

Theory

Introduction to drives. Working principle of drives. Types of drives.

Module-II: APPLICATION (2 Hours)

Theory

Applications of VFD, Features, inside components of VFD, Block Diagram and Architecture.

Module-III: INTRODUCTION TO AB POERFLEX (4M) (2 Hours)

Theory

Introduction to Allen Bradley Powerflex (4M). Parameters in AB Power flex 4M,

Module-IV: BASIC PROGRAMMING OF DRIVES (8 Hours)

Theory

Display group parameters, Parameter of commissioning

Practice

- Understanding of display parameters.

- Quick commissioning technique.

Module-V: OPERATIONAL MODES OF DRIVES

(8 Hours)

Theory

Local control using Basic Operators Panel, Remote control using pushbuttons and sensors.

Practice

- Local control mode operation using BOP.
- Remote control mode operation using sensors and push buttons.

Module-VI: ADVANCE PROGRAMMING CONCEPT

(12 Hours)

Theory

Ramp time, DC Brake. Skip Frequency. Frequency control. Direction control.

Practice

- Different parameter setting of drive.

Module-VII: PLC & DRIVE COMMUNICATION & CONTROL

(11 Hours)

Theory

Remote mode control connecting with PLC VFD.

Practice

- Input & output connection technique of drive.
- Connection technique of PLC & Drive.

Session Plan

Topics	No. of Sessions (in hrs.)	Activity	Assignment	Suggested Reading
Module – 1 (INTRODUCTION TO DRIVES) (Theory- 2 hours)				
Introduction Details of Human Machine Interface, HMI Basics. Working principle of drives. Types of drives.	2	Lecture	Assignment 1.1	Reference Book (RB)
Module – 2 (APPLICATION) (Theory- 2 hours)				
Applications of VFD. Features, inside components of VFD, Block Diagram and Architecture.	2	Lecture+ Practice	Assignment 1.2	RB
Module – 3 (INTRODUCTION TO AB POWERFLEX (4M) (Theory- 2 hours)				
Introduction to Allen Bradley Powerflex (4M). Parameters in AB Power flex 4M. Screen type, control, screen, property	2	Lecture+ Practice	Assignment 1.3	RB
Module – 4 (BASIC PROGRAMMING OF DRIVES) (Theory- 2 hours + Practice- 6 hours)				

Display group parameters. Parameter of commissioning. a) Understanding of display parameters. b) Quick commissioning technique.	2+6	Lecture+ Practice	Assignment 1.4	RB
Module - 5 OPERATIONAL MODES OF DRIVES) (Theory- 2 hours + Practice- 6 hours)				
Local control using Basic Operators Panel. Remote control using pushbuttons and sensors. a) Local control mode operation using BOP. b) Remote control mode operation using sensors and push buttons.	2+6	Lecture+ Practice	Assignment 1.5	RB
Module – 6 (ADVANCE PROGRAMMING CONCEPT) (Theory- 62hours + Practice- 10 hours)				
Ramp time, DC Brake. Skip Frequency. Frequency control. Direction control. a) Different parameter setting of drive.	2+10	Lecture+ Practice	Assignment 1.6	RB
Module – 7 (PLC & DRIVE COMMUNICATION) (Theory- 3 hours + Practice- 8 hours)				
Remote mode control connecting with PLC VFD. a) Input & output connection technique of drive. b) Connection technique of PLC & Drive.	3+8	Lecture+ Practice	Assignment 1.7	RB
Total- 45 Hours (Theory- 15 hours + Practice- 30 hours)				

The following colour represents the syllabus revision, skill, employability and entrepreneurship.

Green : Skill

Pink : Employability

Sky : Entrepreneurship

Domain: Operation and Maintenance of Transmission and Distribution Systems

Sl. No	Course Code	Course Title	Course Nature	Credits
1	DEOM0101	Modern Transmission and Distribution System	Theory	3
2	DEOM0401	Operation and Testing of Power and Distribution Transformer	Theory + Practice	3
3	DEOM0402	System Protection and Auxiliaries	Theory + Practice	3
4	DEOM0102	Construction of HT and LT lines and Cables	Theory	3

5	DEOM0201	Safety Practice and First Aid	Practice	2
6	DEOM0202	Electrical System Layout and Drawing	Practice	2
7	DEOM0103	Power System Market, Act and Regulations	Theory	4
8	DEET0300	Project	Project	6
9	DEET0800	Internship	Practice	4
			Total	30

Course Objective:

To create technically trained manpower readily available for recruitment to the power companies in the area of Transmission & Distribution of electrical power

Course Outcome:

After completion of the course the students will acquire extensive basic and advanced knowledge of

- Operation & Maintenance of Transmission and Distribution accessories
- Necessary safety aspects required in T&D
- Details of associated equipment's
- T&D project management Process flow

Modern Transmission and Distribution System

Course Title	Code	Type of course	T-P-PJ	Prerequisite
Modern Transmission and Distribution System	DEOM0101	Theory	3-0-0	Nil

Objective

- To know the different methods of power transmission and distribution, the different equipment used in transmission and distribution system also to know the operation and maintenance of equipment used in transmission and distribution system.

Course Outcome

- The students will be able to rate and compute the parameters of the major components of the system: lines, cables, transformers, circuit breakers, capacitors and grounding systems.
- The students will understand the principles of protection for short-circuit, lightning strikes and some internal transients.

Evaluation Systems

	Component	% of Marks	Method of Assessment
Internal Examination	Internal Theory	30	Written examination
	Assignment	5	Report or Presentation + Learning Record
	Attendance	5	Based on class attended
External Examination	External Theory	60	Written examination
Total		100	

Course outline

Module-I: General Introduction To Power Generation And Transmission (8 Hours)

Theory

GENERAL INTRODUCTION: Generation, Transmission & Distribution Scenario of India

POWER GENERATION: Types of generation: Conventional and Non-conventional, Thermal Power Plant, Hydro Power Plant, Gas Power Plant, Nuclear Power Plant, Co-generation Various sources Non-conventional Energy Sources.

POWER TRANSMISSION (A) SWITCHYARD/SUBSTATION Types: Generation sub-station, Grid sub-station, Gas Insulated s/s etc, Indoor/outdoor, general comparison.

Module-II: Sub-Station Switchgears And Grounding

(8 Hours)

Theory

SUB-STATION/TRANSMISSION EQUIPMENTS AND SWITCHGEARS - Circuit breaker: Types (MOCB, ABCB, VCB, SF6), constructional details, specifications, interlocks (a) Isolator: Types earth switch, Bus bar (b) CT/CVT. Lighting Arrestors/Lighting Mask (c) Power Line Carrier Communication (PLCC):- Principle, purpose, types of coupling (d) Relays: Types, functions, constructional details, (e) Protection System: Philosophy, types, protection of transformer/reactor, motor, line/feeder generator, bus etc.

GROUNDING:- Ground and Neutral. Touch and Step Potentials. Petersen Coil. Resonant Grounding

AUXILIARY FACILITIES: DG Set Station Battery System etc.

Module-III: Sub-station Maintenance

(9 Hours)

Theory

SUB-STATION MAINTENANCE: (a) Types-Routine, preventive, planned, predictive, break-down, emergency maintenance, online maintenance of different equipments, (b) Transformer/Reactor Maintenance-Factors affecting the life of transformer/Reactor. Inspection/preliminary testing of various components-oil sampling and testing, oil filtration, Dissolved Gas Analysis (DGA), maintenance schedule (c) Switchgear & protection Maintenance:- Maintenance of CB, Isolator, Earth switch, Support Insulators, CT/CVT,LA,LM, Protective relay maintenance testing . Erection and commissioning pre-commissioning checks/Tests of sub-station.

Module-IV: Characteristics of Loads

(4 Hours)

Theory

Characteristics of Loads: Customer Classes and Categories. Voltage Sensitivity of Loads. Constant Power. Constant Current. Constant Impedance. ZIP Coefficients. Load Curves and Duty Cycle. Coincidental and Non-coincidental Loads. Load Growth.

Module-V: Loss Optimization

(4 Hours)

Theory

Optimization: Loss Minimization. System Reconfiguration. Capacitor Switching. (Energy) Conservation Voltage Reduction. Introduction to System Restoration.

Module-VI: Capacitors

(8 Hours)

Theory

Capacitors: Construction . Application of Capacitors in Transmission, Distribution and Industrial Systems. Shunt Capacitors (Voltage Control and Power Factor Correction). Series Capacitors (Line Reactance Compensation). Rating. Capacitor Switching and Operating Problems with Capacitors (Inrush Currents).

Module-VII: Modern Grids

(4 Hours)

Theory

Modern Grids: Distribution Automation. Distributed Generation. Grid 2030. Nano Grid. Micro Grid. Mini Grid. Smart Grid. Super Grid. The Issues.

Text Books:

1. TuranGonen “Electrical Power Transmission System Engineering: Analysis and Design”, Third Edition, ,CRC Press
2. Kamaraju, “Electrical Power Distribution System”, Tata McGraw-Hill

Reference Books:

1. Soni Gupta,Bhatnagar,“Power System Engineering”, SecondEdition, DhantpatRai Publication
2. J B Gupta, S. K. Kataria& Sons, “Transmission & Distribution Of Electrical Power”, 2009
3. TuranGonen,“Electric Power Distribution Engineering”, Third Edition, CRC Press
4. A S Pabla,“Electrical Power Distribution”, Tata McGraw-Hill,Sixth Edition

Session Plan

Topics	No. of Sessions	Activity	Assignment	Suggested Reading
Module-I: General Introduction To Power Generation And Transmission(8 Hours)				
GENERAL INTRODUCTION Generation, Transmission & Distribution Scenario of India	2	Lecture	Assignment 1.1	TB 1
POWER GENERATION Types of generation: Conventional and Non-conventional, Thermal Power Plant, Hydro Power Plant, Gas Power Plant, Nuclear Power Plant, Co-generation Various sources Non-conventional Energy Sources.	3	Lecture	Assignment 1.2	TB 1
POWER TRANSMISSION SWITCHYARD/SUBSTATION . Types: Generation sub-station, Grid sub-station, Gas Insulated s/s etc. Indoor/outdoor, general comparison	3	Lecture	Assignment 1.3	TB 1
Module-II: Sub-Station Switchgears And Grounding (8 Hours)				
SUB- STATION/TRANSMISSION EQUIPMENTS Switchgears - Circuit breaker: Types (MOCB, ABCB, VCB, SF6) constructional details, pecifications, interlocking	1	Lecture	Assignment 2.1	TB 1
Isolator: Types earth switch, Bus bar,	1	Lecture	Assignment 2.2	TB 1
CT/CVT. Lighting Arrestors/Lighting Mask	1	Lecture	Assignment 2.3	TB 1
Relays: Types, functions, constructional details	1	Lecture	Assignment 2.4	TB 1

Protection System: Philosophy, types, protection of transformer/reactor, motor, line/feeder generator, bus etc	2	Lecture	Assignment 2.5	TB 1
Grounding:- Types of grounding, earth testing & treatment, earthmat design, step potential, Neutral grounding reactor Auxiliary facilities: DG Set Station Battery System etc. Cables-Types, Control cables, power cables, cable termination & jointing	2	Lecture	Assignment 2.6	TB 1
Module-III: Sub-station Maintenance (9 Hours)				
Sub-station operation: Grid operation, communication with RLDC/SLDC etc.	2	Lecture and field studies	Assignment 3.1	TB 1
Sub-Station Maintenance: (a) Types-Routine, preventive, planned, predictive, break-down, emergency maintenance, online maintenance of different equipments	2	Lecture	Assignment 3.2	TB 1
Transformer/ Reactor Maintenance-Factors affecting the life of transformer/Reactor. Inspection/preliminary testing of various components-oil sampling and testing, oil filtration, Dissolved Gas Analysis (DGA), maintenance schedule	2	Lecture	Assignment 3.3	TB 1
Switchgear & protection Maintenance:- Maintenance of CB, Isolator, Earthswitch, Support Insulators, CT/CVT,LA,LM, Protective relay maintenance testing	2	Lecture	Assignment 3.4	TB 1
Erection and commissioning pre-commissioning checks/Tests of	1	Lecture	Assignment	TB 1

sub-station;			3.5	
Module-IV: Characteristics of Loads (4 Hours)				
Characteristics of Loads. Customer Classes and Categories. Voltage Sensitivity of Loads. Constant Power. Constant Current. Constant Impedance. ZIP Coefficients. Load Curves and Duty Cycle. Coincidental and Non-coincidental Loads. Load Growth.	4	Lecture	Assignment 4.1	TB 1
Module-V: Loss Optimization (4 Hours)				
Optimization. Loss Minimization. System Reconfiguration. Capacitor Switching. (Energy) Conservation Voltage Reduction. Introduction to System Restoration.	4	Lecture	Assignment 5.1	TB 1
Module-VI: Capacitors (8 Hours)				
Capacitors. Construction . Application of Capacitors in Transmission, Distribution and Industrial Systems. Shunt Capacitors (Voltage Control and Power Factor Correction). Series Capacitors (Line Reactance Compensation). Rating. Capacitor Switching and Operating Problems with Capacitors (Inrush Currents).	8	Lecture	Assignment 6.1	TB 1
Module-VII: Modern Grids (4 Hours)				
Modern Grids. Distribution Automation. Distributed Generation. Grid 2030. Nano Grid. Micro Grid. Mini Grid. Smart Grid. Super Grid. The Issues.	4	Lecture	Assignment 7.1	TB 1

Operation and Testing of Power and Distribution Transformer

Course Title	Code	Type of course	T-P-PJ	Prerequisite
Operation and Testing of Power and Distribution Transformer	DEOM0401	Theory + Practice	2-1-0	Nil

Objective

- To know detail about the operation and testing of both power and distribution transformers

Course Outcome

- Identify power/instrument and distribution transformer types, components and auxiliary equipment.
- Simulate appropriate tests to evaluate the condition and perform maintenance on transformers.
- Perform oil sampling, testing, drying, filling and filtering, Analyze test results to troubleshoot transformer problems.

Evaluation Systems

Internal Examination	Component	% of Marks	Method of Assessment
	Internal Theory	20	Written examination
	Internal Practice	30(20+10)	Lab work + Learning Record
External Examination	External Theory	30	Written examination
	External Practice	20	Lab work
Total		100	

Course Outline

Module-I: Transformer

(6 hours)

Theory

Transformer: Basic principles of transformer, magnetization and hysteresis, electromagnets. Flux density Ampere-turn Ratio

Practice:

- Ampere-turns Ratio test of transformer
- Magnetic balance test of transformer

Module-II: Equations related to transformers

(14 hours)

Theory

Equation for transformation: Two/ three winding & Auto Transformer

Silent features of core & shell type, transformer constructional details, Grounding transformers

Practice:

3. Grounding test of a transformer

Module-III: Transformer fixtures and oil

(8 hours)

Theory

Transformer fixtures : buchholz relay, breather, conservators, bushing of different types, thermometers, indicators, alarms. Cooling of Transformer, Transformer Oil: Specifications & Characteristics. Sources, manufacturing and Handling. Methods of Sampling and testing.

Practice:

4. Oil testing of transformer

Module-IV: Maintenance of Transformer Oil

(8 hours)

Theory

Maintenance of Transformer Oil: Filter Machine O&M,DGA. Importance of Oil Filtration & drying out of transformer. Working principles of OLTC & its' O/M.

Practice:

5. Dissolved gas analysis of transformer

6. Maintenance of oil filter machine

Module-V: Transformer Test

(7 hours)

Theory

Transformer Test: Failures and causes, maintenance & repairs. Power Transformers Testing and commissioning - Significance & importance of tests protection of transformers

Practice:

7. Study of Protection scheme of Power Transformer

Module-VI: Test on transformer

(9 hours)

Theory

Test on transformer: Insulation resistance measurement, winding resistance measurement, magnetic current test, magnetic balance test, vector group confirmation short circuit test and differential stability test, etc.

Practice:

8. IR test of transformer

9. Winding resistance test of transformer

10. Vector grouping test of transformer

Module-VII: Conditions leading to faults

(8 hours)

Theory

Conditions leading to faults: Protective relays, differential protection, overcurrent protection , ground fault protection and monitors for protection – Factory testing of power transformers

Practice:

11. Testing of protective relay connected to transformer

Text Book

1. Indrajit Dasgupta, “Design of Transformers”, Tata McGraw-Hill, Eighth Edition

Reference Books

1. Bhel, “Transformers”, Tata McGraw-Hill, Second Edition
2. Indrajit Dasgupta, “Power Transformers Quality Assurance”, Tata McGraw-Hill

Session Plan

Topic	No. of Sessions	Activity	Assignment	Suggested Reading
Module-I: Transformer (6 hours)				
Basic principles of transformer, magnetization and hysteresis, electromagnets	4	Lecture+ Practice	Assignment 1.1	TB1
Flux density Ampere-turn Ratio	2	Lecture+ Practice	Assignment 1.2	TB1
Module-II: Equations related to transformers (14 hours)				
Two/ three winding & Auto Transformer	4	Lecture	Assignment 2.1	TB1
Silent features of core & shell type, transformer constructional details	4	Lecture	Assignment 2.2	TB1
Grounding transformers	6	Lecture+ Practice		
Module-III: Transformer fixtures and oil (8 hours)				
Buchholz relay, breather, conservators, bushing of different types, thermometers, indicators, alarms. Cooling of Transformer	4	Lecture+ Practice	Assignment 3.1	TB1
Specifications & Characteristics. Sources, manufacturing and Handling. Methods of Sampling and testing.	4	Lecture+ Practice	Assignment 3.2	TB1
Module-IV: Maintenance of Transformer Oil (8 hours)				
Filter Machine O&M,DGA.	4	Lecture+ Practice	Assignment	TB1

Importance of Oil Filtration & drying out of transformer.			4.1	
Working principles of OLTC & its' O/M	4	Lecture+ Practice	Assignment 4.2	TB1
Module-V: Transformer Test (7 hours)				
Failures and causes, maintenance & repairs. Power Transformers Testing and commissioning -	4	Lecture+ Practice	Assignment 5.1	TB1
Significance & importance of tests protection of transformers	3	Lecture+ Practice	Assignment 5.2	TB1
Module-VI: Test on transformer(9 hours)				
Insulation resistance measurement	3	Lecture+ Practice	Assignment 6.1	TB1
winding resistance measurement, magnetic current test, magnetic balance test	3	Lecture+ Practice	Assignment 6.2	TB1
vector group confirmation short circuit test and differential stability test, etc	3	Lecture+ Practice	Assignment 6.3	TB1
Module-VII: Conditions leading to faults (8 hours)				
Protective relays, differential protection, over current protection	4	Lecture+ Practice	Assignment 7.1	TB1
Ground fault protection and monitors for protection – Factory testing of power transformers	4	Lecture+ Practice	Assignment 7.2	TB1
Total- 60 Hours				

System Protection and Auxiliaries

Course Title	Code	Type of course	T-P-P	Prerequisite
System Protection And Auxiliaries	DEOM0402	Theory + Practice	2-1-0	Nil

Objective

- To know the different methods used for power system protection
- To Know the different equipment's and auxiliaries used in power system protection and to know the maintenance schedule of different equipment's.

Course Outcome

- Operate the protective equipment efficiently
- Can perform the maintenance of that protective equipment and also can test the protective equipment before commissioning

Evaluation Systems

Internal Examination	Component	% of Marks	Method of Assessment
	Internal Theory	20	Written examination
	Internal Practice	30(20+10)	Lab work + Learning Record
External Examination	External Theory	30	Written examination
	External Practice	20	Lab work
Total		100	

Course Outline

Module-I: CT & PTs

(6 hours)

Theory

CT & PTs: Types of CT & PTs' – their working principles, ratings and accuracy. Functions of CT & PTs' Failures of CT & PTs – their causes.

Practice

1. Testing of CT and PT

Module-II: Metering Schemes

(12 hours)

Theory

Metering Schemes: Protection of Transmission Line with Schemes. Protection of Transformer with different Schemes. Local & Back-up Protection. New Generation Relays.

Practice

2. Testing of different types of relay

Module-III: Breakers**(10 hours)****Theory**

Breakers: Function of breakers. Different types of indoor and outdoor breakers e.g. Bulk oil, MOCB, Air blast, SF₆ and Vacuum Breaker - principle and their application. Operating Mechanism – springs, hydraulic, pneumatic, Current ratings, rupturing capacity, clearance time, Commissioning procedures.

Practice

3. Study the Operation of different types of breaker
4. Determining the current rating of circuit breaker

Module-IV :Breaker Maintenance**(8 hours)****Theory**

Breaker Maintenance: failures and their causes. CB Control Circuit description and fault finding procedures.

Practice

5. Maintenance of circuit breaker
6. Testing of the control circuit of the CB

Module-V: Lightning Arrestors/Surge Arrestors**(7 hours)****Theory**

Lightening Arrestors/Surge Arrestors: Simple description of lightening phenomena and surges. Constn. of S.As' and principles of their working. Different types of Surge Arrestor and ratings. Earthing and Location of S.A. Testing&Maint.of S.As.

Practice

7. Study of different types of Lightning Arrestors
8. Testing of Surge arrestor

Module-VI: Isolators And Insulators**(9 hours)****Theory**

Isolators : Tilting and rotating isolators with & without arcing horns – earth blades – current ratings. Breaking of circuits by isolators. Interlocking with circuit Breaker. Maintenance of isolators. Insulators : Types - their electrical & mechanical characteristics.

Practice

9. Study of different types of isolators.
10. Practicing the interlocking of Isolators with Circuit breaker

Module-VII : Auxiliary facilities**(8 hours)****Theory**

Auxiliary facilities: DG Set Station Battery System etc. V. Cables-Types, Control cables, power cables, cable termination & jointing. Auxiliary D.C. Supply. Battery:- Current & Ampere Hours Ratings. Battery Charging Equipment – Checking of Specific Gravity of Electrolyte – Maintenance of batteries – Trouble Shootings. Condition monitoring and hotline maintenance.

Practice

11. Preparing a maintenance schedule for the battery bank.
12. Preparing a maintenance schedule for the DG set.

Text Book

1. IEEE Guide for Power System Protection Testing, IEEE, 2009

Reference Books

1. T. S. Madhava Rao, "Power System Protection: Static Relays", Second Edition, Tata McGraw-Hill
2. Clarence Herbert Sanderson, "Electric system handbook", McGraw-Hill

Session Plan

Topic	No. of Sessions	Activity	Assignment	Suggested Reading
Module-I: CT & PTs (6 hours)				
CT & PTs: Types of CT & PTs' – their working principles, ratings and accuracy.	2	Lecture	Assignment 1.1	TB1
Functions of CT & PTs' Failures of CT & PTs – their causes.	4	Lecture+ Practice	Assignment 1.2	TB1
Module-II: Metering Schemes (12 hours)				
Metering Schemes: Protection of Transmission Line with Schemes.	3	Lecture	Assignment 2.1	TB1
Protection of Transformer with different Schemes.	4	Lecture+ Practice	Assignment 2.2	TB1
Local & Back-up Protection. New Generation Relays.	5	Lecture+ Practice	Assignment 2.3	TB1
Module-III: Breakers (10 hours)				
Breakers: Function of breakers. Different types of indoor and outdoor breakers e.g. Bulk oil, MOCB, Air blast, SF6 and Vacuum Breaker - principle and their application.	5	Lecture+ Practice	Assignment 3.1	TB1
Operating Mechanism – springs, hydraulic, pneumatic, Current ratings, rupturing capacity, clearance time, Commissioning procedures	5	Lecture+ Practice	Assignment 3.2	TB1
Module-IV :Breaker Maintenance (8 hours)				
Failures and their causes	2	Lecture	Assignment 4.1	TB1

CB Control Circuit description and fault finding procedures.	6	Lecture+ Practice	Assignment 4.2	TB1
Module-V: Lightening Arrestors/Surge Arrestors (7 hours)				
Simple description of lightening phenomena and surges. Construction .of S.As' and principles of their working.	4	Lecture+ Practice	Assignment 5.1	TB1
Different types of Surge Arrestor and ratings. Earthing and Location of S.A.Testing&Maint.of S.As	3	Lecture+ Practice	Assignment 5.2	TB1
Module-VI: Isolators And Insulators (9 hours)				
Isolators: Tilting and rotating isolators with & without arcing horns – earth blades – current ratings. Breaking of circuits by isolators. Interlocking with circuit Breaker. Maintenance of isolators.	5	Lecture+ Practice	Assignment 6.1	TB1
Insulators : Types - their electrical & mechanical characteristics	4	Lecture+ Practice	Assignment 6.2	TB1
Module-VII : Auxiliary facilities (8 hours)				
Auxiliary facilities: DG Set Station Battery System etc. V. Cables-Types, Control cables, power cables, cable termination & jointing. Auxiliary D.C. Supply.	4	Lecture+ Practice	Assignment 7.1	TB1
Battery:- Current & Ampere Hours Ratings. Battery Charging Equipment – Checking of Specific Gravity of Electrolyte – Maintenance of batteries – Trouble Shootings. Condition monitoring and hotline	4	Lecture+ Practice	Assignment 7.2	TB1

maintenance.				
Total- 60 Hours				

Construction of HT and LT lines and Cables

Course Title	Code	Type of course	T-P-PJ	Prerequisite
Construction of HT and LT lines and Cables	DEOM0102	Theory	3-0-0	Nil

Objective

- | |
|--|
| <ul style="list-style-type: none"> To identify various types of LT / HT cables and lines and its application. |
|--|

Course Outcome

- | |
|---|
| <ul style="list-style-type: none"> Test underground cables, trouble shooting, Locating faults, open circuit, short circuit & leakage in cables, Repairs of faulty cables. Current carrying capacity and selection of cables |
|---|

Evaluation Systems

	Component	% of Marks	Method of Assessment
Internal Examination	Internal Theory	30	Written examination
	Assignment	5	Report or Presentation + Learning Record
	Attendance	5	Based on class attended
External Examination	External Theory	60	Written examination
Total		100	

Course Outline

Module I: Transmission Lines

(8 hours)

Theory

TRANSMISSION LINES: Transmission system in India, Tower types, Conductors, Earth wire, Insulators

Module II: IE rules and Acts

(8 hours)

Theory

IE rules and Acts:Statutory clearances, Surveying, Route Alignment Maintenance of transmission line, Thermo vision scanning

Module III: Modern trends in Underground Cabling Basic Concepts (9 hours)

Theory

Modern trends in Underground Cabling Basic Concepts: Selection, Types and Design of Underground including Standards of Cables Primary & Detailed Survey, Laying of Cable, Jointing

Module IV: Testing and Commissioning (4 hours)

Theory

Testing and Commissioning: Fault Location of Cables Maintenance & Trouble Shooting & Earthing of Underground Cables Problems encountered during conversion of overhead lines to underground cables.

Module V: Materials Used in Cables, Conductors (4 hours)

Theory

Materials Used in Cables, Conductors: Voltage Drop; Conductor Ampacity calculation; Conductor resistance; Conductor Inductance and capacitance calculation.

Module VI: Testing (8 hours)

Theory

Testing : Ampacity, Calculation of losses, AC resistance of conductor, Dielectric losses, Loss factor, Thermal resistance Test

Module VII: Buried cables (4 hours)

Theory

Drying-out of the soil does not occur, Buried cables where partial drying-out of the soil occurs Ampacity in two cases.

Text Book:

1. "Electrical Power Equipment Maintenance and Testing", Second Edition, CRC PRESS

Reference Books:

1. James E. Mack, Thomas M. Shoemaker, "The Lineman's and Cableman's Handbook", Thirteenth Edition, McGraw Hill Professional

Session Plan

Topic	No. of Sessions	Activity	Assignment	Suggested Reading
Module I: Transmission Lines (8 hours)				
TRANSMISSION LINES Transmission system in India, Tower types, Conductors, Earth wire, Insulators	8	Lecture	Assignment 1	TB1

Module II: IE rules and Acts (8 hours)				
IE rules and Acts, Statutory clearances, Surveying, Route Alignment Maintenance of transmission line, Thermo vision scanning	8	Lecture	Assignment 2	TB1
Module III: Modern trends in Underground Cabling Basic Concepts (9 hours)				
Modern trends in Underground Cabling Basic Concepts, Selection, Types and Design of Underground including Standards of Cables Primary & Detailed Survey, Laying of Cable, Jointing	9	Lecture	Assignment 3	TB1
Module IV: Testing and Commissioning (4 hours)				
Testing and Commissioning Fault Location of Cables Maintenance & Trouble Shooting & Earthing of Underground Cables Problems encountered during conversion of overhead lines to underground cables.	4	Lecture	Assignment 4	TB1
Module V: Materials Used in Cables, Conductors(4 hours)				
Materials Used in Cables, Conductors; Voltage Drop; Conductor Ampicity calculation; Conductor resistance; Conductor Inductance and capacitance calculation.	4	Lecture	Assignment 5	TB1
Module VI: Testing(8 hours)				
Testing Ampacity, Calculation of losses, AC resistance of conductor, Dielectric losses, Loss factor, Thermal resistance Test	8	Lecture	Assignment 5	TB1
Module VII: Buried cables(4 hours)				

Buried cables where drying-out of the soil does not occur, Buried cables where partial drying-out of the soil occurs Ampacity in two cases.	4	Lecture	Assignment 7	TB1
Total- 45 Hours				

Safety Practice & First Aid

Course Title	Code	Type of course	T-P-PJ	Prerequisite
Safety Practice & First Aid	DEOM0201	Practice	0-2-0	Nil

Objective

- To learn the basics of safety practice to be carried out in industry

Course Outcome

- Deal with emergency situations
- Know the limits of basic first aid
- Identify signals of a heart attack.
- Identify the most important action you can take in a life-threatening emergency.

Evaluation scheme

Internal Examination	Component	% of Marks	Method of Assessment
	Internal Practice	50 (40+10)	Lab work + Learning Record
External Examination	External Practice	50	Lab work
Total		100	

Lists of Experiments

(i) Safety Requirement, Hazards, Electrical Accidents and prevention,

(ii) Safety

- Safety Philosophy.
- Safety Procedures.
- GRID Safety Norms.
- Procedures for issuing L.C.P. and cancellation.
- Maintenance of Safety records.

(iii) First Aid

- Places of Potential Hazards.
- Electric Shock Treatment.
- Artificial Respiration.
- Handling Emergency Conditions.

- Treatment of Wounds, Injuries & Burns.
- (iv) Fire Fighting
- Causes of Fire.
 - Fire Extinction.
 - Classification of Fires.
 - Fire Fighting Equipment: their operation – maintenance & refilling.
 - Fire prevention.

Session plan

Topic	No. of Sessions	Activity	Assignment	Suggested Reading
Safety Requirement, Hazards, Electrical Accidents and prevention	10	Demonstration and mock drill		Electrical safety handbook
Safety <ul style="list-style-type: none"> • Safety Philosophy. • Safety Procedures. • GRID Safety Norms. • Procedures for issuing L.C.P. and cancellation. • Maintenance of Safety records. 	15	Demonstration and mock drill		Electrical safety handbook
First Aid <ul style="list-style-type: none"> • Places of Potential Hazards. • Electric Shock Treatment. • Artificial Respiration. • Handling Emergency Conditions. • Treatment of Wounds, Injuries & Burns. 	15	Demonstration and mock drill		Electrical safety handbook
Fire Fighting <ul style="list-style-type: none"> • Causes of Fire. • Fire Extinction. 	20	Demonstration and mock drill		Electrical safety handbook

<ul style="list-style-type: none"> • Classification of Fires. • Fire Fighting Equipment: their operation – maintenance & refilling. • Fire prevention. 				
Total- 60 Hours				

Electrical System Layout & Drawing

Course Title	Code	Type of course	T-P-PJ	Prerequisite
Electrical System Layout & Drawing	DEOM0202	Practice	0-2-0	Nil

Objective

- To list out the various design aspects of earthing in indoor and outdoor substation.
- List the basic steps for drawing a electrical layout diagram.

Course Outcome

- Design the Relays, Relaying schemes and auxiliaries Wiring Diagram for the given specifications.
- Design the Substation control room wiring diagram
- Prepare the winding diagram and sketches of the designed layout of a power system network using AUTOCAD Software

Evaluation Systems

Internal Examination	Component	% of Marks	Method of Assessment
	Internal Practice	50 (40+10)	Lab work + Learning Record
External Examination	External Practice	50	Lab work
Total		100	

Lists of Experiments

1. Introduction to AutoCAD Electrical, Drawing Files, Electrical Components and Wires.
2. Symbol creation.
3. General layout of a power system network.
4. Single line diagram/equipments[Equipments-transformer, CB, fuse etc.]
5. Relays, Relaying schemes and auxiliaries Wiring Diagram
6. Relay panel wiring diagram

7. Substation control room wiring diagram
8. Layout diagram of earthing system in outdoor substation.
9. Layout of Sub-Station (33/11KV S/S, 220/33KV S/S)
10. Indoor and outdoor busbars — bus-bar mountings and their clearances.
11. Layout of different Busbar arrangement in a substation.
12. Designing Electrical Transmission Tower Types and Design
13. Layout diagram of a GIS substation.
14. Layout diagram of earthing system in outdoor substation.
15. Designing tower earthing layout and pole earthing layout.

Note: Using AUTOCAD or Smart Draw

Session Plan

Topics	No. of Sessions	Activity	Assignment	Suggested Reading
Introduction to AutoCAD Electrical, Drawing Files, Electrical Components and Wires.	4	Practice	Designing	AutoCAD Manual
Symbol creation.	4	Practice	Designing	AutoCAD Manual
General lay out of a power system network.	4	Practice	Designing	AutoCAD Manual
Single line diagram/equipments[Equipments-transformer, CB, fuse etc.]	4	Practice	Designing	AutoCAD Manual
Relays, Relaying schemes and auxiliaries Wiring Diagram	4	Practice	Designing	AutoCAD Manual
Relay panel wiring diagram	4	Practice	Designing	AutoCAD Manual
Substation control room wiring diagram.	4	Practice	Designing	AutoCAD Manual
Layout diagram of earthing system in outdoor substation.	4	Practice	Designing	AutoCAD Manual
Layout of Sub-Station(33/11KV S/S,	4	Practice	Designing	AutoCAD Manual

220/33KV S/S)				
Indoor and outdoor busbars — bus-bar mountings and their clearances.	4	Practice	Designing	AutoCAD Manual
Layout of different Busbar arrangement in a substation.	4	Practice	Designing	AutoCAD Manual
Designing Electrical Transmission Tower Types and Design	4	Practice	Designing	AutoCAD Manual
Layout diagram of a GIS substation.	4	Practice	Designing	AutoCAD Manual
Layout diagram of earthing system in outdoor substation.	4	Practice	Designing	AutoCAD Manual
Designing tower earthing layout and pole earthing layout.	4	Practice	Designing	AutoCAD Manual
Total- 60 Hours				

Power System Market, Act and Regulations

Course Title	Code	Type of course	T-P-PJ	Prerequisite
Power System Market, Act and Regulations	DEOM0103	Theory	4-0-0	Nil

Objective

- To know the Restructuring and economic evaluation of power system
- To acquire the knowledge of power system restructuring and economics of regulation

Course Outcome

- Prepare an effective contracts for different markets
- Demonstrate the factors affecting the bill structure

Evaluation Systems

	Component	% of Marks	Method of Assessment
Internal Examination	Internal Theory	30	Written examination
	Assignment	5	Report or Presentation + Learning Record
	Attendance	5	Based on class attended
External Examination	External Theory	60	Written examination
Total		100	

Course outline

Module I: Overview of Power System Market

(10 Hours)

Theory

Overview: Types of Markets: Spot market, Forward contracts and forward , Future contracts and futures markets, Options, Contracts for different markets.

Module II: Markets For Electrical Energy

(10 hours)

Theory

MARKETS FOR ELECTRICAL ENERGY: Difference Between a Megawatt-Hour and a Barrel of Oil, The Need for a Managed Spot Market, Operation of the managed spot market, Open Electrical

Energy Markets, Bilateral trading, Electricity pools, Comparison of pool and bilateral trading , The Settlement Process

Module III: Participating in Markets For Electrical Energy (10 Hours)

Theory

PARTICIPATING IN MARKETS FOR ELECTRICAL ENERGY: The Consumer's Perspective, Retailers of electrical energy, The Producer's Perspective, Perfect competition, The production versus purchase decision, Imperfect competition.

Module IV: System Security And Ancillary Services (12 Hours)

Theory

SYSTEM SECURITY AND ANCILLARY SERVICES: Describing the Needs, Balancing issues, Network issues, System restoration, Obtaining Ancillary Services, Compulsory provision of ancillary services, Market for ancillary services, Demand-side provision of ancillary services, Selling Ancillary

Module V: Energy Conservation (10 Hours)

Theory

ENERGY CONSERVATION: Energy Audit Basic, Energy Accounting & Analysis, Understanding the utility bill: energy charge, Demand charge, fuel cost arrangement, power factor charge.

Module VI: Electricity Rate Structure (4 Hours)

Theory

ELECTRICITY RATE STRUCTURE: state example, Energy Economics: LCC, IRR, Energy & taxation: tax consideration & analysis. General Procedure of detail energy audit. Common Energy conservation measures.

Module VII: Energy Costing (4 Hours)

Theory

ENERGY COSTING: Block pricing rate, seasonal pricing rate, innovative rate, Real time pricing rate, Electric lighting system, energy.

Text Books:

1. Moncef Krarti, "Energy Audit of Building Systems: An Engineering Approach", Second Edition, CRC Press.

Reference Books:

1. James Momoh, Lamine Mili, "Economic Market Design and Planning for Electric Power Systems", Wiley & IEEE

Session Plan

Topic	No. of Sessions	Activity	Assignment	Suggested Reading
Module I: Overview of Power System Market (10 Hours)				
Overview, Types of Markets: Spot market, Forward contracts and forward , Future contracts and futures markets, Options, Contracts for different markets.	8	Lecture	Assignment	TB1 (Ch-1)
Module II: Markets For Electrical Energy (10 hours)				
MARKETS FOR ELECTRICAL ENERGY: Difference Between a Megawatt-Hour and a Barrel of Oil, The Need for a Managed Spot Market, Operation of the managed spot market, Open Electrical Energy Markets, Bilateral trading, Electricity pools, Comparison of pool and bilateral trading , The Settlement Process	8	Lecture	Assignment	TB1 (Ch-2)
Module III: Participating in Markets For Electrical Energy (10 Hours)				
PARTICIPATING IN MARKETS FOR ELECTRICAL ENERGY: The Consumer"s Perspective, Retailers of electrical energy, The Producer"s Perspective, Perfect competition, The production versus purchase decision, Imperfect competition.	9	Lecture	Assignment	TB1 (Ch-3)
Module IV: System Security And Ancillary Services (12 Hours)				
SYSTEM SECURITY AND ANCILLARY SERVICES: Describing the Needs, Balancing issues, Network issues, System restoration, Obtaining Ancillary Services, Compulsory provision of	8	Lecture	Assignment	TB1 (Ch-4)

ancillary services, Market for ancillary services, Demand-side provision of ancillary services, Selling Ancillary				
Module V: Energy Conservation (10 Hours)				
ENERGY CONSERVATION: Energy Audit Basic, Energy Accounting & Analysis, Understanding the utility bill: energy charge, Demand charge, fuel cost arrangement, power factor charge.	4	Lecture	Assignment	TB1 (Ch-5)
Module VI: Electricity Rate Structure (4 Hours)				
ELECTRICITY RATE STRUCTURE: state example, Energy Economics: LCC, IRR, Energy & taxation: tax consideration & analysis. General Procedure of detail energy audit. Common Energy conservation measures.	4	Lecture	Assignment	TB1 (Ch-6)
Module VII: Energy Costing (4 Hours)				
ENERGY COSTING: Block pricing rate, seasonal pricing rate, innovative rate, Real time pricing rate, Electric lighting system, energy	4	Lecture	Assignment	TB1 (Ch-6)
Total- 60 Hours				



School of Forensic Sciences

B.Sc. Forensic Science (2019)

Programme Objectives:

POs: Forensic Science Graduates will be able to:

POs Outcomes	POs Outcomes
PO1	Forensic knowledge: Apply knowledge of mathematics, various disciplines of science and basic principles of forensic in investigation.
PO2.	Perform experiments as well as to carry out problem analysis and data interpretation of instrumental analysis
PO3	The crime and society: Apply reasoning informed by the contextual knowledge to assess civil and criminal laws,society,health and cultural issues and the consequent responsibilities relevant to forensics
PO4	Individual and team work: Function affectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings in the field of forensic Science.
PO5	Conduct investigations: Visit crime scene and help the police officials in proper collection, preservation and handling of scientific evidences which will aid in maintaining the integrity of evidences
PO6	Understanding of professional and ethical responsibility of forensic scientist
PO7	Communication: Communicate effectively on various activities of forensics with proper understanding of scientific and legal terminologies
PO8	Understand psychology of criminal mind
PO9	Life- long learning: Recognize the need for lifelong learning in the broadest contest of challenges and recent advances in the field of forensic science.
PO10	Project Management: Demonstrate knowledge & understanding of the forensic science and apply these to one's own work, as a member and leader in a team, to manage projects in forensic science.
PO11	Use of modern techniques, skills, and instruments necessary for forensic expert or any person working in such field.

PO12	Make a robust report on the basis of scientific analysis.
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PSO (Program Specific Outcomes)

Sl No.	Program Specific Outcomes
PSO1	Graduate will be able to develop skill which can be applied in the jobs of Forensic Science
PSO2	Graduate will be able to pursue higher studies and research
PSO3	Graduate will be able to use software and technologies that can be effectively used to solve various problems encountered during investigations.

Course Outcome (CO)

BSFS0401 : Basics of Forensic Science

Course Objective : To teach in depth knowledge of forensic science, it's disciplines and importance and working of FSL.

Course Outcome : On completion of this course, the successful students should be able to:

CO	Statements
CO-1	know the significance of forensic science to human society.
CO-2	understand fundamental principles and functions of forensic science.
CO-3	get idea about working of the forensic establishments in India and abroad.

BSFS0402 : Crime and Society

Course Objective : To obtain knowledge about criminology i.e. crime and its causes, its impact on society and basic elements of justice delivery system.

Course Outcome : On completion of this course, the successful students should be able to:

CO	Statements
CO-1	Student will know about importance of criminology.
CO-2	Understand the causes of criminal behaviour.
CO-3	Understand the significance of criminal profiling to mitigate crime.
CO-4	Understand the elements of criminal justice system.

BSFS0403 : Criminal Law

Course Objective : To obtain knowledge about basic law which governs our society

Course Outcome : On completion of this course, the successful students should be able to :

CO	Statements
CO-1	Know about Elements of Criminal Procedure Code related to forensic science.
CO-2	Understand the acts and provisions of the Constitution of India related to forensic science.
CO-3	Understand the acts governing socio-economic crimes.
CO-4	Understand acts governing environmental crimes

BSFS0404 : Forensic Psychology

Course Objective : To obtain knowledge about forensic psychology and various psychological investigative tools.

Course Outcome : On completion of this course, the successful students should be able to :

CO	Statements
CO-1	Know about importance of psychological assessment in gauging criminal behaviour.

CO-2	Understand the legal aspects of forensic psychology.
CO-3	Understand the significance of criminal profiling.
CO-4	Do critical assessment of advanced forensic techniques like polygraph, Narco analysis and brain electrical oscillation signatures.

BSFS0405 : Forensic Dermatoglyphics

Course Objective : To study fingerprints and its fundamental principles, its role in linking a person to the crime scene, techniques to develop prints

Course Outcome : On completion of this course, the successful students should be able to :

CO	Statements
CO-1	Know about physical and chemical techniques of developing fingerprints on crime science evidence.
CO-2	Understand the significance of foot, palm, ear and lip prints.
CO-3	Understand pattern types and matching

BSFS0406 : Technological Methods in Forensic Science

Course Objective : To gain knowledge about various instruments and techniques used in analysis and examination of evidences

Course Outcome : On completion of this course, the successful students should be able to :

CO	Statements
CO-1	Understand the importance of chromatographic and spectroscopic techniques in processing crime scene evidence.
CO-2	Understand the significance of microscopy in visualizing trace evidence and comparing it with control samples.
CO-3	Understand usefulness of photography and videography for recording the crime scenes.

BSFS0407: Criminalistics

Course Objective: To gain knowledge about crime scene and its processing including securing, searching and documentation as well as collection and packaging of evidences.

Course Outcome: On completion of this course, the successful students should be able to :

CO	Statements
CO-1	Understand the methods of securing, searching and documenting crime scenes.
CO-2	Understand the tools and techniques for analysis of different types of crime scene evidence.
CO-3	Understand about legal importance of chain of custody.

BSFS0408 : Forensic Chemistry

Course Objective : The study enhances ability of investigating officer in arson cases. Scientific study to analyse the explosives and Petroleum product and investigation in cases of IED.

Course Outcome : On completion of this course, the successful students should be able to :

CO	Statements
CO-1	Understand the methods of analysing trace amounts of petroleum products in crime scene evidence.
CO-2	Understand the classification of explosives, including the synthesis and characterization of representative analogues.
CO-3	Understand significance of bomb scene management.

BSFS0409 : Questioned Documents

Course Objective : helps in understanding nature of paper and some other characteristics of written as well printed document with respect to class and individual characteristics and helps to examine fraud cases.

Course Outcome : On completion of this course, the successful students should be able to :

CO	Statements
CO-1	Understand the importance of examining questioned documents in crime cases.
CO-2	Understand the tools required for examination of questioned documents.
CO-3	Understand significance of comparing hand writing samples.
CO-4	Know about the importance of detecting frauds and forgeries by analysing questioned Documents.

BSFS0410: Forensic Biology

Course Objective: To teach about biological fluid this helps to determine source of origin among the individuals. Hair evidence distinguishes between human and animal. Study of wild life forensic science enhances skill and knowledge of investigator in investigation smuggling cases.

Course Outcome: On completion of this course, the successful students should be able to:

CO	Statements
CO-1	Know about the significance of biological and serological evidence.
CO-2	Understand importance of biological fluids – blood, urine, semen, saliva, sweat and milk – in crime investigations.
CO-3	Know about how wildlife forensics aid in conserving natural resources.
CO-4	Know about how forensic entomology assists in death investigations

BSFS0411 : Forensic Ballistics

Course Objective: It helps to identify class and individual characteristics of firearm and ammunition. Enhance the skill and knowledge of investigating officer.

Course Outcome: On completion of this course, the successful students should be able to:

CO	Statements
CO-1	Know about classification of firearms and their firing mechanisms..

CO-2	Understand importance of firearm evidence
CO-3	Know about methods of identifying firearms.
CO-4	Know about methods for characterization of gunshot residue.

BSFS0412 : Forensic Toxicology

Course Objective : To study qualitative and quantitative analysis of poison in body fluids. It also helps understanding mode of administration of poison and their absorption.

Course Outcome: On completion of this course, the successful students should be able to:

CO	Statements
CO-1	Know about the significance of toxicological studies in forensic science.
CO-2	Classify poisons and their modes of actions.
CO-3	Understand classification and characteristics of the narcotics, drugs and psychotropic substances.
CO-4	Know about menace of designer drugs.

BSFS0413 : Forensic Anthropology

Course Objective : Study focuses on skeletal parts and their significance in determining identification of person, characteristics that helps in identifying missing person as well facial reconstruction through sketching of individual characteristics.

Course Outcome: On completion of this course, the successful students should be able to:

CO	Statements
CO-1	Know about the importance of forensic anthropology in identification of persons.
CO-2	Classify poisons and their modes of actions.
CO-3	Understand different techniques of facial reconstruction and their forensic importance.
CO-4	Know about significance of somatoscopy and somatometry

BSFS0414: Forensic Medicine

Course Objective Study helps to distinguish between postmortem and anti-mortem characteristics of corpus delicti. Age and sex can also be determined by forensic odontology.

Course Outcome: On completion of this course, the successful students should be able to:

CO	Statements
CO-1	Know about the importance of forensic odontology
CO-2	Understand the importance of autopsy
CO-3	Understand the importance of bloodstain patterns in reconstructing the crime scene.
CO-4	Importance of bloodstain patterns in reconstructing the crime scene.

Ability Enhancement Elective Course

BSFL1101 : English

Course Objective : To expose the students to a variety of self-instructional, learner-friendly modes of language learning and to enable them to learn better pronunciation through stress on word accent, intonation, and rhythm.

Course Outcome: On completion of this course, the successful students should be able to:

CO	Statements
CO-1	Communicate fluently in different business situation
CO-2	Use appropriate words with correct pronunciation
CO-3	Do effective oral and written communication

FCBS0101 : Environmental Science

Course Objective : To understand the concept of multi-disciplinary nature of Environmental Science where different aspects are dealt with a holistic approach.

Course Outcome: On completion of this course, the successful students should be able to:

CO	Statements
CO-1	develop a sense of community responsibility by becoming aware of environmental issues in the larger social context.
CO-2	Characterize and analyze human impacts on the environment
CO-3	Design and evaluate strategies, technologies and methods for sustainable management of environmental systems and for the remediation or restoration of degraded environments.
CO-4	Integrate facts, concepts, and methods from multiple disciplines and apply to environmental problems.

Ability Enhancement Elective (Skill Based) course

BSSE0201 : Introduction to Biometry

Course Objective: To understand the concept of biometry and its role in identification and various kinds of biometrics.

Course Outcome: On completion of this course, the successful students should be able to:

CO	Statements
CO-1	Understand the basis of biometry.
CO-2	Know about the classification of biometric processes
CO-3	Know about the importance of behavioural biometry

BSSE0202 : Handwriting Identification and Recognition

Course Objective : To understand the important features of handwriting identification and perform detection of document forgery or alteration.

Course Outcome: On completion of this course, the successful students should be able to:

CO	Statements
CO-1	Understand important features in handwriting identification.
CO-2	Learn about basis of handwriting characteristics.
CO-3	Know about significance of forensic documentation.

Discipline Specific Elective

DEFS0401 : Digital Forensics

Course Objective : To understand the basic concepts of digital forensics and types of digital forensics, malwares and investigation methods applied in such cases.

Course Outcome: On completion of this course, the successful students should be able to:

CO	Statements
CO-1	Understand the basics of digital forensics.
CO-2	Analyse the cases which fall under the purview of digital crimes.
CO-3	Understand the types of digital crimes.
CO-4	Understand the elements involved in investigation of digital crimes.

DEFS0402 : Economic Offences

Course Objective: To introduce to terminologies related to economic offences, some common economic offences and its impact on society.

Course Outcome: On completion of this course, the successful students should be able to:

CO	Statements
CO-1	Understand basic economic and financial terminology.
CO-2	Understand steps involved in mitigating economic crimes.
CO-3	Know about types of common economic offences and their consequences.

DEFS0403: Forensic Serology

Course Objective: To gain knowledge about serological evidences and their importance in crucial cases and methods of their detection.

Course Outcome: On completion of this course, the successful students should be able to:

CO	Statements
CO-1	Understand the significance of serological evidence.
CO-2	The importance of biological fluids – blood, urine, semen, saliva, sweat and milk – in crime investigations.
CO-3	Know about the usefulness of genetic markers in forensic investigations.

DEFS0404: Accident Investigations

Course Objective: To study methods of investigation in accidental cases, types of injuries in accidents, documentation, collection and preservation of evidences and their analysis.

Course Outcome: On completion of this course, the successful students should be able to:

CO	Statements
CO-1	Understand the significance of tiremark evidence.
CO-2	Understand the importance of air bags and photography of accident cases
CO-3	Know about the usefulness of trace evidences in forensic investigations.

DEFS0405 : DNA Forensics

Course Objective: Understanding basic concepts of DNA Analysis, DNA Typing, STR markers.

Course Outcome: On completion of this course, the successful students should be able to:

CO	Statements
CO-1	Understand the basic principle of DNA analysis and it's significance
CO-2	Understand the importance of short tandem repeats and restriction fragment length polymorphism in DNA technique.
CO-3	Know about role of DNA typing in parentage testing

DEFS0406 : Audio Recognition and Video Analysis

Course Objective: To Understand the role of voice in forensic investigations, understanding speaker recognition and identification and their analysis.

Course Outcome: On completion of this course, the successful students should be able to:

CO	Statements
CO-1	Understand the basic principle of voice production and forensic significance speaker identification and recognition.
CO-2	Know about the importance of audio recording evidences.
CO-3	Use various software in audio recognition and video analysis.

DEFS0407 : Explosives Analysis & Post Blast Investigation

Course Objective: To study the protocols followed for analysis of explosives and get in depth knowledge about post blast investigations.

Course Outcome: On completion of this course, the successful students should be able to:

CO	Statements
CO-1	Know about History and development of explosives.
CO-2	Understand processing of crime scene.
CO-3	Know about clandestine Laboratories.

DEFS0408 : Quality Control and Quality Assurance

Course Objective : To study the various aspects of quality control and assurance aspects and understand important parameters such as cGMP, QC tests, documentation, Quality certifications, GLP and regulatory affairs.

Course Outcome: On completion of this course, the successful students should be able to:

CO	Statements
CO-1	Understand the cGMP aspects in a pharmaceutical industry.
CO-2	Know about the importance of documentation.
CO-3	Understand the Scope of quality certifications applicable to Pharmaceutical industries and responsibilities of QA and QC department.

School of Forensic Sciences

M.Sc. Cyber Security and Digital Forensics

Programme Outcomes (PO) :

POs	Outcomes
PO1	Cyber forensic knowledge: Apply knowledge of mathematics, tools, techniques various disciplines of science and basic principles of digital forensic in investigation.
PO2	Perform live hands on as well as to carry out problem analysis and data interpretation of tools analysis.
PO3	The cybercrime and digital society: Apply cognitive informed by the circumstantial knowledge to assess corporate and digital criminal laws, society, health and educational issues and the consequent responsibilities relevant to the cyber forensics
PO4	Discrete and team work: Functions affectively as an individual, and as a member or leader in assorted teams, and in multidisciplinary settings in the field of digital forensics.
PO5	Conduct digital investigations: Tracing cyber victims and help the cyber police officials in proper collection, preservation and handling of digital evidences which will aid in maintaining the integrity of digital evidences.
PO6	Understanding of professional and ethical responsibility of cyber security professionals.
PO7	Communication: Communicate effectively on various activities of digital forensics with proper understanding of scientific tools and legal terminologies.
PO8	Understand thinking of felonious mind and finding digital signatures.
PO9	Life- long learning: Recognize the need for lifelong learning in the broadest contest of challenges and recent advances in the field of cyber forensic science.
PO10	Project Management: Demonstrate knowledge & understanding of the digital forensic science and apply these to one's own work, as a member and leader in a team, to manage projects in cyber forensic science.
PO11	Use of modern techniques, tools, skills, and digital devices necessary for forensic expert or any person working in such field.
PO12	Make a robust documentation on the basis of scientific tools analysis.

Programme Specific Outcomes (PSO):

PSO1: Masters will be able to develop skill which can be applied in the jobs of Cyber Forensic Science in private and public sector.

PSO2: Masters will be able to pursue higher studies and research.

PSO3: Masters will be able to use software and technologies that can be effectively used to solve various problems encountered during digital investigations.

MSCS1101: PRINCIPLES OF INFORMATION SECURITY

Course Objective: The objective of this course is to focus on the models, tools, and techniques for enforcement of security. Student will also learn security from multiple perspectives.

Course Outcomes : On completion of this course, the successful students should be able to:

CO	Statements
CO-1	Will gain familiarity with computer network, defences against them, and forensics to investigate the aftermath.
CO-2	Develop a basic understanding of Risk assessment
CO-3	Develop an understanding of security policies as well as protocols to implement such policies.

MSCS1102: DIGITAL FORENSICS

Course Objective : This course focuses on two aspects of Cyber Security: analysis and assessment of risk plus how to minimize it, and, how to extract and use digital information from a wide range of systems and devices.

Course Outcomes : On completion of this course, the successful students should be able to:

CO	Statements
CO-1	Explain the origins of forensic science.
CO-2	Explain the difference between scientific conclusions and legal decision-making
CO-3	Explain the role of digital forensics and the relationship of digital forensics to traditional forensic science, traditional science and the appropriate use of scientific methods
CO-4	Outline a range of situations where digital forensics may be applicable
CO-5	Identify and explain at least three current issues in the practice of digital forensic investigations.

MSCS1103 : COMPUTER NETWORKS

Course Objective: The course objectives include learning about computer network organization and implementation, obtaining a theoretical understanding of data communication and computer networks, and gaining practical experience in installation, monitoring, and troubleshooting of current LAN systems.

Course Outcomes : On completion of this course, the successful students should be able to:

CO	Statements
CO-1	explain the concepts of confidentiality, availability, and integrity (CIA) in context of Information Assurance; articulate the threats to CIA and be able to analyse a given architecture, discern vulnerabilities, and recommend physical, logical, or administrative controls to mitigate the threat; (Cybersecurity Fundamentals—Theory)
CO-2	demonstrate expertise in configuring host and network level technical security controls, to include host firewalls, user access controls, host logging, network

	filtering, intrusion detection, and prevention and encryption at all levels; (Managing Security—Applied)
CO-3	describe the hardware, software, and services that comprise an enterprise network, and be able to articulate how these components integrate to form a network solution; (Network Integration—Theory)
CO-4	Explain key networking protocols, and their hierarchical relationship in the context of a conceptual model, such as the OSI and TCP/IP framework; be able to articulate the low-level data communications and subsequent abstractions that allow networked hosts and applications to communicate across the internet; (Networking Protocols—Theory)
CO-5	Build multiple host and network architectures, given business requirements and constraints; student will configure operating systems, network specific services, routing, switching, and remote access solutions; (Networking—Applied)

MSCS1104: CYBER CRIME & INVESTIGATIONS

Course Objective: This course focusses on two aspects of Cyber Security: analysis and assessment of risk plus how to minimize it, and, how to extract and use digital information from a wide range of systems and devices. The course is structured so that all students cover the same introductory material, but then choose to specialize in either Cyber Security or Digital Forensics. Any aforesaid science graduate who requires keen interest & knowledge of IT programming languages with basic knowledge of math beyond calculus.

Course Outcomes : On completion of this course, the successful students should be able to:

CO	Statements
CO-1	Discuss data and identify data sources
CO-2	Describe and discuss digital evidence
CO-3	Compare and contrast the differences between digital evidence and traditional evidence
CO-4	Describe and critique digital forensics process models
CO-5	Describe and critique digital forensics process models
CO-6	Critically evaluate standards and good practices for digital evidence and digital forensics

MSCS1105: INTELLECTUAL PROPERTY RIGHTS

Course Objective : The main objective of the IPR is to make the students aware of their rights for the protection of their invention done in their project work. The students will get a basic idea about registration in India and abroad of their invention, designs, thesis written/developed by them during their project work and for this they must have knowledge of patents, copy right, trademarks, designs.

Course Outcomes : On completion of this course, the successful students should be able to:

CO	Statements
CO-1	Once the students complete their syllabus and assessment, they will develop the basic knowledge and awareness of acquiring the patent and copyright for their innovative works.
CO-2	They will also get an idea about plagiarism while writing any article, blog, research or review paper and learn how to avoid it.

MSCS1201: NUMBER THEORY & CRYPTOGRAPHY

Course Objective : Covers fundamental algorithms for integer arithmetic, greatest common divisor calculation, modular arithmetic, and other number theoretic computations. Algorithms are derived, implemented and analysed for primality testing and integer factorization. Applications to cryptography are explored including symmetric and public-key cryptosystems. A cryptosystem will be implemented and methods of attack investigated. To be able to implement and analyse algorithms for integer factorization and primality testing. To be able to use a system like Maple to explore concepts and theorems from number theory. To understand fundamental algorithms from symmetric key and public key cryptography.

Course Outcomes : On completion of this course, the successful students should be able to:

CO	Statements
CO-1	To understand fundamental number theoretic algorithms such as the Euclidean algorithm, the Chinese Remainder algorithm, binary powering, and algorithms for integer arithmetic.
CO-2	To understand fundamental algorithms for symmetric key and public key cryptography.
CO-3	To understand the number theoretic foundations of modern cryptography and the principles behind their security.
CO-4	To implement and analyze cryptographic and number theoretic algorithms.
CO-5	To be able to use Maple to explore mathematical concepts and theorems.

MSCS1202: ADVANCED INFORMATION SECURITY

Course Objective: The objective of this course is to focus on the models, tools, and techniques for enforcement of security. Students will learn security from multiple Perspectives.

Course Outcomes:

CO	Statements
CO-1	Will gain familiarity with computer network, defences against them, and forensics to investigate.
CO-2	Develop a basic understanding of Risk assessment
CO-3	Develop an understanding of security policies as well as protocols to implement such policies

MSCS1203: CYBER FORENSICS

Course Objective: The aim of this course is to equip you with the knowledge and techniques to computer forensics practices and evidence analysis. It prepares you to use various forensic investigation approaches and tools necessary to start a computer forensics investigation. It also aims at increasing the knowledge and understanding in cyber security and ethical hacking.

Course Outcomes:

CO	Statements
CO-1	Define computer forensics.
CO-2	Identify the process in taking digital evidence.
CO-3	Describe how to conduct an investigation using methods of memory, operating system, network and email forensics.
CO-4	Assess the different forensics tools.
CO-5	Differentiate among different types of security attacks.
CO-6	Describe the concept of ethical hacking.

MSCS1204: SYSTEM & NETWORK SECURITY

Course Objective: The course objectives include learning about computer network organization and implementation, obtaining a theoretical understanding of data communication and computer networks, and gaining practical experience in installation, monitoring, and troubleshooting of current LAN systems.

Course Outcomes : On completion of this course, the successful students should be able to:

CO	Statements
CO-1	Able to understand the concepts of confidentiality, availability, and integrity (CIA) in context of Information Assurance.
CO-2	Articulate the threats to CIA and be able to analyze a given architecture.
CO-3	Discern vulnerabilities.
CO-4	Recommend physical, logical, or administrative controls to mitigate the threat; (Cybersecurity Fundamentals—Theory)

MSCS1205: CYBER LAW

Course Objective: The Objectives of This Course Is to Enable Learner to Understand, Explore, And Acquire A Critical Understanding Cyber Law. Develop Competencies for Dealing with Frauds and Deceptions (Confidence Tricks, Scams) And Other Cyber Crimes for Example, Child Pornography Etc. That Are Taking Place Via the Internet.

Course Outcomes : On completion of this course, the successful students should be able to:

CO	Statements
CO-1	Make Learner Conversant with The Social and Intellectual Property Issues Emerging From 'Cyberspace.
CO-2	Give Learners in Depth Knowledge of Information Technology Act and Legal Frame Work Of Right to Privacy, Data Security and Data Protection.
CO-3	Make Study on Various Case Studies on Real Time Crimes.

3RD SEMESTER

MSCS2101: MOBILE SECURITY ANALYSIS

Course Objective: This course focuses on two aspects of Cyber Security: analysis and assessment of risk plus how to minimize it, and, how to extract and use digital information from a wide range of systems and devices. The course is structured so that all students cover the same introductory material, but then choose to specialize in either Cyber Security or Digital Forensics. Any aforesaid science graduate who requires keen interest & knowledge of IT programming languages with basic knowledge of math beyond calculus.

Course Outcomes : On completion of this course, the successful students should be able to:

CO	Statements
CO-1	Students learn cryptography basics (concepts, algorithms, techniques,

	implementation, and evaluation) for mobile apps.
CO-2	Students learn basic cryptography implementation for Android mobile security.
CO-3	Understand how to outsource application and data to a cloud in mobile computing which will leverage services provided by cloud providers.
CO-4	Deal with the various aspects arising in architecting secure complex systems, such as analysing and identifying system threats and vulnerabilities, and investigating operating systems security.

MSCS2102: IT GOVERNANCE, RISK& COMPLIANCE

Course Objective: This course focusses on two aspects of Cyber Security: analysis and assessment of risk plus how to minimize it, and, how to extract and use digital information from a wide range of systems and devices. The course is structured so that all students cover the same introductory material, but then choose to specialize in either Cyber Security or Digital Forensics. Any aforesaid science graduate who requires keen interest & knowledge of IT programming languages with basic knowledge of math beyond calculus.

Course Outcomes : On completion of this course, the successful students should be able to:

CO	Statements
CO-1	Understand the concepts of governance, risk management and compliance (GRC) and regulatory environment.
CO-2	Identify high-risk areas and compliance in your organization and apply Risk-based Approach
CO-3	Develop and implement a governance, risk management and compliance strategic plan
CO-4	Understand, define, and enhance organizational culture as it relates to performance, risk, and compliance
CO-5	Implement governance, risk management and compliance processes that are effective and efficient
CO-6	Using a risk-based audit approach

MSCS2103: BUSINESS CONTINUITY PLANNING & DISASTER RECOVERY

Course Objective: This course focuses on two aspects of Cyber Security: analysis and assessment of risk plus how to minimize it, and, how to extract and use digital information from a wide range of systems and devices. The course is structured so that all students cover the same introductory material, but then choose to specialize in either Cyber Security or Digital

Forensics. Any aforesaid science graduate who requires keen interest & knowledge of IT programming languages with basic knowledge of math beyond calculus.

Course Outcomes : On completion of this course, the successful students should be able to:

CO	Statements
CO-1	Understand the concept of business continuity
CO-2	Learn the importance of a BCP (business continuity planning)
CO-3	See how load balancing maintains business continuity
CO-4	Discover how a DCP (Disaster recovery plan) is a second line of defence
CO-5	Learn how to choose the right failure over solution

MSCS2104: PENETRATION TESTING & VULNERABILITY ASSESSMENT

Course Objective: In the end, the goal is to identify security weaknesses in a network, machine, or piece of software. Once they're caught, the people maintaining the systems or software can eliminate or reduce the weaknesses before hostile parties discover them. "Security" isn't limited to how well the machines and software stand up against penetration attempts.

Course Outcomes :

CO	Statements
CO-1	Explain the basic principles and techniques of how attackers can enter computer systems.
CO-2	Put acquired knowledge into practice by performing ethical penetration tests and hide the intrusion.
CO-3	Perform analyses of data breaches and audits of information technology security.
CO-4	Evaluate the strengths and weaknesses of various information technology solutions in terms of data security.
CO-5	Independently present and perform demonstrations of pen-tests for educational purposes.
CO-6	Evaluate the societal role of hacking from a social, ethical and economic standpoint

MSCS2105 : DIGITAL FRAUDS

Course Objective: To provide students with a comprehensive overview of collecting, investigating, preserving, and presenting evidence of cybercrime left in digital storage devices. To introduce topics of forensic data examination of computers and digital storage media.

Investigation of computers used for wrong-doing. Understand file system basics and where hidden files may lie on the disk, as well as how to extract the data and preserve it for analysis. Understand some of the tools of e-discovery. Legal aspects must form a constant background for these types of investigations.

Course Outcomes :

CO	Statements
CO-1	Understand the importance of a systematic procedure for investigation of data found on digital storage media that might provide evidence of wrong-doing.
CO-2	Understand the file system storage mechanisms of two common desktop operating systems (i.e., versions of Microsoft Windows and LINUX)
CO-3	Use tools for faithful preservation of data on disks for analysis. Find data that may be clear or hidden on a computer disk.

4TH SEMESTER

MSCS0301 : PROJECT/ DISSERTATION

Course Objective: To help in training of students with hands on experience of instruments while working on any research topic.

Course Outcomes : On completion of this course, the successful students should be able to:

CO	Statements
CO-1	Have understanding of research methodology and lab work/field work.

**CENTURION UNIVERSITY OF TECHNOLOGY AND
MANAGEMENT, ODISHA**

SCHOOL OF PARAMEDICS & ALLIED HEALTH SCIENCES



Centurion
UNIVERSITY

BACHELORE OF SCIENCE IN CLINICAL MICROBIOLOGY

2019

SYLLABUS

Preface: Clinical Microbiology helps to diagnose and prevent disease through clinical laboratory tests. It is complementary to medical science. It involves analysis of body matter such as Collection of samples like body fluid, tissue, and blood and diagnoses them. It also covers micro-organism screening, sterilization of laboratorial environment and equipments, Antibiotic sensitivity tests.

Clinical Microbiologists are an integral part of the medical profession. These professionals get involved in practical and technical work to aid correct diagnosis and effective functioning of Microbiological Laboratory.

With adequate knowledge and experience, Clinical Microbiologist having +2 Sc with biology qualification can work in supervisory or management positions in laboratories and hospitals. They can also work as Laboratory Manager/Consultant/supervisor, health care Administrator, Hospital Outreach coordination, laboratory information system Analyst/Consultant, educational consultant/coordinator etc. Additional opportunities are available in molecular diagnostics, molecular biotechnology companies and in vitro fertilization laboratories as well as in research labs.

Programme: B. Sc. in Clinical Microbiology.

Duration: Three years (Six semesters) full-time programme with 6 months internship in the last semester.

Eligibility: +2 Science with Physics, Chemistry & Biology or equivalent degree

Examination: Examination rules will be as per guideline of CUTM Examination hand book.

Mini Project: A candidate will have to carry out a mini project work as mentioned in the course structure. After completion of the mini project, the student has to submit the dissertation of the mini project. Internal evaluation of the same (consisting of presentation and viva-voce) will be conducted by the respective School.

Internship: A candidate will have to undergo internship for a period of six calendar months in a hospital/Diagnostics Centre/ government or private organization, equipped with modern microbiology laboratory facility or in a fully equipped pathology laboratory, which fulfills the norms decided by the University.

Dissertation will be compulsory to all students. Students will carry out dissertation work individually or in the group of not more than three students. The format for dissertation/Internship report will be similar to the research thesis style; incorporating chapters on: Introduction, Materials and Methods, Results and Discussion and References / Bibliography. The dissertation will be submitted in a typewritten and bound form.

Degree: The degree of B. Sc. in Clinical Microbiology course of the University shall be conferred on the candidates who have pursued the prescribed course of study for not less than three academic years and have passed examinations as prescribed under the relevant scheme and completed 6 months of compulsory internship in the last semester.

On successful completion of three years programme, with a minimum course credit load of **140 credits**, the candidate will be awarded with “**Bachelor of Science in Clinical Microbiology (B. Sc. CMB)**” from Centurion University.

**BACHELOR OF SCIENCE IN
CLINICAL MICROBIOLOGY**

Course structure

SEMESTER-I				
SL NO	CODE	SUBJECT	SUBJECT TYPE Theory+ Practice+ Project (T+P+Pj)	CREDI TS
1	BSCM1101	Introductory Cell Biology	4+0+0	4
2	BSCM1102	Human Anatomy and Physiology	4+0+0	4
3	BSCM1103	Basic Haematology	4+0+0	4
4	BSCM1104	Basic Medical Instrumentation and Technique	4+0+0	4
5	BSCM1105	Anatomy, Physiology & Hematology Lab	0+6+0	4
Total				20

SEMESTER-II				
SL NO	CODE	SUBJECT	SUBJECT TYPE Theory+ Practice+ Project (T+P+Pj)	CREDIT S
1	FCBS0101	Environmental Science	3+0+0	3
2	FCHU1201	Foundations of English Communication	0+3+0	2
3	BSCM1201	General Microbiology	4+0+0	4
4	BSCM1202	Clinical Biochemistry	4+0+0	4
5	BSCM1203	Clinical Pathology & Diagnosis	4+0+0	4
5	BSCM1205	Clinical Pathology Lab	0+3+0	2
6	BSCM1206	Microbiology Lab	0+3+0	2
			Total	21
		SKILL COURSE- I		2/ 4

SEMESTER-III

SL NO	CODE	SUBJECT	SUBJECT TYPE T+P+Pj	CREDIT
1	BSCM2301	Immunology	4+0+0	4
2	BSCM2302	Systemic Bacteriology	4+0+0	4
3	BSCM2303	Molecular Biology	4+0+0	4
4	BSCM2304	Systemic Virology & Mycology	4+0+0	4
5	FCHU1204	Communicative Practice Laboratory-2	0+3+0	2
6	BSCM2307	Virology & Mycology Lab	0+3+0	2
			Total	20
		SKILL COURSE- II		2/ 4

SEMESTER-IV

SL NO.	CODE	SUBJECT	SUBJECT TYPE T+P+Pj	CREDIT
1	BSCM2407	Public Health Microbiology	3+0+0	3
2	BSCM2402	Pharmaceutical Microbiology	4+0+0	4
3	BSCM2408	Industrial Microbiology	3+0+0	3
4	BSCM2404	Analytical Biochemistry	4+0+0	4
5	BSCM2409	Basic Computer & Information technique	0+2+0	2
6	BSCM2410	Industrial Microbiology Lab.	0+2+0	2
7	BSCM2411	Public Health Microbiology Lab	0+2+0	2
8	BSCM2412	Biochemistry Lab	0+2+0	2
			TOTAL	22
		SKILL COURSE- III		2/ 4

SEMESTER-V

SL NO	CODE	SUBJECT	SUBJECT TYPE T+P+Pj	CREDIT
1	BSCM3508	Epidemiology	2+0+0	2
2	BSCM3509	Diagnostic Bacteriology	3+0+0	3
3	BSCM3503	Diagnostic Virology	4+0+0	4
4	BSCM3504	Diagnostic Mycology	4+0+0	4
5	BSCM3505	Diagnostic Parasitology	4+0+0	4

6	BSOP3504	Medical Law and Ethics	3+0+0	3
7	BSCM3510	Research Methodology	3+0+0	3
8	BSCM3511	Diagnostic	0+3+0	2
		Bacteriology Lab		
9	BSCM3512	Mini Project	0+0+3	2
			TOTAL	27
		SKILL COURSE- IV		2/ 4

SEMESTER-VI

SL NO	CODE	SUBJECT	SUBJECT TYPE T+P+Pj	CREDIT
1	BSCM3603	Project	-	10
2	BSCM3604	Internship	-	10
	Total			20

INTERNSHIP

Minimum 720 hours (calculated based on 8 hours per day, if 90 working days in a 6 months)

Skill Courses:

Students can choose any suitable skill course offered by the University

Value Added Courses:

**Suggested courses:*

SL NO	SUBJECT CODE	SUBJECT
1	FCMG0115	Human Rights
2	FCMG0401	Gender Issues in Development

**(Or courses suggested by the respective School)*

Note: Skill course & Value-added course, to be opted by the student along with the regular courses, as suggested in the syllabus.

Syllabus

1st semester B. Sc Clinical Microbiology

BSCM1101- Introductory Cell Biology

Subject Name	Code	Type of course	T-P-Pj	Prerequisite
Introductory Cell Biology	BSCM1101	Theory	4-0-0	Fundamental Science

Course Objectives

1. Determine the parts of the cell membrane and the cell wall

2. Distinguish the types and mechanism of mutation
3. Compare and contrast the events of cell cycle and its regulation
4. Understand the dynamic character of cellular organelles

Course outcome

- Describe the fundamental principles cellular biology
- Develop a deeper understanding of cell structure and how it relates to cell functions.
- Understand how cells grow, divide, and die and how these important processes are regulated.
- Understand cell signaling and how it regulates cellular functions. Also how its dis-regulation leads to cancer and other diseases.

Unit-1

Biology & Its Branches; Scientific methods in Biology; Scope of biology and career options in Medical Laboratory Sciences; Characters of living organisms (elementary idea of metabolism, transfer of energy at molecular level, open and closed systems, homeostasis, growth and reproduction, adaptation, survival, death). Origin and Evolution of life - Theories of Evolution; Evidence of Evolution; Sources of Variations (mutation, recombination, genetic drift, migration, natural selection); Concept of species; Speciation and Isolation (geographical and reproductive); Origin of species.

Unit-2

Diversity of living organisms, Systematics; Need, history and types of classification (artificial, natural, polygenetic); biosystematics; binomial nomenclature; Two kingdom system, Five kingdom System, their merits and demerits, status of bacteria and virus.

Unit-3

Cell as a basic unit of life - discovery of cell, cell theory, cell as a self - contained unit; prokaryotic and eukaryotic cell; unicellular and multicellular organisms; Ultrastructure of prokaryotic and eukaryotic cell - cell wall, cell membrane - unit membrane concept (Fluid-Mosaic model); membrane transport; cellular movement (exocytosis, endocytosis)

Unit-4

Cell organelles and their functions- nucleus, mitochondria, plastids, endoplasmic reticulum, Golgi complex, lysosomes, microtubules, centriole, vacuole, cytoskeleton, cilia and flagella, ribosomes. Molecules of cell; inorganic and organic materials - water, salt, mineral ions, carbohydrates, lipids, amino acids, proteins, vitamins, hormones and steroids.

Suggested Readings

1. Molecular biology of the cell by Alberts Bruce, publisher Garland Science
2. Molecular Biology by Friefelder David, Publisher Narosa
3. Introduction to Cell biology by John K Young, World Scientific publishing company
4. Introduction to biology, 3rd edition by D G Maackean
5. A Term wise Text book on biology by VIDYA

BSCM1102-Human Anatomy and Physiology

Subject Name	Code	Type of course	T-P-Pj	Prerequisite
Human Anatomy and Physiology	BSCM1102	Theory	4-0-0	Fundamental Science

Objective

- To identify different types of cells and describe their functions.
- To identify the organelles of a typical cell and describe their functions.
- To identify the major components of the integumentary system and describe their functions.
- To identify the major structures of the skin and describe their functions
- To identify the major components of the skeletal system and describe their functions.
- To identify the major components of the circulatory, endocrine, nervous system etc and describe their functions.

Course outcome

- Use anatomical terminology to identify and describe locations of major organs of each system covered.
- Explain interrelationships among molecular, cellular, tissue, and organ functions in each system.
- Describe the interdependency and interactions of the systems.
- Explain contributions of organs and systems to the maintenance of homeostasis.
- Identify causes and effects of homeostatic imbalances.
- Describe modern technology and tools used to study anatomy and physiology.

Unit-1

Scope of Anatomy and physiology. Definition of various terms used in Anatomy. Structure of cell, function of its components with special reference to mitochondria and microsomes.

Elementary tissues: Describe about the elementary tissues of the body, i.e. epithelial tissue, muscular tissue, connective tissue and nervous tissue. Cell division, meiosis and mitosis

Skeletal System: Structure and function of different human Bones, Skelton & Joints. Classification of joints and their function. Joint disorders.

Practice: Demonstration of individual bone from skeleton.

Identification of different organs and system from chart.

Unit-2

Blood, Composition, Structure, classifications, Rh factor, Grouping, Normal and Abnormal Structure of different blood cells, synthesis of blood cells, mechanism of blood clot, blood circulation in body.

Cardiovascular System: Structure and functions and Position of Heart. Various parts of the heart. Blood supply in Artery and veins. Conducting system of the Heart. Cardiac output. Blood pressure and Pulses and its normal recording. Brief information about cardiovascular disorders. Respiratory system: Various parts of respiratory system and their functions, physiology of respiration. Other respiratory organs, their structure and functions. Mechanism of respiration.

*Practice: Demonstration the morphology of different blood cells
Measurement of Blood pressure, impulses, Heart beats, respiration rate etc.*

Unit-3

Urinary System: Various parts of urinary system and their functions, structure and functions of kidney. Physiology of urine formation. Patho-physiology of renal diseases and edema.

Digestive System: names of various parts of digestive system and their functions. Structure and functions of liver, physiology of digestion and absorption.

Endocrine System: Endocrine glands and Hormones. Reproductive system. Structure and function of sense organs.

Practice: Identification of different organs and system from chart.

Suggested Readings:

- (b) Text book Anatomy & Physiology for nurses by Evelyn Pearce, Publisher Faber& Faber.
- (c) Text book Anatomy and Physiology for nurses by Sears, Publisher Edward Arnold.
- (d) Anatomy & Physiology- by Ross and Wilson, Publisher Elsevier.
- (e) Anatomy& Physiology: Understanding the human body by Clark, Publisher Jones & Bartlett.
- (f) Anatomy and Physiology for nurses by Pearson, Publisher Marieb& Hoehn.
- (g) Anatomy and Physiology by N Murgesh, Publisher satya.

BSCM1103- Basic Haematology

Subject Name	Code	Type of course	T-P-Pj	Prerequisite
Basic Haematology	BSCM1103	Theory	4-0-0	Basic Medical science

Course Objectives

- The overall aims are that the student should obtain advanced knowledge of the most common hematologic diseases & understanding the concept of Blood cells and other blood components.
- Be able to handle an investigation of hemorrhagic disorder and laboratory abnormalities such as anaemia, polycythemia, leukopenia, leukocytosis, thrombocytopenia, thrombocytosis, elevated ESR etc within hematology.
- Clinically relevant hematological analysis for deeper understanding of Evaluate normal and abnormal cell morphology with associated diseases and other blood components.

Course outcome

- Differentiate various laboratory test findings with their associated clinical conditions.
- Identify the various skills necessary to perform blood counts, evaluate blood elements, and report results within the stated limits of accuracy.
- Describe the various components of blood, their functions, and roles in various disease states.
- To be able to demonstrate good skills in the relevant Hematology laboratory methodology.
- Collection of blood for the investigations.
- Be able to distinguish the developmental stages of blood cells. It will also cover Bone marrow examination.
- To learn about tests carried out for hematological investigations.
- To be able to carry out blood sampling.

Unit-1

Introduction to Haematology, definition, importance, important equipment and chemicals, various test performed in Haematology laboratory. Focusing different blood cells through microscope.

Practice: Demonstration of instruments used in haematology- Microscope, Blood Cell counter, Shari's Apparatuses.

Unit -2

Synthesis of blood in Bone marrow- Erythropoiesis, leucopoiesis, thrombopoiesis

Anticoagulants, definition, Uses, Different types of Anticoagulants, mode of action, their merits and demerits.

Morphology of normal blood cells, abnormal morphology & diseases.

Practice: Demonstration of different blood cell, their synthesis from slide presentation or chart.

Demonstration the normal and abnormal morphology of different blood cells.

Unit-3

Collection and preservation of blood: Different methods of collection, preservation, changes in stored blood normal and absolute values in haematology, RBC count, WBC count, Platelet count, DLC value, HB, MCH, MCV, MCHC, ESR, PCV.

Blood Film: different types, methods of preparations, staining, Different types of stains, Romanowsky stains: principle of staining, different stains, their composition and preparation, methods of staining.

Practice: Collection of blood by different methods. Preparation of DLC, TLC, TRBC etc Estimation of ESR, Hb and diagnosis procedure of different blood tests.

Unit-4

Hematological Disorders

- Classification of Anemia: Morphological & etiological.
- Iron Deficiency Anemia: Distribution of body Iron, Iron Absorption, causes of iron deficiency, lab findings.
- Megaloblastic Anemia: Causes, Lab findings.
- Haemolytic Anemia: Definition, causes, classification & lab findings.
- Bone Marrow: Cell composition of normal adult Bone marrow, Aspiration, Indication, Preparation & Staining, Special Stain for Bone Marrow- Periodic Acid Schiff, Sudan Black

f. Leukemia: Classification, Blood Picture, Differentiation of Blast Cells.

Practice: Estimation procedure of sickle cell, Identification of different abnormal morphology of blood. Different normal and abnormal morphology of RBCs, WBCs, Platelet.

Suggested Reading

1. Textbook of Medical Laboratory Technology P.B Gotkar Mumbai, Bhalani Publishing House
2. Text book of Medical Laboratory Technology by Paraful B. Godkar, Publisher Bhalani
3. Text book of Medical Laboratory Technology (IInd edition) by V.H Talib, Publisher CBS
4. Atlas of hematology (5th edition) by G.A. McDonald, Publisher Churchill Livingstone
5. Medical Laboratory Technology By K.L Mukharjee, Publisher McGraw Hill education pvt limited

BSCM1104-Basic Medical Instrumentation and Techniques

Subject Name	Code	Type of course	T-P-Pj	Prerequisite
Basic Medical Instrumentation and Techniques	BSCM1104	Theory	4-0-0	Fundamental Science

Course Objectives

- To learn the principle, instrumentation & application of Microscopy
- Principle, instrumentation & application of Centrifugation
- Principle of Spectroscopy

Course outcome

- After completion of the course the student will be efficient in handling the microscopy equipment's.
- They will also be able to have idea about handling instruments like centrifuge, spectrophotometer, chromatography, flow cytometer, Automated and semi- automated Biochemistry analyzer.
- Each graduate will meet expected outcomes in communications, computation, and human relations, per the University General requirements.

Unit -1

Microscope: different types of microscope, operation and care of binocular and monocular microscope, Light, phase contrast, interference, fluorescence, polarization and electron microscopy (principle, parts and its application). Photometry: Basic principal and operation.

Practice: Demonstration, operation, and Quality control of different types of microscopes.

Unit-2

Colorimetric instrumentation and UV-Vis spectrometry and its application. Centrifuge: Basic principle, types; analytical and preparative centrifuges, different density gradient centrifuge and its application. Blood analyzer: Principle, working and its application. Demonstration and Maintenance of Laminar Flow.

Practice: Operation, Demonstration and Quality control of Centrifuge, UV-Vis spectrometer, Colorimeter.

Unit-3

Microtome: Principle, working and its uses. Incubator, Hot air oven and Autoclave: Principle, working and its uses. Operation Techniques and Maintenance of different another microbiological instruments

Practice: Working procedure of microtome, Incubator, Hot air oven, autoclave and others

Suggested Reading

1. A Textbook of Medical Laboratory Technology by P Godkar, Publisher Bhalani
2. Textbook of Clinical laboratory methods and diagnosis by Ales C. Sonnenwirth& Leonard Jarret.
3. A Procedure Manual for Routine Diagnostic Tests Vol. I and II by KL Mukherjee, Publisher McGraw Hill education Pvt limited
4. Manual of lab and diagnostic tests by Lippincott Williams Wilkins, New York, Fischbach, 2005.
5. Microbiology by Prescott
6. Principles and Techniques of Biochemistry and Molecular Biology by Wilson and Walker
7. Medical laboratory science theory and practice by J Ochei and Kolhatkar, Publisher TBS

BSCM1105-Anatomy, Physiology & Haematology Lab

Subject Name	Code	Type of course	T-P-Pj	Prerequisite
Anatomy, Physiology & Haematology Lab	BSCM1105	Practice	0-6-0	Basic Medical Science

Course Objectives

- To identify the cell, different organelles and describe their functions.
- To identify the major organ systems of the human body and describe their functions.
- The overall aims are that the student should obtain advanced knowledge of the most common hematologic diseases & understanding the concept of Blood cells and other blood components.
- Clinically relevant hematological analysis for deeper understanding of Evaluate normal and abnormal cell morphology with associated diseases and other blood components.

Course outcome

- Use anatomical terminology to identify and describe locations of major organs of each system covered.
- Explain interrelationships among molecular, cellular, tissue, and organ functions in each system.
- Describe the interdependency and interactions of the systems.
- Differentiate various laboratory test findings with their associated clinical conditions.
- Identify the various skills necessary to perform blood counts, evaluate blood elements, and report results within the stated limits of accuracy.
- Describe the various components of blood, their functions, and roles in various disease states.

Anatomy, Physiology

Demonstrate the different body parts, their position, Structure from charts, models.

Identification of different joints and bones.

Demonstration of various parts of body, tissues of body, parts of digestive system, parts of respiratory system, parts of excretory system.

Haematology Lab

Cleaning and drying of glass and plastic ware.

Preparation of various anticoagulants, Collection of venous and capillary blood, Cleaning of glass-syringes and its sterilization. Preparation of buffers, Preparation of the stains and other reagents, Preparation of peripheral blood film (PBF), To stain a peripheral blood Film by Leishman- stain, Haemoglobin estimation (oxy Hb and cyanmethaemoglobin method).

Complete Blood Counts, Determination of Haemoglobin, TRBC Count by Haemocytometers, TLC by Haemocytometer, Differential Leukocyte count, Determination of Platelet Count.

Determination of ESR by wintrobes, Determination of ESR by Westergren's method, Determination of PCV by Wintrobes, Erythrocyte Indices- MCV, MCH, MCHC. Reticulocyte Count, Absolute Eosinophil Count, Morphology of Red Blood Cells.

Suggested reading:

1. A Textbook of Medical Laboratory Technology by P. Godkar, Publisher Bhalani
2. Hand book of Medical Lab Technology by V. S. Talib, Publisher CBS
3. Practical Haematology (8th edition) by Sir John, Publisher Churchill Livingstone
4. Clinical Hematology by Christopher A. Ludlam

5. A Procedure Manual for Routine Diagnostic Tests Vol. I and II by K. L. Mukherjee
 Publisher McGraw Hill education Pvt. limited.

2nd semester B. Sc Clinical Microbiology

FCBS0101-Environmental Science

Subject Name	Code	Type of course	T-P-Pj	Prerequisite
Environmental Science	FCBS0101	Theory	3-0-0	Fundamental Science

Course Objectives

- To understand the concept of multi-disciplinary nature of Environmental Science where different aspects are dealt with a holistic approach.
- Students will develop a sense of community responsibility by becoming aware of environmental issues in the larger social context.
- One must be environmentally educated.

Course outcome

- Understand the natural environment and its relationships with human activities.
- Characterize and analyze human impacts on the environment.
- Integrate facts, concepts, and methods from multiple disciplines and apply to environmental problems.
- Design and evaluate strategies, technologies and methods for sustainable management of environmental systems and for the remediation or restoration of degraded environments.

Unit-1

Environment and its multidisciplinary nature; Need for public awareness; Renewable and non-renewable resources—forest, water, mineral, land, food and energy resources; Structure and function of ecosystems of forest, grass land, desert and aquatic types.

Unit-2

Biodiversity and its conservation: Biodiversity at global, national and local levels; Threats to biodiversity - Habitat loss; wild life poaching and man - wildlife conflicts; Endangered and endemic species; conservation measures.

Causes, effects and control measures of pollution, air, water and noise pollution; Nuclear hazards; solid-waste management—Causes, effects and control measures; Management of disasters due to natural causes of floods, earthquakes, cyclones and landslides.

Unit-3

Social issues and the environment; Sustainable environment, Water conservation measures; Rain

water harvesting; Resettlement and rehabilitation of people; Climate change and global warming; Acid rain; Ozone layer depletion; water land reclamation; Consumerism and waste products; Features of Environment Protection Act, Air pollution and Control of Pollution Acts; Water Pollution and its Control Act. Effects of Pollution explosion on environment and public health; Need for value education to Protect environment and resources.

Text Book:

1. Anubhav Kaushik & C.P. Kaushik: Environmental Studies-New age International Publishers.

Reference Books:

1. Benny Joseph: Environmental Studies-Tata Mac Graw Hill
2. Bharucha: Text book of Environmental Studies for under graduate courses– Universities Press. (Book prepared by UGC Committee)

FCHU1201- Foundations of English Communication

Subject Name	Code	Type of course	T-P-Pj	Prerequisite
Foundations of English Communication	FCHU1201	Practice	0-3-0	Fundamental Science

Course Objectives

- To develop vocabulary and grammar knowledge
- To develop reading comprehension skills

Course outcome

- Development of academic and sub-technical vocabulary
- Enhancement of basic language skills, i.e., listening, speaking, reading and writing
- Development of grammatical competence
- Confidence level improvement

This course aims to build the vocabulary, comprehension, and writing skills for effective communication in English language. It will focus on reading, listening to, and writing passages, as a means of learning communications skills. The essential elements of this course will include:

Unit-1

READING SKILLS (7hrs.)

Read one of the following books:

- Animal Farm
- Alice in Wonderland
- Guide
- Malgudi Days
- Harry Potter
- Amar Chitra Katha

Comprehension Skills: Students will respond to comprehension lessons from the chosen book.

Unit-2

WRITING SKILLS (7hr.)

Students learn grammar and usage by writing passages, and getting formal feedback on these.

Unit-3

LISTENING SKILLS (6hrs.) Students respond to questions based on listening to videos, audio, or

speaking assignments of classmates.

Unit-4

SPEAKING SKILLS (7hrs.) Speaking assignments based on chosen book or contemporary topics.

TEXT BOOKS:

Esteras, Santiago Remacha and Fabre, Elena Marco. (2007).

Professional English in Use ICT Student's Book. Cambridge: Cambridge University Press.

REFERENCES:

Grellet, F. (1981). Developing Reading Skills. Cambridge: Cambridge University Press

McCarthy, M. & O'Dell, F. (2008).

Academic Vocabulary in Use. Cambridge: Cambridge University Press.

Ur Penny, (1992). Five- Minute Activities: A Resource Book of Short Activities (Cambridge

Handbooks for Language Teachers). Cambridge: CUP F Klippel. (1984).

Keep Talking. Cambridge: CUP

BSCM1201- General Microbiology

Subject Name	Code	Type of course	T-P-Pj	Prerequisite
General Microbiology	BSCM1201	Theory	4-0-0	General Microbiology

Course Objectives

- Describe the use of microorganism in different industries to produce valuable products like drugs, beverages and different food products etc.
- To developed skills for growing microorganisms in the laboratory for the production of different products by different microorganisms.

Course outcome

- Students has acquired a fairly good knowledge of how microbes are used in the fermentative production of organic acids, alcohols, enzymes, antibiotics and various foods in the industry.
- Enhances analytic ability of various physical parameters which affect production of industrial products by the microorganisms and the safety aspects of the production and use of these products.
- The conceptual understanding of the subject provides opportunities for employability and scopes for higher education.
- Developes laboratory skills in producing alcohol and enzymes by fermentative process using bacteria/yeast.

Unit-1

Introduction to Microbiology, Definition, history, host- microbe relationship, and safety measures in a microbiology laboratory. Morphology of bacterial cell wall, Bacterial anatomy (Bacterial cell structure: including spores, flagella, pili and capsules). Sporulation. Classification of bacteria according to cell wall and shape (arrangement), Classification of micro-organisms.

Growth and Nutrition of Microbes: General nutritional requirements of bacteria, Bacterial growth curve

Practice: Preparation of culture media, demonstrate aerobic and anaerobic culture.

Demonstration the different culture plate and bacterial growth, identification of bacteria

Unit-2

Sterilization: Definition, sterilization by dry heat, moist heat (below, at & above 100° C), Autoclave, Hot air oven, Radiation and Filtration, preventive measures, controls and sterilization indicators. Use of laminar flow in sterilization.

Antiseptics and Disinfectants: Definition, types, properties, mode of action and use of disinfectants and antiseptics, efficiency testing of disinfectants.

Practice:- Demonstrate the different methods of sterilization with handling Hot air oven, Autoclave. Handling Of compound microscope. Demonstration of Antiseptics, Spirit, Cetrimide & Povidone-iodine.

Demonstration the disinfectants and precaution while using disinfectants

Unit-3

Staining techniques: Methods of smear preparation, Gram stain, AFB stain, Albert's stain and special staining for spore, capsule and flagella, Culture Media, Liquid and solid media, defined and synthetic media, routine laboratory media (basal, enriched, selective, enrichment, indicator, and transport media). Different Culture, media their preparation and uses in microbial growth.

Practice: Demonstration the different staining procedure like Gram stain, Zn stain, Albert's stain etc Demonstrate different microbial growth in different media. Identify the morphology.

Suggested Reading:

1. Medical Laboratory Technology by Kanai Lal Mukherjee; Tata McGraw Hill, New Delhi
2. Microbiology by Prescott
3. An Introduction to Medical Laboratory Technology by FJ Baker; Butterworth – Heinemann; Oxford
4. Practical Book of Medical Microbiology by Satish Gupta; JP Brothers, New Delhi
5. Medical Laboratory Manual for Tropical Countries Vol. I and II by Monica Cheesbrough; Cambridge University Press; UK
6. Textbook of Medical Laboratory Technology by Praful B Godkar; Bhalani Publishing House, Mumbai

7. Text book of Medical Microbiology by Gruckshiank

BSCM1202- Clinical Biochemistry

Subject Name	Code	Type of course	T-P-Pj	Prerequisite
Clinical Biochemistry	BSCM1202	Theory	4-0-0	Fundamental Science

Course Objectives

- To understand the concept of metabolism of carbohydrates
- To understand the significance of amino acids, proteins
- Use of enzymes in enhancing metabolic reactions
- Role of lipids

Course outcome

- After completion of the course the student will be developed a very good understanding of various biomolecules which are required for development and functioning of cells.
- Would have understood the significance of carbohydrates in energy generation and as storage food molecules for cells.
- They would have understood the significance of proteins and enzymes in accelerating various metabolic activities.
- The conceptual understanding of the subject provides opportunities for skill enhancement and scopes for higher education.

Unit-1

Enzymes - Introduction, definition, classification, coenzymes, isoenzymes, properties, factors affecting enzyme action, enzyme inhibition, enzyme kinetics, diagnostic value of serum enzymes - Creatinine kinase, Alkaline phosphatase, Acid phosphatase, LDH, SGOT, SGPT, Amylase, Lipase, Carbonic anhydrase etc.

Unit- 2

Chemistry of carbohydrates & their related metabolism - Introduction, definition, classification, biomedical importance & properties. Brief outline of metabolism: Glycogenesis & glycogenolysis, Glycolysis, citric acid cycle & its significance, HMP shunt & Gluconeogenesis, regulation of blood glucose level. Components of respiratory chain, energy relationships during cell respiration, types of respiration. Pathways in intermediary metabolism of carbohydrates.

Unit- 3

Amino acids - Definition, classification, essential & non-essential amino acids. Chemistry of Proteins & their related metabolism - Introduction, definition, classification, biomedical importance. Metabolism: Transamination, Decarboxylation, Ammonia formation & transport, Urea cycle, metabolic disorders in urea cycle, catabolism of amino acids especially Phenylalanine, Tyrosine & Tryptophan, Creatine, Creatinine, and Proteinuria.

Practice: Operation procedure of Centrifuge machine, colorimeter, spectrophotometer etc. Estimation of Liver function test, Kidney function test, Thyroid, Lipid profile. Estimation of bile pigment, bile salt, bilirubin etc.

Unit- 4

Chemistry of Lipids & their related metabolism - Introduction, definition, classification, biomedical importance, essential fatty acids. Brief out line of metabolism: Beta oxidation of fatty acids, fatty liver, Ketosis, Cholesterol & it's clinical significance, Lipoproteins in the blood composition & their functions in brief, Atherosclerosis.

Diabetes mellitus - definition, types, features, gestation diabetes mellitus, glucose tolerance test, glycosurias, Hypoglycaemia& its causes.

Practice: - Demonstrate the estimation of Blood sugar by manual method and through Auto Analytic Technique. Demonstrate different biochemical test comes under the above unit

Suggested Reading

- Text book of Medical Laboratory Technology, P.B. Godkar 2nd Edn. 2003 Bhalani Publication.
- Text book of Biochemistry, M. A. Siddique 8th Edn.1993 Vijay Bhagat Scientific Book Co., Patna.
- Medical Biochemistry by AC Dey.
- Handbook of Christen Medical Association, India Medical Laboratory Technology- Robert H. Carman.

BSCM1203-Clinical Pathology & Diagnosis

Subject Name	Code	Type of course	T-P-Pj	Prerequisite
Clinical Pathology & Diagnosis	BSCM1203	Theory	4-0-0	Fundamental Science

Course Objectives

- Analyze body fluid for diagnosis of disease
- Analyze waste product for diagnosis of disease
- Understanding DOT Policy
- Understand Physiological disorder and infectious disease
- Analysis of pregnancy

Course outcome

- Able to collect pathological specimen
- Able to detect diabetes, ketosis, nephritis, jaundice and other physiological disorder
- Able to detect infectious disease (UTI, Hematuria, Filaria, Dysentery, Ulcer, TB, etc.)
- Preservation and processing of pathological sample.
- Identification of Parasites
- Analysis of Infertility disorder

Unit-1

Composition, collection and preservation of urine for various tests, physical chemical and microscopic examination of urine, estimation of total albumin, Specific gravity, litmus paper, tests for albumin, sugar, blood, bile salts and pigments, urobilinogen, ketones bodies etc. Urine meter, Esbachl'sAlbuminometer, preparation of various reagents.

Practice: Collection procedures of urine, Important precursors for collecting samples.

Physical and Chemical and Microscopic examination of urine.

Unit-2

Stool- Sample collection, physical, chemical and microscopic examination.

Sputum- Sample collection, stain and study of A.F.B.

Cerebrospinal Fluid: Pandy's test, Cell count, cell type differential count and malignant cells. Cells start; sell morphology and detection of malignant cells in peritoneal fluid, pleured fluid, pericardial fluid, and synovial fluid. Differences between transuded and exudates.

Semen Sample collections microscopic examination for count and malignant and morphology.

Practice: Collection procedures and important precursors for collecting samples like STOOL, CSF, SEMEN and different bodies fluid.

Physical and Chemical and Microscopic examination of different samples.

Unit-3

ANATOMIC PATHOLOGY: 1. Reception, Registration, preservation and processing of specimens. Haematoxyline and eosine staining procedure, mounting of stained sections, Filing of paraffin blocks, and slides. Method of decalcification, Sharpening and holing Knives techniques, using of microtome.

2. Museum: Mounting of specimens, labeling, maintenance of specimens and catalogue etc.

Post mortem/ Autopsy: Maintenance of the records of the Dead Bodies and specimens received, Autopsy techniques, Autopsy instruments, cold storage plants, legal aspects etc.

Practice: Handling clinical laboratorial equipment.

Preparation of some stains, and reagents for clinical diagnosis purpose.

Suggested Reading

- Textbook of Clinical laboratory methods and diagnosis by Gradwohls, Publisher Mosby
- Manual Text book of lab and diagnostic tests by Lippincott Williams Wilkins, New York.
- Medical laboratory science theory and practice by J Ochei and Kolhatkar, 2002, Tata McGraw- Hill, Publisher TBS

BSCM1205-Clinical pathology Lab

Subject Name	Code	Type of course	T-P-Pj	Prerequisite
Clinical pathology Lab	BSCM1205	Practical	0-3-0	Fundamental Science

Course Objectives

- Analyze body fluid for diagnosis of disease
- Analyze waste product for diagnosis of disease
- Understand Physiological disorder and infectious disease

Course outcome

- Able to collect pathological specimen
- Able to detect diabetes, ketosis, nephritis, jaundice and other physiological disorder
- Able to detect infectious disease (UTI, Hematuria, Filaria, Dysentery, Ulcer, TB, etc.)
- Preservation and processing of pathological sample.

Urine analysis Physical, Chemical, Microscopic, Microbiological.

Stool analysis Physical, Chemical, Microscopic, Microbiological.

Sputum analysis Physical, Chemical, Microscopic, Microbiological.

Semen analysis Physical, Chemical, Microscopic, Microbiological.

Bacteriological examination of pus.

Bacteriological examination of trout swab.

Laboratory study of parasites in stool, blood. Giardia lamblia, Entamoeba

BSCM1206- Microbiology Lab

Subject Name	Code	Type of course	T-P-Pj	Prerequisite
Microbiology Lab	BSCM1206	Practice	0-3-0	Fundamental Science

Course Objectives

- To know various Culture media and their applications and also understand various physical and chemical means of sterilization
- To know General bacteriology and microbial techniques for isolation of pure cultures of bacteria, fungi and virus
- To master aseptic techniques and be able to perform routine culture handling tasks safely and effectively

Course outcome

- This study demonstrates the practical skills in microscopy and their handling techniques and staining procedures.
- Provides knowledge on growth of microorganism.
- Provides knowledge Culturing microorganism.

Handling of Microscope

To learn techniques for Inoculation of bacteria on culture media To isolate specific bacteria from a mixture of organisms.

To demonstrate simple staining (Methylene blue)

To prepare India ink preparation to demonstrate negative staining.

Bacterial identification: To demonstrate reagent preparation and procedure for

Gram stain, Albert stain, Neisser's staining, Z-N staining, Capsule staining, Demonstration of flagella by staining methods, Spore staining, To demonstrate spirochetes by Fontana staining procedure

To prepare the reagent and demonstrate following biochemical tests with positive and negative control bacteria:

Catalase, Coagulase, Indole, Methyl Red (MR), Voges Proskauer (VP), Urease, Citrate, Oxidase, TSIA, Nitrate reduction, Carbohydrate fermentation, Huger and Leifson, Bile solubility, H₂S production Demonstration and motility, Decarboxylases, CAMP, Hippurate hydrolysis, Nagler's reaction

Antibiotic susceptibility test

Suggested Reading

1. Manual of lab and diagnostic tests by Lippincott Williams Wilkins, Fischbach, 2005 New York.
2. Clinical laboratory methods and diagnosis by Gradwohl, 2000, Publisher Mosby
3. Medical laboratory science theory and practice, J Ochei and Kolhatkar, 2002, publisher TBS
4. Medical laboratory technology Vol.1 by K. L. Mukherjee, 2007, publisher Tata McGraw Hill.

3rd semester B. Sc Clinical Microbiology
BSCM2301- Immunology

Subject Name	Code	Type of course	T-P-Pj	Prerequisite
Immunology	BSCM2301	Theory	4-0-0	Fundamental Science

Course Objectives

- Understanding the concept of Innate & adaptive immune system; complement system; Hypersensitivity.
- Clinically relevant serological analysis for deeper understanding of antigen-antibody interaction.

Course outcome

- Application of Immunology in disease diagnosis.
- Students will be able to understand and explain the basis of allergy and allergic diseases along with immunological tolerance and autoimmunity.
- The conceptual understanding of the subject provides opportunities for employability and scopes for higher education.

Unit-1

Immunity: Classification, Measurement of immunity, Local immunity, Herd immunity.

Antigens: Types of antigen, Antigenic Determinant or Epitome, Determinants of Antigenicity Tolerogens, Biological Classes of antigens, Superantigens.

Antibodies-Immunoglobulins: Antibody structure, Immunoglobulin classes of Antigens, Antigenic Determinants on Immunoglobins.

Practice: Collection of blood sample by vein puncture, separation and preservation of serum. Raising haemolysin in Rabbit and performing its titration for Rose-Waaler test.

Unit-2

The Complement System: Principal pathways of Complement activation, Quantitation of Complement

(C) and its Components. Biosynthesis of complement, Complement Deficiencies. Antigen-Antibody Reactions: Antigen-Antibody Interactions, General characteristics of Antigen-Antibody Reactions, Antigen-Antibody measurement, Parameters of serological tests, Serological Reactions.

Practice: - Preparation of Phosphate buffers, Vernol buffer, ASO buffer, Richardsonsbuffer Buffers of different pH and molarity, tris buffer, Standardization of cell concentration by spectrophotometer

Unit-3

Immune Response: Types of Immune response, Humoral immunity, Fate of Antigen in tissues, Production of Antibodies, Cell-mediated Immune Responses, Cytokines, Immunological tolerance, Theories of immune Response.

Hypersensitivity Reactions: Classification of hypersensitivity reactions, Type I Hypersensitivity (IgE Dependent). Type II Hypersensitivity: Cytolytic and Cytotoxic. Type III Hypersensitivity- Immune Complex-mediated, Type IV Hypersensitivity- Delayed Hypersensitivity, Shwartzman

Reaction.

Practice: Performance of Serological tests i.e. Widal, Brucella Tube Agglutination, VDRL(including Antigen Preparation), ASO (Antistreptolysin 'O'), C-Reactive Protein (Latex agglutination), Rheumatoid factor (RF) Latex agglutination, Rose Waalest

Suggested Readings:

1. Text book of Microbiology by Ananthanereyan&Paniker, Publisher Universities press
2. Short text book of Medical microbiology by Satish Gupta, Publisher Jaypee brotthers
3. Medical laboratory Technology vol.I ,II, III by K L Mukherjee, Publisher McGraw Hill education
4. Medical Laboratory manual for tropical countries Vol II Microbiology by MoniaCheesbrough, publisher Butterworth Heinemann ltd
5. Immunology by Ivan Roitt, JonathaanBrostoff and David Male
6. Practical Medical Microbiology by Mackie &MacCartney Volume 1 and 2
7. Immunology by Kuby

BSCM2302- Systemic Bacteriology

Subject Name	Code	Type of course	T-P-Pj	Prerequisite
Systemic Bacteriology	BSCM2302	Theory	4-0-0	Fundamental Science

Course Objectives

- To learn opportunities in the basic principles of medical microbiology and infectious disease.
- To study mechanisms of infectious disease transmission, principles of aseptic practice, and the role of the human body's normal microflora.
- To understand the importance of pathogenic bacteria in human disease with respect to infections of the respiratory tract, gastrointestinal tract, urinary tract, skin and soft tissue.

Course outcome

- The course provides the conceptual basis for understanding pathogenic microorganisms and the mechanisms by which they cause disease in the human body.
- Recall the relationship of this infection to symptoms, relapse and the accompanying pathology.
- Explain the methods of microorganism's control, e.g. chemotherapy & vaccines. Solve problems in the context of this understanding.

Unit 1

Morphology, Metabolism, Pathogenesis, Laboratory Diagnosis, Prevention and Control of:

a. Cocci (Gram Positive):

Aerobic: Micrococcus spp., Staphylococcus spp., Streptococcus spp.

Anaerobic: Peptococcus spp., Peptostreptococcus spp., Villanelle spp., Acidaminococcus spp.

Megasphaeria spp., Coprococcus spp., Ruminococcus spp. and others.

b. Cocci (Gram Negative): Aerobic: Neisseria spp., Anaerobic Gram-negative bacteria.

Unit 2

Morphology, Metabolism, Pathogenesis, Laboratory Diagnosis, Prevention and Control of:

a. Aerobic non-spore forming gram positive bacilli:

Bacillus spp., Corynebacterium spp., Antinomycespyogens, Nocardia spp., Mycobacterium spp.-

pathogenic, Tubercle bacilli and MOTT bacilli (Atypical mycobacterium) and Hansen's bacilli and others.

b. Anaerobic: Bifidobacterium spp., Eubacterium spp., Actinomyces spp., Propionebacterium, Arachenia spp., Clostridium spp., and others.

Unit 3

Morphology, Metabolism, Pathogenesis, Laboratory Diagnosis, Prevention and Control of Gram-Negative Bacilli

Aerobic: Enterobacteriaceae , Citrobacter spp , Edwardsiella spp ,Enterobacter spp , Escherichia coli, Ewingella , Hafnia spp., Klebsiella spp., Kluyvera ,Leclercia , Leminorella, Moellerella, Morganella spp., Pantoea ,Proteus spp., Porvidencia spp., Rahnella Salmonella spp., Serratia spp., Shigella spp., Tatumella, Yersinia spp., Vibrio spp., Pseudomonas spp., Clamidia and chlamydophila, Brucella spp., Bordetella spp., Haemophilus spp., mycoplasma spp.

BSCM2303- Molecular Biology

Subject Name	Code	Type of course	T-P-Pj	Prerequisite
Molecular Biology	BSCM2303	Theory	4-0-0	Fundamental Science

Course Objectives

- To provide depth knowledge of biological or medicinal processes through the investigation of the underlying molecular mechanisms.
- Understanding of chemical and molecular processes that occur in and between cells. Understanding will become such that can be able to describe and explain processes and their meaning for the characteristics of living organisms.

Course outcome

1. Conduct independent work in a laboratory.
2. Read scientific articles and gain a critical understanding of their contents.
3. Give a spoken and written presentation of scientific topics and research results.
4. Present hypotheses and select, adapt and conduct molecular and cell-based experiments to either confirm or reject the hypotheses.

Unit 1

Introduction: a. Introduction to molecular biology, b. Molecular biology of cell, Evolution and Molecular structure of cell and its organelles.

Types of cells. Including different kinds of Prokaryotic and eukaryotic cells,

Cell growth, Cell adhesion, cell junctions and extra cellular matrix organelles, Cell cycle, Cell membrane and its structure (fluid-mosaic model)

Factors influencing on membrane fluidity, asymmetry of membrane and membrane transport (active and passive)

Unit 2

Molecular Nature of the Genetic Material in Prokaryotic and Eukaryotic Cells:

Molecular biology of Genes, DNA: Molecular structure, types: Primary, secondary and tertiary, Double helix, types, DNA Replication, Transferring information from DNA to RNA, Synthesis of RNA, Translation

RNA: Molecular structure, types. Evolution of DNA and RNA, Gene and genetic codes

Unit 3

General Concept on:

a. Regulation of the Gene Expression

b. Regulating the Metabolism:

The Lac- Operon system, Catabolic repression, Trp Operon system: regulating the biosynthesis of the tryptophan, Gene expression in Eukaryotic cells, Plasmids: types, maintenance and functions

Unit 4

DNA Replication and Gene Expression: DNA Replication: Semi conservative Nature of DNA Replication, DNA Replication in prokaryotic Cells, DNA Replication in Eukaryotic cell Enzymes involved in DNA Replication: DNA polymerases, Proofreading, post-replication Modification of DNA. Transferring information from DNA to RNA, Synthesis of RNA, RNA polymerase, Initiation and Termination of Transcription, Post transcription modification of the RNA

Protein Biosynthesis: Translation of the genetic code, Translation of m RNA, Role of RNA in protein synthesis, Forming the polypeptides- elongation, Termination of the protein biosynthesis.

BSCM2304- Systemic Virology & Mycology

Subject Name	Code	Type of course	T-P-Pj	Prerequisite
Systemic Virology & Mycology	BSCM2304	Theory	4-0-0	Fundamental Science

Course Objectives

- To learn opportunities in the basic principles of medical microbiology and infectious disease.
- To study mechanisms of infectious disease transmission, principles of aseptic practice, and the role of the human body's normal microflora.
- To understand the importance of pathogenic Virus and fungus in human disease with respect to infections of the respiratory tract, gastrointestinal tract, urinary tract, skin and soft tissue.

Course outcome

- The course provides the conceptual basis for understanding pathogenic microorganisms and the mechanisms by which they cause disease in the human body.
- Know the methods used in studying viruses and fungi.
- Recall the relationship of this infection to symptoms, relapse and the accompanying pathology.
- Explain the methods of microorganism's control, e.g. chemotherapy & vaccines. Solve problems in the context of this understanding.

Unit 1

Introduction and Scope of Virology.

General Properties of Viruses and Structure (Morphology).

Classification of Medically Important Viruses.

Genetic material, Organ system involved, Transmission

Unit 2

Replication of Viruses, Virus Host Interaction, Bacteriophage

Epidemiology, Pathogenesis, Treatment, Prevention and Control of Viral Diseases (DNA Viruses) *Adenoviridae, Poxviridae, Herpesviridae, Papoviridae, Parvoviridae, Hepadnaviridae*

Epidemiology, Pathogenesis, Treatment, Prevention & Control of Viral Diseases (RNA Viruses):

Orthomyxoviridae, Paramyxoviridae, Picornaviridae, Corona viridae, Togaviridae, Rhabdoviridae,

Retroviridae, Coronaviridae, Bunyaviridae, Arenaviridae, Filoviridae, Reoviridae and Calciviridae

Unit 3

Mycology: Introduction: Scope and medical importance of fungi- Molds, Mushroom, Yeast. Definition: Mycology, Medical Mycology, Mycetes, Mycosis, Thallus, Hypha, Mycelium, Coenocyte, Rhizoids and Club.

Classification, Structure and Physiology of fungi:

Cryptogam (Thallophyta: Fungi Algae), Phanerogam, Pseudomycetes, Schizomycetes (Bacteria Actinomycetes, Actinomycetalia, Nocardia, Yeasts)

Myxomycetes (Slime, Molds), Eumycetes (True fungi), Ascomycetes (Histoplasma, Candida, Blastomycosis), Basidiomycetes (Cryptococcus, Rhizopus), Phycomycetes Mucor, Epidermophyton

Fungi imperfecti: (Trichophyton).

Unit 4

Vegetative Structure (Morphology) of Fungi: Septate, aseptate, Plectenchyma, Prosenchyma, Pseudoparenchyma, Modification of Plectenchyma (Rhizomorph, Sclerotia, Stroma).

Mode of Nutrition of Fungi: Saprophytes, Parasites (Obligate parasite, Facultative parasite, Ecto-parasite, Endo-parasite), Symbionts: Lichen

Pathogenic Group of Fungi: Opportunistic pathogens, True pathogens:

Blastomyces dermatitidis, Cooccidioides immitis, Paracoccidioides brasiliensis, Histoplasma capsulatum.

A. Dermatophytes: *Mycrosporium* (Hair, skin), *Trichophyton* (Skin, hair, nail), *Epidermophyton* (Skin, nail), *Aspergillus spp.*

1. Dermatomycosis (*Candida albicans, Cryptococcus neoformans*)

FCHU1204- Communicative Practice Laboratory-2

Subject Name	Code	Type of course	T-P-Pj	Prerequisite
Communicative Practice Laboratory-2	FCHU1204	Practice	0-3-0	Fundamental Science

Course Objectives

- To master Study Skills
- To acquire strategic competence to use both spoken & written language to use in a wide range of communication strategies
- To acquire Business Performance Skills

Course outcomes

- The students will be able to Write effectively for a variety of professional and social settings. They will practice writing as a process of motivated inquiry engaging others writers' ideas as they explore and develop their own. They will demonstrate an ability to revise for content and edit for grammatical and stylistic clarity. And they will develop an awareness and confidence in their own voice as a writer.
- Become accomplished, active readers who appreciate ambiguity and complexity, and who can articulate their own interpretations with an awareness and curiosity for other perspectives.
- Demonstrate the skills needed to participate in a conversation that builds knowledge

collaboratively; listening carefully and respectfully to others' view points; articulating their own ideas in relation to other voices and ideas. Students will be able to prepare, organize and deliver an engaging oral presentation. A student is required to take up five lab tests of 100 marks- at least two tests in written mode and three tests in spoken mode.

Module I

LISTENING (6 HOURS) Exercises on Active Listening:

- The whole group listens to any speech/news broadcast in English and notes down the important points. They listen again to check their points and evaluate themselves. The group then compares points to see how well they have understood the broadcast.

Module II

SPEAKING (8 HOURS)

- Situational Dialogues / Role Play: Organization Communication
- Oral Presentations- Prepared and Extempore
- 'Just a minute' Sessions (JAM)
- Debates
- Mock Meetings
- Cracking Job Interviews: Mock Sessions
- Group Discussions on current topics (This module will be practiced through speaking activities like role plays, presentations, and discussions)

Module III

READING (8 HOURS)

- Students will be given practice in reading and comprehension 6-8 passages of 100-300 words each, on topics of General as well as professional interest. The texts will be supported by suitable exercises designed to foster comprehension skills and vocabulary enrichment. Students are encouraged to read newspapers, articles, books and novels.
- Reading Comprehension Exercises Through Tests, Writing Summary and Presenting, Note Making
- Review Presentation (Movie/ Article/ Book)
- Vocabulary Building Exercises (This module encourages extensive use of reading materials)

Module IV

WRITING (8 HOURS)

- The Writing Lab content is designed to acquaint the students not only with the techniques of effective writing but also give them an insight into planning and writing documents that produce results.
- Short Paragraphs on current general and technical topics
- Creative Writing: Idea Generation
- Business Letters, Email Messages, Project Writing
- Writing Resumes and Cover Letters (* Students will be required to produce and submit by the end of second semester a 350-500 word project report on a topic of their choice. The project should involve data collection, analysis and reporting. Ten marks (out of 100 marks allocated for Lab Test) will be set apart for the project.)

BSCM2307- Virology & Mycology Lab

Subject Name	Code	Type of course	T-P-Pj	Prerequisite
Virology & Mycology Lab	BSCM2307	Practice	0-3-0	Fundamental Science

Course Objectives

- To understand the importance of pathogenic Virus and fungus in human disease with respect to infections of the respiratory tract, gastrointestinal tract, urinary tract, skin and soft tissue.

Course outcome

- The course provides the conceptual basis and methods used in studying viruses and fungi.
- Recall the relationship of this infection to symptoms, relapse and the accompanying pathology.
- Aware and train in aseptic handling of microbial specimens. Practice safe microbiology, using appropriate protective and emergency procedures.

Virology

Demonstration of virus isolation techniques.

Demonstration of cell and tissue culture techniques used for virus isolation.

Serological techniques used in diagnostic virology.

Mycology

Organization of laboratory – Mycology

Preparation of different media, chemical and stain for fungus study.

Isolation and identification of different fungi of medical important.

4th semester BSc Clinical Microbiology

BSCM2407- Public Health Microbiology

Subject Name	Code	Type of course	T-P-Pj	Prerequisite
Public Health Microbiology	BSCM2407	Theory	3-0-0	Fundamental Science

Course Objectives

- To learn the occurrence, abundance and distribution of microorganism in the community and their role in the associated with Public health and also learn different methods for their detection and characterization.
- To understand the basic principles of environment microbiology and be able to apply these principles to understanding and solving environmental problems – Water pollution and waterborne diseases, Air pollution and airborne infections.

Course outcome

- Explain prognosis of diseases and become aware about the role of medical microbiology in public health
- Understanding the role of microbiologist in public health

- Study of Air borne & water borne infection

Unit 1

Introduction to Public Health: Definition, scope, concept and importance of public health microbiology, Roles of microbiologist in public health, Concept of health and disease, Indicators of health, Microbial association of water, air and soil, Basic concept on pollution (air, water, noise, radiation and waste pollution) and public health hazard in the community.

Unit 2

Air Borne Infections: 1. Introduction: Air and its composition, Microbial air pollution, Sources of air pollution & control, Indicator of air pollution – WHO guide line (microbial pollution).

2. Air borne diseases: Transmission of pathogens, Respiratory infection (Viral, bacterial, fungal), Sources of infection, characters of organisms and controls of:

Bacterial pneumonia, Diphtheria, Tuberculosis, Influenza, Measles.

3. Method of measuring microorganisms in air.

Practice:- Selection, collection, perseveration and transportation of samples from the community to the laboratory.

Unit 3

Water Borne Infections: 1. Introduction: Definition of wholesome and safe water, Nature, cycle, sources, importance and quality (WHO guide line) of water. Water pollution and sanitation,

2. Microorganisms in water: Transmission of pathogens, Water borne diseases (Viral, bacterial, protozoal), Sources of infection, characters of organisms and control of:

Hepatitis, Cholera, Typhoid, Amoebiasis, Giardiasis, Poliomyeliti

Water Pollution Control. Method of Measuring Microorganisms in Water. Water Treatment, Control of Water Borne Diseases.

Practice:- Isolation and Identification of microorganisms from air.

Isolation and Identification of microorganisms from water and evaluation of water quality

Suggested Reading

1. A Text Book of Microbiology, by Ghimire P. & Parajuli K. VidhyarthiPustakBhandar Publication, Kathmandu.
2. Text Book of Social and Preventive Medicine by Park JE and Park K
3. Evidence Based Public Health by Brownson, RC., Baker, EA., Leet. TL., Follespie. KN, Oxford University Press
4. The Quest for Health, Educational Enterprises, Kathmandu, by Dixit H.
5. Epidemiology for Public Health Practice, by Friis, RH., and Sellers, TA, 2nd Edition, Gaithersburg, MD: Aspen Publication,
6. Modern Food Microbiology, by Jay, J, H 3rd Edition CBS Publication and Distributors Delhi 1987.
7. Introduction to Soil Microbiology, Martin Alecender, by Academic press, 1961.

BSCM2402- Pharmaceutical Microbiology

Subject Name	Code	Type of course	T-P-Pj	Prerequisite
Pharmaceutical Microbiology	BSCM2402	Theory	4-0-0	Fundamental Science

Course Objectives

- Understanding of types & synthesis of antimicrobial agents
- Manufacture of antibiotics
- To understand the mechanism of action of antibiotics
- To study how microorganisms are known to develop resistance to antibiotics

Course outcome

- With the completion of the course, the students will acquire detailed knowledge of antimicrobial agents, their mechanism of action and basis of resistance of microbes to these antimicrobials, formulations.
- They will develop an understanding of different types of disinfectants/antiseptics and their uses, evaluation of their bactericidal and bacteriostatic action.
- The conceptual understanding of the subject provides opportunities for employability and scopes for higher education.

Unit 1

Introduction to Pharmaceutical Microbiology: Scope, Importance, Chemical disinfectants, Antiseptic, Antibiotics, Preservatives, Static and cidal activity (fungus, bacteria), Germicidal activities Types of Antibiotics and Synthetic Antimicrobial Agents:
Antibiotics, Types and Classification of antibiotics, Synthetic antibiotics, Antiviral drug

Unit 2

Manufacture of Antibiotics: Production of penicillin, Production of streptomycin
Assessment of New Antibiotics: Parameters, determination of the usefulness of antibiotics (in vitro and in vivo), Pharmacokinetics and Pharmacodynamics of Antimicrobial agents
Antibiotic Assay: Microbiological method, Disc diffusion technique, Dilution technique, Rapid method.

Unit 3

Mechanisms of Action of Antibiotics: Cell wall synthesis inhibitors, Inhibitors of protein biosynthesis, Inhibitors of tetrahydrofolate, Disorganize the cytoplasm membrane. Mode of Action of Antibiotics and Bacterial Resistance to Antibiotics:
Mode of action of antibiotics (cell wall cytoplasmic membrane, cytoplasm and compounds), Biochemical mechanisms of resistance, Genetic basis of antibiotic resistance, Problems in antibiotic therapy due to resistance
Evaluation of Antibiotics and Non-antibiotics Agents: Preliminary evaluation, Evaluation of Static activity (fungus, bacteria), Evaluation of Germicidal activities (fungus, bacteria)
Microbial Spoilage and Preservation of Pharmaceutical Products.

Suggested Reading

1. W B Hugo and A D Russel, Pharmaceutical Microbiology, 2nd Edition
2. Ghimire P. Hand book of Practical Microbiology, 2003, Pravesh Publication, Kathmandu

BSCM2408-Industrial Microbiology

Subject Name	Code	Type of course	T-P-Pj	Prerequisite
Industrial Microbiology	BSCM2408	Theory	3-0-0	General Microbiology

Course Objectives

- Describe the use of microorganism in different industries to produce valuable products like drugs, beverages and different food products etc.
- To developed skills for growing microorganisms in the laboratory for the production of different products by different microorganisms.

Course outcomes

- Students has acquired a fairly good knowledge of how microbes are used in the fermentative production of organic acids, alcohols, enzymes, antibiotics and various foods in the industry.
- Enhances analytic ability of various physical parameters which affect production of industrial products by the microorganisms and the safety aspects of the production and use of these products.
- The conceptual understanding of the subject provides opportunities for employability and scopes for higher education.
- Develops laboratory skills in producing alcohol and enzymes by fermentative process using bacteria/yeast.

Unit 1

Introduction to Industrial Microbiology: Introduction, History, Definition and scope.

Industrial Equipment and Uses.

Fermentation Process: Primary and secondary screening, Detection and assay of fermentation products- Physical and chemical assays, Biological assay

Stock culture, Fermentation media, Inoculums preparation, Increasing products, Phage

Practice-: Observational visit to a beer/alcohol factory.

Observational visit to pharmaceutical, food and dairy industry.

Unit 2

Typical Fermentation Process:

Antibiotic drug fermentation - Penicillin, Streptomycin, Bacterial insecticide, Other antibiotics- Acetone, Lactic acid, Brewing

Biological Waste Treatment / Bioremediation: Anaerobic fermentation

Production of: Vitamin, Vaccines, Milk & Milk Products, Food, Baker's yeast, Food and feed yeasts, Mushrooms, Vinegar

Enzymes: Amylase, Proteolytic enzyme, Pectinases, Invertase Other enzymes

Unit 3

Industrial effluent: Introduction, Industrial pollution, Microbiology of Domestic sewage Methods for the treatment of industrial effluent and sewage.

Practice- Detection of Fermentation, Biological waste treatment.

Suggested Reading

L. E. Casida, JR., *Industrial Microbiology*, 1991, Wiley Eastern Limited, New Delhi,

BSCM2404- Analytical Biochemistry

Subject Name	Code	Type of course	T-P-Pj	Prerequisite
Analytical Biochemistry	BSCM2404	Theory	4-0-0	Fundamental Science

Course Objectives

- Understanding the concept of Biochemical analyzing instruments both automated and semi-automated.

- To learn about how to Care & Maintenance of Equipment & Chemicals.
- To learn normal ranges of biochemical components in our body.
- Clinically relevant biochemical analysis for deeper understanding of all biochemical components i.e., Proteins, Electrolytes, Hormones etc.

Course outcome

- Understanding of instrumentation technique & principle of spectrophotometry, colometry, photometry and electrolyte analyzer.
- To learn about Various tests carried out for biochemical analysis & Hormone investigations.
- To learn about safety precautions and handling the equipment in biochemical laboratory.

Unit-1

Principle of colorimetry and Spectrophotometry, Chromatography: Basics of chromatography (Paper chromatography, Thin Layer Chromatography, Column chromatography, Gas chromatography, Ion exchange chromatography, Gel chromatography)

Unit-2

Electrophoresis: Introduction, principle, Instrumentation, types of electrophoresis - paper and gel electrophoresis, application

Unit-3

Automation in clinical Biochemistry, Method of estimation and assessment for: a. Glucose tolerance test, b. Insulin tolerance test, c. Xylose excretion test.

Clearance test for renal function. Gastric analysis, LFT, KFT, Lipid profile, Qualitative test for Urobilinogens, Barbiturates, T3, T4 and TSH, 17 Ketosteroids. Principles, clinical significance and procedures for estimation, of Acid phosphatase, Alkaline phosphatase, Lactate dehydrogenase, Aspartate transaminase, Alanine, transaminase and Creatine phosphokinase.

Suggested readings

1. Handbook of Christen Medical Association, India (CMAI) Medical Laboratory Technology- Robert H.Carman. 2nd Edn. CMAI, New Delhi.
2. Text book of Medical Laboratory Technology, P.B. Godkar 2nd Edn. Bhalani Publication.
3. Handbook of Biochemistry by M. A. Siddique 8th Edn. Vijay Bhagat Scientific Book
4. Principle of Biochemistry by Lehninger
5. Biochemistry by Voet&Voet
6. Biochemistry by Stryer

BSCM2409- Basic Computer & Information Technique

Subject Name	Code	Type of course	T-P-Pj	Prerequisite
Basic Computer & Information Technique	BSCM2409	Practice	0-3-0	Fundamentals of Computer

Course Objectives

- Identify the function of computer hardware components.
- Identify the factors that go into an individual or organizational decision on how to purchase computer equipment.
- Identify how to maintain computer equipment and solve common problems relating to computer hardware.
- Identify how software and hardware work together to perform computing tasks and how software is developed and upgraded

- Identify different types of software, general concepts relating to software categories, and the tasks to which each type of software is most suited or not suited.

Course outcome

- Understand the fundamental hardware components that make up a computer's hardware and the role of each of these components.
- Understand the difference between an operating system and an application program, and what each is used for in a computer.
- Describe some examples of computers and state the effect that the use of computer technology has had on some common products

Unit-1

Introduction to computer: introduction, characteristics of computer, block diagram of computer, generations of computer, computer languages.

Input output devices: input devices (keyboard, point and draw devices, data scanning devices, digitizer, electronic card reader, voice recognition devices, vision-input devices), output devices (monitors, pointers, plotters, screen image projector, voice response systems).

Unit-2

Processor and memory: The Central Processing Unit (CPU), main memory.

Storage Devices: sequential and direct access devices, magnetic tape, magnetic disk, optical disk, mass storage devices.

Introduction to MS-Word: introduction, components of a word window, creating, opening and inserting files, editing a document file, page setting and formatting the text, saving the document, spell checking, printing the document file, creating and editing of table, mail merge.

Unit-3

Introduction to Excel: introduction, about worksheet, entering information, saving workbooks and formatting, printing the worksheet, creating graphs.

Introduction to power-point: introduction, creating and manipulating presentation, views, formatting and enhancing text, slide with graphs. Introduction of Operating System: introduction, operating system concepts, types of operating system. Introduction to MS-DOS: History of DOS, features of MS-DOS, MS-DOS Commands (internal and external).

Unit-4

Introduction of windows: History, features, desktop, taskbar, icons on the desktop, operation with folder, creating shortcuts, operation with windows (opening, closing, moving, resizing, minimizing and maximizing, etc.). Computer networks: introduction, types of network (LAN, MAN, WAN, Internet, Intranet), network topologies (star, ring, bus, mesh, tree, hybrid), components of network.

Internet and its Applications: definition, brief history, basic services (E-Mail, File Transfer Protocol, telnet, the World Wide Web (WWW)), www browsers, use of the internet. Application of Computers in various fields: Medical, Education, Railway, Defense, Industry, Management, Sports, Commerce, Internet.

Suggested readings:

1. Objective Computer Awareness
2. Computer Networking (Global Edition)

BSCM2410- Industrial Microbiology Lab

Subject Name	Code	Type of course	T-P-Pj	Prerequisite
Industrial Microbiology Lab	BSCM2410	Practice	0-3-0	General Microbiology

Course Objectives

- Describe the use of microorganism in different industries to produce valuable products like drugs, beverages and different food products etc.

Course outcomes

- Enhances analytic ability of various physical parameters which affect production of industrial products by the microorganisms and the safety aspects of the production and use of these products.
- Understand the basics of fermentation technology, screening techniques, microbial culture preservation techniques etc.
- Aware about the detail downstream process of fermentation of important microbial products.

- Observational visit to a beer/alcohol factory.
- Observational visit to pharmaceutical, food and dairy industry.
- Detection of Fermentation
- Biological waste treatment.

BSCM2411- Public Health Microbiology Lab

Subject Name	Code	Type of course	T-P-Pj	Prerequisite
Public Health Microbiology Lab	BSCM2411	Practice	0-3-0	Fundamental Science

Course Objectives

- To learn the occurrence, abundance and distribution of microorganism in the community and their role in the associated with Public health and also learn different methods for their detection and characterization.

Course outcome

- Understanding the role of microbiologist in public health
- Get a clear vision about various aspects of infectious diseases
- Carry out fundamental or applied research in the field of Public Health Microbiology

- Isolation and identification of microorganism from different food products: meat, canned juice, milk, cheese and ice cream.
- Isolation and identification of microorganism transmitted through vector, insect.
- Isolation and identification of microorganism (STIs)
- Isolation and Identification of microorganisms (hospital acquired infection)

BSCM2412- Biochemistry lab

Subject Name	Code	Type of course	T-P-Pj	Prerequisite
Biochemistry Lab	BSCM2412	Practice	0-3-0	Fundamental Science

Course Objectives

- To understand the significance of carbohydrates in energy generation and as storage food molecules for cells. To understand the significance of amino acids, proteins.

Course outcome

- They would have understood the significance of proteins and enzymes in accelerating various metabolic activities.
- The conceptual understanding of the subject provides opportunities for skill enhancement and scopes for higher education and would have understood the principles of Liver function test, kidney function test, lipid profile etc.

1. Demonstration of centrifuge machine, colorimeter
2. Estimation of Liver function test, kidney function test, lipid profile
3. Estimation of Glucose in Urine and in Blood.
4. Estimation of Protein in Urine and Blood.
5. Estimation of Urea in blood.
6. Estimation of uric acid in blood.
7. Estimation of serum bilirubin
8. Estimation of Total Cholesterol in blood.
9. Estimation of HDL Cholesterol.
10. Estimation of LDL Cholesterol.
11. Estimation of TG, Estimation of Creatinine in Blood.
12. Estimation of serum calcium.
13. To measure electrolytes Sodium, Potassium & Chloride.

5th semester B. Sc. Clinical Microbiology

BSCM3508 –Epidemiology

Subject Name	Code	Type of course	T-P-Pj	Prerequisite
Epidemiology	BSCM3508	Theory	2-0-0	Fundamental Science

Course Objectives

- Understand the basic epidemiological methods and study designs.
- Understand and discuss population based perspective to examine disease and health – related events.
- Discuss the ethical issues in epidemiological research.
- Explain the importance of epidemiology for informing scientific, ethical, economic and political discussion of health issues.
- Describe a public health problem in terms of person, place, and time.
- Evaluate the strengths and limitations of epidemiologic reports

- Apply concepts, methods, and tools of public health data collection, analysis and interpretation, and the evidence-based reasoning and informatics approaches that are essential to public health practice.

Course outcome

- Distinguish between definitions of epidemiology and clinical epidemiology and public health research.
- Apply the terminology of the Epidemiologic Triad to an infectious disease.
- Describe the important historic events in the field of epidemiology.

Unit 1

Introduction to Principles of Epidemiology:

History, Definition, and scope of epidemiology, Achievements in epidemiology, Terms & Terminologies used in epidemiology.

Measuring Health and Disease: Definitions of health and disease, Measures of disease frequency Use of available information, Comparing disease occurrence

Unit 2

Concept of Epidemiological Study: Basic concepts of epidemiology Descriptive / Analytical, Applied/Experimental, Field Epidemiology

Concept of Prevention and Control of Diseases:

Causation in epidemiology: The concept of cause, Establishing the cause of a disease Epidemiological markers, Phenotypic and genetic markers including molecular epidemiology.

Disease surveillance: Clinical, Laboratory

Unit 3: Applied Epidemiology:

Communicable disease epidemiology, Clinical epidemiology, Environmental & occupational epidemiology, Nutritional epidemiology, Reproductive epidemiology, Social epidemiology

Food epidemiology.

Epidemiology, Health services and health Policy:

Health care planning, Monitoring & evaluation, The planning cycle, Epidemiology, public policy and health policy, Healthy public policy in practice

Suggested Reading

1. Basic Epidemiology. By Beaglehole R., Bonita R., Kjellstrom , World Health Organization, Geneva,
2. Field Epidemiology, By B Gregg, 2nd Edition, Oxford University Press, 2002
3. Gordis L. *Epidemiology*, 2nd Edition, WB Saunders Company Aharcourt Health Sciences Company, Philadelphia.
4. Epidemiology in Medicine, by LippincottEilliams and Wilkins, and Walters Kluwer Company
5. Epidemiology, Principle and Method, McMahon B, Trichopoulos D, by 2nd Edition, Boston, Little, Brown.

BSCM3509 -Diagnostic Bacteriology

Subject Name	Code	Type of course	T-P-Pj	Prerequisite
Diagnostic Bacteriology	BSCM3509	Theory	3-0-0	Fundamental Science

Course Objectives

- To confirm the suspicion of infectious bacterial disease.
- To identify the etiologic agent by isolating the causative bacterial pathogen.

Course outcome

- Study of Lab diagnosis for Enteric infection, Respiratory tract Infection, Oral & Stomach infection, Urinary tract infections.
- Study of control measures for nosocomial infection.
- Student can safeguard himself & society and can work diagnostics and hospitals

Unit 1

Aerobic Culture: Scope and importance of aerobic culture, Factors affecting aerobic culture, Various media and techniques of aerobic culture.

Laboratory Diagnosis of Enteric Infections: (Terminology, mechanism of infection, etiology, conventional and rapid diagnostic methods) Enteric fever / Typhoid fever, Bacterial endocarditis, Bacteraemia, Septicemia, Pyrexia of unknown origin (PUO).

Unit 2

Laboratory Diagnosis of Respiratory Tract Infection (RTI): (Terminology, mechanism of infection, etiology, conventional and rapid diagnostic methods) Lower RTI, Upper RTI.

Laboratory Diagnosis of Urinary Tract Infection: (Terminology, mechanism of infection, etiology, conventional and rapid diagnostic methods)

Unit 3

Laboratory Diagnosis of Oral, Throat and Stomach Infection: (Terminology, mechanism of infection, etiology, conventional and rapid diagnostic methods) Gingivitis and anaerobic infection of oral cavity.

Peptic ulcer (with emphasis in mechanism of peptic ulcer caused by *Helicobacter pylori*).

Laboratory Diagnosis of Eye Infection: (Terminology, mechanism of infection, etiology, conventional and rapid diagnostic methods) Corneal ulcer, Conjunctivitis.

Suggested Reading

1. Medical Laboratory Manual for Tropical Countries, by Cheesbrough M., Vol. I & II, Edition, ELBS.
2. *Clinical Microbiology*, by Stoker, Edward Arnold.
3. *Manual Clinical Microbiology*, by Lynnette, E. H., 8th Edition, American Society for Microbiology, Washington DC.
4. Basic Bacteriology Laboratory manual, WHO

BSCM3503- Diagnostic Virology

Subject Name	Code	Type of course	T-P-Pj	Prerequisite
Diagnostic Virology	BSCM3503	Theory	4-0-0	Basic virology

- Understanding laboratory diagnosis of virus by both conventional and molecular approach.
- To produce a cadre of specialized medical virologists who would help establish clinical diagnostic services in various hospitals/centres.

Course Objectives

Course outcome

- Organise sample collection, transportation, processing and storage in an appropriate manner.
- Plan, write and implement research projects in virology, analyze their results and publish these in peer-reviewed journals.
- Coordinate with concerned agencies regarding viral diseases and their outbreaks.
- Plan and execute epidemiological studies and provide advice in relation to viral diseases.

Unit 1

Laboratory Organization:

Room (space), Electricity, Water supply, Sterility Sampling in Diagnostic Virology: Selection, collection, storage, transportation and processing of samples

Electron Microscope: Principle, importance and use

Unit 2

Laboratory Diagnosis of Viral Infections:

Virus isolation, Inoculation in laboratory animal, Egg inoculation, Tissue culture, Recognition of viral growth-Cytopathic effect, Haemadsorption (Hd), Immunofluorescence or immunoperoxidase staining, Interference.

Identification of virus- Neutralization (N), Haemagglutination – inhibition (HI), Immunofluorescence or immunoperoxidase staining, Electronic microscope (EM).

Direct demonstration of virus or virus antigens - Serology - Immunofluorescence, Electronic Microscopy, Histological demonstration of inclusion bodies,

Serological tests: Detection of viral antigen, Detection of anti-viral antibodies. (Rising titer in paired sera: 4–fold or more -Detection of IgM

Complement fixation (CF), Haemagglutination inhibition (HAI), Neutralization (N), Immunofluorescence (IFA), Enzyme immunoassay.

Unit-3

Laboratory Diagnosis of Important

- a. DNA Viruses and b. RNA Viruse, Antiviral Drugs

Practice-: Practical sessions (Laboratory Practices) will be based in the Hospital Laboratory performing diagnostic tests available / requested, in Diagnostic Virology laboratory

BSCM3504- Diagnostic Mycology

Subject Name	Code	Type of course	T-P-Pj	Prerequisite
Diagnostic Mycology	BSCM3504	Theory	4-0-0	Fundamental Science

Course Objectives

- To confirm the suspicion of fungal disease.
- To identify the etiologic agent by isolating the causative fungal pathogen.

Course outcome

- This course provides learning opportunities in the basic principles of medical microbiology and infectious fungal diseases.
- The course provides the conceptual basis for understanding pathogenic fungi and the mechanisms by which they cause disease in the human body.

- Student can safeguard himself & society and can work diagnostics and hospitals

Unit 1

Introduction to Diagnostic Mycology:

Medically important fungi, Opportunistic Fungi

Fungal Diseases: Mycoses

1. Superficial mycoses:

2. Subcutaneous mycoses:

3. Cutaneous mycoses: Trichophytosis, Microsporiosis, Epidermophytosis.

4. Systemic mycoses: Histoplasmosis, Blastomycosis, Cryptococcosis, Coccidioidosis, Paracoccidioidosis .

Unit 2

Pathogenesis and Laboratory Diagnosis of Mycotic Infections:

Aspergillus spp, Candida albicans, Fusarium spp, Cryptococcus neoformans, Histoplasma capsulatum, Sporothrix spp, Philophora spp., Trichophyton microsporium, Epidermophyton spp.

Blastomyces dermatitidis, Coccidioides immitis.

Unit 3

Isolation and Identification of Fungi (Laboratory Diagnosis):

A. Selection, collection and transportation of specimens 5 hours

Skin, Hair, Nail, Mucous membranes, Ear, eye, Corneal ulcer, Pus, Blood, Biopsy, Sputum, Urine, Vaginal and Cervical swab, Stool samples, Plural and peritoneal fluid, Superficial, sub-cutaneous and cutaneous samples.

B. Smear Preparation: 2 hours

KOH Preparation, 20% KOH with 20% Glycerol, KOH – DMSO (Dimethylsulphoxide) 100% Lactophenol Cotton Blue, India ink preparation.

Practice: Antifungal Sensitivity Test: Antibiotics. Stock solution of drug Dilution technique, Sensitivity test by different method, Minimal inhibitory concentration (MIC) and Minimal fungicidal concentration (MFC)

Serological Test: Identification of Antigen, Antibody and Metabolites in Body Fluid & Serum.

BSCM3505- Diagnostic Parasitology

Subject Name	Code	Type of course	T-P-Pj	Prerequisite
Diagnostic Parasitology	BSCM3505	Theory	4-0-0	Basic Parasitology

Course Objectives

- To explain the mechanisms of pathogenesis from a gross, microscopic and molecular perspective.
- Recognize the diagnostic stage of the infection under the microscope and to manage the infected patient.
- To examine parasites and parasitism, emphasizing the influence of parasites on the ecology and evolution of free-living species, and the role of parasites in global public health.

Course outcome

- rganise sample collection, transportation, processing and storage in an appropriate manner.
- Plan, write and implement research projects in parasitology, analyze their results and publish these in peer-reviewed journals.
- Coordinate with concerned agencies regarding protozoan and helminth diseases and their outbreaks.
- Plan and execute epidemiological studies and provide advice in relation to protozoan diseases.

Unit 1

Laboratory Organization (Parasitology Lab)

Selection, Collection, Perseveration and Transportation of Samples

Unit-2

Laboratory Diagnosis, of the Intestinal and Vaginal Parasites: 28 hours

(Terminology, mechanism of infection, etiology, conventional and rapid diagnostic methods)

Protozoa: Entamoeba histolytica, Giardia lamblia, Trichomonas spp, Cyrtosporidium, Cyclospora cayantensis, Isospora

Helminthes: Ascaries lumbricoides, Hook worm: Anacylostoma and Necator, Enterobius vermicularis, Trichuris trichuira, Strongloides spp., Taenia spp., Echinococcus spp., Hymonolepis nana

Tissue and Blood Parasites: Malaria spp, Kalaazar, Wacheria spp. Brugia, Loa loa, Oncocerca, Dracuhculus, Paragonimuswestermani/hertmani

Unit 3

Laboratory Diagnosis of Various Parasites: 6 hours

Direct method, Indirect method, Rapid methods, Molecular Technique

Parasite Culture. Different Stains used in Diagnostic Parasitology.

Practice:- Practical sessions (Laboratory Practices) will be based in the Hospital Laboratory performing diagnostic tests available / requested, in Diagnostic Parasitology laboratory

BSOP3504-Medical Law and Ethics

Subject Name	Code	Type of course	T-P-Pj	Prerequisite
Medical Law and Ethics	BSOP3504	Theory	3-0-0	Fundamental Science

Course Objectives

- The course provides an introduction to ethics generally and more specifically to medical ethics, examining in particular the principle of autonomy, which informs much of medical law. The course then considers the general part of medical law governing the legal relationship between medical practitioners and their patients. It considers the legal implications of the provision of medical advice, diagnosis and treatment. Selected medico-legal issues over a human life are also examined. These may include reproductive technologies, foetal rights, research on human subjects,

organ donation, the rights of the dying and the legal definition of death.

Course outcome

- The ethical underpinnings of the law as it relates to medicine,
- The law of negligence in the context of the provision of healthcare,
- Legal and ethical issues surrounding end and beginning of life decisions,
- The maintenance of professional standards in the healthcare profession, and
- The role of policy in the formation of law as it relates to medicine.

Module-1 (14HRS)

1. Medical ethics - Definition - Goal - Scope
2. Introduction to Code of conduct
3. Basic principles of medical ethics – Confidentiality

Module-2 (15 HRS)

1. Malpractice and negligence - Rational and irrational drug therapy
2. Autonomy and informed consent - Right of patients
3. Care of the terminally ill- Euthanasia
4. Organ transplantation

Module-3 (13 HRS)

1. Medico legal aspects of medical records – Medico legal case and type- Records and document related to MLC - ownership of medical records - Confidentiality Privilege communication - Release of medical information - Unauthorized disclosure - retention of medical records - other various aspects.
2. Professional Indemnity insurance policy
3. Development of standardized protocol to avoid near miss or sentinel events
4. Obtaining an informed consent

Books Recommended:

1. Reflections on Medical law and Ethics in India by B. Sandeepabhat, publisher Eastern law house.

BSCM3510 -Research Methodology

Subject Name	Code	Type of course	T-P-Pj	Prerequisite
Research Methodology	BSCM3510	Theory	3-0-0	Fundamental Science

Course Objectives

- To equip students with a basic understanding of the underlying principles of quantitative and qualitative research methods.
- Provide students with in-depth training on the conduct and management of research from inception to completion using a wide range of techniques.

Course outcome

- Students can understand the ethical and philosophical issues associated with research in education
- This study provides knowledge on various modes of presenting and disseminating research findings.
- Enable students to acquire expertise in the use and application of the methods of data collection and analysis.
- Provide learning opportunities to critically evaluate research methodology and findings.
- Enable students to be reflexive about their role and others' roles as researchers.

Unit 1

Introduction to Research Methodology: 4 hours

Meaning and Nature of Research-

Meaning, definition and characteristics of health research Importance of health research in nursing field. Foundation of Scientific Research -

Scientific Thinking, Research Idea and the thought Process: Reasoning, Deduction, Induction, Combining Induction and Deduction, and Reflective thinking and the Scientific Method, Scientific Research. Identification and Analysis of Research Problem

Selection of a problem, Sources Criteria, defining a problem, Characteristics of a problem, Criteria of good research questions, Steps in analyzing the research problem.

Unit 2

Proposal Development:

Basic steps involved in the health research proposal development process

Literature Review:

Importance and Sources, Strategies for gaining access to information, Library search, Computer search. Research Title and Objectives

Criteria for selecting a research title, Formulation of research objectives, Types of research objectives, Qualities of research objective

Research Hypothesis: Definition, Qualities of research hypothesis Importance and types of research hypothesis.

Unit 3

Variables: Definition, Importance, Qualitative and Quantitative variables Dependent and Independent variables

Confounding variables, Background variables, Operational definition (defining variables), Indicator. Research Design: Purpose of research design,

Types of study designs: Interventional study design - Exploratory, Descriptive (case study / case series, cross-sectional, longitudinal), Analytical (case control, cohort) study designs; Non-Interventional study design - Pre experimental (pre-test post-test), Quasi experimental, True experimental (Completely Randomized, Completely Randomized Block, Factorial, Time Series) study

designs.

Unit 4

Sampling Design and Procedure:

Definition, Importance, Characteristics of a good sample

Qualities of sampling frame, Population concept and parameter, Types of sampling units,

Types of Sampling – Non probability sampling (purposive, quota, convenient, snowball etc.),

Probability sampling (simple random, systematic, stratified, cluster, multistage, PPS etc.)

Techniques to choose appropriate sampling procedure, Sampling errors, Sample size, Testing reliability of sample

Qualitative and Quantitative Techniques used in Health Research Process.

Data Collection Methods:

Pre-testing Data Collection Tools and Making Work Plan: Preparation of working schedule

Gantt chart.

Data Processing and Analysis

Coding/decoding, Editing, Preparation of master tables, Master field books, Dummy table

preparation, Data processing and analysis plan – Selection of appropriate statistical techniques.

Research Ethics and Research Proposal Format.

Suggested Reading

1. WHO, Health Research Methodology: A guide for training in research Methods, 2nd Edition, WHO- WIPRO
2. A Student's Guide to Methodology by Clough P and Nutbrown C. Sage Publication.
3. National Ethical Guidelines for Health Research in Nepal, Available at Nepal Health Research Council.
4. Field Trials of Health Interventions in Developing Countries by Smith PG, Morrow.

BSCM3511 - Diagnostic Bacteriology Lab

Subject Name	Code	Type of course	T-P-Pj	Prerequisite
Diagnostic Bacteriology Lab	BSCM3511	Practice	0-3-0	Fundamental Science

Course Objectives

- To confirm the suspicion of infectious bacterial disease.
- To identify the etiologic agent by isolating the causative bacterial pathogen.

Course outcome

- Study of Lab diagnosis for pus, mycobacterium, venereal diseases, GI Tract, Meningitis and Encephalitis.
- Handling of Clinical Specimen for Microbial Study
- Student can safeguard himself & society and can work diagnostics and hospitals

Diagnostic Bacteriology

1. Preparation and use of different stains in bacteriology laboratory Grams stain, ZN stain, Albert stain, Spore stain, Capsule stain, Flagella stain, Motility test.
2. Isolation & identification of different groups of bacteria in laboratory Antimicrobial susceptibility testing.
3. Anaerobic Culture
4. Laboratory Diagnosis of Pus.

5. Laboratory Diagnosis of Mycobacterium Infection
6. Laboratory Diagnosis of Venereal Diseases
7. Laboratory Diagnosis of GI Tract.
8. Laboratory Diagnosis of Meningitis and Encephalitis
9. Laboratory Organization and Management
10. Handling of Clinical Specimen for Microbial Study
11. Performance of different Tests Rapid Diagnostic Tests
12. Molecular Tests 8 hours
13. Interpretation of Test Results 5 hours
14. Test reporting

Subject: BSCM3512 - Mini Project

Subject Name	Code	Type of course	T-P-Pj	Prerequisite
Mini Project	BSCM3512	Project	0-0-3	Basic Medical science

The student is supposed to carry out project work in assistance with a mentor. The project should be relevant to the syllabus and should be qualitatively initiated towards fetching a research publication/ case study/ clinical study/ community service/ survey on successful completion within the stipulated time.

Outcome: Research paper publication/ new idea generation/ case study/ clinical study/ community service/ survey.

6th semester B.sc Clinical microbiology

Internship Thesis Guideline

This Guideline is designed to provide students the knowledge and practice of public health research activity, to enable them to carry out researches and solve research related problems and to help them in writing thesis and defend their work. Upon successful completion of the course, the students shall be able to:

1. Search relevant scientific literature
2. Develop a research proposal
3. Employ appropriate data collection techniques and tools
4. Manage collected data
5. Analyze data with appropriate statistical techniques
6. Write thesis
7. Defend the findings

Proposal Development:

At the ending of third year (Sixth Semester), students individually consultation with designated faculties and extensive literature survey will develop research proposal during the initial 6 months period.

Data Collection/ Thesis Writing:

Students will carry out data collection, data management, data analysis, and thesis writing during the remaining period (Six Semester).

The Dissertation should have following format:

1. Title
2. Introduction

3. Materials and Methods
4. Results
5. Discussion
6. Conclusion
7. Recommendation
8. References
9. Appendix

Subject: BSCM3603 -Project

Subject Name	Code	Type of course	Credits	Prerequisite
Project	BSCM3603	-	10	Basic Medical science

Project work:

Suggested Project title

1. Antibacterial activity of sweet orange (citrus sinensis) on Staphylococcus aureus and Escherchia coli isolated from wound infected.
2. The incidence of Salmonella and Escherchia coli in livestock (Poultry) feeds
3. Microbial evaluation of milk from a dairy farm.
4. Gastroenteritis in primary school children (6-12yr) of specific locality.
5. Comparative analysis of microbial load of the main water production and water available to CUTM campus

Subject: BSCM3604 - Internship

Subject Name	Code	Type of course	Credits	Prerequisite
Internship	BSCM3604	-	10	Basic Medical science

Internship

1. Case record
2. Lab management and ethics
3. Evaluation -Guide(internal)
 - Industries guide(external)
 - University-project report/ Viva

**VALUE ADDED COURSES:
FCMG0115- Human Rights**

Subject Name	Code	Type of course	T-P-Pj	Prerequisite
Human Rights	FCMG0115	Theory	2-0-0	Social science

Course Objectives

- Apply effective written and oral communication skills to business and legal situations.
- Analyze the global legal environment.
- Students will graduate with the ability to analyze complex problems, find and deploy a variety of legal authorities, and communicate effectively in a variety of settings.
- Use critical thinking skills in business situations.
- Apply an ethical understanding and perspective to business situations.

Course outcomes

- Students will ultimately be assessed on their ability to demonstrate a commitment to

- professionalism, rights, ethical behavior, service, and, as appropriate, leadership.
- Students will ultimately be assessed on their knowledge of the legal system and legal doctrine. Students will graduate with a broad knowledge of foundational and other core areas human rights, specialized knowledge in areas of interest, and experience with advanced study.
- Students will ultimately be assessed on the development of legal analysis, legal communication, and legal research.

Unit 1

Introduction to Human Rights: Meaning and Definition, History, Principles, Characteristics, Types

Unit 2

Human Rights Law: International Human Rights Law, Council of Human Rights, Universal Declaration of Human Rights, Legal Effects of the Declaration, International Humanitarian Law

Unit 3

Conflicts of Rights and Future Challenges: Meaning and Definition, History, Principles, Characteristics, Types

Text Books:

1. Arihants UGC NET Human Rights and Duties
2. Kapoor, S. K. Central Law Agency's Human Rights under International Law and National Law

Reference Books:

1. Ciapham Andrew, 2015, Human Rights: A Very Short Introduction, Oxford University Press
- Smith Rhona, 2015, Textbook on International Human Rights, Oxford University Press

Online Source:

Human Rights Study Books you can download for free

<https://www.humanrightscareers.com/.../10-human-rights-study-books-you-can-download>

<https://www.humanrightscareers.com/courses/>

Subject- FCMG0401- Gender Issues in Development (T+P+PJ: 2+0+0)

Subject Name	Code	Type of course	T-P-Pj	Prerequisite
Gender Issues in Development	FCMG0401	Theory	2-0-0	Social science

Unit 1

Understanding and Conceptualizing Gender Relations

Unit 2

Gender Issues in Development Sectors

Unit 3

Gender Analysis, Tools, Techniques and Frameworks

**CENTURION UNIVERSITY OF TECHNOLOGY AND
MANAGEMENT, ODISHA**

SCHOOL OF PARAMEDICS & ALLIED HEALTH SCIENCES



Centurion
UNIVERSITY

Shaping Lives...
Empowering Communities...

**BACHELORE OF SCIENCE IN
MEDICAL LABORATORY TECHNOLOGY**

2019

SYLLABUS

Preface: Medical Laboratory Technology helps to diagnose and prevent disease through clinical laboratory tests. It is complementary to medical science. It involves analysis of body matter such as fluid, tissue, and blood. It also covers micro-organism screening, chemical analyses, and cell count.

Medical Technologists are an integral part of the medical profession. These professionals get involved in practical and technical work to aid correct diagnosis and effective functioning of Biochemical Laboratories.

With adequate knowledge and experience, Medical Laboratory Technologists having B.Sc. MLT qualification can work in supervisory or management positions in laboratories and hospitals. They can also work as Laboratory Manager/Consultant/supervisor, health care Administrator, Hospital Outreach coordination, laboratory information system Analyst/Consultant, educational consultant/coordinator etc. Additional opportunities are available in molecular diagnostics, molecular biotechnology companies and in vitro fertilization laboratories as well as in research labs.

Programme: B. Sc. in Medical Laboratory Technology

Duration: Three years (Six semesters) full-time programme with 6 months internship in the last semester.

Eligibility: +2 Science with Physics, Chemistry & Biology or equivalent degree

Examination: Examination rules will be as per guideline of CUTM Examination hand book.

Mini Project: A candidate will have to carry out a mini project work as mentioned in the course structure. After completion of the mini project, the student has to submit the dissertation of the mini project. Internal evaluation of the same (consisting of presentation and viva-voce) will be conducted by the respective School.

Internship: A candidate will have to undergo internship for a period of six calendar months in a hospital/Diagnostics Centre equipped with modern pathology laboratory facility or in a fully equipped pathology laboratory, which fulfills the norms decided by the University.

Dissertation will be compulsory to all students. Students will carry out dissertation work individually or in the group of not more than three students. The format for dissertation/Internship report will be similar to the research thesis style; incorporating chapters on: Introduction, Materials and Methods, Results and Discussion and References / Bibliography. The dissertation will be submitted in a typewritten and bound form.

Degree: The degree of B. Sc. in Medical Laboratory Technology course of the University shall be conferred on the candidates who have pursued the prescribed course of study for not less than three academic years and have passed examinations as prescribed under the relevant scheme and completed 6 months of compulsory internship in the last semester.

On successful completion of three years programme, with a minimum course credit of **140 credits**, the candidate will be awarded with “**Bachelor of Science in Medical Laboratory Technology (B.Sc. MLT)**” from Centurion University.

Programme Structure**BACHELOR
OF
SCIENCE
IN
MEDICAL
LABORATORY
TECHNOLOGY**

SEMESTER-I				
SL NO	CODE	SUBJECT	SUBJECT TYPE Theory+ Practice+ Project (T+P+Pj)	CREDITS
1.	BSMT1101	Introductory Biology	4+0+0	4
2.	BSMT1102	Basic Anatomy and Physiology	4+0+0	4
3.	BSMT1103	Basic Haematology	4+0+0	4
4.	BSMT1104	Basic Medical Instrumentation and Technique	4+0+0	4
5.	BSMT1105	Anatomy, Physiology & Hematology Lab	0+6+0	4
Total				20

SEMESTER-II				
SL NO	CODE	SUBJECT	SUBJECT TYPE (T+P+Pj)	CREDITS
1.	FCBS0101	Environmental Science	3+0+0	3

2.	FCHU1201	Foundations of English Communication	0+3+0	2
3.	BSMT1201	Microbiology	4+0+0	4
4.	BSMT1202	Basic Biochemistry	4+0+ 0	4
5.	BSMT1203	Clinical Pathology	4+0+0	4
6.	BSMT1205	Clinical Pathology Lab	0+3+0	2
7.	BSMT1206	Microbiology Lab	0+3+0	2
			Total	21
		SKILL COURSE- I		2/ 4

SEMESTER-III				
SL NO	CODE	SUBJECT	SUBJECT TYPE (T+P+Pj)	CREDITS
1	BSMT2301	Immunology	4+0+0	4
2	BSMT2302	Applied Hematology	4+0+0	4
3	BSMT2304	Basic Histology	4+0+0	4
4	BSMT2306	Molecular Biology	4+0+0	4
5	FCHU1204	Communicative Practice Laboratory-2	0+3+0	2
6	BSMT2307	Immunology Lab	0+3+0	2
7.	BSMT2308	Histology Lab	0+3+0	2
			Total	22
		SKILL COURSE- II		2/ 4

SEMESTER-IV				
SL NO	CODE	SUBJECT	SUBJECT TYPE (T+P+Pj)	CREDITS
1.	BSMT2401	Parasitology	4+0+0	4
2.	BSMT2403	Advanced Hematology	4+0+0	4
3.	BSMT2407	Analytical Biochemistry	4+0+0	4
4.	BSMT2408	Immunopathology	4+0+0	4
5.	BSMT2409	Basic Computers and Information Science	0+3+0	2
6.	BSMT2410	Biochemistry Lab	0+3+0	2
7.	BSMT2411	Parasitology Lab	0+3+0	2
			Total	22
		SKILL COURSE- III		2/ 4

SEMESTER-V				
SL NO	CODE	SUBJECT	SUBJECT TYPE (T+P+Pj)	CREDITS
1.	BSMT3501	Transfusion Medicine	4+0+0	4
2.	BSMT3502	Medical Laboratory Management	4+0+0	4
3.	BSMT3508	Introduction to Quality and Patient Safety	3+0+0	3
4.	BSOP3504	Medical Law and Ethic	3+0+0	3
5.	BSMT3509	Research Methodology	3+0+0	3
6.	BSMT3506	Mycology & Virology	4+0+0	4
7.	BSMT3510	Mycology & Virology Lab	0+3+0	2
8.	BSMT3511	Mini Project	0+0+3	2
			TOTAL	25
		SKILL COURSE- IV		2/4

SEMESTER-VI				
SL NO	CODE	SUBJECT	SUBJECT TYPE (T+P+Pj)	CREDITS
1.	BSMT3603	Project	-	10
2.	BSMT3604	Internship	-	10
		Total		20

INTERNSHIP

Minimum 720 hours (calculated based on 8 hours per day, if 90 working days in 6 months)

Skill Courses:

Students can choose any suitable skill course offered by the University

Value Added Courses:

**Suggested courses:*

SL NO	SUBJECT CODE	SUBJECT
1	FCMG0115	Human Rights
2	FCMG0401	Gender Issues in Development

**(Or courses suggested by the respective School)*

Note: Skill course & Value-added course, to be opted by the student along with the regular courses, as suggested in the syllabus.

Syllabus
First semester B.sc Medical Lab. Technology

BSMT1101-Introductory Biology

Subject Name	Code	Type of course	L-T-P	Prerequisite
Introductory Biology	BSMT1101	Theory+ Practice	3-1-0	Fundamental Science

Objective:

- Determine the parts of the cell membrane and the cell wall
- Distinguish the types and mechanism of mutation
- Compare and contrast the events of cell cycle and its regulation
- Understand the dynamic character of cellular organelles

Course Outcome

- Describe the fundamental principals cellular biology
- Develop a deeper understanding of cell structure and how it relates to cell functions.
- Understand how cells grow, divide, and die and how these important processes are regulated.
- Understand cell signaling and how it regulates cellular functions. Also how its dis-regulation leads to cancer and other diseases.

Subject: BSMT1101- Introductory Biology

(T+P+Pj: 4+0+0) (Credit:

4) Unit-1

Biology & Its Branches; Scientific methods in Biology; Scope of biology and career options in Medical Laboratory Sciences; Characters of living organisms (elementary idea of metabolism, transfer of energy at molecular level, open and closed systems, homeostasis, growth and reproduction, adaptation, survival, death). Origin and Evolution of life - Theories of Evolution; Evidence of Evolution; Sources of Variations (mutation, recombination, genetic drift, migration, natural selection); Concept of species; Specification and Isolation (geographical and reproductive); Origin of species.

Unit-2

Diversity of living organisms, Systematic; Need, history and types of classification (artificial, natural, polygenetic); biosystematics; binomial nomenclature; Two kingdom system, Five kingdom System, their merits and demerits, status of bacteria and virus.

Unit-3

Cell as a basic unit of life - discovery of cell, cell theory, cell as a self - contained unit; prokaryotic and eukaryotic cell; unicellular and multicellular organisms; Ultrastructure of prokaryotic and eukaryotic cell - cell wall, cell membrane - unit membrane concept (Fluid-Mosaic model); membrane transport; cellular movement (exocytosis, endocytosis)

Unit-4

Cell organelles and their functions- nucleus, mitochondria, plastids, endoplasmic reticulum, Golgi complex, lysosomes, microtubules, centriole, vacuole, cytoskeleton, cilia and flagella, ribosomes. Molecules of cell; inorganic and organic materials - water, salt, mineral ions, carbohydrates, lipids, amino acids, proteins, vitamins, hormones and steroids.

Suggested Readings

1. Molecular biology of the cell by Alberts Bruce, publisher Garland Science
2. Molecular Biology by Friefelder David, Publisher Narosa
3. Introduction to Cell biology by John K Young, World Scientific publishing company
4. Introduction to biology ,3rd tropic edition by D G Maackean
5. A Term wise Text book on biology by VIDYA

BSMT1102-Human Anatomy & Physiology

Subject Name	Code	Type of course	L-T-P	Prerequisite
Human Anatomy and Physiology	BSMT1102	Theory	4-0-0	Fundamental Science

Objective:

- To identify different types of cells and describe their functions.
- To identify the organelles of a typical cell and describe their functions.
- To identify the major components of the integumentary system and describe their functions.
- To identify the major structures of the skin and describe their functions
- To identify the major components of the skeletal system and describe their functions.
- To identify the major components of the circulatory, endocrine, nervous system etc and describe their functions.

Course Outcome:

- Use anatomical terminology to identify and describe locations of major organs of each system covered.
- Explain interrelationships among molecular, cellular, tissue, and organ functions in each system.
- Describe the interdependency and interactions of the systems.
- Explain contributions of organs and systems to the maintenance of homeostasis.
- Identify causes and effects of homeostatic imbalances.
- Describe modern technology and tools used to study anatomy and physiology.

Subject: BSMT1102- Human Anatomy and Physiology(T+P+Pj: 4+0+0)

(Credit: 4)

Unit-1

Scope of Anatomy and physiology. Definition of various terms used in Anatomy. Structure of cell, function of its components with special reference to mitochondria and microsomes.

Elementary tissues: Elementary tissues of the body, i.e. epithelial tissue, muscular tissue, connective tissue and nervous tissue.

Skeletal System: Structure and function of Skelton. Classification of joints and their function. Joint disorders.

Practice: Demonstration of individual bone from skeleton.

Identification of different organs and system from chart.

Unit-2

Cardiovascular System: Composition of blood, functions of blood elements. Blood group and coagulation of blood. Brief information regarding disorders of blood. Name and functions of lymph glands. Structure and functions of various parts of the heart. Blood pressure and its recording. Brief information about cardiovascular disorders.

Respiratory system: Various parts of respiratory system and their functions, physiology of respiration.

Practice: Demonstration the morphology of different blood cells

Measurement of Blood pressure, impulses, Heart beats, respiration rate etc.

Unit-3

Urinary System: Various parts of urinary system and their functions, structure and functions of kidney. Physiology of urine formation. Patho-physiology of renal diseases and edema.

Digestive System: names of various parts of digestive system and their functions. Structure and functions of liver, physiology of digestion and absorption.

Endocrine System: Endocrine glands and Hormones. Reproductive system. Structure and function of sense organs.

Practice: Identification of different organs and system from chart.

Suggested Readings:

1. Text book Anatomy & Physiology for nurses by Evelyn Pearce, Publisher Faber& Faber.
2. Text book Anatomy and Physiology for nurses by Sears, Publisher Edward Arnold.
3. Anatomy & Physiology- by Ross and Wilson, Publisher Elsevier.
4. Anatomy& Physiology: Understanding the human body by Clark, Publisher Jones & Bartlett.
5. Anatomy and Physiology for nurses by Pearson, Publisher Marieb & Hoehn.
6. Anatomy and Physiology by N Murgesh, Publisher Satya.

BSMT1103-Basic Haematology

Subject Name	Code	Type of course	L-T-P	Prerequisite
Basic Hematology	BSMT1103	Theory+Practice	3-1-0	Basic Medical science

Objective:

- The overall aims are that the student should obtain advanced knowledge of the most common hematologic diseases & understanding the concept of Blood cells and other blood components.
- Be able to handle an investigation of hemorrhagic disorder and laboratory abnormalities such as anaemia, polycythemia, leukopenia, leukocytosis, thrombocytopenia, thrombocytosis, elevated ESR etc within hematology.
- Clinically relevant hematological analysis for deeper understanding of Evaluate normal and abnormal cell morphology with associated diseases and other blood components .

Course Outcome:

- Differentiate various laboratory test findings with their associated clinical conditions.
- Identify the various skills necessary to perform blood counts, evaluate blood elements, and report results within the stated limits of accuracy.
- Describe the various components of blood, their functions, and roles in various disease states.
- To be able to demonstrate good skills in the relevant Hematology laboratory methodology.
- Collection of blood for the investigations.
- Be able to distinguish the developmental stages of blood cells. It will also cover Bone marrow examination.
- To learn about tests carried out for hematological investigations.
- To be able to carry out blood sampling.

Subject: BSMT1103- Basic Haematology (T+P+Pj: 4+0+0) (Credit: 4)

Unit-1

Introduction to Hematology, definition, importance, important equipment and chemicals, various tests performed in Hematology laboratory.

Practice: Demonstration of instruments used in hematology- Microscope, Blood Cell counter, Shari's Apparatuses.

Unit -2

Composition and function of blood, Function of normal cellular components

Formation of blood, Erythropoiesis, leucopoiesis, thrombopoiesis

Anticoagulants, definition, Uses, Different types, mode of action, their merits and demerits.

Morphology of normal blood cells, abnormal morphology & diseases.

*Practice: Demonstration of different blood cell, their synthesis from slide presentation or chart.
Demonstration the normal and abnormal morphology of different blood cells.*

Unit-3

Collection and preservation of blood: different methods of collection, preservation, changes in stored blood normal and absolutely values in hematology, RBC count, WBC count, Platelet count, DLC value, HB, MCH, MCV, MCHC, ESR, PCV.

Blood Film: different types, methods of preparations, staining, Different types of stains, Romanowsky stains: principle of staining, different stains, their composition and preparation, methods of staining.

*Practice: Preparation of DLC, TLC, TRBC etc
Estimation of ESR, Hb and values of MCH, MCV, MCHC, ESR, PCV.*

Unit-4

Hematological Disorders

- a. Classification of Anemia: Morphological & etiological.
- b. Iron Deficiency Anemia: Distribution of body Iron, Iron Absorption, causes of iron deficiency, lab findings.
- c. Megaloblastic Anemia: Causes, Lab findings.
- d. Hemolytic Anemia: Definition, causes, classification & lab findings.
Bone Marrow: Cell composition of normal adult Bone marrow, Aspiration, Indication, Preparation & Staining, Special Stain for Bone Marrow -Periodic Acid Schiff, Sudan Black
- e. Leukemia: Classification, Blood Picture, Differentiation of Blast Cells.

*Practice: Collection of blood by different methods
Different normal and abnormal morphology of RBCs, WBCs, Platelet.*

Suggested Reading

1. Textbook of Medical Laboratory Technology P.B Gotkar Mumbai, Bhalani Publishing House
2. Text book of Medical Laboratory Technology by Paraful B. Godkar, Publisher Bhalani
3. Text book of Medical Laboratory Technology (IInd edition) by V.H Talib, Publisher CBS
4. Atlas of hematology (5th edition) by G.A. McDonald, Publisher Churchill Livingstone
5. Medical Laboratory Technology By K.L Mukharjee, Publisher McGraw Hill education pvt limited

BSMT1104-Basic Medical Instrumentation & Techniques

Subject Name	Code	Type of course	L-T-P	Prerequisite
Basic Medical Instrumentation and Techniques	BSMT1104	Theory+Practice	3-1-0	Fundamental Science

Objective:

- To learn the principle, instrumentation & application of Microscopy
- Principle, instrumentation & application of Centrifugation
- Principle of Spectroscopy

Course Outcome:

- After completion of the course the student will be efficient in handling the microscopy equipment's.
- They will also be able to have idea about handling instruments like centrifuge, spectrophotometer, chromatography, flow cytometer, Automated and semi- automated Biochemistry analyzer.
- The conceptual understanding of the subject provides opportunities for skill enhancement and scopes for higher education.

Subject: BSMT1104-Basic Medical Instrumentation & Techniques (T+P+Pj: 4+0+0) (Credit: 4)

Unit -1

Microscope: different types of microscope, operation and care of binocular and monocular microscope, Light, phase contrast, interference, fluorescence, polarization and electron microscopy (principle, parts and its application). Photometry: Basic principal and operation.

Practice: Demonstration, operation, and Quality control of different types of microscopes.

Unit-2

Colorimetric instrumentation and UV-Vis spectrometry and its application. Centrifuge: Basic principle, types; analytical and preparative centrifuges, different density gradient centrifuge and its application. Blood analyzer: Principle, working and its application. Demonstration and Maintenance of Laminar Flow.

Practice: Operation, Demonstration and Quality control of Centrifuge, UV-Vis spectrometer, Colorimeter.

Unit-3

Microtome: Principle, working and its uses. Incubator, Hot air oven and Autoclave: Principle, working and its uses. Operation Techniques and Maintenance of different another microbiological instruments

Practice: Working procedure of microtome, Incubator, Hot air oven, autoclave and others

Suggested Reading

1. A Textbook of Medical Laboratory Technology by P Godkar, Publisher Bhalani
2. Textbook of Clinical laboratory methods and diagnosis by Ales C. Sonnenwirth & Leonard Jarret.
3. A Procedure Manual for Routine Diagnostic Tests Vol. I and II by KL Mukherjee, Publisher McGraw Hill education pvt limited
4. Manual of lab and diagnostic tests by Lippincott Williams Wilkins, New York, Fischbach, 2005.
5. Microbiology by Prescott
6. Principles and Techniques of Biochemistry and Molecular Biology by Wilson and Walker
7. Medical laboratory science theory and practice by J Ochei and Kolhatkar, Publisher TBS

BSMT1105-Anatomy, physiology & Haematology Lab

Subject Name	Code	Type of course	L-T-P	Prerequisite
Anatomy, physiology & Haematology Lab	BSMT1105	Practice	0-0-4	Fundamental Science

Objective:

- To identify the major structures of the skin and describe their functions
- To identify the major components of the skeletal system and describe their functions.
- Clinically relevant hematological analysis for deeper understanding of Evaluate normal and abnormal cell morphology with associated diseases and other blood components .

Course Outcome:

- To be able to demonstrate good skills in the relevant Hematology laboratory methodology.
- Collection of blood for the investigations.
- Be able to distinguish the developmental stages of blood cells.It will also cover Bone marrow examination.
- Explain contributions of organs and systems to the maintenance of homeostasis.
- Identify causes and effects of homeostatic imbalances.
- Describe modern technology and tools used to study anatomy and physiology.

Subject: BSMT1105- Anatomy, Physiology & Hematology Lab (T+P+Pj: 0+6+0) (Credit: 4)
Anatomy, Physiology lab

Demonstrate the different body parts, their position, Structure from charts, models.

Identification of different joints and bones.

Demonstration of various parts of body, tissues of body, parts of digestive system, parts of respiratory system, parts of excretory system.

Haematology lab

Cleaning and drying of glass and plastic ware.

Preparation of various anticoagulants, Collection of venous and capillary blood, Cleaning of glass-syringes and its sterilization. Preparation of buffers, Preparation of the stains and other reagents, Preparation of peripheral blood film (PBF), To stain a peripheral blood Film by Leishman- stain, Haemoglobin estimation (oxy Hb and cyanmethaemoglobin method).

Complete Blood Counts, Determination of Haemoglobin, TRBC Count by Haemocytometers, TLC by Haemocytometer, Differential Leukocyte count, Determination of Platelet Count.

Determination of ESR by wintrobes, Determination of ESR by Westergeren's method, Determination of PCV by Wintrobes, Erythrocyte Indices- MCV, MCH, MCHC. Reticulocyte Count, Absolute Eosinophil Count, Morphology of Red Blood Cells.

Suggested Reading:

1. A Textbook of Medical Laboratory Technology by P Godkar, publisher Bhalani
2. Hand book of Medical Lab Technology by V S Talib, Publisher CBS
3. Practical Haematology(8th edition) by Sir John, Publisher Churchill Livingstone
4. Clinical Hematology by Christopher A. Ludlam
5. A Procedure Manual for Routine Diagnostic Tests Vol. I and II by KL Mukherjee
Publisher McGraw Hill education pvt limited

2nd semester B. Sc Medical Lab. Technology

FCBS0101-Environmental Science

Subject Name	Code	Type of course	L-T-P	Prerequisite
Environmental Science	FCBS0101	Theory+ Practice	3-1-0	Fundamental Science

Objective:

- Students will investigate and understand and model the concepts of ecology.
- Students will investigate and understand the earth's atmosphere and how it affects living organisms.
- Identify the major concerns of the atmosphere and the impact on living organisms.
- To explain the reasons for global warming, the ozone hole and acid rain and the measures being taken for prevention.
- To understand the concept of multi-disciplinary nature of Environmental Science where different aspects are dealt with a holistic approach.
- Students will develop a sense of community responsibility by becoming aware of environmental issues in the larger social context.
- One must be environmentally educated.

Course Outcome:

- Understand the natural environment and its relationships with human activities.
- Characterize and analyze human impacts on the environment.
- Integrate facts, concepts, and methods from multiple disciplines and apply to environmental problems.
- Design and evaluate strategies, technologies and methods for sustainable management of environmental systems and for the remediation or restoration of degraded environments.

Subject: FCBS0101-Environmental Science

(T+P+Pj: 3+0+0) (Credit: 3)

Course Objectives:

- To understand the concept of multi-disciplinary nature of Environmental Science where different aspects are dealt with a holistic approach.
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- Students will develop a sense of community responsibility by becoming aware of environmental issues in the larger social context.

- One must be environmentally educated.

Unit-1

Environment and its multidisciplinary nature; Need for public awareness; Renewable and non-renewable resources—forest, water, mineral, land, food and energy resources; Structure and function of ecosystems of forest, grass land, desert and aquatic types.

Unit-2

Biodiversity and its conservation: Biodiversity at global, national and local levels; Threats to biodiversity - Habitat loss; wild life poaching and man - wildlife conflicts; Endangered and endemic species; conservation measures.

Causes, effects and control measures of pollution, air, water and noise pollution; Nuclear hazards; solid-waste management—Causes, effects and control measures; Management of disasters due to natural causes of floods, earthquakes, cyclones and landslides.

Unit-3

Social issues and the environment; Sustainable environment, Water conservation measures; Rain water harvesting; Resettlement and rehabilitation of people; Climate change and global warming; Acid rain; Ozone layer depletion; water land reclamation; Consumerism and waste products; Features of Environment Protection Act, Air pollution and Control of Pollution Acts; Water Pollution and its Control Act. Effects of Pollution explosion on environment and public health; Need for value education to Protect environment and resources.

Course Outcome:

1. Understand the natural environment and its relationships with human activities.
2. Characterize and analyze human impacts on the environment.
3. Integrate facts, concepts, and methods from multiple disciplines and apply to environmental problems.
4. Design and evaluate strategies, technologies and methods for sustainable management of environmental systems and for the remediation or restoration of degraded environments.

Text Book:

1. Anubhav Kaushik & C.P. Kaushik: Environmental Studies-New age International Publishers.

Reference Books:

1. Benny Joseph: Environmental Studies-Tata Mac Graw Hill
2. E. Bharucha: Text book of Environmental Studies for under graduate courses—Universities Press. (Book prepared by UGC Committee.

FCHU1201 Foundations of English Communication

Subject Name	Code	Type of course	L-T-P	Prerequisite
Foundations of English Communication	FCHU1201	Practice	0-0-3	General English

Objective:

- To develop vocabulary and grammar knowledge.
- To develop reading comprehension skills.

Course Outcome:

- Development of academic and sub-technical vocabulary.
- Enhancement of basic language skills i.e listening, speaking, reading and writing.
- Development of grammatical competence.
- Confidence level improvement.

Subject: FCHU1201 Foundations of English Communication (T+P+Pj: 0+3+0) (Credit: 2)

This course aims to build the vocabulary, comprehension, and writing skills for effective communication in English language. It will focus on reading, listening to, and writing passages, as a means of learning communications skills. The essential elements of this course will include:

Unit-1

READING SKILLS (7hrs.)

Read one of the following books:

- Animal Farm
- Alice in Wonderland
- Guide
- Malgudi Days
- Harry Potter
- Amar Chitra Katha

Comprehension Skills: Students will respond to comprehension lessons from the chosen book.

Unit-2

WRITING SKILLS (7hr.)

Students learn grammar and usage by writing passages, and getting formal feedback on these.

Unit-3

LISTENING SKILLS (6hrs.)

Students respond to questions based on listening to videos, audio, or speaking assignments of classmates.

Unit-4

SPEAKING SKILLS (7hrs.)

Speaking assignments based on chosen book or contemporary topics.

TEXT BOOKS:

Esteras, Santiago Remacha and Fabre, Elena Marco. (2007).

Professional English in Use ICT Student's Book. Cambridge: Cambridge University Press.

REFERENCES:

Grellet, F. (1981). Developing Reading Skills. Cambridge: Cambridge University

Press McCarthy, M. & O'Dell, F. (2008).

Academic Vocabulary in Use. Cambridge: Cambridge University Press.

Ur Penny, (1992). Five- Minute Activities: A Resource Book of Short Activities (Cambridge

Handbooks for Language Teachers). Cambridge: CUP F Klippel. (1984).

Keep Talking. Cambridge: CUP

BSMT1201-Basic Microbiology

Subject Name	Code	Type of course	L-T-P	Prerequisite
Basic Microbiology	BSMT1201	Theory-Practice	3-1-0	General Biology

Objective:

- To know various Culture media and their applications and also understand various physical and chemical means of sterilization.
- To know General bacteriology and microbial techniques for isolation of pure cultures of bacteria, fungi and virus .
- To master aseptic techniques and be able to perform routine culture handling tasks safely and effectively.

Course Outcome:

- Understanding the details of microorganism morphology and metabolism.
- Broad idea regarding the different types of staining.
- Understanding the sterilization and its types.

Subject: BSMT1201- Basic Microbiology (T+P+Pj: 4+0+0) (Credit: 4)

Unit-1

Introduction to Microbiology, Definition, history, host- microbe relationship, and safety measures in a microbiology laboratory. Morphology of bacterial cell wall, Bacterial anatomy (Bacterial cell structure: including spores, flagella, pili and capsules). Sporulation. Classification of bacteria according to cell wall and shape (arrangement), Classification of micro-organisms.

Growth and Nutrition of Microbes: General nutritional requirements of bacteria, Bacterial growth curve.

Practice: Preparation of culture media, demonstrate aerobic and anaerobic culture.

Demonstration the different culture plate and bacterial growth, identification of bacteria

Unit-2

Sterilization: Definition, sterilization by dry heat, moist heat (below, at & above 100° C), Autoclave, Hot air oven, Radiation and Filtration, preventive measures, controls and sterilization indicators. Use of laminar flow in sterilization.

Antiseptics and Disinfectants: Definition, types, properties, mode of action and use of disinfectants and antiseptics, efficiency testing of disinfectants.

Practice:- Demonstrate the different methods of sterilization with handling Hot air oven, Autoclave. Handling Of compound microscope. Demonstration of Antiseptics, Spirit, Cetrimide & Povidone-iodine. Demonstration the disinfectants and precaution while using disinfectants

Unit-3

Staining techniques: Methods of smear preparation, Gram stain, AFB stain, Albert's stain and special staining for spore, capsule and flagella, Culture Media, Liquid and solid media, defined and synthetic media, routine laboratory media (basal, enriched, selective, enrichment, indicator, and transport media). Different Culture, media their preparation and uses in microbial growth.

Practice: Demonstration the different staining procedure like Gram stain, Zn stain, Albert's stain etc Demonstrate different microbial growth in different media. Identify the morphology.

Suggested Reading:

1. Medical Laboratory Technology by Kanai Lal Mukherjee; Tata McGraw Hill, New Delhi
2. An Introduction to Medical Laboratory Technology by FJ Baker; Butterworth – Heinemann; Oxford
3. Practical Book of Medical Microbiology by Satish Gupte; JP Brothers, New Delhi
4. Medical Laboratory Manual for Tropical Countries Vol. I and II by Monica Cheesbrough; Cambridge University Press; UK
5. Textbook of Medical Laboratory Technology by Praful B Godkar; Bhalani Publishing House, Mumbai
6. Microbiology by Prescott
7. Text book of Medical Microbiology by Gruckshiank

BSMT1202-Basic Biochemistry

Subject Name	Code	Type of course	L-T-P	Prerequisite
Basic Biochemistry	BSMT1202	Theory-Practice	3-1-0	Basic Medical Science

Objective:

- Understanding the different bio molecule structure and metabolism and metabolic pathway.
- Clinically relevant biochemical analysis for deeper understanding of all biochemical components i.e., Proteins, Electrolytes, Hormones etc.

Course Outcome:

- To learn about tests carried out for biochemical investigations.
- Understanding of principle of biochemical Clinical biochemistry tests.
- To learn normal ranges and abnormal ranges of biochemical components and hormones.
- To study about diseases related to biochemical and hormone imbalance in human body.

Subject: BSMT1202- Basic Biochemistry (T+P+Pj: 4+0+0) (Credit: 4)

Unit- 1

Enzymes - Introduction, definition, classification, coenzymes, isoenzymes, properties, factors affecting enzyme action, enzyme inhibition, enzyme kinetics, diagnostic value of serum enzymes - Creatinine kinase, Alkaline phosphatase, Acid phosphatase, LDH, SGOT, SGPT, Amylase, Lipase, Carbonic anhydrase etc.

Unit- 2

Chemistry of carbohydrates & their related metabolism - Introduction, definition, classification, biomedical importance & properties. Brief outline of metabolism: Glycogenesis & glycogenolysis, Glycolysis, citric acid cycle & its significance, HMP shunt & Gluconeogenesis, regulation of blood glucose level. Components of respiratory chain, energy relationships during cell respiration, types of respiration. Pathways in intermediary metabolism of carbohydrates.

Unit- 3

Amino acids - Definition, classification, essential & non-essential amino acids. Chemistry of Proteins & their related metabolism - Introduction, definition, classification, biomedical importance. Metabolism: Transamination, Decarboxylation, Ammonia formation & transport, Urea cycle, metabolic disorders in urea cycle, catabolism of amino acids especially Phenylalanine, Tyrosine & Tryptophan, Creatine, Creatinine, and Proteinuria.

Practice: Operation procedure of Centrifuge machine, colorimeter, spectrophotometer etc. Estimation of Liver function test, Kidney function test, Thyroid, Lipid profile. Estimation of bile pigment, bile salt, bilirubin etc.

Unit- 4

Chemistry of Lipids & their related metabolism - Introduction, definition, classification, biomedical importance, essential fatty acids. Brief outline of metabolism: Beta oxidation of fatty acids, fatty liver, Ketosis, Cholesterol & its clinical significance, Lipoproteins in the blood composition & their functions in brief, Atherosclerosis, Diabetes mellitus - definition, types, features, gestation diabetes mellitus, glucose tolerance test, glycosurias, Hypoglycaemia & its causes.

Practice: - Demonstrate the estimation of Blood sugar by manual method and through Auto Analytic Technique. Demonstrate different biochemical test comes under the above unit

Suggested Reading

1. Text book of Medical Laboratory Technology, P.B. Godkar 2nd Edn. 2003 Bhalani Publication.
2. Text book of Biochemistry, M. A. Siddique 8th Edn.1993 Vijay Bhagat Scientific Book Co., Patna.
3. Medical Biochemistry by AC Dey.
4. Handbook of Christen Medical Association, India Medical Laboratory Technology- Robert H. Carman.

BSMT1203-Clinical Pathology

Subject Name	Code	Type of course	L-T-P	Prerequisite
Clinical Pathology	BSMT1203	Theory-Practice	3-1-0	Basic biology

Objective:

- Analyze body fluid for diagnosis of disease
- Analyze waste product for diagnosis of disease
- Understanding DOT Policy
- Understand Physiological disorder and infectious disease

Course Outcome:

- Able to collect pathological specimen
- Able to detect diabetes, ketosis, nephritis, jaundice and other physiological disorder
- Able to detect infectious disease (UTI, Hematuria, Filaria, Dysentery, Ulcer, TB, etc.)
- Preservation and processing of pathological sample.
- Identification of Parasites

Subject: BSMT1203-Clinical Pathology (T+P+Pj: 4+0+0) (Credit: 4)

Unit-1

URINE: Urine meter, Esbachl's Albuminometer, preparation of various reagents. Composition, collection and preservation of urine for various tests, physical chemical and microscopic examination of urine, estimation of total albumin, Specific gravity, litmus paper, tests for albumin, sugar, blood, bile salts and pigments, urobilinogen, ketones bodies etc.

*Practice: Collection procedures of urine, Important precursors for collecting samples.
Physical and Chemical and Microscopic examination of urine.*

Unit-2

STOOL: Sample collection, physical, chemical and microscopic examination.

SPUTUM: Sample collection, stain and study of A.F.B.

CEREBROSPINAL FLUID: Pandy's test, Cell count, cell type differential count and malignant cells.

BODIES FLUID: Cells count; cell morphology and detection of malignant cells in peritoneal fluid, pleural fluid, pericardial fluid, and synovial fluid. Differences between transudates and exudates.

SEMEN: Sample collection microscopic examination for count and morphology.

*Practice: Collection procedures and important precursors for collecting samples like STOOL, CSF, SEMEN and different bodies fluid.
Physical and Chemical and Microscopic examination of different samples.*

Unit-3

ANATOMIC PATHOLOGY: 1. Reception, Registration, preservation and processing of specimens. Haematoxyline and eosine staining procedure, mounting of stained sections, Filing of paraffin blocks, and slides. Method of decalcification, Sharpening and honing Knives techniques, using of microtome.

2. Museum: Mounting of specimens, labeling, maintenance of specimens and catalogue etc.

Post mortem/ Autopsy: Maintenance of the records of the Dead Bodies and specimens received, Autopsy techniques, Autopsy instruments, cold storage plants, legal aspects etc.

*Practice: Handling clinical laboratorial equipment.
Preparation of some stains, and reagents for clinical diagnosis purpose.*

Suggested Reading

1. Textbook of Clinical laboratory methods and diagnosis by Gradwohls, Publisher Mosby
2. Manual Text book of lab and diagnostic tests by Lippincott Williams Wilkins, New York.
3. Medical laboratory science theory and practice by J Ochei and Kolhatkar, 2002, Tata McGraw- Hill, Publisher TBS
4. Medical laboratory technology Vol.1 by K. L. Mukherjee, 2007, Publisher Tata McGraw Hill.

BSMT1204-Clinical Pathology & microbiology lab

Subject Name	Code	Type of course	L-T-P	Prerequisite
Clinical Pathology & Microbiology lab	BSMT1204	Practice	0-0-4	Basic Pathology and microbiology

Objective:

- Analyze body fluid for diagnosis of disease
- Analyze waste product for diagnosis of disease
- To know General bacteriology and microbial techniques for isolation of pure cultures of bacteria, fungi and virus .
- To master aseptic techniques and be able to perform routine culture handling tasks safely and effectively.

Course Outcome:

- Understanding the details of microorganism morphology and metabolism.
- Broad idea regarding the different types of staining.
- Understanding the sterilization and its types.
- Able to collect pathological specimen
- Able to detect diabetes, ketosis, nephritis, jaundice and other physiological disorder

Subject: BSMT1205 -Clinical pathology Lab (T+P+Pj: 0+3+0) (Credit: 2)

Clinical Pathology Lab:

Urine analysis Physical, Chemical, Microscopic, Microbiological.
 Stool analysis Physical, Chemical, Microscopic, Microbiological.
 Sputum analysis Physical, Chemical, Microscopic,
 Microbiological. Semen analysis Physical, Chemical, Microscopic,
 Microbiological. Bacteriological examination of pus.
 Bacteriological examination of trout swab.
 Laboratory study of parasites in stool, blood. Giardia lamblia, Entamoeba

Subject: BSMT1206 - Microbiology Lab: (T+P+Pj: 0+3+0) (Credit: 2)

Handling of Microscope

To learn techniques for Inoculation of bacteria on culture media
 To isolate specific bacteria from a mixture of organisms.
 To demonstrate simple staining (Methylene blue)
 To prepare India ink preparation to demonstrate negative staining.
 Bacterial identification: To demonstrate reagent preparation and procedure for
 Gram stain, Albert stain, Neisser's staining, Z-N staining, Capsule staining, Demonstration of flagella
 by staining methods, Spore staining, To demonstrate spirochetes by Fontana staining procedure
 To prepare the reagent and demonstrate following biochemical tests with positive and
 negative control bacteria:
 Catalase, Coagulase, Indole, Methyl Red (MR), Voges Proskauer (VP), Urease, Citrate, Oxidase, TSIA,
 Nitrate reduction, Carbohydrate fermentation, Huger and Leifson, Bile solubility, H₂S production
 Demonstration and motility, Decarboxylases, CAMP, Hippurate hydrolysis, Nagler's reaction
 Antibiotic susceptibility test

Suggested Reading

1. Manual of lab and diagnostic tests by Lippincott Williams Wilkins, Fischbach, 2005 New

York..

2. Clinical laboratory methods and diagnosis by Gradwohls, 2000, Publisher Mosby
3. Medical laboratory science theory and practice, J Ochei and Kolhatkar, 2002, publisher TBS
4. Medical laboratory technology Vol.1 by K. L. Mukherjee, 2007, publisher Tata McGraw Hill.

3rd semester B.sc Medical Lab. Technology

BSMT2301-Immunology

Subject Name	Code	Type of course	L-T-P	Prerequisite
Immunology	BSMT2301	Theory-Practice	3-1-0	Fundamental Science

Objective:

- Understanding the concept of Innate & adaptive immune system; complement system; Hypersensitivity.
- Clinically relevant serological analysis for deeper understanding of antigen-antibody interaction.
- To understand the concept of cells of immune system and organs of immune system.

Course Outcome:

- The student will learn the application of Immunology in disease diagnosis.
- Complement system followed by the body on encountering an Antigen.
- Immune Response produced on encounter with foreign body.
- The students will learn the role of immunity in fighting disease, along with consequence of undesirable expression of immune system such as, hypersensitivity and auto immune disease.

Subject: BSMT2301-Immunology (T+P+Pj: (4+0+0) (Credit:4) Unit-1

Immunity: Classification, Measurement of immunity, Local immunity, Herd immunity. Antigens:

Types of antigen, Antigenic Determinant or Epitome, Determinants of Antigenicity

Tolerogens, Biological Classes of antigens, Superantigens.

Antibodies-Immunoglobulins: Antibody structure, Immunoglobulin classes of Antigens, Antigenic Determinants on Immunoglobins.

Practice: Collection of blood sample by vein puncture, separation and preservation of serum

Raising haemolysin in Rabbit and performing its titration for Rose-Waaler test.

Unit-2

The Complement System: Principal pathways of Complement activation, Quantitation of Complement

(C) and its Components. Biosynthesis of complement, Complement Deficiencies.

Antigen-Antibody Reactions: Antigen-Antibody Interactions, General characteristics of Antigen-

Antibody Reactions, Antigen-Antibody measurement, Parameters of serological tests, Serological Reactions.

Practice: - Preparation of Phosphate buffers, Vernol buffer, ASO buffer, Richardsons buffer Buffers of different pH and molarity, tris buffer, Standardization of cell concentration by spectrophotometer

Unit-3

Immune Response: Types of Immune response, Humoral immunity, Fate of Antigen in tissues, Production of Antibodies, Cell-mediated Immune Responses, Cytokines, Immunological tolerance, Theories of immune Response.

Hypersensitivity Reactions: Classification of hypersensitivity reactions, Type I

Hypersensitivity (IgE Dependent). Type II Hypersensitivity: Cytolytic and Cytotoxic. Type III Hypersensitivity

-Immune Complex-mediated, Type IV Hypersensitivity-Delayed Hypersensitivity, Shwartzman Reaction.

Practice: Performance of Serological tests i.e. Widal, Brucella Tube Agglutination ,VDRL (including Antigen Preparation), ASO (Antistreptolysin 'O'), C-Reactive Protein (Latex agglutination), Rheumatoid factor (RF) Latex agglutination, Rose Waaler test.

Suggested Readings:

1. Text book of Microbiology by Ananthanereyan & Paniker, Publisher Universities press
2. Short text book of Medical microbiology by Satish Gupte, Publisher Jaypee brothers
3. Medical laboratory Technology vol.I ,II, III by K L Mukherjee, Publisher McGraw Hill education
4. Medical Laboratory manual for tropical countries Vol II Microbiology by Monia Cheesbrough, publisher Butterworth Heinemann ltd
5. Immunology by Ivan Roitt, JonathaanBrostoff and David Male
6. Practical Medical Microbiology by Mackie & MacCartney Volume 1 and 2

BSMT2302-Applied Haematology

Subject Name	Code	Type of course	L-T-P	Prerequisite
Applied Hematology	BSMT2302	Theory-Practice	3-1-0	Basic Medical science

Objective:

- The overall aims are that the student should obtain advanced knowledge of the most common hematologic diseases & understanding the concept of Blood cells and other blood components.
- Be able to handle an investigation of hemorrhagic disorder and laboratory abnormalities such as anaemia, polycythemia, leukopenia, leukocytosis, thrombocytopenia, thrombocytosis, elevated ESR etc within hematology.
- Clinically relevant hematological analysis for deeper understanding of Evaluate normal and abnormal cell morphology with associated diseases and other blood components.

Course Outcome:

- Differentiate various laboratory test findings with their associated clinical conditions.
- Identify the various skills necessary to perform blood counts, evaluate blood elements, and report results within the stated limits of accuracy.
- Describe the various components of blood, their functions, and roles in various disease states.
- To be able to demonstrate good skills in the relevant Hematology laboratory methodology.

BSMT2302-Applied Hematology

Subject Name	Code	Type of course	T-P-Pj	Prerequisite
Applied Hematology	BSMT2302	Theory	4-0-0	Basic Medical science

Objective:

- The overall aims are that the student should obtain advanced knowledge of the most common hematologic diseases & understanding the concept of Blood cells and other blood components.
- Be able to handle an investigation of hemorrhagic disorder and laboratory abnormalities such as anaemia, polycythemia, leukopenia, leukocytosis, thrombocytopenia, thrombocytosis, elevated ESR etc within hematology.
- Clinically relevant hematological analysis for deeper understanding of Evaluate normal and abnormal cell morphology with associated diseases and other blood components.

Course Outcome:

- Differentiate various laboratory test findings with their associated clinical conditions.
- Identify the various skills necessary to perform blood counts, evaluate blood elements, and report results within the stated limits of accuracy.
- Describe the various components of blood, their functions, and roles in various disease states.
- To be able to demonstrate good skills in the relevant Hematology laboratory methodology.

Subject: BSMT2302- Applied Hematology (T+P+Pj: 4+0+0) (Credit:4)

Unit-1

Definition and classification of anemia.

Definition, classification and laboratory diagnosis of leukaemias

Definition and laboratory diagnosis of Leukamoid reactions

Cytochemical staining, procedure and their significance in various haemopoietic disorders.

Laboratory diagnosis of iron deficiency anaemia, Laboratory diagnosis of megaloblastic anaemia

Laboratory diagnosis of haemolytic anemia.

Practice: Collection of blood from different body parts. Data and record Maintain, Handling hematological equipments.

Unit-2

Chromosomal studies in various haematological disorders and their significance.

Mechanism of normal fibrinolysis and Laboratory diagnosis of hyperfibrinolysis .

Mechanism and laboratory diagnosis of disseminated intravascular coagulation (DIC).

Laboratory diagnosis of Haemophilia and von-willebrand disease .

Laboratory diagnosis of Idiopathic thrombocytopenic purpura (ITP), Platelet function tests and their interpretation . Various radioactive isotopes used in hematology

*Practice: - To estimate serum iron and total iron binding capacity. To detect whether the given specimen is G6PD deficient or normal. To estimate Hb-F in a given blood sample. To estimate plasma and urine Haemoglobin in the given specimens.
To demonstrate the presence of Hb-S by Sickling and solubility tests.*

Unit-3

L.E.cell phenomenon-

a. Definition of L.E.cell , b. Demonstration of L.E.cell by various methods c. Clinicals

Physiological variations in Hb, PCV, TLC and Platelets .

Investigations of a case suffering from bleeding disorders. Quantitative

assay of coagulation factors - a. Principle b. Procedure

Biomedical waste management in hematology laboratory (Other than Radioactive material)

Practice:- Demonstration of functional aspect of blood cell counter

Study the RBCs abnormal morphological form -a.Variation in size , shape and staining Character , b. Red cell inclusion

Identify morphologically the-Immature Erythroid series of cells

Immature Myeloid ad other WBCs series of cells

Suggested readings

1. Text book of Medical Laboratory Technology by Paraful B. Godkar, Bhalani Publisher
2. Text book of Practical Hematology by JB Dacie
3. Hand book of Medical Laboratory Technology (2nd edition) by V.H. Talib, publisher CBS
4. Hematology (International edition) Emmanuel C.Besa Harwal Publisher
5. Practical Hematology (8th edition) by Sir John, Publisher Churchill livingstone
6. Clinical Hematology by Christopher A. Ludlam, Publisher Churchill livingstone
7. Clinical Diagnosis & Management by Laboratory methods (20th edition) by John bernard Henary

BSMT2303-Applied Biochemistry

Subject Name	Code	Type of course	L-T-P	Prerequisite
Applied Biochemistry	BSMT2303	Theory-Practice	3-1-0	Basic Medical science

Objective:

- Understanding the concept of Biochemical analyzing instruments both automated and semi automated.
- Understanding about different biochemical test.

Course Outcome:

- Understanding of instrumentation technique & principle of spectrophotometry, colometry, photometry and electrolyte analyzer.
- To learn about safety precautions and handling the equipment in a biochemical laboratory.
- Students will explain/describe the synthesis of proteins, lipids, nucleic acids, and carbohydrates and their role in metabolic pathways

Subject: BSMT2303-Applied Biochemistry LTP :(3+1+0)(Credit:4) Unit- 1

Automation in clinical Biochemistry,

Method of estimation and assessment for: a. Glucose tolerance test ,b. Insulin tolerance test, c. Xylose excretion test.

Practice:- Demonstration the centrifuge machine ,Demonstration of Colorimeter.

Unit-2

Clearance test for renal function . Gastric analysis, LFT , KFT, Lipid profile, Qualitative test for Urobilinogens ,Barbiturates, T3, T4 and TSH, 17 Ketosteroids. Principles, clinical significance and procedures for estimation, of Acid phosphatase, Alkaline phosphatase, Lactate dehydrogenase, Aspartate transaminase, Alanine, transaminase and Creatine phosphokinase.

Practice:- Estimation of Liver function test, Kidney function test, Lipid profile.

Unit-3

Qualitative analysis of renal calculi . Chemical examination of cerebrospinal fluid , Brief knowledge about rapid techniques in clinical biochemistry.

Practice:- Estimation of Glucose in urine and blood . Estimation of Protein in urine and blood .

Suggested readings

1. Text book of Medical Laboratory Technology by P. B. Godker, Publisher Bhalani.

2. Text book of Medical Biochemistry by Chaterjee & Shinde, Publisher JPB
3. Medical Laboratory Technology by Mukherjee, Publisher
4. Principal of Biochemistry by Lehninger, Publisher Kalyani
5. Practical Clinical Biochemistry by Harold Varley, Publisher CBS.

BSMT2304- Basic Histology

Subject Name	Code	Type of course	L-T-P	Prerequisite
Basic Histology	BSMT2304	Theory-Practice	3-1-0	Basic Medical science

Objective:

- Understanding the concept of histotechnology; Basic concepts about routine methods of examination of tissues Collection.
- perform routine laboratory procedures encompassing all major areas of the histology laboratory.
- Clinically relevant onchological analysis for deeper understanding of abnormal cell growth at anywhere in human body.

Course Outcome:

- The students will learn about various staining procedures for demonstration of different substances & various cytological investigations.
- The students will learn about special staining procedures & handling & testing of various cytological specimens.
- Reception and labeling of histological specimens.
- Use of antiseptics, disinfectants and insecticides in a tissue processing laboratory.

Subject: BSMT2304 –Basic Histology (T+P+Pj: 4+0+0) (Credit:4)

Unit-1

Introduction to histotechnology, Care, maintenance and Safety measures of laboratory equipment used in histotechnology. Basic concepts about routine methods of examination of tissues Collection and transportation of specimens for histological examination, fixation Various types of fixatives used in a routine histopathology laboratory- Simple fixatives, Compound fixatives, Special fixatives for demonstration of various tissue elements.

Practice: Demonstration of instruments used for dissection.

Use of antiseptics, disinfectants and insecticides in tissue processing laboratory.

Unit-2

Decalcification Criteria of a good decalcification agent, Technique of decalcification Followed with selection of tissue, fixation, decalcification, neutralization of acid and thorough washing. Various types of decalcifying fluids, Processing of various tissues for histological examination, Embedding, Schedule for manual or automatic Tissue processing, Components & principles of various types of a tissue processors.

Practice: -Method of Decalcification, fixation, Embedding, manual or automatic tissue processing.

Unit-3

Section Cutting, Sharpening of Microtome Knives, Honing, Stropping, various types of microtome and their applications, Freezing Microtome and various types of Cryostats, Staining, Impregnation and Mountains, Commonly used mountains in histotechnology lab. General Staining Procedures for Paraffin Infiltrated and Embedded tissue. Nuclear Stains and Cytoplasmic stain, Equipment and Procedure for manual Staining and Automatic Staining Technique. Mounting of Cover Slips, Labeling and Cataloguing the Slides.

Practice: - Procedure for manual Staining and Automatic Staining Technique.

Suggested readings

1. Color text book of histology by Gartner & Hiatt, publisher Elsevier
2. Netter's essential histology by William Ovalle, publisher Elsevier
3. Histology E-book by Barry Mitchell, publisher Elsevier
4. Textbook of Histology (color atlas) by Krishna Garg, Indira Bahl, Mohini kaul, publisher CBS
5. Textbook of Histology and a Practical Guide by JP Gunasegaran, Publisher Elsevier

BSMT2306 - Molecular Biology

Subject Name	Code	Type of course	T-P-Pj	Prerequisite
Molecular Biology	BSMT2306	Theory	4-0-0	Fundamental Science

Objective

- To provide depth knowledge of biological or medicinal processes through the investigation of the underlying molecular mechanisms.

- Understanding of chemical and molecular processes that occur in and between cells. Understanding will become such that, can be able to describe and explain processes and their meaning for the characteristics of living organisms.

Course Outcome

- Conduct independent work in a laboratory.
- Read scientific articles and gain a critical understanding of their contents.
- Give a spoken and written presentation of scientific topics and research results.
- Present hypotheses and select, adapt and conduct molecular and cell-based experiments to either confirm or reject the hypotheses.

Subject: BSMT2306 - Molecular Biology (T+P+Pj: 4+0+0) (Credit: 4) Unit 1

Introduction: a. Introduction to molecular biology, b. Molecular biology of cell, Evolution and Molecular structure of cell and its organelles, Types of cells. Including different kinds of Prokaryotic and eukaryotic cells, Cell growth, Cell adhesion, cell junctions and extra cellular matrix organelles, Cell cycle, Cell membrane and its structure (fluid-mosaic model)

Factors influencing on membrane fluidity, asymmetry of membrane and membrane transport (active and passive)

Unit 2

Molecular Nature of the Genetic Material in Prokaryotic and Eukaryotic Cells:

Molecular biology of Genes, DNA: Molecular structure, types: Primary, secondary and tertiary, Double helix, types, DNA Replication, Transferring information from DNA to RNA, Synthesis of RNA, Translation RNA: Molecular structure, types. Evolution of DNA and RNA, Gene and genetic codes

Unit 3

General Concept on:

a. Regulation of the Gene Expression

b. Regulating the Metabolism:

The Lac- Operon system, Catabolic repression, Trp Operon system: regulating the biosynthesis of the tryptophan, Gene expression in Eukaryotic cells, Plasmids: types, maintenance and functions

Unit 4

DNA Replication and Gene Expression: DNA Replication: Semi conservative Nature of DNA Replication, DNA Replication in prokaryotic Cells, DNA Replication in Eukaryotic cell Enzymes involved in DNA Replication: DNA polymerases, Proofreading, post-replication Modification of DNA. Transferring information from DNA to RNA, Synthesis of RNA, RNA polymerase, Initiation and Termination of Transcription, Post transcription modification of the RNA

Protein Biosynthesis: Translation of the genetic code, Translation of m RNA, Role of RNA in protein synthesis, Forming the polypeptides- elongation, Termination of the protein biosynthesis.

FCHU1204 -Communicative Practice Laboratory-II

Subject Name	Code	Type of course	T-P-Pj	Prerequisite
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Communicative Practice Laboratory II	FCHU1204	practice	0-2-0	General english
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Objective:

To expose the students to a variety of self- instructional, learner- friendly modes of language learning. To enable them to learn better pronunciation through stress on word accent, intonation, and rhythm. To maintain good linguistic - through accuracy in grammar, pronunciation and vocabulary.

Course Outcome:

- Ability to communicate fluently in different business situation
- Effective oral and written communication
- Appropriate word usage with correct pronunciation
- Clarity of word stress and intonation

**Subject: FCHU1204 -Communicative Practice Laboratory-II (T+P+Pj: 0+3+0)
(Credit: 2)**

Module I

LISTENING (6 HOURS) Exercises on Active Listening:

- The whole group listens to any speech/news broadcast in English and notes down the important points. They listen again to check their points and evaluate themselves. The group then compares points to see how well they have understood the broadcast.

Module II

● **SPEAKING (8 HOURS)**

- Situational Dialogues / Role Play: Organization Communication

- Oral Presentations- Prepared and Extempore

- ‘Just a minute’ Sessions (JAM)

- Debates

- Mock Meetings

- Cracking Job Interviews: Mock Sessions

- Group Discussions on current topics (This module will be practiced through speaking activities like role plays, presentations, and discussions)

Module III

READING (8 HOURS)

- Students will be given practice in reading and comprehension 6-8 passages of 100-300 words each, on topics of General as well as professional interest. The texts will be supported by suitable exercises designed to foster comprehension skills and vocabulary enrichment. Students are encouraged to read newspapers, articles, books and novels.

- Reading Comprehension Exercises Through Tests, Writing Summary and Presenting, Note Making

- Review Presentation (Movie/ Article/ Book)

- Vocabulary Building Exercises (This module encourages extensive use of reading materials)

Module IV

WRITING (8 HOURS)

- The Writing Lab content is designed to acquaint the students not only with the techniques of effective writing but also give them an insight into planning and writing documents that produce results.

- Short Paragraphs on current general and technical topics

- Creative Writing: Idea Generation

- Business Letters, Email Messages, Project Writing

- Writing Resumes and Cover Letters (* Students will be required to produce and submit by the end of second semester a 350-500 word project report on a topic of their choice. The project should involve data collection, analysis and reporting. Ten marks (out of 100 marks allocated for Lab Test) will be set apart for the project.)

BSMT2307-Immunology Lab

Subject Name	Code	Type of course	L-T-P-	Prerequisite
Immunology Lab	BSMT2307	Practice	0-2-0	Immunology

Objective:

- Perform routine laboratory procedures encompassing all major areas of the histology laboratory.
- Clinically relevant onchological analysis for deeper understanding of abnormal cell growth at anywhere in human body.
- Clinically relevant serological analysis for deeper understanding of antigen-antibody interaction.

Course Outcome:

- The students will learn about various staining procedures for demonstration of different substances & various cytological investigations.
- The students will learn about special staining procedures & handling & testing of various cytological specimens.
- The student will learn the application of Immunology in disease diagnosis.

Subject: BSMT2307-Immunology Lab (T+P+Pj: 0+3+0) (Credit:2)

Collection of blood sample by vein puncture, separation and preservation of serum

Raising haemolysin in Rabbit and performing its titration for Rose-Waaler test

Preparation of Phosphate buffers, Vernol buffer, ASO buffer, Richardsons buffer,

Buffers of different pH and molarity, tris buffer, Standardization of cell concentration by spectrophotometer

Performance of Serological tests i.e.

- Widal,
- Brucella Tube Agglutination,
- VDRL (including Antigen Preparation),
- ASO (Antistreptolysin 'O')
- C-Reactive Protein (Latex agglutination)
- Rheumatoid factor (RF) Latex agglutination
- Rose Waaler test,

Demonstration of antigen / antibody determination by Immunofluorescence, Immunodiffusion, precipitation in agarosegel(ouchterlony), CCIEP, ELISA, SDSPAGE and western blotting.

BSMT2308-Histology Lab

Subject Name	Code	Type of course	L-T-P-	Prerequisite
Histology Lab	BSMT2308	Practice	0-2-0	Histology

Objective:

- Perform routine laboratory procedures encompassing all major areas of the histology laboratory.
- Clinically relevant onchological analysis for deeper understanding of abnormal cell growth at anywhere in human body.

Course Outcome:

- The students will learn about various staining procedures for demonstration of different substances & various cytological investigations.
- The students will learn about special staining procedures & handling & testing of various cytological specimens.

Subject: BSMT2308- Histology Lab

(T+P+Pj: 0+3+0) (Credit:2)

Demonstration of instruments used for dissection

Use of antiseptics, disinfectants and insecticides in a tissue processing laboratory

Reception and labeling of histological specimens

Preparation of various fixatives -Helly's fluid, Zenker's fluid, Bouin's fluid, Corney's fluid,

10% Neutral formalin, Formal saline, Formal acetic acid, Pereyn's fluid

To perform embedding and casting of block.

To process a bone for decalcification.

To prepare 70% alcohol from absolute alcohol.

Processing of tissue by manual and automated processor method

To demonstrate various part and types of microtome.

To learn sharpening of microtome knife (Honing and stropping technique)

To perform section cutting, learn mounting of stained smears.

To practice attachment of tissue sections to glass slides

To learn using tissue floatation bath drying of sections in incubator (-560 C)

To perform & practice the Haematoxylin and Eosin staining technique

To perform & practice the Mallory's Phosphotungstic Acid Haematoxylin (PTAH)

4th semester B. Sc. Medical Lab. Technology

BSMT2401-Parasitology

Subject Name	Code	Type of course	L-T-P-	Prerequisite
Parasitology	BSMT2401	Theory-Practice	3-1-0	Basic biology

Objective:

- Describe basic morphology, life cycle, pathogenesis, lab diagnosis and treatment of parasites (Protozoa, metazoa and Helminth)
- Perform appropriate laboratory techniques used in the processing of specimens and identification of parasites.

Course Outcome:

- Identification of pathogenic parasite in disease diagnosis and treatment.
- The conceptual understanding of the subject provides opportunities for employability and scopes for higher education.
- To serve as a resource for the clinical laboratories professionals in the different region.

Subject: BSMT2401- Parasitology (T+P+Pj:4+0+0) (Credit:4)

Unit-1

Introduction to Medical Parasitology, General characteristics of protozoa and helminthes
Collection, Transport, processing and preservation of samples for routine parasitological investigations.

Practice:- Method of sample Collection, Transport, processing and preservation of samples for routine parasitological investigations

Unit-2

Morphology, life cycle and lab-diagnosis of Giardia and Entamoeba Morphology,
life cycle and lab-diagnosis of Roundworms and Hookworms

Morphology, life cycle and lab-diagnosis of T. solium and T. saginata

Morphology, life cycle and lab-diagnosis of Malarial parasite with special reference to P. vivax and P. falciparum.

*Practice:-Laboratory diagnosis of hydrated cyst and cysticercosis
Concentration techniques for demonstration of Ova (Principles and applications)
Routine Stool examination for detection of intestinal parasites.
Identification of adult worms from model's or slide's.
Identification of different parasites their morphology from slide's*

Suggested Reading

1. Text book of Parasitology by N C Dey, publisher New central book agency
2. Text book of Parasitology by Chaterjee, publisher CBS
3. Text book of microbiology by Ananthanereyan, Publisher universities press
4. Medical Parasitology by RL Ichhpujani and Rajesh Bhatia, jaypee publisher
5. Short text book of medical microbiology by Satish Gupte, Publisher Jaypee

BSMT2403- Advance Hematology

Subject Name	Code	Type of course	T-P-Pj	Prerequisite
Advance Hematology	BSMT2403	Theory	4-0-0	Basic Medical science

Objective:

- The overall aims are that the student should obtain advanced knowledge of the most common hematologic diseases & understanding the concept of Blood cells and other blood components.
- Be able to handle an investigation of hemorrhagic disorder and laboratory abnormalities such as anaemia, polycythemia, leukopenia, leukocytosis, thrombocytopenia, thrombocytosis, elevated ESR etc within hematology.
- Clinically relevant hematological analysis for deeper understanding of Evaluate

normal and abnormal cell morphology with associated diseases and other blood components.

Course Outcome:

- Differentiate various laboratory test findings with their associated clinical conditions.
- Identify the various skills necessary to perform blood counts, evaluate blood elements, and report results within the stated limits of accuracy.
- Describe the various components of blood, their functions, and roles in various disease states.
- To be able to demonstrate good skills in the relevant Hematology laboratory methodology.

Subject: BSMT2403- Advance Hematology (T+P+Pj:4+0+0) **(Credit:4) Unit-1**

Definition and classification of anemia's, Laboratory diagnosis of iron deficiency anemia.

Laboratory diagnosis of megaloblastic anemia, Laboratory diagnosis of hemolytic anemia.

Definition, classification and laboratory diagnosis of leukemia's

Definition and laboratory diagnosis of Leukamoid reactions Cytochemical staining, procedure and their significance in various haemopoietic disorders. Chromosomal studies in various hematological disorders and their significance. Mechanism of normal fibrinolysis and Laboratory diagnosis of hyperfibrinolysis.

Mechanism and laboratory diagnosis of disseminated intravascular coagulation (DIC).

Practice: Demonstrate the different abnormal morphology of RBCs in Anemia cases.

Laboratory diagnosis of hemolytic anemia, leukemia's, Leukamoid reactions

Unit-2

Laboratory diagnosis of Hemophilia and von-will brand disease. Laboratory diagnosis of Idiopathic thrombocytopenic purpura (ITP), Platelet function tests and their interpretation.

Unit-3

Measurement of:

a. Blood volume, b. Determination of Red cell volume and Plasma volume, c. Red cell life span,

d. Platelet life span. Estimate serum iron, total iron, Hb-F, Plasma and urine hemoglobin.

Demonstrate the presence of Hb-S by Sickling and solubility, Perform various Platelet function test.

Practice: Demonstration the sickle cells

Suggested readings

1. Text book of Medical Laboratory Technology by Paraful B. Godkar Practical Hematology Publisher JB Dacie, Bhalani publisher
2. Text book of Medical Laboratory Technology (2nd edition) by V.H. Talib, publisher CBS
3. Hematology (International edition) Emmanuel C. Besa Harwal Publisher
4. Practical Hematology (8th edition) by Sir John, publisher Churchill livingstone

BSMT2407- Analytical Biochemistry

Subject Name	Code	Type of course	T-P-Pj	Prerequisite
Analytical Biochemistry	BSMT2407	Theory	4-0-0	Fundamental Science

Objective

- Understanding the concept of Biochemical analyzing instruments both automated and semi-automated.
- To learn about how to Care & Maintenance of Equipment & Chemicals.
- To learn normal ranges of biochemical components in our body.
- Clinically relevant biochemical analysis for deeper understanding of all biochemical components i.e., Proteins, Electrolytes, Hormones etc.

Course Outcome

- Understanding of instrumentation technique & principle of spectrophotometry, colometry, photometry and electrolyte analyzer.
- To learn about various tests carried out for biochemical analysis & Hormone investigations.
- To learn about safety precautions and handling the equipment in biochemical laboratory.

Subject: BSMT2407- Analytical Biochemistry

(T+P+Pj:4+0+0) (Credit:4)

Unit-1

Principle of colorimetry and Spectrophotometry, Chromatography: Basics of chromatography (Paper chromatography, Thin Layer Chromatography, Column chromatography, Gas chromatography, Ion exchange chromatography, Gel chromatography)

Unit-2

Electrophoresis: Introduction, principle, Instrumentation, types of electrophoresis - paper and gel electrophoresis, application

Unit-3

Automation in clinical Biochemistry, Method of estimation and assessment for: a. Glucose tolerance test, b.

Insulin tolerance test, c. Xylose excretion test.

Clearance test for renal function. Gastric analysis, LFT, KFT, Lipid profile, Qualitative test for Urobilinogens, Barbiturates, T3, T4 and TSH, 17 Ketosteroids. Principles, clinical significance and procedures for estimation, of Acid phosphatase, Alkaline phosphatase, Lactate dehydrogenase, Aspartate transaminase, Alanine, transaminase and Creatine phosphokinase.

Suggested readings

1. Handbook of Christen Medical Association, India (CMAI) Medical Laboratory Technology- Robert H. Carman. 2nd Edn. CMAI, New Delhi.
2. Text book of Medical Laboratory Technology, P.B. Godkar 2nd Edn. Bhalani Publication.
3. Handbook of Biochemistry by M. A. Siddique 8th Edn. Vijay Bhagat Scientific Book

BSMT2408-Immunopathology

Subject Name	Code	Type of course	T-P-Pj	Prerequisite
Immunopathology	BSMT2408	Theory	4-0-0	Fundamental Science

Objective

- To understand how the immune system is working, about the components of the immune system, their functioning, the defense mechanisms against different pathogens (viruses, bacteria, and parasites), the pathogenesis of immune diseases (hypersensitivity, autoimmunity, immunodeficiencies), and on the mechanisms underlying the rejection of the transplants and the antitumor immune response.
- It also provides knowledge of the main immunological techniques used in research and diagnostics.

Course Outcome

- To know and describe the organization and functioning of the immune system, its cells and its molecules.
- To know the principles of diagnostic tests described on immunological techniques.
- To know the fundamental stages of the immune system and its changes over the course of life (intrauterine life, newborn, adult, elderly)
- The conceptual understanding of the subject provides opportunities for employability and scopes for higher education.

Subject: BSMT2408-Immunopathology(T+P+Pj:4+0+0)(Credit:4)

Unit-1

Basic Components of the Immune System

Immunological Techniques, Immune Regulation, Immunological Aspects of Infection

Immunological Aspects of Immunodeficiency Diseases

Unit-2

Autoimmunity, Chronic Lymphocytic

Leukemia Immunology of HIV Infections

Immunological Aspects of Allergy and Anaphylaxis

Immunological Aspects of Skin Diseases

Unit-3

Experimental Approaches to the Study of Autoimmune Rheumatic Diseases

Immunological Aspects of Cardiac Disease

Immunological Aspects of Chest Diseases: The Case of

Tuberculosis Immunological Aspects of Gastrointestinal and Liver

Immunological Aspects of Endocrine Disease

Immunological Aspects of Renal Disease Immunological Aspects of Transplantation.

Suggested Readings:

1. Text book of Microbiology by Ananthanereyan & Paniker, Publisher Universities press
2. Short text book of Medical microbiology by Satish Gupte, Publisher Jaypee brothers
3. Medical laboratory Technology vol.I ,II, III by K L Mukherjee, Publisher McGraw Hill education
4. Medical Laboratory manual for tropical countries Vol II Microbiology by Monia Cheesbrough, publisher Butterworth Heinemann ltd
5. Immunology by Ivan Roitt, Jonathaan Brostoff and David Male.

BSMT2409 -Basic Computers & Information Science

Subject Name	Code	Type of course	T-P-Pj	Prerequisite
Basic Computer and Information Science	BSMT2409	Practice	0-2-0	Fundamentals of Computer

Objective

- Identify the function of computer hardware components.
- Identify the factors that go into an individual or organizational decision on how to purchase computer equipment.
- Identify how to maintain computer equipment and solve common problems relating

to computer hardware.

- Identify how software and hardware work together to perform computing tasks and how software is developed and upgraded
- Identify different types of software, general concepts relating to software categories, and the tasks to which each type of software is most suited or not suited.

Course Outcome

- Understand the fundamental hardware components that make up a computer's hardware and the role of each of these components.
- Understand the difference between an operating system and an application program, and what each is used for in a computer.
- Describe some examples of computers and state the effect that the use of computer technology has had on some common products

Subject: BSMT2409 -Basic Computers & Information Science (T+P+Pj:0+3+0)

(Credit:2)

Unit-1

Introduction to computer: introduction, characteristics of computer, block diagram of computer, generations of computer, computer languages.

Input output devices: input devices (keyboard, point and draw devices, data scanning devices, digitizer, electronic card reader, voice recognition devices, vision-input devices), output devices (monitors, pointers, plotters, screen image projector, voice response systems).

Unit-2

Processor and memory: The Central Processing Unit (CPU), main memory.

Storage Devices: sequential and direct access devices, magnetic tape, magnetic disk, optical disk, mass storage devices.

Introduction to MS-Word: introduction, components of a word window, creating, opening and inserting files, editing a document file, page setting and formatting the text, saving the document, spell checking, printing the document file, creating and editing of table, mail merge.

Unit-3

Introduction to Excel: introduction, about worksheet, entering information, saving workbooks and formatting, printing the worksheet, creating graphs.

Introduction to power-point: introduction, creating and manipulating presentation, views, formatting and enhancing text, slide with graphs. Introduction of Operating System: introduction, operating system concepts, types of operating system. Introduction to MS-DOS: History of DOS, features of MS-DOS, MS-DOS Commands (internal and external).

Unit-4

Introduction of windows: History, features, desktop, taskbar, icons on the desktop, operation with folder, creating shortcuts, operation with windows (opening, closing, moving, resizing, minimizing and maximizing, etc.). Computer networks: introduction, types of network (LAN, MAN, WAN, Internet, Intranet), network topologies (star, ring, bus, mesh, tree, hybrid), components of network.

Internet and its Applications: definition, brief history, basic services (E-Mail, File Transfer Protocol, telnet, the World Wide Web (WWW)), www browsers, use of the internet. Application of Computers in various fields: Medical, Education, Railway, Defense, Industry, Management, Sports, Commerce, Internet.

Suggested readings:

1. Objective Computer Awareness
2. Computer Networking (Global Edition)

BSMT2410- Biochemistry lab

Subject Name	Code	Type of course	T-P-Pj	Prerequisite
Biochemistry Lab	BSMT2410	Practice	0-3-0	Basic Medical science

Objective

- Understanding the concept of Biochemical analyzing instruments, chemicals and normal ranges of biochemical components in our body.
- Clinically relevant biochemical analysis for deeper understanding of all biochemical components i.e., Proteins, Electrolytes, Hormones etc

Course Outcome

- To learn about tests carried out for biochemical investigations.
- Understanding of principle of biochemical Clinical biochemistry tests.
- To learn normal ranges and abnormal ranges of biochemical components and hormones.
- To study about diseases related to biochemical and hormone imbalance in human body.

Subject: BSMT2410 - Biochemistry lab**(T+P+Pj:0+3+0) (Credit: 2)**

1. Demonstration of centrifuge machine, colorimeter
2. Estimation of Liver function test, kidney function test, lipid profile
3. Estimation of Glucose in Urine and in Blood.
4. Estimation of Protein in Urine and Blood.
5. Estimation of Urea in blood.
6. Estimation of uric acid in blood.
7. Estimation of serum bilirubin
8. Estimation of Total Cholesterol in blood.
9. Estimation of HDL Cholesterol.
10. Estimation of LDL Cholesterol.
11. Estimation of TG, Estimation of Creatinine in Blood.
12. Estimation of serum calcium.
13. To measure electrolytes Sodium, Potassium & Chloride.

Subject Name	Code	Type of course	T-P-Pj	Prerequisite
Parasitology	BSMT2411	Practice	0-3-0	Fundamental Science

Objective

- Describe basic morphology, life cycle, pathogenesis, lab diagnosis and treatment of parasites (Protozoa, metazoa and Helminth)
- Perform appropriate laboratory techniques used in the processing of specimens and identification of parasites.

Course Outcome

- Identification of pathogenic parasite in disease diagnosis and treatment.
- The conceptual understanding of the subject provides opportunities for employability and scopes for higher education.
- To serve as a resource for the clinical laboratories professionals in the different region.

Subject: BSMT2411 - Parasitology Lab**(T+P+Pj:0+3+0) (Credit: 2)**

Method of sample Collection, Transport, processing and preservation of samples for routine parasitological investigations.

Laboratory diagnosis of hydrated cyst and cysticercosis

Concentration techniques for demonstration of Ova (Principles and applications) Routine

Stool examination for detection of intestinal parasites.

Identification of adult worms from model's or slide's.

Identification of different parasites their morphology from slide's

5th semester B.sc Medical Lab. Technology

BSMT3501-Transfusion Medicine

Subject Name	Code	Type of course	L-T-P	Prerequisite
Transfusion Medicine	BSMT3501	Theory-Tutorial	3-1-0	Basic biology

Objective:

- To provide an outstanding education in all aspects of blood banking and transfusion medicine and prepare fellows for a career in a blood center or in a hospital transfusion service, either in an academic center or in a community hospital.

Course Outcome:

- Describe the principles of patient identification.
- Perform pre-transfusion testing, including ABO and/or Rh testing, red blood cell (RBC) antibody screen and antibody identification.
- Learn adverse reactions of transfusion techniques.

Subject: BSMT3501-Transfusion Medicine

(T+P+Pj:4+0+0) (Credit:4)

Unit-1

Introduction of transfusion medicine.

Blood products and transfusion procedures, summary information about blood products and hemostatic agents.

Basics of red cell immunology and compatibility testing, Pre transfusion and transfusion procedure.

Practice: Demonstrate the different method for blood collection. Identify the different organs for transfusion medicine. Demonstrate Pre transfusion and transfusion procedure.

Unit-2

Clinical transfusion: Surgery and critical illness, planned surgery.

Clinical transfusion in the medical setting, Immunoglobulin for the prevention of infection.

Practice: Demonstrate routine test on blood donation, ABO blood grouping. Identify anemic disorders, renal disorders, congenital hemostatic disorders,

Immunological Disorders etc.

Unit-3

Transfusion in antenatal obstetric and neonatal care. Adverse effects of transfusion

Suggested Reading

1. Text book of Blood banking and transfusion medicine by Sally V. Rudmann
Publisher Elsevier Health Sciences
2. Handbook of Transfusion Medicine, Editor D B L McClelland, United Kingdom
Blood Services 4th Edition
3. Medical Laboratory Technology By K.L Mukherjee, Publisher McGraw Hill
education pvt limited

BSMT3502 –Medical Laboratory Management

Subject Name	Code	Type of course	L-T-P	Prerequisite
Medical Laboratory Management	BSMT3502	Theory-practice	3-1-0	Fundamental Science

Objective:

- Explain and apply principle of effective test utilization
- Interpret, implement and complying law, regulation, accrediting standards and guidelines of Govt. and NG organizations.
- Design, implement and evaluate resources in lab
- Communicate effectively with laboratory personnel and health care professional.
- Explain and apply the major principle and tactics of laboratory administration.

Course Outcome:

- Become professional competent in medical laboratory

- Exhibit a sense of commitment to the ethical and human aspect of patient care
 - Recognize the role of clinical laboratory scientist in the assurance of quality health care
- Application of safety and governmental regulation and standards as applied to medical laboratory practice.

Subject: BSMT3502– Medical Laboratory Management (T+P+Pj:4+0+0)
(Credit:4) Unit-1

Ethical Principles and standards for a clinical laboratory professional-
 Duty to the patient, Duty to colleagues and other professionals, Duty to the society
 Good Laboratory Practice (GLP) Regulations and Accreditation-
 Introduction to Basics of GLP and Accreditation, Aims of GLP and Accreditation, Advantages of Accreditation
 Brief knowledge about Nation and International Agencies for clinical laboratory accreditation
 Awareness / Safety in a clinical laboratory-General safety precautions, HIV: pre- and Post-exposure guidelines, Hepatitis B & C: pre- and Post-exposure guidelines, Drug Resistant Tuberculosis

Unit-2

Patient management for clinical samples collection, collection of sample, transportation and preservation, Sample accountability- Purpose of accountability, Methods of accountability
 Sample analysis-Introduction, Factors affecting sample analysis
 Reporting results-Basic format of a test report, Reported reference range, Clinical Alerts, Abnormal results, Turnaround time, Results from referral laboratories, Release of examination results
 Alteration in reports.

Unit-3

Quality Management system- Introduction,
 Ethical Principles and standards for a clinical laboratory professional-
 Duty to the patient-Duty to colleagues and other professionals, Duty to the society
 Good Laboratory Practice (GLP) Regulations and Accreditation-
 Introduction to Basics of GLP and Accreditation, Aims of GLP and Accreditation, Advantages of Accreditation, Brief knowledge about Nation and International Agencies for clinical laboratory accreditation
 Awareness / Safety in a clinical laboratory
 General safety precautions-HIV: pre- and Post-exposure guidelines, Hepatitis B & C: pre- and Post- exposure guidelines, Drug Resistant Tuberculosis.

Unit-4

Patient management for clinical samples collection, collection of sample, transportation and preservation, Sample accountability- Purpose of accountability,

Methods of accountability Sample analysis-Introduction, Factors affecting sample analysis
Reporting results, Basic format of a test report, Reported reference range, Clinical Alerts,
Abnormal results, Turnaround time, Results from referral laboratories, Release of examination results

BSMT3504-Introduction to Quality And Patient Safety

Subject Name	Code	Type of course	L-T-P	Prerequisite
Introduction To Quality And Patient Safety	BSMT3508	Theory-practice	3-1-0	Fundamental Science

Objective:

- Knowing patient safety
- Report Distribution system
- Laboratory infection control Policy
- Bio-Medical waste management
- Understanding Patient rights
- ISO Policy for medical laboratory

Course Outcome:

- Know about rights and duties of patient
- Know about right and duties of lab technician
- Understand various policy to manage lab
- Understand infection control procedure

Subject: BSMT3508- Introduction To Quality And Patient Safety (T+P+Pj:3+0+0)

(Credit:3)

Unit-1

Introduction – the science of safety Medical Error & Metacognition
Investigating an Error/ Root cause analysis Responding to Adverse
events Error reporting systems Disclosure
Health Literacy and Patient Safety Human Factors Engineering .

Unit-2

Teamwork and Communication Culture of Safety/
Leadership Thinking about Quality 1 Thinking about
Quality
Components of Measurement Measure development and
evaluation Regulation and accountability Case Mix
Adjustment
Spring Break, Patient Satisfaction Using large datasets for quality
evaluation Quality Measure Presentations.

Unit-3

Introduction to Quality Improvement Innovation and
Adoption Knowledge Translation Evaluation of
Implementation
Lean Methodology and Problem Solving Audit and Feedback; Process mapping; Trigger tool
Information Technology in Quality Improvement
Quality Improvement Project Presentations

BSMT3505-Medical law and Ethics

Subject Name	Code	Type of course	L-T-P	Prerequisite
Medical law and Ethics	BSMT3505	Theory-practice	3-1-0	Fundamental Science

Objective:

- The course provides an introduction to ethics generally and more specifically to medical ethics, examining in particular the principle of autonomy, which informs much of medical law. The course then considers the general part of medical law governing the legal relationship between medical practitioners and their patients.
- It considers the legal implications of the provision of medical advice, diagnosis and treatment. Selected medico-legal issues over a human life are also examined. These may include reproductive technologies, foetal rights, research on human subjects, organ donation, the rights of the dying and the legal definition of death.

Course Outcome:

- The ethical underpinnings of the law as it relates to medicine,
- The law of negligence in the context of the provision of healthcare,
- Legal and ethical issues surrounding end and beginning of life decisions,
- The maintenance of professional standards in the healthcare profession, and
- The role of policy in the formation of law as it relates to medicine.

Subject: BSMT3505-Medical law and Ethics (LTP:3+1+0)(Credit:4) Unit-1

Module-1 (14HRS)

1. Medical ethics - Definition - Goal - Scope
2. Introduction to Code of conduct
3. Basic principles of medical ethics – Confidentiality

Module-2 (15 HRS)

4. Malpractice and negligence - Rational and irrational drug therapy
5. Autonomy and informed consent - Right of patients
6. Care of the terminally ill- Euthanasia
7. Organ transplantation

Module-3 (13 HRS)

8. Medico legal aspects of medical records – Medico legal case and type- Records and document related to MLC - ownership of medical records - Confidentiality Privilege communication - Release of medical information - Unauthorized disclosure - retention of medical records - other various aspects.
9. Professional Indemnity insurance policy
10. Development of standardized protocol to avoid near miss or sentinel events
11. Obtaining an informed consent

Books Recommended:

1. Reflections on Medical law and Ethics in India by B. Sandeepabhat,

publisher Eastern law house.

BSMT3509-Research Methodology

Subject Name	Code	Type of course	T-P-Pj	Prerequisite
Research Methodology	BSMT3509	Theory	3-0-0	Fundamental Science

Objective

- To equip students with a basic understanding of the underlying principles of quantitative and qualitative research methods.
- Provide students with in-depth training on the conduct and management of research from inception to completion using a wide range of techniques.

Course Outcome

- Students can understand the ethical and philosophical issues associated with research in education
- This study provides knowledge on various modes of presenting and disseminating research findings.
- Enable students to acquire expertise in the use and application of the methods of data collection and analysis.
- Provide learning opportunities to critically evaluate research methodology and findings.
- Enable students to be reflexive about their role and others' roles as researchers.

Subject: BSMT3509-Research Methodology

(T+P+Pj:3+0+0) (Credit:3)

Unit 1

Introduction to Research Methodology:

Meaning and Nature of Research-

Meaning, definition and characteristics of health research

Importance of health research in nursing field. Foundation of Scientific Research -

Scientific Thinking, Research Idea and the thought Process: Reasoning, Deduction, Induction, Combining Induction and Deduction, and Reflective thinking and the Scientific Method, Scientific Research. Identification and Analysis of Research Problem

Selection of a problem, Sources Criteria, defining a problem, Characteristics of a problem, Criteria of good research questions, Steps in analyzing the research problem.

Unit 2

Proposal Development:

Basic steps involved in the health research proposal development process

Literature Review:

Importance and Sources, Strategies for gaining access to information, Library search, Computer search.

Research Title and Objectives

Criteria for selecting a research title, Formulation of research objectives, Types of research objectives, Qualities of research objective

Research Hypothesis: Definition, Qualities of research hypothesis

Importance and types of research hypothesis.

Unit 3

Variables: Definition, Importance, Qualitative and Quantitative variables

Dependent and Independent variables

Confounding variables, Background variables, Operational definition (defining variables), Indicator. Research Design:

Purpose of research design,

Types of study designs: Interventional study design - Exploratory, Descriptive (case study / case series, cross-sectional, longitudinal), Analytical (case control, cohort) study designs; Non-Interventional study design - Pre experimental (pre-test post-test), Quasi experimental, True experimental (Completely Randomized, Completely Randomized Block, Factorial, Time Series) study designs.

Unit 4

Sampling Design and Procedure:

Definition, Importance, Characteristics of a good sample

Qualities of sampling frame, Population concept and parameter, Types of sampling units,

Types of Sampling – Non probability sampling (purposive, quota, convenient, snowball etc.), Probability sampling (simple random, systematic, stratified, cluster, multistage, PPS etc.)

Techniques to choose appropriate sampling procedure, Sampling errors, Sample size, Testing reliability of sample Qualitative and Quantitative Techniques used in Health Research Process.

Data Collection Methods:

Pre-testing Data Collection Tools and Making Work Plan: Preparation of working schedule Gantt chart.

Data Processing and Analysis

Coding/decoding, Editing, Preparation of master tables, Master field books, Dummy table preparation, Data processing and analysis plan – Selection of appropriate statistical techniques. Research Ethics and Research Proposal Format.

Suggested Reading

1. WHO, Health Research Methodology: A guide for training in research Methods, 2nd Edition, WHO-WIPRO
2. A Student's Guide to Methodology by Clough P and Nutbrown C. Sage Publication.
3. National Ethical Guidelines for Health Research in Nepal, Available at Nepal Health Research Council.
4. Field Trials of Health Interventions in Developing Countries by Smith PG, Morrow.

BSMT3506- Mycology & Virology

Subject Name	Code	Type of course	T-P-Pj	Prerequisite
Mycology and virology	BSMT3506	Theory	4-0-0	General biology

Objective

- To describe the characteristics and diseases caused by pathogenic viruses and fungi.
- To perform basic laboratory techniques in mycology, to isolate fungus from clinical samples.
- Understanding different methods of virus cultivation.
- Understanding collection, transportation and preservation methods of clinical specimen.

Course Outcome

- Broad idea about structure and basic characteristics of virus and fungus.
- Plan, write and implement research projects in virology and mycology analyze their results and publish these in peer-reviewed journals.
- Coordinate with concerned agencies regarding viral and fungal diseases and their outbreaks.
- Plan and execute epidemiological studies and provide advice in relation to viral diseases.

Subject: BSMT3506- Mycology & Virology (T+P+Pj:4+0+0)

(Credit:4) Unit-1

Introduction to medical mycology, Basic concepts about superficial and deep Mycoses. Taxonomy and classification and general characteristics of various medically important fungi. Normal fungal flora.

Morphological, cultural characteristics of common fungal laboratory contaminants Culture media used in mycology.

Practice-: To prepare culture media used routinely in mycology. To perform all the staining techniques for identification of fungi as mentioned in theory syllabus.

Unit-2

Direct microscopy in Medical mycology laboratory.

Processing of clinical samples for diagnosis of fungal infections i.e. Skin, nail, hair, pus, sputum, CSF and other body fluids.

Techniques used for isolation and identification of medically important fungi

Methods for identification of yeasts and moulds.

Practice-: To identify given yeast culture (By performing various identification techniques studied in theory. To identify given mould culture (By performing various identification techniques studied in theory. To demonstrate dimorphism in fungi

Unit-3

Introduction to medical virology, Classification of viruses. Introduction to medically important viruses. Collection, transportation and storage of sample for viral diagnosis Staining techniques used in Virology. Processing of samples for viral diagnosis (Egg inoculation and tissue culture).

Practice-: Demonstration of fertilized hen egg. Demonstration of various inoculation routes in fertilized hen egg. Inoculation of fertilized hen egg through various routes.

BSMT3510 -Mycology &Virology Lab

Subject Name	Code	Type of course	T-P-Pj	Prerequisite
Mycology and virology Lab	BSMT3510	Practice	0-2-0	General biology
<ul style="list-style-type: none">● To describe the characteristics and diseases caused by pathogenic viruses and fungi.● To perform basic laboratory techniques in mycology, to isolate fungus from clinical samples.● Understanding different				

methods of
virus
cultivation.

- Understanding collection, transportation and preservation methods of clinical specimen.

Objective

Course Outcome

- Broad idea about structure and basic characteristics of virus and fungus.
- Plan, write and implement research projects in virology and mycology analyze their results and publish these in peer-reviewed journals.
- Coordinate with concerned agencies regarding viral and fungal diseases and their outbreaks.
- Plan and execute epidemiological studies and provide advice in relation to viral diseases.

Subject: BSMT3510 -Mycology & Virology Lab (T+P+Pj:0+3+0) (Credit:2)

1. To prepare culture media used routinely in mycology.
2. To perform all the staining techniques for identification of fungi as mentioned in theory syllabus.
3. To identify given yeast culture (By performing various identification techniques studied in theory.
4. To identify given mould culture (By performing various identification techniques studied in theory.
5. To demonstrate dimorphism in fungi
6. To process clinical samples for laboratory diagnosis of fungal infections i.e.
 - a) Skin
 - b) Nail
 - c) Hair
 - d) Body fluids and secretions
7. To use mice for lab diagnosis of any fungal infection
8. Demonstration of fertilized hen egg.
9. Demonstration of various inoculation routes in fertilized hen egg
10. Inoculation of fertilized hen egg through various routes.

BSMT3511- Mini Project

Subject Name	Code	Type of course	T-P-Pj	Prerequisite
Mini Project	BSMT3511	Project	0-0-2	Basic Medical science

Subject: BSMT3511 - Mini Project

(T+P+Pj:0+0+3) (Credit:2)

The student is supposed to carry out project work in assistance with a mentor. The project should be

relevant to the syllabus and should be qualitatively initiated towards fetching a research publication/ case study/ clinical study/ community service/ survey on successful completion within the stipulated time.

Outcome: Research paper publication/ new idea generation/ case study/ clinical study/ community service/ survey.

6th semester B.sc Medical Lab. Technology

Subject Name	Code	Type of course	T-P-Pj	Prerequisite
Internship	BSMT3604	NA	0-10-0	Basic Medical science

Internship Thesis Guideline

This Guideline is designed to provide students the knowledge and practice of public health research activity, to enable them to carry out researches and solve research related problems and to help them in writing thesis and defend their work. Upon successful completion of the course, the students shall be able to:

- Search relevant scientific literature
- Develop a research proposal
- Employ appropriate data collection techniques and tools
- Manage collected data
- Analyze data with appropriate statistical techniques
- Write thesis
- Defend the findings

Proposal Development:

At the ending of third year (Sixth Semester), students individually consultation with designated faculties and extensive literature survey will develop research proposal during the initial 6 months period.

Data Collection/ Thesis Writing:

Students will carry out data collection, data management, data analysis, and thesis writing during the remaining period (Six Semester).

The Dissertation should have followed format:

1. Title
2. Introduction
3. Materials and Methods
4. Results

5. Discussion
6. Conclusion
7. Recommendation
8. References
9. Appendix

Subject Name	Code	Type of course	T-P-Pj	Prerequisite
Project	CUTM1755	NA	0-0-10	Basic Medical science

Subject: BSMT3603 -Project

(Credit: 10)

Project work:-

Suggested Project title

1. Serum electrolytes/urea/creatinine in pregnant women with Malaria Parasitamia.
2. Urinary tract infection in adult students in CUTM Campus.
3. Blood groups, Prothrombin time (PT), Activated partial thromboplastin time (APTT) among Undergraduate student.
4. Gastroenteritis in primary school children (6-12yr) of specific locality.

Subject: BSMT3604 – Internship

(Credit: 10)

Internship

- Case record
- Lab management and ethics Evaluation -
- Guide(internal)
-Industries guide(external)

-University-project report/viva

**CENTURION UNIVERSITY OF TECHNOLOGY AND
MANAGEMENT, ODISHA**

SCHOOL OF PARAMEDICS & ALLIED HEALTH SCIENCES



Centurion
UNIVERSITY

Shaping Lives...
Empowering Communities...

MASTER OF SCIENCE IN APPLIED & CLINICAL MICROBIOLOGY

2019
SYLLABUS

M.Sc. in Applied and Clinical Microbiology

Preface: Medical microbiology is the branch of medical science concerned with the prevention, diagnosis and treatment of infectious diseases. In addition, this field of science studies various clinical applications of microbes for the improvement of health. There are four kinds of microorganisms that cause infectious disease: bacteria, fungi, parasites and viruses and one type of infectious protein called Prion.

A medical microbiologist studies the characteristics of pathogens, their modes of transmission, mechanism of infection and growth. Using this information, a treatment can be revised.

Medical microbiologist often serves as consultant of physician, providing identification of pathogen and suggesting treatment option.

Scope: M. Sc in Applied and Clinical Microbiology gives opportunity for specialized study in the field of medical & clinical microbiology. Candidates who successfully complete M. Sc in Applied and Clinical Microbiology course may obtain jobs as

- Specialized technologist in Microbiology or supervisors of clinical laboratories in hospitals.
- Laboratory scientists in Biomedical and research institutes.
- Teachers in training institutes of Medical Laboratory Technology/graduate & post graduate programme of microbiology & related areas.
- Utilize or apply the concepts, theories and principles of laboratory science.
- Demonstrate the ability to plan an effect the change in laboratory practice and health care delivery system.
- Establish collaborative relationship with members of other disciplines.
- Demonstrate interest in continued learning and research for personal and professional advancement.
- Be able to interpret or guide the development of medical diagnostics in need locally and cheaply
- Be able to manage and guide appropriately equipped and staffed clinical microbiology laboratories
- Be a highly skilled human resource for the emerging pharmaceutical/medical industry
- Be able to participate in supervised or team-research in universities, industry or government
- Demonstrate advanced knowledge in the fields of Clinical Microbiology and Immunology, with excellent skills to teach and communicate this knowledge
- Demonstrate independent critical and analytical thinking, both within their field of study, and beyond, for the use of their knowledge for service to others.
- Be able to guide patient care and the public on the pathology, pathogenesis and clinical manifestation, mode of transmission, prevention and current control methods for infections of public health importance
- Be a highly skilled human resource in the management of an increasing number of patients with tissue/Organ transplants, Cancers and immunodeficiencies.
- Be able to critique and evaluate the impact of the existing national disease control programs on the epidemiology of infectious diseases and advise on improving them

- Have acquired critical and analytical skills required for further studies in specialized areas of microbiology or related studies
- Identify and suggest possible solutions to ethical dilemmas that occur in their work and field of study, and understand the importance of professional ethics in all aspects of scientific communication and laboratory work
- Demonstrate competence in the laboratory, including application of the scientific method and appropriate use of basic and state of the art laboratory tools and techniques
- Demonstrate written and oral skills necessary for communication of research, knowledge, and ideas to scientists and non-scientists alike.

Programme: M.Sc. in Applied and Clinical Microbiology

Duration: Two years (Fourth semesters) full-time programme with 6 months internship in the last semester.

Eligibility: Bachelor's degree in any branch of Life Science/ Agriculture/ Pharmacy/ Veterinary /Medicine (MBBS/BDS).

Examination: Examination rules will be as per guideline of CUTM Examination hand book.

Mini Project: A candidate will have to carry out a mini project work as mentioned in the course structure. After completion of the mini project, the student has to submit the dissertation of the mini project. Internal evaluation of the same (consisting of presentation and viva-voce) will be conducted by the respective School.

Internship: A candidate will have to undergo internship for a period of six calendar months in a hospital/Diagnostics Centre /Research Institution equipped with modern laboratory facility, which fulfills the norms decided by the University. Dissertation will be compulsory to all students. Students will carry out dissertation work individually or in the group of not more than three students. The format for dissertation/Internship report will be similar to the research thesis style; incorporating chapters on: Introduction, Materials and Methods, Results and Discussion and References / Bibliography. The dissertation will be submitted in a typewritten and bound form.

Degree: The degree of M. Sc. in Applied and Clinical Microbiology course of the University shall be conferred on the candidates who have pursued the prescribed course of study for not less than two academic years and have passed examinations as prescribed under the relevant scheme and completed 6 months of compulsory internship in the last semester.

On successful completion of two years programme, with a minimum course credit of **96 credits**, the candidate will be awarded with “**Master of Science in Applied and clinical microbiology (M. Sc. CMB)**” from Centurion University.

MASTER OF SCIENCE IN APPLIED & CLINICAL MICROBIOLOGY

Programme Structure

SEMESTER-I				
SL NO	CODE	SUBJECT	SUBJECT TYPE Theory+ Practice+ Project (T+P+Pj)	CREDITS
1.	MSCM1101	General Microbiology	4+0+0	4
2.	MSCM1102	Human Anatomy & Physiology	4+0+0	4
3.	MSCM1103	Biomolecules	4+0+0	4
4.	MSCM1104	Analytical Techniques	4+0+0	4
5.	MSCM1105	Basic Microbiology Lab	0+4+0	4
Total				20

SEMESTER-II				
SL NO	CODE	SUBJECT	SUBJECT TYPE (T+P+Pj)	CREDITS
1.	FCBS0101	Environmental Science	3+0+0	3
2.	FCHU1203	Business Communication	0+2+0	2
3.	MSCM1201	Systematic Bacteriology	4+0+0	4
4.	MSCM1202	Molecular Biology and Clinical Biochemistry	4+0+0	4
5.	MSCM1203	Medical Parasitology and Mycology	4+0+0	4
6.	MSCM1206	Clinical Pathology	4+0+0	4
7.	MSCM1204	Applied microbiology	4+0+0	4
8.	MSCM1207	Parasitology & Mycology Lab	0+2+0	2
			Total	27
		SKILL COURSE- I		2/ 4

SEMESTER-III				
SL NO	CODE	SUBJECT	SUBJECT TYPE (T+P+Pj)	CREDITS
1	MSCM2301	Immunology & Virology	4+0+0	4
2	MSCM2302	Diagnostic Bacteriology	4+0+0	4
3	MSCM2303	Biochemistry	4+0+0	4
4	MSCM2304	Histology	4+0+0	4
5	MSCM2307	Research Methodology	3+0+0	3
6	FCHU1204	Communicative Practice Laboratory–II	0+2+0	2
7	MSCM2308	Immunology Lab	0+2+0	2
8	MSCM2309	Histopathology Lab	0+2+0	2
9	MSCM2310	Biochemistry Lab	0+2+0	2
10	MSCM2311	Mini Project	0+2+0	2
			Total	29
		SKILL COURSE- II		2/ 4

SEMESTER-IV				
SL NO	CODE	SUBJECT	SUBJECT TYPE(T+P+Pj)	CREDIT S
1.	MSCM2403	Project	-	10
2.	MSCM2404	Internship	-	10
Total				20

INTERNSHIP

Minimum 720 hours (calculated based on 8 hours per day, if 90 working days in 6 months)

Skill Courses:

Students can choose any suitable skill course offered by the University

Value Added Courses:

***Suggested courses:**

SL NO	SUBJECT CODE	SUBJECT
1	FCMG0115	Human Rights
2	FCMG0401	Gender Issues in Development

**(Or courses suggested by the respective School)*

Note: Skill course & Value-added course, to be opted by the student along with the regular courses, as suggested in the syllabus.

Syllabus

1st semester M.Sc. in Applied and Clinical Microbiology

MSCM1101- General Microbiology

Subject Name	Code	Type of course	T-P-Pj	Prerequisite
General Microbiology	MSCM1101	Theory	4-0-0	Fundamental Science

Objective

- To know various Culture media and their applications and also understand various physical and chemical means of sterilization
- To know General bacteriology and microbial techniques for isolation of pure cultures of bacteria, fungi and virus
- To master aseptic techniques and be able to perform routine culture handling tasks safely and effectively

Course Outcome

- This study demonstrates the theory and practical skills in microscopy and their handling techniques and staining procedures.
- Understanding the details of microbial cell organelles.
- Provides knowledge on growth of microorganism.
- Provides knowledge culturing microorganism.

Unit-1

History and scope of Microbiology, Recent trends and developments in modern microbiology. Identification, characterization and classification of microorganisms. Distinguishing characteristics between prokaryotic and eukaryotic cells. Structure and function of Cell wall of bacteria, cell membranes, flagella, pili, capsule, gas vesicles, carboxysomes, magnetosomes and phycobolismes.

Unit-2

Methods of sterilization: Physical methods – Dry heat, moist heat, radiation methods, filtration methods, chemical methods and their application. Concept of containment facility, sterilization at industrial level. Different staining techniques used in bacteriology.

Practice: - Demonstration the different type of Sterilization technique and operation of the Instruments used in microbiological lab. Demonstration of various parts of microscope. Demonstrate the different staining techniques.

Unit-3

Bacterial nutrition – Nutritional requirement of bacteria. Cultivation of aerobes and anaerobes, Reproduction in bacteria and spore formation. Bacterial growth curve and bacterial nutrition Media. Culture Media, Liquid and solid media, defined and synthetic media, routine laboratory media (basal, enriched, selective, enrichment, indicator, and transport media).

Practice: - Preparation and demonstration of different culture media, biochemical tests, growth Bacteria.

Suggested Readings

1. Textbook of Medical Laboratory Technology by Praful B Godkar, Publisher Bhalani
1. Text book of Medical Microbiology by Gruckshiank
2. Medical Laboratory Technology by Kanai Lal Mukherjee, Publisher Tata McGraw Hill
3. An Introduction to Medical Laboratory Technology by FJ Baker, Publisher Butterworth
4. Practical Book of Medical Microbiology by Satish Gupta, Publisher Jaypee Brothers
5. Medical Laboratory Manual for Tropical Countries Vol. I and II by Monica Cheesbrough

MSCM1102- Anatomy and Physiology

Subject Name	Code	Type of course	T-P-Pj	Prerequisite
Human Anatomy and Physiology	MSCM1102	Theory	4-0-0	Fundamental Science

Objective

- To identify different types of cells and describe their functions.
- To identify the organelles of a typical cell and describe their functions.
- To identify the major components of the integumentary system and describe their functions.
- To identify the major structures of the skin and describe their functions
- To identify the major components of the skeletal system and describe their functions.
- To identify the major components of the circulatory, endocrine, nervous system etc and describe their functions.

Course Outcome

- Use anatomical terminology to identify and describe locations of major organs of each system covered.
- Explain interrelationships among molecular, cellular, tissue, and organ functions in each system.
- Describe the interdependency and interactions of the systems.
- Explain contributions of organs and systems to the maintenance of homeostasis.
- Identify causes and effects of homeostatic imbalances.
- Describe modern technology and tools used to study anatomy and physiology.

Unit-1

Scope of Anatomy and physiology. Definition of various terms used in Anatomy. Structure of cell, function of its components with special reference to mitochondria and microsomes.

Elementary tissues: Elementary tissues of the body, i.e. epithelial tissue, muscular tissue, connective tissue and nervous tissue.

Skeletal System: Structure and function of Skelton. Classification of joints and their function. Joint disorders.

Practice: Demonstration of individual bone from skeleton Identification of different organs and system from chart.

Unit-2

Cardiovascular System: Composition of blood, functions of blood elements. Blood group and coagulation of blood. Brief information regarding disorders of blood. Name and functions of lymph glands. Structure and functions of various parts of the heart. Blood pressure and its recording. Brief information about cardiovascular disorders.

Respiratory system: Various parts of respiratory system and their functions, physiology of respiration.

*Practice: Demonstration the morphology of different blood cells
Measurement of Blood pressure, impulses, Heart beats, respiration rate etc.*

Unit-3

Urinary System: Various parts of urinary system and their functions, structure and functions of kidney. Physiology of urine formation. Patho-physiology of renal diseases and edema.

Digestive System: names of various parts of digestive system and their functions. Structure and functions of liver, physiology of digestion and absorption.

Endocrine System: Endocrine glands and Hormones. Reproductive system Structure and function of senseorgans.

Practice: Demonstration of various parts of body, tissues of body, parts of digestive system, parts of respiratory system, parts of excretory system. Identification of different organs and system from chart

Suggested Readings:

1. Text book Anatomy & Physiology for nurses by Evelyn Pearce, Publisher Faber&Faber.
2. Text book Anatomy and Physiology for nurses by Sears, Publisher EdwardArnold.
3. Anatomy & Physiology- by Ross and Wilson, PublisherElsevier.
4. Anatomy& Physiology: Understanding the human body by Clark, Publisher Jones &Bartlett.
5. Anatomy and Physiology for nurses by Pearson, Publisher Marieb&Hoehn.
6. Anatomy and Physiology by N Murgesh, Publishersatya.

Subject Name	Code	Type of course	T-P-Pj	Prerequisite
Biomolecules	MSCM1103	Theory	4-0-0	Fundamental Science

Objective

- To study the structure and function of biomolecules and the vital processes that occurs in living organisms.

Course Outcomes

- Provide students with learning experiences that help in still deep interests in learning biochemistry
- Develop broad and balanced knowledge and understanding of biomolecules, key biochemical concepts, principles and theories related to biochemistry
- Equip students with appropriate tools of analysis and with theoretical, technical and analytical skills to tackle issues and problems in the field of biochemistry.

Unit-1

Major Biomolecules: Carbohydrates – Classification, chemistry, properties, and function – mono, di, oligo and polysaccharides. bacterial cell wall polysaccharides. Conjugated polysaccharides– glycoproteins, mureins and lipopolysaccharides.

Lipids – classification, chemistry, properties and function – free fatty acids, triglycerides, phospholipids, glycolipids & waxes. Conjugated lipids – lipoproteins. Major steroids of biological importance – prostaglandins.

Unit -2

Amino acids and proteins – classification, structure and function. Essential amino acids & amphoteric nature of amino acids and reactions and functions of carboxyl and amino groups and side chains. Peptide structure. Ramachandran's plot. Methods for isolation and characterization of proteins. Structural levels of proteins – primary, secondary, tertiary and quaternary, denaturation of proteins. Hydrolysis of proteins. Protein sequencing using various methods.

Unit -3

Nucleic acids – structure, function and their properties. Structural polymorphism of DNA, RNA. Structural characteristics of RNA.

Sources, Chemistry and biochemical functions of water-soluble vitamins. Chemistry of Porphyrins – Heme, Cytochromes, Chlorophylls, xanthophylls, Bacteriochlorophylls & algal pigments, Carotenoids

Unit-4

Biological oxidation, Biological redox carriers, biological membranes, electron transport, oxidative phosphorylation and mechanism. Bacterial photosynthesis, photosynthetic electron transport
 Mineral metabolism – phosphorus, potassium, calcium and Trace elements – molybdenum, zinc, manganese, cobalt and copper. Influence of minerals on the production of toxins. Role of trace elements on microbial enzymes.

Suggested readings

1. Text book of Medical Laboratory Technology by P. B. Godker, Publisher Bhalani.
2. Text book of Medical Biochemistry by Chaterjee & Shinde, Publisher JPB
3. Medical Laboratory Technology by Mukherjee, Publisher
4. Principal of Biochemistry by Lehninger, Publisher Kalyani
5. Practical Clinical Biochemistry by Harold Varley, Publisher CBS.

MSCM1104-Analytical Techniques

Subject Name	Code	Type of course	T-P-Pj	Prerequisite
Analytical Techniques	MSCM1104	Theory	4-0-0	Fundamental Science

Objective

- To learn the principle, instrumentation & application of Microscopy
- Principle, instrumentation & application of Centrifugation
- Chromatographic techniques
- Electrophoretic techniques
- Principle of Spectroscopy

Course Outcome

- After completion of the course the student will be efficient in handling the microscopy equipment's.
- They will also be able to have idea about handling instruments like centrifuge, spectrophotometer, chromatography, flow cytometer, Automated and semi-automated Biochemistry analyzer.
- They will gain knowledge on the principle behind and the application of NMR, X-ray diffraction, ESR.
- The conceptual understanding of the subject provides opportunities for skill enhancement and scopes for higher education.

Unit-1

Microscopy– Microscopic techniques: Basic principles and applications of light, phase – contrast microscopy

(phase annulus, phase plate, specimen preparations), fluorescent microscopy (filters, dark field condenser, complex optical system, sample preparations) and electron microscopy (Magnetic lenses, electron beams, condensers, types of electron microscopy – scanning and transmission, sample preparations - fixing of specimens, preparation of blocks, Microtomy – sectioning, microtomy and staining, negative staining techniques of biological samples), cytometry and flowcytometry

Practice: Demonstration of different Microscopes with their operation and maintain technique.

Preparing specimens for observing under above microscopes.

Unit-2

Principles of Centrifugation – Centrifugation techniques-preparative and analytical methods, density gradient centrifugation.

General principles and applications of chromatography – Paper, Thin layer, Column, Ion exchange, Affinity chromatography, Gelfiltration, Gas, HPLC, FPLC.

Electrophoresis – moving boundary, zone (Paper Gel) electrophoresis, Immunoelectrophoresis, Immunoblotting Isoelectric focusing, 2-Delectrophoresis.

Practice: Demonstration the Centrifuge, Different Electrophoresis, Auto /Semi auto Analyzer, Microtome. Maintenance and Quality control of Medical Lab Equipment 's.

Unit-3

Principles, Laws of absorption and radiation. Visible, ultraviolet, infrared and mass spectrophotometry. Absorption spectra, fluorescence flame photometry, Principles of colorimetry, Turbidometry, Viscometry. Determination of size, shape and molecular weight of macromolecules– osmotic pressure, flow birefringence, optical rotatory dispersion. light scattering, diffusion, sedimentation and X-ray diffraction, NMR, ESR.

Suggested Reading

1. Instrumental Methods of Chemical Analysis by CHATWAL &ANANAD.
2. Practical Biochemistry: Principles and techniques by WILSON &WALKER.
3. Physical Biochemistry: Application to Biochemistry and Molecular biology (2nd edition) by FREIFELDER.
4. Biochemical methods (2nd edition) by SADASIVAM &MANICKAM.
5. Biophysical Chemistry: Principles and techniques by UPADHYAY, UPADHYAY &NATH.
6. HAWK'S Physiological Chemistry by OSER.

MSCM1105- Basic microbiology Lab

Subject Name	Code	Type of course	T-P-Pj	Prerequisite
General	MSCM1105	Practice	0-6-0	Fundamental Science

Microbiology				
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Objective

- To know various Culture media and their applications and also understand various physical and chemical means of sterilization
- To know General bacteriology and microbial techniques for isolation of pure cultures of bacteria, fungi and virus
- To master aseptic techniques and be able to perform routine culture handling tasks safely and effectively

Course Outcome

- This study demonstrates the theory and practical skills in microscopy and their handling techniques and staining procedures.
- Understanding the details of microbial cell organelles.
- Provides knowledge on growth of microorganism.
- Provides knowledge culturing microorganism.

1. Demonstration of various parts of centrifuge; its functioning and care , Demonstration of various parts of microscope its functioning and care ,Cleaning and drying of glass and plastic ware , Preparation of various anticoagulants , Collection of venous and capillary blood ,Cleaning of glass ,syringes and its sterilization. Preparation of buffers ,Preparation of the stains and other reagents , Preparation of peripheral blood film (PBF) ,To stain a peripheral blood Film by Leishman , stain ,Hemoglobin estimation (oxy Hb and cyanmethaemoglobin method)
2. Preparation of bacterial smear and staining – Gram’s ,Acid-fast, Staining of bacterial spores flagella, capsule, spirochaetes
3. Preparation of media, cultivation of bacteria, Biochemical tests for identification of bacteria, Preservation of stock cultures of bacteria.
4. Demonstration of various parts of body ,tissues of body, parts of digestive system, parts of respiratory system ,parts of excretory system

Suggested Reading

1. A Procedure Manual for Routine Diagnostic Tests Vol. I and II by KL Mukherjee; Tata McGraw Hill Publishers, New Delhi
2. A Textbook of Medical Laboratory Technology by P Godkar, Bhalani Publishing House, Mumbai

2nd semester M.Sc. in Applied and Clinical Microbiology

FCBS0101-Environmental Science

Subject Name	Code	Type of course	T-P-Pj	Prerequisite
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Environmental Science	FCBS0101	Theory	3-0-0	Fundamental Science
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Objectives

- To understand the concept of multi-disciplinary nature of Environmental Science where different aspects are dealt with a holistic approach.
- Students will develop a sense of community responsibility by becoming aware of environmental issues in the larger social context.
- One must be environmentally educated.

Course Outcome

- Understand the natural environment and its relationships with human activities.
- Characterize and analyze human impacts on the environment.
- Integrate facts, concepts, and methods from multiple disciplines and apply to environmental problems.
- Design and evaluate strategies, technologies and methods for sustainable management of environmental systems and for the remediation or restoration of degraded environments.

UNIT-I

Environment and its multidisciplinary nature; Need for public awareness; Renewable and non-renewable resources—forest, water, mineral, land, food and energy resources; Structure and function of ecosystems of forest, grass land, desert and aquatic types.

UNIT -II

Biodiversity and its conservation: Biodiversity at global, national and local levels; Threats to biodiversity - Habitat loss; wild life poaching and man - wildlife conflicts; Endangered and endemic species; conservation measures.

Causes, effects and control measures of pollution, air, water and noise pollution; Nuclear hazards; solid-waste management—Causes, effects and control measures; Management of disasters due to natural causes of floods, earthquakes, cyclones and landslides.

UNIT-III

Social issues and the environment; Sustainable environment, Water conservation measures; Rain water harvesting; Resettlement and rehabilitation of people; Climate change and global warming; Acid rain; Ozone layer depletion; water land reclamation; Consumerism and waste products; Features of Environment Protection Act, Air pollution and Control of Pollution Acts; Water Pollution and its Control Act. Effects of Pollution explosion on environment and public health; Need for value education to Protect environment and resources.

Text Book:

1. AnubhavKaushik& C.P. Kaushik: Environmental Studies-New age International Publishers.

Reference Books:

1. Benny Joseph: Environmental Studies-Tata Mac GrawHill
2. E. Bharucha: Text book of Environmental Studies for under graduate courses– Universities Press. (Book prepared by UGCCCommittee.

FCHU1203-Business Communication

Subject Name	Code	Type of course	T-P-Pj	Prerequisite
Business Communication	FCHU1203	Practice	0-3-0	Fundamental Science

Objectives

- The course on Business Communication focuses on the basic skills required to be an effective communicator. It aims at imparting the communication skills that are needed in the academic and professional pursuits.
- This is directed towards helping the students gain skills in comprehension, group discussions, presentations, interviews, active listening, technical writing and the ability to manage cross-cultural interactions. The focus is on the difficulty experienced by individual students, and the effort to explore a useful strategy for self-improvement. This is achieved through an amalgamation of lecture-oriented approach of teaching with the task based skill oriented methodology of learning.

Course Outcomes

- Understand the differences between general communication and business communication
- Development of basic language skills, i.e., listening, speaking, reading and writing
- Effective participation in group discussion and job interviews

Unit-1**UNDERSTANDING COMMUNICATION IN BUSINESS (8 hrs.)**

- The module is a guide to organization communication. It is directed towards enabling students to develop the skills necessary to manage the human resources of their organization.
- General Communication and Business Communication
- Communication in Organizational Settings: Patterns of Communication in the Business World – Upward, Downward, Horizontal Grapevine etc, Channels of Communication- Internal and External, Formal and Informal
- Introduction to Cross Cultural Communication
- Strategies to Overcome Communication Barriers

Unit-2**READING AND WRITING (10 hrs.)**

- This unit works on the competency in reading and writing skills through such tasks/activities as reading books, articles, magazines, novels, developing outlines, key expressions, situations, slogan

writing and theme building exercises, dialogue writing, interpreting pictures, technical writing.

- Importance of Developing Reading Skills
- Sub-Skills of Reading: Predicting Content, Skimming & Scanning, Topic sentence and supporting details, Inferential Reading, Guessing the Meaning of Unfamiliar Words, Note Making
- Importance of Writing Skills and Principles of Effective Writing ♣ Writing Process: Pre-writing, Drafting and Re-Writing
- Paragraph Writing
- Summaries and Abstracts Page |10
- Business Correspondence: Writing Business Letters, E-mail Messages, Memo, Notice, Circulars, Reports, Proposals
- Career Communication: Writing Resume/ CV and Job Application Letter

Unit-3

LISTENING AND SPEAKING (9 HOURS)

- Listening is the mother of all speaking. This unit aims to achieve competence in speaking i.e., the ability to communicate orally in clear, coherent, and persuasive language appropriate to purpose, occasion, and audience. The module focuses on developing this competency which includes acquiring poise and developing control of the language through experience in making presentations to small groups, to large groups, and through the media.
- Listening Skills: Listening Process, Hearing and Listening, Types and Barriers, Effective Listening Strategies
- Common forms of Oral Communication in the Business World:
- Meetings: Organize Meetings, Preparing an Agenda, Chairing a Meeting, Drafting Resolutions, Writing Minutes
- Persuasive Speaking: Improving Fluency and Self-Expressions, Articulation, Good Pronunciation, Voice Quality
- Making an Oral Presentation: Planning, Preparing and Delivery
- Facing an Interview: Preparation, Types of Interview, Do's and Don'ts
- Group Discussions: Debate and GD, Types of GD, GD Etiquette (Treatment: Developing listening and speaking skills through various activities, such as role play activities, practicing short dialogues, JAM, group discussions, debates, speeches, listening to news bulletins, viewing and reviewing documentaries and short films etc.)

TEXT BOOKS:

- An Introduction to Professional English and soft skills by B.K Das et al., Cambridge University Press

REFERENCES:

- *Effective Technical Communication*, M. Ashraf Rizvi, TMH Publications. *Business Communication*, Krizan. Merrier. Logan. Williams, Thomson *Business Communication Today*, Courtland L Bovee, John V Thill & Mukesh Chaturvedi, Pearson Education. *Business communication* by Meenakshi Raman and Prakash Singh (Oxford) *Business Communication*, Urmila Rai & S.M Rai, Himalaya Publishing House

MSCM1201-Systematic Bacteriology

Subject Name	Code	Type of course	T-P-Pj	Prerequisite
Systemic Bacteriology	MSCM1201	Theory	4-0-0	Fundamental Science

Objective

- To learn opportunities in the basic principles of medical microbiology and infectious disease.
- To study mechanisms of infectious disease transmission, principles of aseptic practice, and the role of the human body's normal microflora.
- To understand the importance of pathogenic bacteria in human disease with respect to infections of the respiratory tract, gastrointestinal tract, urinary tract, skin and soft tissue.

Course Outcome

- The course provides the conceptual basis for understanding pathogenic microorganisms and the mechanisms by which they cause disease in the human body.
- Recall the relationship of this infection to symptoms, relapse and the accompanying pathology.
- Explain the methods of microorganism's control, e.g. chemotherapy & vaccines. Solve problems in the context of this understanding.

Unit-1

Morphology, culture, identification, pathogenesis, clinical findings, laboratory diagnosis, epidemiology and pathogenesis of following bacterial infections

Staphylococci, Streptococci, Enterococci, Micrococci, Gram positive anaerobic cocci, Neisseria, Moraxella, Branhamella

Unit-2

Bacillus, Corynebacteria, Listeria, Erysipelothrix, Lactobacillus, Clostridium, Brucella, Propionibacterium, Prevotella, Eubacterium, Leptotrichia, Fusobacterium, Gardnerella, Actinobacilli, Bordetella, Legionella, Calymato bacterium, Campylobacter, Helicobacter, Bacteriodes, Spirillum minus, Tropheryma.

Unit-3

Mycobacterium, Actinomyces, Nocardia, Mycoplasma, Ureaplasma, Rickettsiae, Chlamydia, Spirochaetes, Enterobacteriaceae- Escherichia coli, Shigella, Salmonella, Klebsiella, Proteus, Morganella, Providencia, Citrobacter, Enterobacter, Serratia, Yersinia, Pasteurella, Francisella, Vibrio, Aeromonas, Plesiomonas, Pseudomonas, Acinetobacter, Alcaligenes, Achromobacter. Normal bacterial flora of human beings.

Suggested Reading

1. Medical Laboratory Technology by Kanai Lal Mukherjee; Tata McGraw Hill, New Delhi
2. An Introduction to Medical Laboratory Technology by FJ Baker; Butterworth – Heinemann; Oxford
3. Practical Book of Medical Microbiology by Satish Gupta; JP Brothers, New Delhi
4. Medical Laboratory Manual for Tropical Countries Vol. I and II by Monica Cheesbrough; Cambridge

University Press;UK

5. Textbook of Medical Laboratory Technology by Praful B Godkar; Bhalani Publishing House, Mumbai
6. Text book of Medical Microbiology by Gruckshiank

MSCM1202-Molecular Biology and Clinical Biochemistry

Subject Name	Code	Type of course	T-P-Pj	Prerequisite
Molecular Biology and Clinical Biochemistry	MSCM1202	Theory	4-0-0	Fundamental Science

Objective

- Understanding the central dogma of life
- To understand the concept of gene regulation and its impact
- The use of several molecular diagnostic techniques for disease interpretation
- Understanding the concept of Biochemical analyzing instruments, chemicals and normal ranges of biochemical components in our body.
- Clinically relevant biochemical analysis for deeper understanding of all biochemical components i.e., Proteins, Electrolytes, Hormones etc

Course Outcome

- After completion of the course the student will be gain knowledge of the significance of genes and proteins.
- They will understand the mechanism of gene expression and protein synthesis,
- The significance of gene expression regulation will become clear.
- The students will understand the use of several molecular techniques in disease diagnosis.
- To learn about tests carried out for biochemical investigations.
- Understanding of principle of biochemical Clinical biochemistry tests.

Unit-1

Chemistry of Nucleic acids: DNA Structure and function, RNA Types: Structure and function. Replication, Transcription, genetic code, Translation, Regulation of transcription and translation, Ageing, malignant transformation of cells and role of oncogenes. Apoptosis, cell regeneration.

Unit-2

Molecular diagnostics: Recombinant DNA Technology, Polymerase chain reaction, application of PCR in diagnosis of pathogens, Site directed mutagenesis, DNA finger printing, DNA Foot Printing, antisense RNA

technology, chromosomal walking, inherited genetic disorders in man and gene therapy

Unit-3

Metabolic disorders and Diagnostic enzymology: Disorders of metabolism: carbohydrate, Lipids, Amino acids and Nucleic acids. Diagnostic enzymes: Role of Enzymes in Clinical Practice: Marker enzymes in myocardium, liver and pancreas. Tumour markers, Radio isotope techniques

Unit-4

Organ function tests: Liver function tests, Bile pigment metabolism, tests for liver function. Jaundice and its type, Functions of Kidney, Urine formation and renal function tests disease of kidney, Renal Calculi: Theory of formation and analysis, Gastric Analysis, Composition of gastric juice, concepts of free and bound acid, Fractional Test Meal.

*Practice: Operation procedure of Centrifuge machine, colorimeter, spectrophotometer etc Estimation of Liver function test, Kidney function test, Thyroid, Lipid profile.
Estimation of bile pigment, bile salt, bilirubin etc.*

Suggested Reading

1. Text book of Medical Laboratory Technology, P.B. Godkar 2nd Edn. 2003 Bhalani Publication.
2. Text book of Biochemistry, M. A. Siddique 8th Edn. 1993 Vijay Bhagat Scientific Book Co., Patna.
3. Medical Biochemistry by ACDey.
4. Handbook of Christen Medical Association, India Medical Laboratory Technology- Robert H. Carman.

MSCM1203-Medical Parasitology & Mycology

Subject Name	Code	Type of course	T-P-Pj	Prerequisite
Medical Parasitology and Mycology	MSCM1203	Theory	4-0-0	Fundamental Science

Objective

- Describe basic morphology, life cycle, pathogenesis, lab diagnosis and treatment of parasites and fungi.
- Perform appropriate laboratory techniques used in the processing of specimens and identification of parasites and fungi.
- Describe basic principle and procedures of isolation of fungus and parasites from clinical samples like stool, vaginal swab etc.
- Perform appropriate laboratory techniques used in the processing of specimens and identification of parasites and fungi.

Course Outcome

- Identification of pathogenic parasite and fungus in disease diagnosis and treatment.
- The conceptual understanding of the subject provides opportunities for employability and scopes for higher education.
- To serve as a resource for the clinical laboratories professionals in the different region.

Unit-1

General Parasitology, Classification of medically important parasites, epidemiology of parasitic infections, immunology of human parasitic infections. Diagnostic parasitology- Systematic study of following parasites (Geographical distribution, habitat, morphology and life cycle, risk of infection, pathogenesis, laboratory diagnosis prophylaxis and serological diagnosis)

Unit-2

Protozoa – Intestinal amoeba, free living pathologic amoeba, giardia, trichomonas, balantidium, isospora, cryptosporidium, microspora, cyclospora Plasmodia, leishmania, trypanosoma, toxoplasma, babesia.

Helminthes – Cestodes – Taenia, Echinococcus, Diphylobothrium, Hymenolepis, Multiceps Trematodes – Schistosoma, Fasciola, Fasciolepis, Paragonimus, Clonorchis, Opisthorchis, Nematodes – Ascaris, Hookworm, Trichuris, Enterobius, Strongyloides, Filaria, Trichinella, Toxocara, Dracunculus Biological vectors.

Practice: Collection & transport of specimens. Examination of stool for parasites. Examination of blood & bone marrow for parasites. Demonstrate different staining techniques

Unit-3

General Mycology – Fungus – Classification Fungal Structure & Morphology, Reproduction in fungi, Immunity to Fungal Infections. Culture Media in Mycology, Stains in Mycology. Normal fungal flora of human beings. Diagnostic Mycology - Epidemiology, Pathogenesis, Laboratory Diagnosis of Fungal Infections. Specimen collection, preservation, Transportation & Identification of Mycological Agent. Biochemical tests for fungal identification Anti-fungal agents, invitro tests. Serological tests for mycotic infections. Use of laboratory animals in Mycology. Typing of fungi Preparation of fungal antigens & their standardization.

Unit-4

Method of different sample collection and preservation for mycological examination.

Media & Stains preparation for Mycology, Diagnostic Methods in Mycotic Infections, Identification test in Mycology, Serological tests in Mycology Skin tests. Animal inoculation techniques.

Practice: Collection & transport of specimens Examination of stool for parasites. Examination of blood & bone marrow for parasites. Examination of other body fluids & biopsy specimens for parasites. Culture techniques for parasites. Serological diagnostic methods, skin tests.

Suggested Reading

1. Text book of Parasitology by N C Dey, publisher New central bookagency
2. Text book of Parasitology by Chaterjee, publisherCBS
3. Text book of microbiology by Ananthanereyan, Publisher universitiespress
4. Medical Parasitology by RL Ichhpujani and Rajesh Bhatia, Jaypeepublisher
5. Short text book of medical microbiology by Satish Gupta, PublisherJaypee

MSCM1206 -Clinical Pathology

Subject Name	Code	Type of course	T-P-Pj	Prerequisite
Clinical pathology	MSCM1206	Theory	4-0-0	Fundamental Science

Objective

- Analyze body fluid for diagnosis of disease
- Analyze waste product for diagnosis of disease
- Understanding DOT Policy
- Understand Physiological disorder and infectious disease
- Analysis of pregnancy

Course Outcome

- Able to collect pathological specimen
- Able to detect diabetes, ketosis, nephritis, jaundice and other physiological disorder
- Able to detect infectious disease (UTI, Hematuria, Filaria, Dysentery, Ulcer, TB, etc.)
- Preservation and processing of pathological sample.
- Identification of Parasites
- Analysis of Infertility disorder

Unit-1

URINE: Urine meter, Esbachl'sAlbumino meter, preparation of various reagents. Composition, collection and preservation of urine for various tests, physical chemical and microscopic examination of urine, estimation of total albumin, Specific gravity, litmus paper, tests for albumin, sugar, blood, bile salts and pigments, urobilinogen, ketones bodies etc.

Practice: Collection procedures of urine, important precursors for collecting samples. Physical and Chemical and Microscopic examination of urine.

Unit-2

STOOL: Sample collection, physical, chemical and microscopic examination. SPUTAM: Sample collection, stain and study of A.F.B.

CEREBROSPINAL FLUID: Pandy's test, Cell count, cell type differential count and malignant cells. BODIES FLUID: Cells stain; cell morphology and detection of malignant cells in peritoneal fluid, pleural fluid, pericardial fluid, and synovial fluid. Differences between transudates and exudates.

SEMEN: Sample collections microscopic examination for count and malignant and morphology.

Practice: Collection procedures and important precursors for collecting samples like STOOL, CSF, SEMEN and different body fluids.

Physical and Chemical and Microscopic examination of different samples.

Unit-3

ANATOMIC PATHOLOGY

1. Reception, Registration, preservation and processing of specimens. Haematoxyline and eosine staining procedure, mounting of stained sections, Filing of paraffin blocks, and slides. Method of decalcification, Sharpening and holding Knives techniques, using of microtome.

2. Museum: Mounting of specimens, labeling, maintenance of specimens and catalogue etc.

Post mortem/ Autopsy: Maintenance of the records of the Dead Bodies and specimens received, Autopsy techniques, Autopsy instruments, cold storage plants, legal aspects etc.

Practice: Handling clinical laboratory equipment.

Preparation of some stains, and reagents for clinical diagnosis purpose.

Suggested Reading

1. Manual of lab and diagnostic tests, Fischbach, 2005. Publisher Lippincott Williams Wilkins, New York.
2. Clinical laboratory methods and diagnosis Gradwohls, 2000 by (ed) Ales C. Sonnenwirth and Leonard Jarret, M.D.B.I., New Delhi.
3. Medical laboratory science theory and practice, J Ochei and Kolhatkar, 2002. Publisher Tata McGraw, Hill, New Delhi.
4. Medical laboratory technology Vol.1 by Kanai L. Mukherjee, 2007, Publisher Tata McGraw Hill.

MSCM1204- Applied Microbiology

Subject Name	Code	Type of course	T-P-Pj	Prerequisite
Applied Microbiology	MSCM1204	Theory	4-0-0	Fundamental Science

Objective

- To impart knowledge of the basic principles of bacteriology, virology, including the nature of pathogenic microorganisms, pathogenesis, laboratory diagnosis, transmission, prevention and control of diseases common in the country

Course Outcome

- To know the applications of microbiology in diagnostics, hospitals and community
- Learn principles underlying diagnostic tests and handle kits for diagnosis of diseases
- Explain prognosis of diseases and become aware about the role of medical microbiology in public health aware about the role of medical microbiology in public health

Unit-1

The normal flora, collection and transport of clinical specimens Collection and preliminary processing of specimens.

Unit-2

Diagnostic microbiology- an approach to laboratory diagnosis Rapid and automation methods in diagnostic microbiology Molecular techniques in microbiology. Serological and skin tests

Unit-3

Microbiology in the service of human being Community microbiology. Emerging and re-emerging Microbial disease Nosocomial infections

Unit-4

Hospital and laboratory waste. Diagnostic virology, Emergency microbiology Bacteriology of Milk, Air and Water

Suggested Reading

1. Medical Parasitology by RL Ichhpujani and Rajesh Bhatia, jaypeepublisher
2. Short text book of medical microbiology by Satishgupt, PublisherJaypee

MSCM1207- Parasitology & Mycology Lab

Subject Name	Code	Type of course	T-P-Pj	Prerequisite
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Parasitology & Mycology Lab	MSCM1207	Practice	0-3-0	Fundamental Science
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Objective

- Describe basic morphology, life cycle, pathogenesis, lab diagnosis and treatment of parasites and fungi.
- Perform appropriate laboratory techniques used in the processing of specimens and identification of parasites and fungi.
- Describe basic principle and procedures of isolation of fungus and parasites from clinical samples like stool, vaginal swab etc.
- Perform appropriate laboratory techniques used in the processing of specimens and identification of parasites and fungi.

Course Outcome

- Identification of pathogenic parasite and fungus in disease diagnosis and treatment.
- The conceptual understanding of the subject provides opportunities for employability and scopes for higher education.
- To serve as a resource for the clinical laboratories professionals in the different region.

1. Collection & transport of specimens Examination of stool for parasites. Examination of blood & bone marrow for parasites. Examination of other body fluids & biopsy specimens for parasites. Laboratory diagnosis of hydrated cyst and cysticercosis, Concentration techniques for demonstration of Ova (Principles and applications), Routine Stool examination for detection of intestinal parasites.
2. Identification of adult worms from model's or slide's. Identification of different parasites their morphology from slide's. Culture techniques for parasites. Serological diagnostic methods, skin tests.
3. Media & Stains preparation for Mycology, Diagnostic Methods in Mycotic Infections, Identification test in Mycology, Serological tests in Mycology Skin tests. Animal inoculation techniques.
4. To prepare culture media used routinely in mycology
5. To perform all the staining techniques for identification of fungi as mentioned in theory syllabus. To identify given yeast culture (By performing various identification techniques studied in theory.

3rd semester M. Sc. Applied and Clinical Microbiology
MSCM2301- Immunology & Virology

Subject Name	Code	Type of course	T-P-Pj	Prerequisite
Immunology and Virology	MSCM2301	Theory	4-0-0	Fundamental Science

Objective

- Understanding the concept of Innate & adaptive immune system; complement system; Hypersensitivity.
- Clinically relevant serological analysis for deeper understanding of antigen-antibody interaction.
- To understand the concept of cells of immune system and organs of immune system.
- To understand the properties of virus, diagnosis of important viruses and vaccination.

Course Outcome

- The student will learn the application of Immunology in disease diagnosis.
- Complement system followed by the body on encountering an Antigen.
- Immune Response produced on encounter with foreign body.
- The students will learn the role of immunity in fighting disease, along with consequence of undesirable expression of immune system such as, hypersensitivity and auto immune disease.
- They will gather knowledge regarding the properties, diagnosis of virus and vaccination against them.
- The conceptual understanding of the subject provides opportunities for employability and scopes for higher education.

Unit –1

Introduction to Immunology: Immunity, Type (Innate & adaptive immune response). Organs of Immune System: Primary and Secondary lymphoid organ. Ontogeny and phylogeny of Lymphocytes: T and B Lymphocytes, Null Antigen, Antibody. Cell of Immune System: Mononuclear cell and granulocytes, Antigen presenting cell. Antigen, Heptanes: Factors effecting immunogenicity, epitopes (Properties of it) Antibodies: Structure, Types and function.

Unit – 2

Complement System: Role of complement system in immune response, complements and Components and Activation pathways. Monoclonal antibodies: Production characterization and applications in diagnosis, therapy and basic research. Antigen-Antibody interaction, avidity & affinity measurement.

Hypersensitivity: Definition, factor causing hypersensitivity. Common hypersensitivity reaction,

types, classification based on the time taken for reaction. Auto Immune disease.
Serological Reactions.

Unit-3

Medical Virology General Properties of viruses, Detection of viruses and antigens in clinical specimens, Serological diagnosis of virus infections. Cultivation of viruses. Arthropod borne and rodent borne virus diseases, Picorna viruses and diseases. Hepatitis viruses; Rabies and other neuro viruses: Orthomyxoviruses and paramyxoviruses. Pox, Adeno, Herpes, Reo, Rota and HIV Viruses, Oncogenic viruses, Viral vaccines, their Preparation and their immunization schedules. Viruses of importance to bacteria, Bacteriophages, their structure, types, Typing and application in bacterial genetics.

Suggested Readings:

1. Practical Medical Microbiology by Mackie & MacCartney Volume 1 and 2
2. Text book of Microbiology by Ananthanereyan
3. Medical Microbiology by Paniker & Satish Gupte
4. Medical laboratory Technology vol. I, II, III by Mukherjee
5. Medical Laboratory manual for tropical countries Vol II Microbiology by Monia Cheesbrough
6. Immunology by Ivan Roitt, Jonathan Brostoff and David Male
7. Immunology by Kuby

MSCM2302-Diagnostic Bacteriology

Subject Name	Code	Type of course	T-P-Pj	Prerequisite
Diagnostic Bacteriology	MSCM2302	Theory	4-0-0	Fundamental Science

Objective

- To confirm the suspicion of infectious bacterial disease.
- To identify the etiologic agent by isolating the causative bacterial pathogen.

Course Outcome

- Study of Lab diagnosis for Enteric infection, Respiratory tract Infection, Oral & Stomach infection, Urinary tract infections.
- Study of control measures for nosocomial infection.
- Student can safeguard himself & society and can work diagnostics and hospitals

Unit-1

Laboratory strategy in the diagnosis of various Infective syndromes: Samples of choice, Collection, transportation and processing of samples for laboratory diagnosis of the following complications:

- a) Septicemia and bacteraemia, b) Upper Respiratory tract infections, c) Lower Respiratory tract infections
- d) Wound, skin, and deep sepsis, e) Urinary tract infections, f) Genital Tract infections, g) Meningitis,

h) Gastro intestinal infections, i) Enteric fever, j) Tuberculosis (Pulmonary and Extra- pulmonary), k) Pyrexia of unknown origin

Practice: collection of different specimens from different organs. Record maintaining process.

Preparation and use of different media in bacteriology laboratory. Isolation and identification of different groups of bacteria in laboratory.

Unit-2

Antibiotic susceptibility testing in bacteriology- a. Definition of antibiotics, b. Culture medium used for Antibiotic susceptibility testing, c. Preparation and standardization of inoculum, d. Control bacterial strains,

e. Choice of antibiotics, f. MIC and MBC, g. Various methods of Antibiotic susceptibility testing with special reference to Stokes method and Kirby-Bauer method, h. Tests for production of β -lactamase

Practice: Antimicrobial susceptibility testing

Unit-3

Bacteriological examination of water, milk, food and air –

- a. Examination of water - Collection and transportation of water sample, Presumptive coliform count, Eijkman test, Introduction and importance of other bacteria considered as indicators of faecal contamination
- b. Examination of Milk and milk products - Basic Concepts regarding gradation of milk, Various tests for Bacteriological examination
- c. Examination of food articles -Basic Concepts regarding classification of food like frozen food, canned food, raw food, cooked food etc. Various tests for Bacteriological examination with special reference to food poisoning bacteria
- d. Examination of Air -Significance of air bacteriology in healthcare facilities, Collection processing and reporting of an air sample.

Practice: Sterility testing of I/v fluids -a. Collection, transportation and processing of I/v fluids for bacterial contamination, b. Recording the result and interpretation

Nosocomial Infection, Epidemiological markers.

Suggested Readings:

1. Practical Medical Microbiology by Mackie & MacCartney Volume 1 and 2
2. Text book of Microbiology by Ananthanereyan
3. Medical Microbiology by Paniker & Satish Gupte
4. Medical laboratory Technology vol. I, II, III by Mukherjee
5. Medical Laboratory manual for tropical countries Vol II Microbiology by Monia Cheesbrough

MSCM2303-Biochemistry

Subject Name	Code	Type of course	T-P-Pj	Prerequisite
Biochemistry	MSCM2303	Theory	4-0-0	Basic Medical science

Objective

- Understanding the concept of Biochemical analyzing instruments, chemicals and normal ranges of biochemical components in our body.
- Clinically relevant biochemical analysis for deeper understanding of all biochemical components i.e., Proteins, Electrolytes, Hormones etc

Course Outcome

- To learn about tests carried out for biochemical investigations.
- Understanding of principle of biochemical Clinical biochemistry tests.
- To learn normal ranges and abnormal ranges of biochemical components and hormones.
- To study about diseases related to biochemical and hormone imbalance in human body.

Unit -1

Carbohydrate: Introduction, Carbohydrate Metabolism: Glycolysis, Gluconeogenesis, HMP, and its regulations, Disorders of carbohydrates metabolism related to each cycle (inborn error of metabolism)
Proteins: Different metabolic pathway of amino acid. Amino acids oxidation. Transamination, deamination and pathways leading to acetylco-A. Decarboxylation of Amino acids, formation of nitrogenous excretion products. Urea cycle and ammonia excretion. Lipid: Biosynthesis and oxidation of fatty acids, Ketone bodies formation and their oxidation. Regulation and inborn error of lipid metabolism

Unit -2

Biochemical aspects of Hormone: Hormone receptors and intracellular messengers, Adenylatecyclase, protein kinase and phosphodiesterase. Role of Insulin, glucagon's, epinephrine and their mechanism. Various endocrine and regulatory systems mediated by cyclic AMP. Vitamin: Fat and Water soluble and their deficiency. Mineral metabolism: Minor and Major (cu, Fe, Ca, Mg & P). Inborn error of Nucleic acids metabolism

Unit- 3

LFT, KFT, Lipid profile, Estimation of Glucose / GOD – POD method. Draw a standard graph of GTT curve, Introduction of electrophoresis.

Practice- Demonstration the centrifuge machine, Demonstration of Colorimeter, Estimation of Glucose in urine and blood, Estimation of Protein in urine and blood, Estimation of Liver function test, Kidney function test, Lipid profile.

Suggested readings

1. Text book of Medical Laboratory Technology by P. B. Godker, Publisher Bhalani.
2. Text book of Medical Biochemistry by Chaterjee & Shinde, Publisher JPB
3. Medical Laboratory Technology by Mukherjee, Publisher
4. Principal of Biochemistry by Lehninger, Publisher Kalyani
5. Practical Clinical Biochemistry by Harold Varley, Publisher CBS.

MSCM2304- Histology

Subject Name	Code	Type of course	T-P-Pj	Prerequisite
Histology	MSCM2304	Theory	4-0-0	Basic Medical Science

Objective

- Understanding the concept of histotechnology; Basic concepts about routine methods of examination of tissues Collection.
- Perform routine laboratory procedures encompassing all major areas of the histology laboratory.
- Accurately and proficiently embed tissue and understand the principles of microtomy.
- Clinically relevant onchological analysis for deeper understanding of abnormal cell growth at anywhere in human body.
- The conceptual understanding of the subject provides opportunities for employability and scopes for higher education.

Course Outcome

- In this section students will be made aware of terminology used in histotechnology, various instruments and their maintenance and also learn the processing of various samples for histopathological investigations.
- Reception and labeling of histological specimens.
- Use of antiseptics, disinfectants and insecticides in a tissue processing laboratory.
- The students will learn about various staining procedures for demonstration of different substances & various cytological investigations.
- The students will learn about special staining procedures & handling & testing of various cytological specimens.

Unit-1

Introduction to histotechnology, Care, maintenance and Safety measures of laboratory equipment used

in histotechnology. Basic concepts about routine methods of examination of tissues Collection and transportation of specimens for histological examination, fixation Various types of fixatives used in a routine histopathology laboratory- Simple fixatives, Compound fixatives, Special fixatives for demonstration of various tissue elements.

Practice: Demonstration of instruments used for dissection.

Use of antiseptics, disinfectants and insecticides in tissue processing laboratory.

Unit-2

Decalcification Criteria of a good decalcification agent

Technique of decalcification followed with selection of tissue, fixation, decalcification, neutralization of acid and thorough washing. Various types of decalcifying fluids

Processing of various tissues for histological examination, Embedding

Schedule for manual or automatic tissue processing, Components & principles of various types of tissue processors.

Practice: -Method of Decalcification, fixation, Embedding, manual or automatic tissue processing.

Unit-3

Section Cutting, Sharpening of Microtome Knives, Honing, Stropping, various types of microtome and their applications, Freezing Microtome and various types of Cryostats.

Staining, Impregnation and Mountants, Commonly used mountants in histotechnology lab. General Staining Procedures for Paraffin Infiltrated and Embedded tissue.

Nuclear Stains and Cytoplasmic stain, Equipment and Procedure for manual Staining and Automatic Staining Technique. Mounting of Cover Slips, Labeling and Cataloguing the Slides.

Practice: Demonstration of instruments used for dissection .Use of antiseptics, disinfectants and insecticides in tissue processing laboratory. Preparation of various fixatives- Hell's fluid, Zenker's fluid, Formal saline, Formal acetic acid etc.

Demonstration various parts and types of microtome.

Suggested Readings

1. Color text book of histology by Gartner & Hiatt, publisher Elsevier
2. Netter's essential histology by William Ovalle, publisher Elsevier
3. Histology E-book by Barry Mitchell, publisher Elsevier
4. Textbook of Histology (color atlas) by Krishna Garg, Indira Bahl, Mohini Kaul, publisher CBS
5. Textbook of Histology and a Practical Guide by JP Gunasegaran, Publisher Elsevier.

MSCM2307- Research Methodology

Subject Name	Code	Type of course	T-P-Pj	Prerequisite
Research Methodology	MSCM2307	Theory	3-0-0	Fundamental Science

Objective

- To equip students with a basic understanding of the underlying principles of quantitative and qualitative research methods.
- Provide students with in-depth training on the conduct and management of research from inception to completion using a wide range of techniques.

Course Outcome

- Students can understand the ethical and philosophical issues associated with research in education
- This study provides knowledge on various modes of presenting and disseminating research findings.
- Enable students to acquire expertise in the use and application of the methods of data collection and analysis.
- Provide learning opportunities to critically evaluate research methodology and findings.
- Enable students to be reflexive about their role and others' roles as researchers.

Unit-1

Introduction to Research: Definition, Scope, Limitations, and Types. Objectives of Research. Research Process. Research Designs.

Project: Related to above unit.

Unit-2

Data Collection: Secondary Data, Primary Data, and Methods of Collection. Scaling Techniques: Concept, Types, Rating scales & Ranking Scales Scale Construction Techniques, Multi-Dimensional Scaling. Sampling Designs: Concepts, Types and Techniques Sample Size Decision.

Practice: Demonstrate the data collection technique, scaling and sampling.

Unit-3

Theory of Estimation and Testing of Hypothesis Small & Large Sample Tests, Tests of Significance based on t, F, Z test and Chi-Square Test. Designing Questionnaire. Interviewing. Tabulation, Coding, Editing. Interpretation and Report Writing.

Suggested Readings

1. Research Methodology kindle edition by R. Panneerselvam publisher PHI Learning; 2 edition
2. Research Methodology: Methods and Techniques Paperback – Abridged, Audiobook, Box set by C R Kothari, publisher newage

FCHU1204- Communicative Practice Laboratory–II

Subject Name	Code	Type of course	T-P-Pj	Prerequisite
Communicative Practice Laboratory-II	FCHU1204	Practice	0-3-0	Fundamental Science

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Objectives

- To master Study Skills
- To acquire strategic competence to use both spoken & written language to use in a wide range of communication strategies
- To acquire Business Performance Skills

Course Outcomes

- The students will be able to Write effectively for a variety of professional and social settings. They will practice writing as a process of motivated inquiry engaging others writers' ideas as they explore and develop their own. They will demonstrate an ability to revise for content and edit for grammatical and stylistic clarity. And they will develop an awareness and confidence in their own voice as a writer.
- Become accomplished, active readers who appreciate ambiguity and complexity, and who can articulate their own interpretations with an awareness and curiosity for other perspectives.
- Demonstrate the skills needed to participate in a conversation that builds knowledge collaboratively; listening carefully and respectfully to others' view points; articulating their own ideas in relation to other voices and ideas. Students will be able to prepare, organize and deliver and engaging oral presentation. A student is required to take up five lab tests of 100 marks- at least two tests in written mode and three tests in spoken mode.

Unit-1

LISTENING (6 HOURS) Exercises on Active Listening:

- The whole group listens to any speech/news broadcast in English and notes down the important points. They listen again to check their points and evaluate themselves. The group then compares points to see how well they have understood the broadcast.

Unit-2

SPEAKING (8 HOURS)

- Situational Dialogues / Role Play; Organization Communication
- Oral Presentations- Prepared and Extempore
- 'Just a minute' Sessions (JAM)
- Debates
- Mock Meetings
- Cracking Job Interviews: Mock Sessions
- Group Discussions on current topics (This module will be practiced through speaking activities like role plays, presentations, and discussions)

Unit-3

READING (8 HOURS)

- Students will be given practice in reading and comprehension 6-8 passages of 100-300 words

each, on topics of General as well as professional interest. The texts will be supported by suitable exercises designed to foster comprehension skills and vocabulary enrichment. Students are encouraged to read newspapers, articles, books and novels.

- Reading Comprehension Exercises Through Tests, Writing Summary and Presenting, Note Making
- Review Presentation (Movie/ Article/Book)
- Vocabulary Building Exercises (This module encourages extensive use of reading materials)

Unit-4

WRITING (8 HOURS)

- The Writing Lab content is designed to acquaint the students not only with the techniques of effective writing but also give them an insight into planning and writing documents that produce results.
- Short Paragraphs on current general and technical topics
- Creative Writing: Idea Generation
- Business Letters, Email Messages, Project Writing
- Writing Resumes and Cover Letters (* Students will be required to produce and submit by the end of second semester a 350- 500 words project report on a topic of their choice. The project should involve data collection, analysis and reporting. Ten marks (out of 100 marks allocated for Lab Test) will be set apart for the project.)

TEXT BOOK:

An Introduction to Professional English and soft skills by B.K Das et al., Cambridge University Press

REFERENCES:

Effective Business Communication, Asha Kaul, Prentice Hall Professional Communication, Aruna Koneru, TMH

MSCM2308- Immunology Lab

Subject Name	Code	Type of course	T-P-Pj	Prerequisite
Immunology Lab	MSCM2308	Practice	0-3-0	Fundamental Science

Objective

- Understanding the concept of Innate & adaptive immune system; complement system; Hypersensitivity.
- Clinically relevant serological analysis for deeper understanding of antigen-antibody interaction.
- To understand the concept of cells of immune system and organs of immune system.
- To understand the properties of virus, diagnosis of important viruses and vaccination.

Course Outcome

- The student will learn the application of Immunology in disease diagnosis.
- Complement system followed by the body on encountering an Antigen.
- Immune Response produced on encounter with foreign body.
- The students will learn the role of immunity in fighting disease, along with consequence of undesirable expression of immune system such as, hypersensitivity and auto immune disease.
- They will gather knowledge regarding the properties, diagnosis of virus and vaccination against them.
- The conceptual understanding of the subject provides opportunities for employability and scopes for higher education.

Collection of blood sample by vein puncture, separation and preservation of serum

Performance of Serological tests i.e.-Widal, Brucella Tube Agglutination, VDRL (including Antigen Preparation), ASO (Antistreptolysin 'O'), (Latex agglutination), Rheumatoid factor (RF) Latex agglutination, Rose Waaler test,

Demonstration of antigen / antibody determination by Immunofluorescence, Immunodiffusion, precipitation in agarosegel(ouchterlony), CIEP, ELISA, SDSPAGE and western blotting.

MSCM2309-Histopathology Lab

Subject Name	Code	Type of course	T-P-Pj	Prerequisite
Histopathology Lab	MSCM2309	Practice	0-3-0	Fundamental Science

Objective

Distinguish normal tissues and organs by microscopic appearance when shown a microscopic image (light or electron microscopic photomicrograph) or glass slide.

Course Outcome

- After completion of the Practical student will be able to understand the use of instruments used for dissection , embedding and casting of block and use of microtome.
- Recognise the histological appearance of a number of pathological tissues
- Understand how sections can be photographed, presented and reported

1. Demonstration of instruments used for dissection.
2. Use of antiseptics, disinfectants and insecticides in a tissue processing laboratory Reception and labeling of histological specimens.
3. To perform embedding and casting of block. To process a bone for decalcification
4. To prepare 70% alcohol from absolute alcohol
5. Processing of tissue by manual and automated processor method
6. To demonstrate various part and types of microtome
7. To learn sharpening of microtome knife (Honing and stropping technique).

8. To perform section cutting.
9. To practice attachment of tissue sections to glass slides.

MSCM2310-Biochemistry Lab

Subject Name	Code	Type of course	T-P-Pj	Prerequisite
Biochemistry Lab	MSCM2310	Practice	0-3-0	Fundamental Science

Objective

- Analyze body fluid for diagnosis of disease
- Understand Physiological disorder and infectious disease

Course Outcome

- Able to detect Glucose ,Proteins, Urea, Uric acid, Creatinine, Bilirubin, Lipids
- They would have understood the significance of proteins and enzymes in accelerating various metabolic activities.
- The conceptual understanding of the subject provides opportunities for skill enhancement and scopes for higher education and would have understood the principles of Liver function test, kidney function test, lipid profile etc.

Hazards & safety measures in clinical Biochemistry laboratory .

Quality control and quality assurance in a clinical biochemistry laboratory . Laboratory organization, management and maintenance of records

Principles of assay procedures, Normal range in blood, Serum, Plasma and Urine and reference values for

- a. Glucose b. Proteins c. Urea d. Uric acid e. Creatinine f. Bilirubin g. Lipids

Principles, procedures for estimation & assessment of the following including Errors involved and their corrections:

- a. Sodium, Potassium and Chloride, Iodine. b. Calcium, Phosphorous and Phosphates

MSCM2311 - Mini Project

Subject Name	Code	Type of course	T-P-Pj	Prerequisite
Mini Project	MSCM2311	Project	0-0-3	Basic Medical science

The student is supposed to carry out project work in assistance with a mentor. The project should be relevant to the syllabus and should be qualitatively initiated towards fetching a research publication/ case study/ clinical study/ community service/ survey on successful completion within the stipulated time.

Outcome: Research paper publication/ new idea generation/ case study/ clinical study/ community service/ survey.

4th semester M. Sc. in Applied and Clinical Microbiology

Internship Thesis Guideline

This Guideline is designed to provide students the knowledge and practice of public health research activity, to enable them to carry out researches and solve research related problems and to help them in writing thesis and defend their work. Upon successful completion of the course, the students shall be able to:

- Search relevant scientific literature
- Develop a research proposal
- Employ appropriate data collection techniques and tools
- Manage collected data
- Analyze data with appropriate statistical techniques
- Write thesis
- Defend the findings

Proposal Development:

At the ending of second year (fourth Semester), students individually consultation with designated faculties and extensive literature survey will develop research proposal during the initial 6 months period.

Data Collection/ Thesis Writing:

Students will carry out data collection, data management, data analysis, and thesis writing during the remaining period (fourth Semester).

The Dissertation should have following format:

1. Title
2. Introduction
3. Materials and Methods
4. Results
5. Discussion
6. Conclusion
7. Recommendation
8. References
9. Appendix

MSCM2403-PROJECT

Subject Name	Code	Type of course	Credits	Prerequisite
Project	MSCM2403	-	10	Basic Medical science

Project work:

- **Microbiology:**

Suggested Project title

1. Hepatitis C viruses among pregnant women/people living with HIV/AIDS.
2. Antibacterial activity of honey on staphylococcus Aureus, escherichia coli and streptococcus Pyogen isolated from wound.
3. Susceptibilities of salmonella Typhi and other bacterial pathogens to antibiotics and hot aqueous extract of hibiscus sabdariffa.
4. Isolation and identification of bacteria from food vendors and some vegetable available.
5. Urinary tract infections in adult students of centurion university, BBSR campus
6. Air borne microbiological disorders (DOTS centre)

MSCM2404 - INTERNSHIP

Subject Name	Code	Type of course	Credits	Prerequisite
Internship	MSCM2404	-	10	Basic Medical science

Internship

- Caserecord
- Lab management and ethics
- Evaluation-Guide(internal)

-Industries guide(external)

-University-project report/ Viva

The following colour represents the syllabus revision, skill, employability and entrepreneurship.

Green : Skill

Pink : Employability

Sky : Entrepreneurship

Centurion University of Technology and Management Odisha

CHOICE BASED CREDIT SYSTEM

COURSE STRUCTURE & SYLLABUS

BASKET - I



School of Engineering & Technology

2019

BASKET - I (Basic Sciences)

Course Code	Course Title	Course Type	Credits	Prerequisite	Department Offering
FCBS0101	<i>Environmental Science</i>	<i>Theory</i>	3	<i>Nil</i>	<i>Chemistry</i>
FCBS 0102	<i>Differential Equations</i>	<i>Theory</i>	3	<i>Nil</i>	<i>Mathematics</i>
FCBS 0103	<i>Linear Algebra & Vector Calculus</i>	<i>Theory</i>	3	<i>Nil</i>	<i>Mathematics</i>
FCBS 0104	<i>Integral Transform</i>	<i>Theory</i>	3	<i>Nil</i>	<i>Mathematics</i>
FCBS 0105	<i>Complex Analysis</i>	<i>Theory</i>	3	<i>Nil</i>	<i>Mathematics</i>
FCBS0106	<i>Discrete Mathematics</i>	<i>Theory</i>	3	<i>Nil</i>	<i>Mathematics</i>

<i>FCBS0107</i>	Calculus	<i>Theory</i>	3	<i>Nil</i>	<i>Mathematics</i>
<i>FCBS0108</i>	Probability & Statistics	<i>Theory</i>	3	<i>Nil</i>	<i>Mathematics</i>
<i>FCBS0109</i>	Numerical Methods	<i>Theory</i>	3	<i>FCBS0102 Differential Equations</i>	<i>Mathematics</i>
<i>FCBS0401</i>	<i>Applied Analytical Chemistry</i>	<i>Theory + Practice</i>	3	<i>Nil</i>	<i>Chemistry</i>
<i>FCBS0402</i>	<i>Industrial Chemistry</i>	<i>Theory + Practice</i>	3	<i>Nil</i>	<i>Chemistry</i>
<i>FCBS0403</i>	<i>Applied Engineering Materials</i>	<i>Theory + Practice</i>	3	<i>Nil</i>	<i>Chemistry</i>
<i>FCBS0404</i>	<i>Electricity and Magnetism</i>	<i>Theory + Practice</i>	4	<i>Nil</i>	<i>Physics</i>
<i>FCBS0405</i>	<i>Basic Mechanics and Properties of Matter</i>	<i>Theory + Practice</i>	4	<i>Nil</i>	<i>Physics</i>
<i>FCBS0406</i>	<i>Optics and Optical Fibres</i>	<i>Theory + Practice</i>	4	<i>Nil</i>	<i>Physics</i>

Environmental Science

Course Name	Code	Type of course	T-P-PJ (Credit)	Prerequisite
Environmental Science	FCBS0101	Theory	3	Nil

Course Objective:

- *To understand the concept of multi-disciplinary nature of Environmental Science where different aspects are dealt with a holistic approach.*
- *Students will develop a sense of community responsibility by becoming aware of environmental issues in the larger social context.*
- *One must be environmentally educated.*

Course Outcome:

- Understand the natural environment and its relationships with human activities.
- Characterize and analyze human impacts on the environment.
- Integrate facts, concepts, and methods from multiple disciplines and apply to environmental problems.
- Design and evaluate strategies, technologies and methods for sustainable management of environmental systems and for the remediation or restoration of degraded environments.

Evaluation System

	Component	% of Marks	Method of Assessment
Internal Examination	Midterm Test	30	Written examination
	Assignment	05	Report and Presentation
	Attendance	05	Attendance percentage
	Total	40	
External Examination		60	Written examination
Total		100	

MODULE-I

Environment and its multidisciplinary nature; Need for public awareness; Renewable and non renewable resources—forest, water, mineral, land, food and energy resources; Structure and function of ecosystems of forest, grass land, desert and aquatic types.

MODULE -II

Biodiversity and its conservation: Biodiversity at global, national and local levels; Threats to biodiversity - Habitat loss; wild life poaching and man - wildlife conflicts; Endangered and endemic species; conservation measures.

Causes, effects and control measures of pollution, air, water and noise pollution; Nuclear hazards; solid-waste management—Causes, effects and control measures; Management of disasters due to natural causes of floods, earthquakes, cyclones and landslides.

MODULE-III

Social issues and the environment; Sustainable environment, Water conservation measures; Rain water harvesting; Resettlement and rehabilitation of people; Climate change and global warming; Acid rain; Ozone layer depletion; water land reclamation; Consumerism and waste products; Features of Environment Protection Act, Air pollution and Control of Pollution Acts; Water Pollution and its Control Act. Effects of Pollution explosion on environment and public health; Need for value education to Protect environment and resources.

Text Book: Anubhav Kaushik & C.P. Kaushik : *Environmental Studies-New age International Publishers.*

Reference Books:

1. Benny Joseph : *Environmental Studies-Tata Mac Graw Hill*
2. E. Bharucha : *Text book of Environmental Studies for Under graduate courses– Universities Press. (Book prepared by UGC Committee.*

Differential Equations

Course Name	Code	Type of course	T-P-PJ (Credit)	Prerequisite
Differential Equations	FCBS 0102	Theory	3	Nil

Course Objectives:

- To understand most of the physical phenomena from Science and Engineering which are modeled by differential equations.
- To find and interpret the solutions of the ODE & PDE appearing in signal systems, dynamical systems, stability theory and a number of applications to scientific and engineering problems.
- To develop the ability to apply differential equations to significant applied and/or theoretical problems.

Course Outcomes: Upon successful completion of this course, the student will be able to:

- Learn fundamental concepts of ODE & PDE theories and where and how such equations arise in applications to scientific and engineering problems.
- Be competent in solving linear/non-linear 1st & higher order ODEs & PDEs using analytical solution methods to obtain their exact solutions.
- Recognize the major classification of ODEs & PDEs and the qualitative differences between the classes of equations.

Evaluation System

	<i>Component</i>	<i>% of Marks</i>	<i>Method of Assessment</i>
<i>Internal Examination</i>	Midterm Test	30	Written examination
	Assignment	05	Report and Presentation
	Attendance	05	Attendance percentage
	Total	40	
<i>External Examination</i>		60	Written examination
<i>Total</i>		100	

MODULE-I (12 Hours)

First Order Differential Equations: Separable Equations, Homogeneous & Non-homogeneous Equations, Exact Differential Equations, Integrating Factor, Linear Differential Equations, Bernoulli Equation.

MODULE-II (15 Hours)

Second & Higher Order Linear Differential Equations: Linear Dependence and Independence of Solutions, Wronskian, Constant Coefficient Homogeneous Equations, Cauchy-Euler Equation, Nonhomogeneous Equations, Method of Variation of Parameter, Method of Inverse Operator, Legendre Equation.

MODULE-III (15Hrs)

Partial Differential Equation of First Order, Linear and Non-linear Partial Differential Equations, Charpit's Method, Homogeneous and Non-homogeneous Linear Partial Differential Equations with Constant Coefficients, Cauchy Type Differential Equation.

Text Book:

1) Higher Engineering Mathematics by B.V. Raman Publisher: TMH

Chapters: 8 (8.1 to 8.10); 9 (9.1 to 9.7), 18 (18.1 to 18.8)

Reference Book: 1) Advanced Engineering Mathematics by P.V.O'Neil Publisher: Thomson

Linear Algebra & Vector Calculus

Course Name	Code	Type of course	T-P-PJ (Credit)	Prerequisite
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Linear Algebra & Vector Calculus	FCBS 0103	Theory	3	Nil
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Course Objectives:

- To apply concepts of Linear Algebra & Vector Calculus to the problems related to models in work, circulation and flux Problems, hydrodynamics and fluid dynamics, electrical circuits, networking, linear programming, graph theory, computer graphics, cryptography, thermodynamics, construction of curves and surfaces through specified points etc.
- To solve the system of linear equations appearing in the problems of electrical engineering, mechanical engineering, applied mechanics etc.
- To apply vectors in higher dimensional space in experimental data, storage and warehousing, electrical circuits, graphical images, mechanical systems and in physics.

Course Outcomes:

Upon successful completion of this course, the student will be able to:

- Use matrix operations to solve systems of linear equations and be able to determine the nature of the solutions.
- Compute with the characteristic polynomial, eigenvalues, eigenvectors and eigenspaces of a matrix as well as the geometric and the algebraic multiplicities of an eigenvalue and then to diagonalise that matrix.
- Determine the important quantities associated with scalar and vector fields.

Evaluation System

	<i>Component</i>	<i>% of Marks</i>	<i>Method of Assessment</i>
<i>Internal Examination</i>	Midterm Test	30	Written examination
	Assignment	05	Report and Presentation
	Attendance	05	Attendance percentage
	Total	40	
<i>External Examination</i>		60	Written examination
<i>Total</i>		100	

MODULE-I (14 Hours)

Linear Algebra, Basic Concepts, Linear System of Equations, Solution by Gauss Elimination, Conditions of Existence and Uniqueness of Solutions, Rank of a Matrix, Determinants and Cramer's Rule, Linear Dependence and Independence.

MODULE-II (14 Hours)

Eigen Values and Eigen Vectors, Basis, Symmetric, Skew-Symmetric and Orthogonal Matrices, Complex Matrices, Similarity of Matrices, Diagonalization.

MODULE-III (14 Hours)

Vector Differential Calculus: Vector Algebra, Inner Product, Vector Product, Vector & Scalar Functions and Fields, Derivatives, Gradient of a Scalar Field, Directional Derivative, Divergence of a Vector Field, Curl of a Vector Field.

Text Book:

1) *Advanced Engineering Mathematics* by E. Kreyszig Publisher: Johnwiley & Sons Inc-8th Edition Chapters: 6 (6.1 to 6.6); 7 (7.1, 7.3 to 7.5), 8 (8.1 to 8.4, 8.9 to 8.11)

Reference Books:

1) *Advanced Engineering Mathematics* by P.V.O' Neil Publisher: Thomson

Mathematical Methods by Potter & Goldberg ; Publisher : PHI

Integral Transform

Course Name	Code	Type of course	T-P-PJ (Credit)	Prerequisite
Integral Transform	FCBS 0104	Theory	3	Nil

Course Objectives: To describe the ideas of Fourier and Laplace Transforms and indicate their applications in the fields such as Signal & System, Digital Signal Processing, Image Processing, Theory of Control Systems, Differential Equations and many others.

- To use Fourier series for solving boundary value problems appearing in scientific & engineering problems.
- To get acquainted with the fact that the Laplace transform is related to the Fourier transform, but the Fourier transform expresses a function or signal as a series of modes of vibration (frequencies), whereas the Laplace transform resolves a function into its moments.

Course Outcomes: Upon successful completion of this course, the student will be able to:

- Obtain Laplace transform of simple functions, functions expressed in graphical form, integrals and derivatives.
- Solve differential & integral equations with initial conditions using Laplace transform.
- Compute the Fourier series representation of a periodic function, in both exponential and sine-cosine forms.
- Evaluate the Fourier transform of a continuous function and be familiar with its basic properties.

Evaluation System

	Component	% of Marks	Method of Assessment
Internal Examination	Midterm Test	30	Written examination
	Assignment	05	Report and Presentation
	Attendance	05	Attendance percentage
	Total	40	
External Examination		60	Written examination
Total		100	

MODULE-I (16 Hours)

Laplace Transforms, Transforms of Derivatives and Integrals, Derivatives and Integrals of Transforms, Shifting Properties, Unit Step Function, Dirac's Delta Function, Convolution, Inverse Transforms, Solution to Differential Equation, Integral Equation.

MODULE-II (12 Hours)

Periodic Functions, Trigonometric Series, Fourier Series, Fourier Expansion of Functions of any

Period, Even and Odd Functions, Half Range Expansions,

MODULE-III (14Hrs)

Fourier Integrals: Fourier Sine Integral, Fourier cosine Integral. Fourier Transforms: Fourier Sine Transform, Fourier Cosine Transform.

Text Book:

Advanced Engineering Mathematics by E.Kreyszig

Publisher: Johnwiley & Sons Inc-8th Edition

Chapters: 5 (5.1 to 5.6); 10 (10.1 to 10.4,

10.8, 10.9) Reference Books:

1) Advanced Engineering Mathematics by P.V.O'Neil .Publisher: Thomson

2) Higher Engineering Mathematics by B.V.Raman .Publisher: TMH

Complex Analysis

Course Name	Code	Type of course	T-P-PJ (Credit)	Prerequisite
Complex Analysis	FCBS 0105	Theory	3	Nil

Course Objectives:

- *To understand the application of Complex Analysis to Two-Dimensional problems in Physics including Hydrodynamics and Thermodynamics and also in Engineering fields such as; Nuclear, Aerospace, Mechanical and Civil engineering, signal processing & communications.*
- *To acquire the skill of contour integration to evaluate complicated real integrals appearing in Engineering problems via residue calculus.*

Course Outcomes: Upon successful completion of this course, the student will be able to:

- *To get equipped with the understanding of the fundamental concepts of functions of a complex variable along with the concepts of analyticity, Cauchy-Riemann relations and harmonic functions.*
- *Evaluate complex contour integrals applying the Cauchy integral theorem, Cauchy integral formula and Residue theorem.*
- *Illustrate the applications of the calculus of residues in the evaluation of real integrals.*

Evaluation System

	Component	% of Marks	Method of Assessment
Internal Examination	Midterm Test	30	Written examination
	Assignment	05	Report and Presentation
	Attendance	05	Attendance percentage
	Total	40	
External Examination		60	Written examination
Total		100	

MODULE-I (14 Hours)

Complex Analysis: Analytic Function, Cauchy-Riemann Equations, Laplace Equation, Harmonic Function, Linear Fractional Transformation.

MODULE-II (14 Hours)

Parametric representation, Line Integral in the Complex plane, Cauchy's Integral Theorem, Cauchy's Integral Formula, Derivatives of Analytic Function.

MODULE-III (14Hrs)

Power Series, Taylor's Series, Maclaurin Series, Laurent's Series, Singularities and Zeroes, Residue Theorem, Residue Integration Method, Evaluation of Real Integrals.

Text Book:

1) *Advanced Engineering Mathematics* by E. Kreyszig Publisher: John Wiley & Sons Inc-8th Edition Chapters: 12 (12.1 to 12.4, 12.9); 13, 14 (14.2, 14.4) & 15.

Reference Books:

1) *Advanced Engineering Mathematics* by P.V. O'Neil Publisher: Thomson

2) *Fundamentals of Complex Analysis (with Applications to Engineering and Science)* by E.B. Saff & A.D. Snider Publisher: Pearson

Discrete Mathematics

Course Name	Code	Type of course	T-P-PJ (Credit)	Prerequisite
Discrete Mathematics	FCBS 0106	Theory	3	Nil

Course Objectives:

- To learn a particular set of mathematical facts and to apply their applications in many subjects of Computer Science and Engineering such as Cryptography, Theory of Computation & Data Networking.
- To understand mathematical reasoning in order to read, comprehend and construct mathematical arguments as well as to solve problems, occurred in the development of programming languages.
- To work with discrete structures such as graphs to study the structure of the world wide web, to model a computer network and to find the shortest path between two places in a transportation network.

Course Outcomes: Upon successful completion of this course, the student will be able

to:

- Evaluate elementary mathematical arguments and identify fallacious reasoning.
- Apply the logical structure of proofs and work symbolically with connectives and quantifiers to produce logically valid, correct and clear arguments.
- Reformulate statements from common language to formal logic. Apply truth tables and the rules of propositional and predicate calculus.
- Model and solve real-world problems using graphs, both quantitatively and qualitatively.

Evaluation System

	Component	% of Marks	Method of Assessment
Internal Examination	Midterm Test	30	Written examination
	Assignment	05	Report and Presentation
	Attendance	05	Attendance percentage
	Total	40	
External Examination		60	Written examination
Total		100	

MODULE-I (12 Hours)

Propositional Logic, Propositional Equivalence, Predicates and Quantifiers, Nested Quantifiers, Rules of Inference, Recurrence Relations, Solving Linear Recurrence Relations.

MODULE-II (16 Hours)

Relations and its properties, Representation of Relations, Closure of Relations, Equivalence Relations and Partitions, Partial Ordering, POSet, Hasse Diagram, Maximal

& Minimal elements of a Poset, Supremum & Infimum of a Poset, Lattice, Basic properties of Lattices.

MODULE-III (14Hrs)

Introduction to Graph Theory, Graph terminology, Representation of graphs, Graph Isomorphism, Connectivity, Euler and Hamiltonian Paths, Planar graph, Graph Coloring,

Text Books:

- 1 *Discrete Mathematics and its Applications* by K.H.Rosen Publisher: TMH, Sixth Edition Chapters:1(1.1 to 1.5) ; 6 (6.1, 6.2) ; 7; 8(8.1 to8.5, 8.7, 8.8)
- 2 *Elements of Discrete Mathematics* by C.L.liu & D.P. Mohapatra Publisher: TMH, Third Edition Chapter: 11 (11.1 to 11.4) **Reference Books:**
Discrete and Combinatorial Mathematics by R.P.Grimaldi Publisher: Pearson
Discrete Mathematics and Applications by Thomas Koshy Publisher: Elsevier
Discrete Mathematical Structures by B. Kolman, R.C. Busby & S. Ross Publisher: PHI

Calculus

Course Name	Code	Type of course	T-P-PJ (Credit)	Prerequisite
Calculus	FCBS0107	Theory	3	Nil

Objective

- To study how things change. It provides a framework for modeling systems in which there is change, and a way to deduce the predictions of such models.
- To construct a relatively simple quantitative models of change, and to deduce their consequences.
- The fundamental idea of calculus is to study change by studying “instantaneous” change, by which we mean change over tiny interval of time.

Course Outcome

- Upon successful completion of this course, students will be able to:
- Understand the importance of linear functions in mathematics.
 - Understand the major problems of differential and integral calculus.
 - Understand and recognize other important classes of functions (such as trigonometric and rational functions), and be able to use calculus with these functions.

Evaluation Systems

	Component	% of Marks	Method of Assessment
Internal Examination	Midterm Test	30	Written examination
	Assignment	05	Report and Presentation
	Attendance	05	Attendance percentage
	Total	40	
External Examination		60	Written examination
Total		100	

MODULE-I

Asymptotes

(6 Hours)

MODULE-II

Curve Tracing

(6 Hours)

MODULE-III Curvature	(6 Hours)
MODULE-IV Reduction Formulae	(6 Hours)
MODULE-V Vector Integral Calculus: Line Integrals.	(6 Hours)
MODULE-VI Surface Integrals, Green's Theorem	(6 Hours)
MODULE-VII Volume Integrals, Gauss's Theorem, Stokes' Theorem (without proof).	(6 Hours)

Text Books:

- 1) A Text book of Calculus Part-III : Shantinakaran
Chapters: 1 (Art 1 & 3), 3(Art 7, 8, 9)
- 2) A Text book of Calculus Part – II : Shantinakaran
Chapter: 8 (Art. 24, 25, 26),
- 3) A Text book of Calculus Part – II : Shantinakaran
Chapter: 10 (Art.33, 34, 35, 36, 37)
- 4) A Textbook of Vector Calculus by Shanti Narayan & P. K. Mittal, S. Chand & Co. , 2003
Chapters: 7 (7.1 to 7.6, 7.8 & 7.11)

Probability & Statistics

Course Name	Code	Type of course	T-P-PJ (Credit)	Prerequisite
Probability & Statistics	FCBS0108	Theory	3	Nil

Objective

- To translate real-world problems into probability models.
- To motivate in students an intrinsic interest in statistical thinking.
- To recognize the role of and application of probability theory, descriptive and inferential statistics in many different fields of engineering.

Course Outcome

- Upon successful completion of this course, students will be able to:
- Define and illustrate the concepts of sample space, events and compute the probability and conditional probability of events.
 - Define, illustrate and apply the concepts of discrete and continuous random variables, the discrete and continuous probability distributions.
 - Define, illustrate and apply the concept of the expectation to the mean, variance and covariance of random variables.
 - Compute probabilities based on practical situations using the Binomial, Poisson and Normal distributions.

Evaluation Systems

	<i>Component</i>	<i>% of Marks</i>	<i>Method of Assessment</i>
Internal Examination	Midterm Test	30	Written examination
	Assignment	05	Report and Presentation
	Attendance	05	Attendance percentage
	Total	40	

<i>External Examination</i>		<i>60</i>	Written examination
<i>Total</i>		<i>100</i>	

MODULE-I (6 Hours)
Probability: Sample space and Events, Principles of Counting, Classical definition of probability.

MODULE-II (6 Hours)
Axioms of probability, Elementary theorems, Addition and Multiplication rules, Conditional probability.

MODULE-III (6 Hours)
Probability Distributions: Discrete and Continuous Random Variables.

MODULE-IV (6 Hours)
Probability Density and Distribution functions, Mean and Variance of Distributions. Binomial Distribution.

MODULE-V (6 Hours)
Poisson Distribution, Normal Distributions, Poisson and Normal Distributions as Limiting forms of Binomial Distribution.

MODULE-VI (6 Hours)
Statistics: Random Sampling, Population and Sample, Sample Mean and Variances.

MODULE-VII (6 Hours)
Point and Interval Estimations, Confidence Intervals, Fitting Straight Lines, Correlation and Regression.

Text Book:

- 1) Advanced Engineering Mathematics by E. Kreyszig
Publisher: John Willey & Sons Inc-8th Edition
Chapters: 22(22.1 to 22.8), 23(23.1 to 23.3, 23.9, 23.10)

Reference Books:

- 1) Statistical Methods By S.P. Gupta (31st Edition); Publisher: Sultan Chand & Sons.
- 2) Mathematical Statistics By S.C. Gupta & V.K. Kapur (10th Edition); Publisher: Sultan Chand & Sons.

Numerical Methods

Course Name	Code	Type of course	T-P-PJ (Credit)	Prerequisite
Numerical Methods	FCBS0109	Theory	3	FCBS0102 Differential Equations

Objective

<ul style="list-style-type: none"> To understand the limitations of analytical methods and the need for numerical methods and the ability to apply these numerical methods to obtain the approximate solutions to engineering and mathematical problems. Ability to decide and to derive appropriate numerical methods for approximating the solutions of various types of problems in engineering and science and analyze the error incumbent in any such numerical approximation. Ability to report analysis, solution and results in a standard engineering format.

Course Outcome

<p>Upon successful completion of this course, students will be able to:</p> <ul style="list-style-type: none"> Perform error analysis to select an appropriate numerical model and to estimate errors in numerical solution of a given problem. Derive a variety of numerical algorithms/methods & compare the viability of different approaches to the numerical solutions of various mathematical problems arising in roots of linear and non-linear equations, interpolation and approximation, numerical differentiation and integration, system of linear algebraic equations and differential equations. Analyze and evaluate the accuracy of common numerical methods.
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Evaluation Systems

	<i>Component</i>	<i>% of Marks</i>	<i>Method of Assessment</i>
Internal Examination	Midterm Test	30	Written examination
	Assignment	05	Report and Presentation
	Attendance	05	Attendance percentage
	Total	40	
External Examination		60	Written examination
Total		100	

MODULE-I

(6 Hours)

Approximation and round of errors, Truncation error and Taylor's series, Roots of equation using Bisection Method.

MODULE-II

(6 Hours)

Roots of equation using the false-position method, fixed point iteration, Newton-Raphson method, Secant method.

MODULE-III

(6 Hours)

Solution of System of Linear algebraic equations: Gauss-Seidel method, Lagrange Interpolation.

MODULE-IV

(6 Hours)

Newton divided difference interpolation, Inverse Interpolation, Lagrange Interpolation, Newton's forward and backward interpolation.

MODULE-V (6 Hours)

Numerical Differentiation, Numerical integration by the trapezoidal rule.

MODULE-VI (6 Hours)

Numerical integration by the Simpson's rules, Gauss quadrature rule.

MODULE-VII (6 Hours)

Solution of Ordinary Differential Equations: Euler's method, Improvement of Euler's method, Runge-Kutta methods.

Text Book:

- 1) Advanced Engineering Mathematics by E. Kreyszig
Publisher: John Willey & Sons Inc-8th Edition
Chapters: 17 (17.1 to 17.3, 17.5), 18 (18.3), 19 (19.1)

Reference Books:

- 1) Numerical Methods for Scientific and Engineering Computation by M. K. Jain, S. R. K. Iyengar & R.K. Jain; New Age International Publishers.
- 2) Introductory Methods of Numerical Analysis by S.S. Sastry; Third Edition, Prentice Hall India.

Applied Analytical Chemistry

Course Name	Code	Type of course	T-P-PJ (Credit)	Prerequisite
Applied Analytical Chemistry	FCBS0401	Theory + Practice	3	Nil

Course Objective

- The aim of this course is to give students that are going to carry out an experimental work the necessary comprehension in analytical chemistry.
- The course will also provide the student with knowledge to be able to understand and critically evaluate experimental data produced by others.

Course outcome

- Explain fundamental principles for environmental analytical methods (titration, electrochemistry, instrumentation and basic parameters of water, soil, fuel etc)
- Point out suitable analytical techniques for analyzing a specific compounds in an environmental matrix
- Point out suitable techniques for sampling and handling of environmental samples
- Apply quality control on chemical analysis and laboratory work and explain its importance
- Plan and carry out laboratory experiments, including data analysis and conclusions
- Describe simple approaches for troubleshooting

Evaluation System

	Component	% of Marks	Method of Assessment
Internal Examination	Internal	20	Written examination
	Assignment	30	Report and Presentation
External Examination	End Sem	30	Written examination
	Practice	20	Experiment followed by Viva
Total		100	

Module-1

Water Analysis: Importance of water, different types of water, sources and uses of water, types of water pollutants and domestic and industrial significance of analysis of water. Removal of hardness by Lime-Soda, Zeolite and Ion exchange methods. Removal of DO and dissolved CO₂ from water by De-aeration method. Desalination of brackish water by Reverse osmosis and electro dialysis process. Water disinfection by bleaching powder, liquid Cl₂, and chloramine.

Practice:

- Determination of total hardness by EDTA method, total dissolved solids, total alkalinity
- Determination of Turbidity by nepheloturbidity meter, pH, Conductivity.
- Determinations of BOD, COD, DO.

NB: The above parameters can also be determined by using water kits and the results are to be compared with those obtained manually.

Module-2

Soil Analysis: Composition of rocks and minerals, soil profile and properties.

Practice:

1. Determination of texture of soil.
2. Determination of moisture content in a soil sample, pH, electrical conductivity,
3. Determination of water holding capacity of soil.
4. Measurement of Calcium and Magnesium Using EDTA methods.

Module-3

Chemistry of fuels: Classification of fuels, composition and properties of Petroleum, LPG, Water gas, producer gas, CNG. Knocking – Mechanism of knocking, harmful effects, Anti knocking agents – TEL, Catalytic converters – Principle & working, Unleaded petrol, Power alcohol & Biodiesel. Photovoltaic cells - construction & working of a PV cell **Practice:**

1. Proximate analysis of fuel (Coal, biomass etc.) Moisture, Volatile content, Ash, fixed carbon
2. Testing of fuel properties of the plastic oil and bio diesel: Specific gravity by picnometer, flash point and fire point by pesky-Marten flash point apparatus, viscosity by Redwood viscometer, calorific value by bomb calorimeter

Industrial Chemistry

Course Name	Code	Type of course	T-P-PJ (Credit)	Prerequisite
Industrial Chemistry	FCBS0402	Theory + Practice	3	Nil

Course Objective

Students may also explore in depth specialized areas of chemistry of materials, including ores, metals, cemenas well as dyes, oils, soaps

- *Introduce the students to industrial processing principles as applicable to chemical and allied industries.*
- *Provide the students with the knowledge of how raw materials are sourced for various chemical industries and how these materials are processed.*
- *Provide students with advanced technical skills in Chemical Engineering that will enable them to (a) translate fundamental discoveries in materials and other high technology areas to commercial exploitation, and (b) adapt readily to the challenges presented in a diverse range of industrial sectors that can benefit from process engineering approaches.*

Course outcome

- *Appreciate better their future roles as chemists in Industrial establishments*
- *Be able to explain the origin of raw materials used in the chemical and allied industries*
- *Have a good understanding of how chemical raw materials are processed into finished products.*
- *Graduates find employment in, quality control, oil and petroleum industry, textile industry, dyes and paints industry, cement industry, just to name a few.*

Evaluation System

	Component	% of Marks	Method of Assessment
Internal Examination	Internal	20	Written examination
	Assignment	30	Report and Presentation
External Examination	End Sem	30	Written examination
	Practice	20	Experiment followed by Viva
Total		100	

Module 1: Preparation of soap, dyes and oil analysis :

Introduction: Types of soap (soft and hard soap), methods of preparation of soap, mechanism, difference between fats and oils, physical properties of fats and oil, general introduction to chemistry of dye, various example of dyes, types of dyes.

Practice:

- Preparation of soap by saponification

- Determination of the properties different type of soap
 1. pH test
 2. Foam test
- Hard water test
- Determination of iodine number of oil
- Preparation of dyes (azo dyes): 2- naphthol + 4 - nitro aniline: salicylic acid + 4- nitro aniline
- Preparation of Phenyle.

Applications: Effect of water hardness in cleansing action of soap. Application of dyes to cloth

Module 2: Metals estimation from ores

Introduction: General introduction on ores, types of ore, important ore minerals, application of ores. **Practice:**

- Estimation of Cu in copper ore
- Determination of Fe as ferrous iron in an ore sample
- Determination of Zn in Zinc ore by EDTA complex metric method

Module 3: Analysis of cement

Introduction: what is cement? types of cement, composition of cement, preparation of cement, applications.

Practice:

- Estimation of calcium in Portland cement
- Cement hydration and pH evaluation during curing
- To check the quality of cement (colour, texture, smell test, float test, shape test and strength test)

Applied Engineering Materials

Course Name	Code	Type of course	T-P-PJ (Credit)	Prerequisite
Applied Engineering Materials	FCBS0403	Theory + Practice	3	Nil

Course Objective

- To understand the importance of the chemical approach to nanomaterials
- To study the preparation, analysis and applications of metal nanoparticles
- To develop an understanding of conjugated polymers and their applications
- To understand how polymer composition and architecture imparts unique properties and behavior
- To study organic-inorganic hybrid materials (COMPOSITES) and how the incorporation of metals in the polymer architecture leads to new properties and applications

Course outcome

- Know what it takes to have a career in nanotechnology
- Understand the need to increase Nanotechnology awareness
- Understand the definition of Nanotechnology
- Know the processing of Nanoparticles and Nanomaterials □ Know the application of Nanotechnology and nanomaterials

Evaluation System

<i>Internal Examination</i>	<i>Component</i>	<i>% of Marks</i>	<i>Method of Assessment</i>
	Internal	20	Written examination
	Assignment	30	Report and Presentation
<i>External Examination</i>	<i>End Sem</i>	30	Written examination
	<i>Practice</i>	20	Experiment followed by Viva
<i>Total</i>		100	

Module 1: Nano Materials:

Introduction, nano scale, applications in various fields.

Practice:

- Synthesis of Ag, Au nano particles by wet chemical methods. □ Synthesis of ZnO Nanoparticles by Precipitation Method □ Synthesis of Cu nano particles Sonochemical method.
- Synthesis of Fe nano particles Co-precipitation method.
- Thickness measurement by sol-gel process of coating.

Module 2: Polymers

Introduction, types of polymers, Polymerisation mechanisms.

Practice:

- Synthesis of Thiokol Rubber
- Synthesis of a Rubber Ball from Rubber Latex
- Synthesis of Polystyrene (PS)
- Synthesis of Polymethyl Methacrylate (PMMA) □ Synthesis of Nylon-6:6.
- Determination of molecular weight of polymers by visometry method.

Module 3: Composites

Introduction :Biopolymers or synthetic polymers reinforced with natural or biofibers(termed as bio composites) as a viable alternative to glass fibre composites.Biocomposites" refers to those composites that can be employed in bioengineering.Biocomposites are composite materials, that is, materials formed by a matrix (resin) and a reinforcement of natural fibers (usually derived from plants or cellulose). Bio composites are the combination of natural fibers (biofibers) such as wood fibers (hardwood and softwood) or non - wood fibers (e.g., wheat, kenaf, hemp, jute, sisal, and flax) with polymer matrices from both renewable and non-renewable resources.

Practice:

- Synthesis of bio composite materials by using jute fibres and wood fibres

Electricity and Magnetism

Course Name	Code	Type of course	T-P-PJ (Credit)	Prerequisite
Electricity and Magnetism	FCBS0404	Theory + Practice	4	Nil

Course Objective

- To understand electric circuit components and their use.
- To learn and verify the fundamental laws of electricity, learn how to use certain electrical devices. Understanding magnetic properties of matter and performing experiments to realize magnetism.

Course outcome

- Realizing the importance and use of electrical components in a circuit.
- Learning how to do different connections and their purpose.
- Understanding magnetism of matter and its applications

Evaluation Criteria

<i>Internal Examination</i>	<i>Component</i>	<i>% of Marks</i>	<i>Method of Assessment</i>
	Internal	20	Written examination
	Assignment	30	Report and Presentation
<i>External Examination</i>	<i>End Sem</i>	30	Written examination
	<i>Practice</i>	20	Experiment followed by Viva
<i>Total</i>		100	

Practice I

Theory:

Electric field, Potential, EMF, capacitance, resistance, series connection, parallel connection,

Kirchhoff's laws, RC circuits, LC circuits.

Lab:

1. Use a Multi-meter for measuring (a) Resistance, (b) AC and DC Voltages, (c) DC Current, (d) Capacitance and (e) Checking electrical fuses.

2. To determine an unknown Low Resistance using Potentiometer.
3. To determine an unknown Low Resistance using Carey Foster's Bridge.

Practice II

Theory: Electrical Circuits: AC Circuits: Kirchhoff's laws for AC circuits. Complex Reactance and Impedance. Series LCR Circuit: (1) Resonance, (2) Power Dissipation and (3) Quality Factor, and (4) Band Width. Parallel LCR Circuit.

Lab:

1. To verify the Superposition, and Maximum power transfer theorems.
2. To determine self-inductance of a coil by Anderson's bridge.
3. To study response curve of a Series LCR circuit and determine its (a) Resonant Frequency, (b) Impedance at resonance, (c) Quality factor Q, and (d) Band width.
4. To study the response curve of a parallel LCR circuit and determine its (a) Anti-resonant frequency and (b) Quality factor Q.

PRACTICE III

Theory: Magnetic Properties of Matter: Magnetization vector (**M**). Magnetic Intensity (**H**). Magnetic Susceptibility and permeability. Relation between **B**, **H**, **M**. Ferromagnetism. B-H curve and hysteresis. Electromagnetic Induction: Faraday's Law. Lenz's Law. Self Inductance and Mutual Inductance. Reciprocity Theorem. Energy stored in a Magnetic Field.

Lab:

2. To study the induced e.m.f. as a function of the velocity of the magnet.
3. Measurement of field strength B and its variation in a solenoid.
4. Determination of μ_r ratio.

Text Book:

1. *Electricity and Magnetism* By K. K. Tiwari, S. Chand Publishing References:
2. *Electricity and Magnetism*, By M. C. Saxena, Satya Prakash, V. P. Arora, Publisher: Pragati Prakashan
3. *Introduction to Electrodynamics*, by David J. Griffiths Prentice-Hall; 3 edition (2011)
4. *Electricity and Magnetism* by - D. C. Tayal, Himalaya Publishing, 2009.

Basic Mechanics and Properties of Matter

Course Name	Code	Type of course	T-P-PJ (Credit)	Prerequisite
Basic Mechanics and Properties of Matter	FCBS0405	Theory + Practice	4	Nil

Course Objective

- To give the students overall idea about material properties and also hands on experience to measure them.
- To make them realize the applications of material properties.
- To expose them to phenomena like hydrostatics, elasticity, viscosity, surface tension and their applications in various places.
- Encouraging them to build simple models to explain the mechanical properties. **Theory:**

Course outcome

- To understand material properties and perform experiments on them.
- To understand the applications of material properties in real life.
- To be able to make small models for explain few mechanical properties.

Evaluation System

	Component	% of Marks	Method of Assessment
Internal Examination	Internal	20	Written examination
	Assignment	30	Report and Presentation
External Examination	End Sem	30	Written examination
	Practice	20	Experiment followed by Viva
Total		100	

Elasticity: Elastic constants, Relation among elastic constants, torsion of right circular cylinder,

bending of beams, Vibration of loaded cantilever.

Lab:

1. Young's modulus by single/double cantilever
2. Young's modulus by Searle's method
3. Rigidity modulus using Barton's apparatus
4. Poisson's ratio

Practice II Theory:

Hydrostatics: hydrostatic force on a body, buoyancy, metacentric height, hydrostatic pressure, pressure measurement: manometer

Viscosity: Viscosity of fluids, Stoke's law, terminal velocity, Poiseuille's equation, Searle's viscometer.

Surface tension & surface energy: Pressure difference across curved liquid surface. **Lab:**

1. Viscosity by Stokes method

2. Viscosity by Poiseuille's method
3. Metacentric height of floating body
4. Measurement of Pressure by manometer
5. Surface tension by capillary rise method
6. Determination of surface tension by Quincke's method

Practice III:

Basic Mechanics

Theory: Kinematics and Kinetics, Effort amplification using levers and pulleys, Friction, Laws of friction.

Rotational Motion: Moment of Inertia, Theorem of Parallel and Perpendicular axes. Moment of inertia of circular disc.

Lab:

1. Effort-output ratio using combination of pulleys
2. Verification of laws of static and dynamic friction
3. Moment of inertia of fly wheel

Text Book:

1. Elements of Properties of Matter, Dec 2010 by D.S. Mathur, S.Chand (G/L) & Company Ltd Reference Books:

- 1. A Text Book of Fluid Mechanics by R.K. Bansal, Laxmi Publishers, 2005*
- 2. Engineering Mechanics Statics and Dynamics by A. K. Tayal, Umesh Publications.*

Optics and Optics Fibre

Course Name	Code	Type of course	T-P-PJ (Credit)	Prerequisite
Optics and Optics Fibre	FCBS0406	Theory + Practice	4	Nil

Course Objective

To understand optical phenomena.

- *To understand different light sources and their use*
- *Understand designing of microscope and artificial light sources*
- *Understanding optical fiber and its applications*

Course outcome

- *Students should understand optical phenomena.*
- *Students should learn about different light sources and their use*
- *Students should be able to understand optical fiber principle, operations and its applications.*

Evaluation System

	Component	% of Marks	Method of Assessment
Internal Examination	Internal	20	Written examination
	Assignment	30	Report and Presentation
External Examination	End Sem	30	Written examination
	Practice	20	Experiment followed by Viva
Total		100	

Practice I

Theory: Reflection and refraction of light. Mirror formula, lens maker's formula. Refraction through a prism. Dispersion, light sources: Principle and operations of sodium lamp, mercury lamp and LASER.

Lab:

1. To determine refractive index of the Material of a prism using sodium source.
2. To determine the dispersive power and Cauchy constants of the material of a prism using mercury source.
3. To determine the refractive index of glass slab using travelling microscope.
4. Designing of a compound microscope.

Practice II

Theory: Interference. Young's experiment, conditions for interference, Intensity distribution of fringes, Interference in thin films, Newton's rings.

Diffraction: types of diffraction, Fraunhofer diffraction at a single slit, diffraction at N-parallel slits and plane diffraction grating.

Polarization: Polariser and analyser, optical rotation and Polarimeter

Lab:

1. Determination of wavelength of light by Newton's ring method.
2. Determination of wavelength of LASER source by diffraction grating method
3. Thickness of thin paper by wedge-shaped films
4. Dispersive power and resolving power of a plane diffraction grating.
5. Polarimetry

Practice-III

Theory: Optical properties—scattering, refraction, reflection, transmission & absorption.

Introduction, principle of Laser, stimulated and spontaneous emission, Coherence (temporal and spatial) Ruby Laser, Application of Lasers.

Optical Fibres: Introduction, numerical aperture, step index and graded index fibres, attenuation & dispersion mechanism in optical fibers (Qualitative only), application of optical fibres, optical communication (block diagram only)

Lab:

1. Measurement of attenuation and bending losses of an optical fibre.
2. Measurement of numerical aperture of a optical fibre
3. Study of spatial and temporal coherence of LASER
4. Making of a light guide

Text Book:

1. *A Text Book of Optics by M.N. Avadhanulu, Brij Lal, N. Subrahmanyam, S Chand; 23rd Rev. Edn.*

References:

2. *Optics by Ajoy Ghatak, McGraw Hill Education; 5 edition*
3. *Physics-I for engineering degree students by B.B. Swain and P.K. Jena.*
4. *Concepts in Engineering Physics by I Md. N. Khan.*

Centurion University of Technology and Management Odisha

COURSE STRUCTURE & SYLLABUS

BASKET - II



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School of Engineering & Technology

2019

CURRICULUM

COURSES OFFERED BY DEPARTMENT OF HUMANITIES AND MANAGEMENT

BASKET - II

Course Code	Course Title	Course type	Credits	Prerequisite
FCHU1201	Foundations of English Communication	Workshop	2	Nil
FCHU1202	Communicative Practice Laboratory -1	Workshop	2	Nil
FCHU1203	Business Communication	Workshop	2	Nil
FCHU1204	Communicative Practice Laboratory-II	Workshop	2	Nil
FCHU1205	Corporate Readiness Laboratory	Workshop	2	Nil
FCHU1206	IT Enabled Communication	Workshop	2	Nil
FCHU1207	Career Communication	Workshop	2	Nil
FCHU1208	Personality Development	Workshop	2	Nil
FCHU1209	Seminar and Technical Writing	Workshop	2	Nil
FCHU1210	Professional Etiquette	Workshop	2	Nil
FCHU1211	Creative Writing	Workshop	2	Nil
FCHU1212	English for Competition (GRE/GMAT/TOEFL/IELTS)	Workshop	2	Nil
FCHU1213	Be a Contributor	Workshop	2	Nil
FCHU0213	Life Skills Development (LSD) – I	Practice	2	Nil
FCHU0214	Life Skills Development (LSD) – II	Practice	2	Nil
FCHU0215	Life Skills Development (LSD) - III	Practice	2	Nil
FCHU0216	Life Skills Development (LSD) - IV	Practice	2	Nil
FCMG011 4	Economics	Theory	2	Nil
FCMG010 2	Accounting & Finance	Theory	2	Nil
FCMG010 3	Management Processes and OB	Theory	2	Nil
FCMG010 4	Production and Operation Management	Theory	2	Nil

FCMG010 5	Marketing Management	Theory	2	Nil
FCMG010 8	Introduction to Research	Theory	2	Nil
FCMG011 3	Indian Society and Culture	Theory	2	Nil
FCMG120 3	Introduction Human Rights	Workshop	2	Nil
FCMG120 4	Introduction to Ethics	Workshop	2	Nil
FCMG120 1	Disaster Management	Workshop	2	Nil
FCMG120 2	Ms Excel	Workshop	2	Nil
FCMG120 5	Introduction to Gender	Workshop	2	Nil

Note: The evaluation for Workshop type subject will be 100% internal by the concerned faculty.

SYLLABUS
FCHU1201 FOUNDATIONS OF ENGLISH COMMUNICATION

Pre - requisites	Course Type	Credits
Nil	Workshop	2

COURSE OBJECTIVES

- To develop vocabulary and grammar knowledge
- To develop reading comprehension skills

COURSE OUTCOMES

- Development of academic and sub-technical vocabulary
- Enhancement of basic language skills, i.e., listening, speaking, reading and writing
- Development of grammatical competence
- Confidence level improvement

This course aims to build the vocabulary, comprehension, and writing skills for effective communication in English language. It will focus on reading, listening to, and writing passages, as a means of learning communications skills.

The essential elements of this course will include:

MODULE-I: READING SKILLS (7hrs.)

Read **one** of the following books:

- Animal Farm
- Alice in Wonderland
- Guide
- Malgudi Days
- Harry Potter
- Amar Chitra Katha

Comprehension Skills: Students will respond to comprehension lessons from the chosen book.

MODULE-II: WRITING SKILLS (7hr.)

Students learn grammar and usage by writing passages, and getting formal feedback on these.
MODULE-III: LISTENING SKILLS (6hrs.)

Students respond to questions based on listening to videos, audio, or speaking assignments of classmates.

MODULE-IV: SPEAKING SKILLS (7hrs.)

Speaking assignments based on chosen book or contemporary topics.

TEXT BOOKS:

Esteras, Santiago Remacha and Fabre, Elena Marco. (2007). Professional English in Use ICT Student's Book. Cambridge: Cambridge University Press.

REFERENCES:

Grellet, F. (1981). Developing Reading Skills. Cambridge: Cambridge University Press

McCarthy, M. & O'Dell, F. (2008). Academic Vocabulary in Use. Cambridge: Cambridge University Press.

Ur Penny, (1992). Five-Minute Activities: A Resource Book of Short Activities (Cambridge Handbooks for Language Teachers). Cambridge: CUP

F Klippel. (1984). Keep Talking. Cambridge: CUP

EVALUATION SYSTEM (CONTINUOUS INTERNAL ASSESSMENT)

Methods	Conversations	Listening Comprehension	Book Review Presentation	Vocabulary	Mid-I (Presentation)	Mid-II (Online) Common Errors	Mid-III (Written)	% of Marks 100 (Best 5)
Total	20	20	20	20	20	20	20	100

S. No.	Topic	Pedagogy	Details	Instructional Hrs			
				Th	Pract	vide o	Pro j
1	Getting to Know Each Other	Activity Based Learning	Catch the Ball Introductions Ice-breaker Share an interesting fact, stories, questions, memories, embarrassing moments or sometimes relevant to the context. Useful link: http://www.icebreakers.ws/small-group/catch-ball-introductions-icebreaker.html	0	1	0	0
2	Conversation Practice	Pair work using Realia	Formulaic Expressions Doing Things with Words/ Objects <u>Description:</u> Student practice real life situations like using maps, asking for directions, small talk on weather, holidays, parties and eating out.	0	1	1	0
3	Formal and Informal Communication	Degrees of Formality	Worksheet: Ask the students to work in small groups of 2/3. They must read through the phrases in the table, deciding whether each phrase is formal or informal in conversation a	0	1	1	0

	ication		conversation situation. When they have finished, review the exercise as a class (answers provided in the worksheet)				
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S. No.	Topic	Pedagog	Details	Instructional Hrs			
				Th	Prac t	vide o	Pro j
4	Shadowing	Pronunciation – intonation, stress, pause	Find an Audio to Listen & Repeat – BBC News, Seminar Talk, Ted Talk etc. https://www.youtube.com/watch?v=GVWFGIyNswI	0	1	1	0
5	Speech Acts	Plain English	Students can 'become' anyone they like for a short time! They will be encouraged to come forward and perform small speech acts and role-plays.	0	1	0	0
6	Ask Me Questions Challenge	Questions & Responses	Individual to respond- the whole class to ask questions. In this session, a student will learn communication management.	0	1	0	0
7	TED Talk Listening	Listening Comprehension	Ice-breaker: Talkathon Assignment: In groups of 4, you are going to create/write 10 questions about the TED Talk Afterwards, the groups of 4 will split up in new groups of 4 to discuss and compare their questions. Comprehension Test	0	1	1	0
8	Ted Talks	Communication & Confidence Body Language	Listen to a Ted Talk & make a presentation on a popular/contemporary topic	0	1	1	0
9	Reading Comprehension Strategies - 1	Pre-reading	Students are encouraged to read any two books in the first semester. [Animal Farm/Old Man and The Sea/ Guide/Malgudi Days/Amar Chitra Katha]	0	1	1	0
10	Reading Comprehension	Mid - reading	Students respond to comprehension lessons from the chosen books. [Comprehension Passages, Gap filling and	0	1	1	0

	Strategies - 2		Sentence Completion]				
11	Reading Comprehension Strategies - 3	Post Reading	Students respond to comprehension lessons from the chosen books. [Summarizing/ Narrating/ Enacting/Vocabulary Quiz/]	0	1	0	0
12	Book Review	Writing Short Passages / Paragraphs	Write a review of your favorite book in at least 250 words. Mention 3 specific learnings and 3 distinct ways in which you plan to incorporate them in your life. To choose from the recommended books.	0	1	0	0
13	News Reading	7 Cs of Communication	Group Activity: Campus/ National News Reading Students read notice boards and visit departments Prepare campus news headlines Present in the class	0	1	0	0

S. No.	Topic	Pedagog	Details	Instructional Hrs			
				Th	Pract	vide o	Pro j
14	Writing to the Point	Word Usage and Sentence Structure Main Idea, Coherence & Cohesion	Each group is seated in a circle. In this activity, the leader of each group cannot see (either blind or blind fold using a handkerchief), but can hear the peer voice. Ask the leader to flip through the pages, and put the finger randomly on fifteen words from the chosen book in five minutes. The other participates copy the words that are closest to the finger. This time bound activity increases the curiosity of the students and engages them in exciting communication and completion of the task. Then, I ask the students to shape the randomly chosen disconnected words into a short poem/story/essay by adding a title to it. Read Out Loud in the Class	0	1	0	0
15	Word Power	Synonyms & Antonyms	App: SPEAK ENGLISH	0	1	1	0

16	Homonyms	Some common words Minimizing errors through discussions	Activity: Select the correct option, Use the confusables in sentences to bring out their meaning	0	1	0	0
17	Reading and Writing about visuals	Useful Expressions	Presentation about visuals Task: Selecting information from a visual	0	1	0	0
18	Word Formation	Word structure Word hunt Vocabulary explorations	Group Activity: Students make word clouds	0	1	0	0
19	Vocabulary Building	Descriptive words	Activity : Describe yourself/ your favorite person using 5 descriptive words	0	1	0	0
20	Listen to Popular Songs	Verb tense and aspect of grammar Vocabulary Idioms and expressions	Listen to the song with lyrics Ask questions about the title Gap Filling Exercises	0	1	0	0
21	Vocabulary Development	Word Power	Quiz/ Puzzle	0	1	0	0
22	Grammar	Common Errors	Surprise Quiz && debriefing	0	1	0	0
23	Grammar	Correct Usage	Easy Grammar App-Practice Sets	0	1	0	0
24	English Language Enhancement-I	Tenses	Usage, Question and explanation Fill in the blanks	0	1	0	0

25	English Language Enhancement -II	Active and Passive	I am passive..../I am active activity	0	1	0	0
26	English Language Enhancement-III	Reported Speech	Assignment & debriefing	0	1	0	0
27	English Language Enhancement -IV	Subject-verb agreement	Online Quiz & debriefing	0	1	0	0
28	Learn Grammar with Fun	Conditionals	Activity: The whole class is divided into The Zero Conditional, The First conditional, The Second conditional, and The Conditional to perform the task	0	1	0	0

FCHU1202 COMMUNICATIVE PRACTICE LABORATORY –I

Pre - requisites	Course Type	Credits
Nil	Workshop	2

The language laboratory acts as a platform for learning, practicing and producing language skills through interactive lessons and communicative mode of teaching.

COURSE OBJECTIVES

- To expose the students to a variety of self- instructional, learner- friendly modes of language learning.
- To enable them to learn better pronunciation through stress on word accent, intonation, and rhythm.
- To maintain good linguistic - through accuracy in grammar, pronunciation and vocabulary.

COURSE OUTCOMES

- Ability to communicate fluently in different business situation
- Effective oral and written communication
- Appropriate word usage with correct pronunciation
- Clarity of word stress and intonation

A student is required to take up five lab tests of 100 marks- three tests in spoken mode and two tests in

written mode.

MODULE-I: FRIENDLY COMMUNICATION (9 HOURS)

- Doing Things with Words: To ask for information, help, permission; To instruct, command, request, accept, refuse, prohibit, persuade
- Practice of Formulaic Expressions: Greetings, farewells, introductions, thanks, apologies, regrets, good wishes, congratulations, condolences, offers.
- Conversation Practice in familiar and unfamiliar situations

(This module will be practiced through conversation activities in pairs & groups)

MODULE-II: GRAMMAR AND VOCABULARY (9 HOURS)

The focus will be on the appropriate usage of language.

- Elimination of common errors
- Editing passages
- Word power A-Z: Easy and quick techniques
- Vocabulary building exercises

(Open Source Language Laboratory will be used to take quizzes and practice grammar & vocabulary)

MODULE-III: PHONETICS AND SPOKEN ENGLISH (12 HOURS)

Students will be trained to find out the correct pronunciation of words with the help of a dictionary /software, to enable them to monitor and correct their own pronunciation.

- Pronunciation Guidelines: Consonants and Vowels
- Pronunciation practice (for accent neutralization), particularly of problem sounds, in isolated words as well as sentences
- Speaking Techniques: Using correct stress patterns, developing voice quality
- Rhythm and Intonation

(Reading aloud of dialogues, speeches etc. for practice in pronunciation)

(In this module, the learners will use video series from BBC & Sky Pronunciation Suite to improve spoken English)

TEXT BOOKS:

Dwyer, J. (2000). The Business Communication Handbook. New Jersey: Prentice Hall.

REFERENCES:

Brown, G & Yule, G. (1983). Teaching the Spoken Language. Cambridge: Cambridge University Press.

Brown, H. D. (1994). Teaching by Principles: An Interactive Approach to Language Pedagogy. New Jersey: Prentice Hall.

EVALUATION SYSTEM (CONTINUOUS INTERNAL ASSESSMENT)

Methods	Role play	Speech Acts	Grammar Quiz	Story Telling	JAM	Vocabulary-Exercise	Vocabulary-Quiz	% of Marks 100(Best 5)
Total	20	20	20	20	20	20	20	100

SESSION PLAN: COMMUNICATIVE PRACTICE LABORATORY -1

MODULE I: FRIENDLY COMMUNICATION (9 HOURS)

S. No.	Topic	Pedagogy	Details	Instructional Hrs.			
				Th	Prac	Video	Proj
Lab-1	Ice-Breaking/ Introductory Session	Name Game and Other Ice-breaking Activities	Knowing Each Other http://www.buzzle.com/articles/classroom-icebreaker-activities-for-students.html http://cutmlanguagelab.org/course/view.php?id=3	0	2	0	0
Lab - 2	Conversation Practice-I	Role Plays OSLL (Moodle)	Speech Acts/ Formulaic Expression http://cutmlanguagelab.org/course/view.php?id=3	0	2	0	0
Lab - 3	Conversation Practice-Ii	Small Skits	Small Skits Using Formulaic Expressions http://www.lazybeescripts.co.uk/Scripts/Results.aspx?iSh=5&iSk=1&iMR=11&iXR=15&iPo=2&i17=1&iAS=2&iPS=2 http://cutmlanguagelab.org/course/view.php?id=3	0	2	0	0

MODULE II: GRAMMAR AND VOCABULARY (12 HOURS)

S. No.	Topic	Pedagogy	Details	Instructional Hrs.			
				Th	Prac	Video	Proj
Lab-4	Elimination of Common Grammatical Errors	Quiz OSLL (Moodle)	Emphasis on Tense, Verbs, Modals, Conditionals, Active and Passive Voice, Statements, Questions and Responses, Articles, Preposition & Concord http://cutmlanguagelab.org/course/view.php?id=3 http://www.learnenglishfeelingood.com	0	2	0	0
Lab - 5	Document Makeover	Assignment OSLL (Moodle)	Editing passages: Grammatical and Construction errors http://cutmlanguagelab.org/course/view.php?id=3	0	2	0	0
Lab - 6	Vocabulary Building-Word Power	Assignment and Online practice	http://a4esl.org/ http://cutmlanguagelab.org/course/view.php?id=3	0	2	0	0
Lab - 7 & 8	Vocabulary Building	Assignment and Online practice	Synonyms, Antonyms, Homophones, One-Word Substitution, Phrasal Verbs http://www.majortests.com/word-focus/vocabulary-tests.php	0	2	0	0

			http://www.grammarbank.com/synonyms-antonyms-worksheet.html http://cutmlanguagelab.org/course/view.php?id3				
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MODULE-III: PHONETICS AND SPOKEN ENGLISH (12 HOURS)

S. No.	Topic	Pedagogy	Details	Instructional Hrs.			
				Th	Prac	Video	Proj
Lab -9	Phonetics-I	Online Practice OSL (Moodle)	Phonemic Transcription Using IPA Symbols, Stress Pattern in Words and Phrases http://usefulengish.ru/phonetics/practice-consonants http://www.agendaweb.org/phonetic.html http://cutmlanguagelab.org/course/view.php?id=3 https://www.youtube.com/watch?v=_htmkbIboG9Q	0	1	1	0
Lab -10	Phonetics-II	Online Practice OSL (Moodle) Sky Pronunciation Suite	Rhythm and Intonation http://www.learning-english-online.net/areas/pronunciation/stress-and-intonation/ http://www.tolearnenglish.com/english_lessons/intonation-exercises http://cutmlanguagelab.org/course/view.php?id=3	0	2	0	0
Lab -11	Event Narration, Story Telling	Assignment	http://gdpi.hitbullseye.com/other-selection-tools-extempore.php http://cutmlanguagelab.org/course/view.php?id=3 http://grammar.about.com/od/developingessays/a/topnarrative07.htm	0	2	0	0
Lab -12	Speaking - Jam, Extempore	Activity Based OSL (Moodle)	http://orelt.col.org/module/unit/3-practice-public-speaking http://cutmlanguagelab.org/course/view.php?id=3 https://www.youtube.com/watch?v=VI566cH5uQ https://www.youtube.com/watch?v=Mmw-4T7qQS4	0	2	0	0

FCHU1203 BUSINESS COMMUNICATION

Pre - requisites	Course Type	Credits
Nil	Workshop	2

COURSE OBJECTIVES

- The course on Business Communication focuses on the basic skills required to be an effective communicator. It aims at imparting the communication skills that are needed in the academic and professional pursuits.
- This is directed towards helping the students gain skills in comprehension, group discussions, presentations, interviews, active listening, technical writing and the ability to manage cross-cultural interactions. The focus is on the difficulty experienced by individual students, and the effort to explore a useful strategy for self-improvement. This is achieved through an amalgamation of lecture oriented approach of teaching with the task based skill oriented methodology of learning.

COURSE OUTCOMES

- Understand the differences between general communication and business communication
- Development of basic language skills, i.e., listening, speaking, reading and writing
- Effective participation in group discussion and job interviews

MODULE-I: UNDERSTANDING COMMUNICATION IN BUSINESS (8 hrs.)

The module is a guide to organization communication. It is directed towards enabling students to develop the skills necessary to manage the human resources of their organization.

- General Communication and Business Communication
- Communication in Organizational Settings: Patterns of Communication in the Business World – Upward, Downward, Horizontal Grapevine etc, Channels of Communication- Internal and External, Formal and Informal
- Introduction to Cross Cultural Communication
- Strategies to Overcome Communication Barriers

MODULE-II: READING AND WRITING (10 hrs.)

This unit works on the competency in reading and writing skills through such tasks/activities as reading books, articles, magazines, novels, developing outlines, key expressions, situations, slogan writing and theme building exercises, dialogue writing, interpreting pictures, technical writing.

- Importance of Developing Reading Skills
- Sub-Skills of Reading: Predicting Content, Skimming & Scanning, Topic sentence and supporting details, Inferential Reading, Guessing the Meaning of Unfamiliar Words, Note Making
- Importance of Writing Skills and Principles of Effective Writing
- Writing Process: Pre-writing, Drafting and Re-Writing
- Paragraph Writing
- Summaries and Abstracts
- Business Correspondence: Writing Business Letters, E-mail Messages, Memo, Notice, Circulars, Reports, Proposals
- Career Communication: Writing Resume/ CV and Job Application Letter

MODULE-III: LISTENING AND SPEAKING (9 HOURS)

Listening is the mother of all speaking. This unit aims to achieve competence in speaking i.e., the ability to communicate orally in clear, coherent, and persuasive language appropriate to purpose, occasion, and audience. The module focuses on developing this competency which includes acquiring poise and developing control of the language through experience in making presentations to small groups, to large groups, and through the media.

- Listening Skills: Listening Process, Hearing and Listening, Types and Barriers, Effective Listening Strategies
- Common forms of Oral Communication in the Business World:
- Meetings: Organize Meetings, Preparing an Agenda, Chairing a Meeting, Drafting Resolutions, Writing Minutes
- Persuasive Speaking: Improving Fluency and Self-Expressions, Articulation, Good Pronunciation, Voice Quality
- Making an Oral Presentation: Planning, Preparing and Delivery
- Facing an Interview: Preparation, Types of Interview, Do's and Don'ts
- Group Discussions: Debate and GD, Types of GD, GD Etiquette

(Treatment: Developing listening and speaking skills through various activities, such as role play activities, practicing short dialogues, JAM, group discussions, debates, speeches, listening to news bulletins, viewing and reviewing documentaries and short films etc.)

TEXT BOOKS:

An Introduction to Professional English and soft skills by B.K Das et al., Cambridge University Press

REFERENCES:

Effective Technical Communication, M. Ashraf Rizvi, TMH Publications.

Business Communication, Krizan. Merrier. Logan. Williams, Thomson

Business Communication Today, Courtland L Bovee, John V Thill & Mukesh Chaturvedi, Pearson Education.

Business communication by Meenakshi Raman and Prakash Singh (Oxford)

Business Communication, Urmila Rai & S.M Rai, Himalaya Publishing House

EVALUATION SYSTEM (CONTINUOUS INTERNAL ASSESSMENT)

Methods	Role Plays (Org. Comm.)	Reading Comprehension & Note –Making	Listening & Individual Presentation	GD	Mid-I (Online Test on Vocabulary)	Mid-II (Written exam on module 2)	Mid-III (Oral Presentation)	% Marks 100(BE 5)
Total	20	20	20	20	20	20	20	100

SESSION PLAN: BUSINESS COMMUNICATION

S. No.	Topic	Pedagogy	Details	Instructional Hrs			
				Th	Prac t	vide o	Pro j
1	Introduction To Business Communication	Business games Written Assignment	What is Business Communication? General Communication vs. Professional Comm. Das, AIPE & SS,	0	1	0	0
2	General Communication & Business Communication	Audio-visual clips Communication	Difference in Style Degrees of Formality pp. 6-7 http://christopherhouse.blogspot.in/2012/08/difference-between-business.html	0	1	0	0

		game- Change your style					
3	Communication In Organisational Settings	Small group work Role Plays Quiz	Internal Communication: Formal Communication Network Informal Communication Network External Communication Raman, BC, pp- 13-21 http://keydifferences.com/difference-between-formal-and-informal-communication.html	0	1	0	0
4	Understanding The Importance Of Cross-Cultural Communications	Flip class- Match your points Role Plays	The Global Marketplace The Multicultural Workforce Krizen, BC, Chapter 2 & Bovee, BCT, pp. 63- 65 http://study.com/academy/lesson/cross-cultural-communication-definition-strategies-examples.html	0	1	0	0

S. No.	Topic	Pedagogy	Details	Instructional Hrs			
				Th	Pract	vide o	Pr oj
5	Improving Intercultural Sensitivity	Communication Games and activities	Recognise Cultural Differences Overcome Ethnocentrism Study other Cultures Overcome Language Barriers Develop Effective intercultural Skills Bovee, BCT, pp. 66-82	0	1	0	0
6	Overcoming Miscommunication	Workshop (Emphasis on listening skill)	The Information Gap principle Organizational Structure Difference in Status Incorrect Choice of Medium Message Complexity Cultural Differences Psychological Barriers Noise, and barriers http://www.businesscoachphil.com/overcoming-miscommunication-at-work Raman, BC, pp.22-27	0	1	0	0
7	Strategies For Improving Organisational	Good Listener Case Studies Role plays & presentations	Open Feedback, Simple Language, Avoid Overload, Walk the Talk http://debo10199businesscommunication.blogspot.in/2012/02/strategi	0	1	0	0

	Communication		es-for-improving-organizational.html Raman, BC, pp.34-40				
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MODULE II: READING AND WRITING

S. No.	Topic	Pedagogy	Details	Instructional Hrs			
				Th	Pract	vide o	Pro j
8	Importance Of Developing Reading Skills & Reading Strategies	Reading News clips	<p><i>The Importance of Developing Reading Skills</i></p> <p><i>Vocabulary Skills</i></p> <p><i>Word Meaning Recognition</i></p> <p><i>Guessing the Meaning from Word Structure and Context</i></p> <p><i>Guidelines for Improving Reading Skill</i></p> <p><i>Types of Reading</i></p> <p><i>Tips for Improving Reading Speed</i></p> <p>Rizvi, ETC, pp. 219- 224</p> <p>http://www.nclrc.org/essentials/reading/stratread.htm</p>	0	1	0	0
9	The Sub-Skills of Reading	Guessing Game	<p>Understanding the Main Idea and Supporting Details</p> <p>Reading between the Lines:</p> <p>Inferential Reading</p> <p>Understanding the Writer's Point Of View</p> <p>Making Predictions</p> <ul style="list-style-type: none"> • Guessing the Meanings of Unfamiliar Words • Skimming and Scanning <p>Rizvi, ETC, pp. 228-250</p> <p>http://literallycommunication.blogspot.in/2013/06/reading-skills-and-its-sub-skills.html</p>	0	1	0	0
10	Note-Making	Topicalizing Schematising Use of Reduction Devices Methods of Sequencing Practice in Note	<p>Mechanics of Note Making</p> <p>Note Writing Techniques</p> <p>Rizvi, ETC, pp.273-289</p> <ul style="list-style-type: none"> • http://www2.le.ac.uk/offices/ld/resources/study/notes 	0	1	0	0

S. No.	Topic	Pedagogy	Details	Instructional Hrs			
				Th	Pract	vide o	Pr oj
11	Importance of Writing Skills	Tasks on small paragraphs Creative writing	Writing Process: Pre-writing, Drafting and Re-writing Idea Mapping Writing and Editing Rai, BC, pp. 182-192 http://smallbusiness.chron.com/importance-writing-skills-business-845.html	0	1	0	0
12	Paragraph Writing	Written Assignment Developing story outline	Unity in writing Topic sentence Chronological order of development Using Connectives Organizing a Paragraph Adequate Development of supporting details Cohesion & Coherence in a Paragraph Rizvi, ETC, pp.337-350 http://www.wikihow.com/Write-a-Paragraph	0	1	0	0
13	Summaries & Abstracts	Written Assignment based on guidelines	Differences between Abstract and Summary Procedure for Writing Abstracts Procedure for writing summary Rizvi, ETC, pp.290-307 http://www.uts.edu.au/current-students/support/helps/self-help-resources/academic-writing/abstract-and-executive-summary	0	1	0	0
14	Writing Business Letter & Proposal	Written Assignment based on guidelines	Purpose & goal Principles of effective letter writing: Courtesy and consideration, Directness and conciseness, Avoid verbosity, Participial endings, Positive and direct statements, Clarity and precision Structure and layout Rizvi, ETC, pp.351-365 & Raman, BC, PP.256-260 http://www.writing-business-letters.com/business-proposal-letter.html	0	1	0	0

15	Memo, Notice, Circulars & Email	Written Assignment based on guidelines	<p>What is a Memo? Email writing format Characteristics of Effective Memo Difference between notice and circular Essentials of notice and notice format Rizvi, ETC, pp.423-436 http://www.umuc.edu/writingcenter/writingresources/effective_memos.cfm http://www.englishtransform.com/2014/04/difference-between-circular-memo-notice.html</p>	0	1	0	0
16	Reports	Written Assignment based on guidelines	<p>Definition and Types Deciding on Format and Length Structure / Parts of Formal Report Topics Covered in a Report Introduction, Body and Closing Krizen, BC, pp 259-303 & Rizvi, ETC, pp. 452-467 http://cgu.edu/pages/852.asp</p>	0	1	0	0

TREATMENT: Tasks/activities as reading books, articles, magazines, novels, developing outlines, key expressions, situations, slogan writing and theme building exercises, dialogue writing, interpreting pictures, technical writing.

MODULE III: LISTENING AND SPEAKING

S. No.	Topic	Pedagogy	Details	Instructional Hrs			
				T h	Prac t	vide o	Pr oj
17	Listening Skills	Effective Listening Strategies TED Talks: Listening and individual presentation	<p>Listening Process Hearing and Listening Types and Barriers Rizvi, ETC, pp. 59-75 Video : https://www.youtube.com/watch?v=C8zNx_IarUw</p>	0	1	0	0
18	Listening Attentively	News video clips and quizzing	<p>Overall comprehension Extracting Detail information Listening between the lines Note taking Video https://www.youtube.com/watch?v=t2z9mdX1j4A</p>	0	1	0	0
19	Persuasive Speaking	Inspirational audio-video	<p>Communication module for persuasive meeting Feed back Taking care of non-verbal elements</p>	0	1	0	0

		clips for language improvement	Decoding message Handling noise Raman, BC, pp. 123- 169 & Rizvi, ETC, pp.195 -218 Video: https://www.youtube.com/watch?v=NBObNfR2n_4 Reference: http://www.speaking.pitt.edu/student/public-speaking/persuasive.html				
20	Oral Presentation	Individual presentation on Events	Improving Fluency and Self-Expressions Articulation Good Pronunciation, Voice Quality Planning & Preparing your Oral Presentation Types of Delivery Guidelines for Delivery: Verbal elements, non-verbal elements, visual elements Practice delivery elements Controlling Nervousness and Stage freight Handling questions responsively narration/JAM Raman, BC, pp. 123- 169 & Rizvi, ETC, pp.195 -218 http://www4.caes.hku.hk/epc/presentation/ VIDEO https://www.youtube.com/watch?v=WJIOzflQ5w4	0	2	0	0
21	Group Discussions	GD Sessions on current/ social issues	Nature of Group Discussion Characteristics of Group Discussion Skills Selection Group Discussions Subject knowledge Oral communication skills Team management Group Discussion Strategies Role Functions in Group Discussions Rizvi, ETC, pp 165-187 https://www.youtube.com/watch?v=ymcMo7JWSu8 http://placement.freshersworld.com/what-is-group-discussion/33122049	0	2	0	0
22	Group Discussions	GD Sessions on current/ social issues	Debate and GD Types of GD GD Etiquette		1		
23	Revision	TUTORIAL	Module - I		1		

24	Revision	TUTORIAL	Module - I		1		
25	Revision	TUTORIAL	Module - I		1		

FCHU1204COMMUNICATIVE PRACTICE LABORATORY –II

Pre - requisites	Course Type	Credits
Nil	Workshop	2

The suggestive assignments in the laboratory are intended as learning activities to facilitate the students in accomplishing the language skills which are needed to succeed in the business world.

COURSE OBJECTIVES

- To master Study Skills
- To acquire strategic competence to use both spoken & written language to use in a wide range of communication strategies
- To acquire Business Performance Skills

COURSE OUTCOMES

The students will be able to

- Write effectively for a variety of professional and social settings. They will practice writing as a process of motivated inquiry engaging others writers' ideas as they explore and develop their own. They will demonstrate an ability to revise for content and edit for grammatical and stylistic clarity. And they will develop an awareness and confidence in their own voice as a writer.
- Become accomplished, active readers who appreciate ambiguity and complexity, and who can articulate their own interpretations with an awareness and curiosity for other perspectives.
- Demonstrate the skills needed to participate in a conversation that builds knowledge collaboratively; listening carefully and respectfully to others' view points; articulating their own ideas in relation to other voices and ideas. Students will be able to prepare, organize and deliver and engaging oral presentation.

A student is required to take up five lab tests of 100 marks- at least two tests in written mode and three tests in spoken mode.

MODULE-I: LISTENING (6 HOURS)

Exercises on Active Listening: The whole group listens to any speech/news broadcast in English and notes down the important points. They listen again to check their points and evaluate themselves. The group then compares points to see how well they have understood the broadcast.

MODULE- II: SPEAKING (8 HOURS)

- Situational Dialogues / Role Play: Organization Communication
- Oral Presentations- Prepared and Extempore
- 'Just a minute' Sessions (JAM)
- Debates
- Mock Meetings
- Cracking Job Interviews: Mock Sessions
- Group Discussions on current topics

(This module will be practiced through speaking activities like role plays, presentations, and discussions)

MODULE-III: READING (8 HOURS)

Students will be given practice in reading and comprehension 6-8 passages of 100-300 words each, on topics of General as well as professional interest. The texts will be supported by suitable exercises designed to foster comprehension skills and vocabulary enrichment. Students are encouraged to read newspapers, articles, books and novels.

- Reading Comprehension Exercises Through Tests, Writing Summary and Presenting, Note Making

- Review Presentation (Movie/ Article/ Book)
- Vocabulary Building Exercises

(This module encourages extensive use of reading materials)

MODULE-IV: WRITING (8 HOURS)

The Writing Lab content is designed to acquaint the students not only with the techniques of effective writing but also give them an insight into planning and writing documents that produce results.

- Short Paragraphs on current general and technical topics
- Creative Writing: Idea Generation
- Business Letters, Email Messages, Project Writing
- Writing Resumes and Cover Letters

(* Students will be required to produce and submit by the end of second semester a 350-500 word project report on a topic of their choice. The project should involve data collection, analysis and reporting. Ten marks (out of 100 marks allocated for Lab Test) will be set apart for the project.)

TEXT BOOK:

An Introduction to Professional English and soft skills by B.K Das et al., Cambridge University Press

REFERENCES:

Effective Business Communication, AshaKaul, Prentice Hall
Professional Communication, ArunaKoneru, TMH

EVALUATION SYSTEM (CONTINUOUS INTERNAL ASSESSMENT)

Methods	Listening Skills	Movie Review	Role Plays	Group Discussion	Mock Interview	JAM	Vocabulary/ Comprehension	% of Marks
Total	20	20	20	20	20	20	20	100(Best 5)

SESSION PLAN: COMMUNICATIVE PRACTICE LABORATORY –II

MODULE I: LISTENING (6 HOURS)

S No.	Topic	Pedagogy	Details	Instructional Hrs
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				Th	Pract	Video	Proj
Lab-1	Introduction and Ice Breakers	Activity - Based	Knowing Each Other, People's Bingo http://cutmlanguagelab.org/course/view.php?id=4	0	2	0	0
Lab - 2	Exercises On Active Listening	Activity Based	Feedback, Note Taking, Summarizing, Paraphrasing and Non-verbal Cues http://cutmlanguagelab.org/course/view.php?id=4 https://www.youtube.com/watch?v=cSohj1YQI2A	0	1	1	0
Lab - 3	Movie Review Presentation	Activity Based	The October Sky/ In Pursuit of Happiness/A Beautiful Mind/ Any Other http://cutmlanguagelab.org/course/view.php?id=4	0	1	1	0

MODULE II: SPEAKING (8 HOURS)

S. No.	Topic	Pedagogy	Details	Instructional Hrs			
				Th	Pract	Video	Pro
Lab-4	Organization Communication	Role play	Business Situations and Mock Meeting http://cutmlanguagelab.org/course/view.php?id=4 http://eduscapes.com/distance/course_activities/simulations.htm https://www.youtube.com/watch?v=3X51J-ZDMmE	0	2	0	0
Lab - 5	Oral Presentations	Activity OSL (Moodle)	Prepared and Extempore/ Debate / 'Just a Minute' Talk (JAM) http://cutmlanguagelab.org/course/view.php?id=4	0	2	0	0
Lab - 6	Interview /Group Discussion	Mock Interview /Group Discussion OSL (Moodle)	Frequently Asked Questions (FAQs) Discussion on Current Topics - General, Social, Political, Management, Creative, Education and Sports http://cutmlanguagelab.org/course/view.php?id=4 https://www.youtube.com/watch?v=ymcMo7JWSu8 https://www.youtube.com/watch?v=7gcsZ9H2I6s	0	2	0	0

MODULE-III: READING (8 HOURS)

	Topic	Pedagogy	Details	Instructional Hrs
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S. No.				Th	Pract	Video	Pro
Lab -7	Reading Assignment -I	Assignment , online practice and discussion	Reading abridged texts, relevant topics, and news articles http://cutmlanguagelab.org/course/view.php?id=4	0	2	0	0
Lab -8	Reading Assignment -Ii		Reading for comprehension and vocabulary http://cutmlanguagelab.org/course/view.php?id=4 http://www.majortests.com/sat/reading-comprehension.php	0	2	0	0

MODULE-IV: WRITING (8 HOURS)

S. No.	Topic	Pedagogy	Details	Instructional Hrs			
				Th	Pract	Video	Pro
Lab -9	Writing Short Paragraphs - General, Current and Technical Topics	Assignment, online practice and discussion	Write, Rewrite, Expand, Correct, Complete, and Improve Paragraphs http://cutmlanguagelab.org/course/view.php?id=4	0	2	0	0
Lab -10	Idea Generation and Creative Writing	Assignment and discussion	Problem solving/decision making, Strategy development, Outline a proposal, Create a timeline Collaboration technique, Expression of creativity, Condensing various thoughts, Put visuals and text together http://cutmlanguagelab.org/course/view.php?id=4	0	2	0	0
Lab -11	Memo Writing & Emails	Assignment and discussion	Adopt the steps of writing process for preparing of memo and emails http://cutmlanguagelab.org/course/view.php?id=4 https://www.youtube.com/watch?v=6zHLHc9CcvQ	0	2	0	0
Lab -12	Preparation Of Business Reports/ Proposals And Presentation	Project Work and discussion	Adopt the steps of writing process for preparing business reports and proposals http://cutmlanguagelab.org/course/view.php?id=4 mails https://www.youtube.com/watch?v=elVRDBAMvQ	0	2	0	0

FCHU1205CORPORATE READINESS LABORATORY

Pre - requisites	Course Type	Credits
Nil	Workshop	2

A real-time project approach in the laboratory is intended to provide a developmentally appropriate ambience, make the students proactive, encourage and motivate as well as develop skills to become a good listener, good communicator and responsible. A student will experience the challenging application process and at the same time prepare for the challenging world. The experience gained from working on projects can help one understand the appropriate and effective use of language skills. It also creates context in which learners engage in purposeful communication.

All communication activities are supported with the help of live projects on general techno-management or local themes which provide exposure to the students and help them to find a suitable job in the industry.

A student is required to take up five laboratory tests of 100 marks.

COURSE OBJECTIVES

- Understand the process of communication
- View communication from the perspective of each stakeholder
- Plan and manage communication difficulties
- Learn exactly how, when and what of communication

COURSE OUTCOMES

- Understanding the convention of project report
- Understanding the process of data collection and documentation
- Preparation and presentation of project report
- Preparation for various academic and professional needs

INSTRUCTION AND DELIVERY

Instruction- led facilitation highlights interactions between students and their facilitators, and emphasizes guidance from the facilitator who will track, assess and mentor them.

Students will make a team of four members who will take up real problems and run through the semester trying to solve the problems. The lab program will augment this learning with the right theory.

Participants will use PPTS, flash presentations or high impact presentations, flip charts, blogs, boards with graphical or pictorial representations, with captions and outlines, video display or any other best mode of presentation, post-it notes and group activities to document all processes and methodology.

OUTLINE

LAB1: Introduction to the Lab Program (Session will be driven by the Facilitators)

(Structure, Objective, Methodology, Objective of Choosing Project as a Vehicle to Learn the Course, Process of Carrying out the Project, Announcing the List of Projects)

LAB2: Discussion on Project Approach and Communication (Session will be driven by the Facilitators)

LAB3: Win Your Project: A Presentation by Groups (Session will be driven by the Students)

LAB4: Project Plan Presentation by Groups (Session will be driven by the Students)

LAB5: Review of Weekly Status Reports by the Guide, and Discussions (Session will be driven by the Students)

LAB6: Progress Presentation by Groups, and Feedback by Guide and Co-Guide (Session will be driven by the Students)

LAB7: Review of Documentation File/Dossier, and Feedback by Guide

LAB8: Progress Presentation and Submission of Dossier Containing Documentary Notes (E.g., compilation of weekly status reports, minutes, photocopies of emails, feedbacks, testimonials, photographs)

LAB 9: Presentation on the Project, Feedback by the Guide and Co-guide

LAB 10: Final Presentation by Groups in front of a Panel and Submission of Project Work
TEXT BOOK:

The Essential Guide to Doing your Research Project by O'LEARY (2011)

REFERENCES:

Logical Framework Analysis, Capacity Building Workshop for Dryland Management, May 3-5, 2000

Professional Presentations by Goodale (2007)

EVALUATION SYSTEM (CONTINUOUS INTERNAL ASSESSMENT)

Methods	Win Your Project	Project Plan Presentation	Weekly Reports	Progress Presentation	Project Presentation	Documentation	Project Report	% of Marks 100 (Best 5)
Total	20	20	20	20	20	20	20	100

S. No.	Topic	Pedagogy	Details	Instructional Hrs			
				Th	Pract	vide	Pr oj
1	Introduction to the Lab Program	Project-based Learning Discussion Beyond the class Learning	Structure, Objective, Methodology, Objective of Choosing Project as a Vehicle to Learn the Course, Process of Carrying out the Project (Session will be driven by the Facilitators)	0	2	0	0
2	Announcing the List of Projects		Topics available in OSLL (Moodle) http://cutmlanguagelab.org/	0	1	0	1
3	Project Approach & Communication		(Session will be driven by the Facilitators) https://www.youtube.com/watch?v=1ybtFwYb7Oc	0	1	0	1
4	Win Your Project		Rationale for choosing the project topic	0	1	0	1

			What makes you say that you deserve the project?/ Why should we give you the project (Session will be driven by the Students)				
5	Project Plan		Stakeholder Analysis, Objective Analysis, Situation Analysis, Problem Analysis, Strategy Analysis (Session will be driven by the Students)	0	1	0	1
6	6Review of Weekly Status		Dossier Verification/Reports by the Guide	0	1	0	1
7	Review of Progress	Project-based Learning Group Presentation with Facilitator Beyond the class Learning	Progress Presentation by Groups, and Feedback by Guide and Co-Guide (Session will be driven by the Students)	0	1	0	1
8	Documentat ion Review		Review of Documentation File/Dossier, and Feedback by Guide	0	1	0	1
9	Progression Presentation and Report Submission	Project-based Learning Presentation and Report Writing Beyond the class Learning	Progress Presentation and Submission of Dossier Containing Documentary Notes (E.g., compilation of weekly status reports, minutes, photocopies of emails, feedbacks, testimonials, photographs)	0	1	0	1
10	Presentation on the Project	Project-based Learning Presentation Beyond the class Learning	Presentation on the Project, Feedback by the Guide and Co-guide	0	1	0	1
11	Project Work	Discussion	Performance Analysis	0	0	0	2
12	Communica tion	Discussion	Performance Analysis	0	2	0	0

FCHU1206IT ENABLED COMMUNICATION

Pre - requisites	Course Type	Credits
Nil	Workshop	2

COURSE OBJECTIVE AND OUTCOME

Upon completing the syllabus, students should be able to:

- Speak confidently and fluently, in both formal and informal contexts.
- Write clearly, correctly and cogently
- Design and have a Home Page/Blog Space, Facebook Page and post comments/reports for collaboration & online presence
- Evolve from the role of an 'information provider', through 'motivator' and 'catalyst of change', to 'Change Agent'.

COURSE OUTLINE

MODULE I: CONCEPTUAL FOUNDATIONS

- Pre-Course Assessment
- Tell me a bit about yourself: Your background, your major, your professional aspirations ... your likes ... and maybe your favorite movie, and what you like to do in your spare time...
- Do you know?
- Introduction to IT Enabled Communication
- Communication in the New Age Context and Demand for Communication Interventions
(This module includes pre-course assessments and presentations)

MODULE II: BLOG DESIGNING & POSTING

- Step-by- Step to Writing a Blog: Researching, Brainstorming and Structuring, Writing, Posting, Editing and Accessorizing
- Photoshop for Image, Editing and graphic design
(This module will be driven through methods like self-learning, learning by doing, and workshop)

MODULE III: TECHNOLOGY AND COMMUNICATION

- Tools for Business Correspondence and web-based exercises
- Creating and delivering high impact presentations with Slides and other Visuals
- Video Documentaries
- Video Conferencing Sites, Skype, Team Viewer
(This module will be facilitated through presentations, use of tools and technology)

TEXT BOOKS

- Shirley Taylor, Model Business Letters (MBL) and Other Business Documents, 5th Edition. Krizen. Merrier.Logan. Williams, Business Communication, and Thomson (BC: Krizen).
- M.M. Monippally, Business Communication Strategies (BCS: MMM), TMH, New Delhi, 2001.
- Arthur H. Bell & Dayle M. Smith, Management Communication (MC: AHB & DMS), Wiley Student Edition, 2005

LINKS

http://ctb.ku.edu/en//tablecontents/section_1017.htm

Useful websites for some topics will be linked to the course for improving language proficiency skills of the students.

www.a4esl.org

www.learnenglishfeelgood.com

EVALUATION SYSTEM (CONTINUOUS INTERNAL ASSESSMENT)

Methods	Presentation	Blog Design & Post	Video Documentary	E-mail Writing	Business Letters	Poster/ Template Design	Mid-Sem written Exam	% of Marks 100(Best 5)
Total	20	20	20	20	20	20	20	100

MODULE I: CONCEPTUAL FOUNDATIONS (3HRS)

S. No.	Topic	Pedagogy	Details	Instructional Hrs			
				Th	Pract	vide o	Proj
1	Pre-Course Assessment [IT Enabled Communication]	Record pre-course assessments on communication management & technology by 'Probing & Doing'	Do you Know?	0	1	0	0
2	Tell me a bit about yourself	Know each other, and create a classroom philosophy through a game	Your background, your major, your professional aspirations ... your likes ... and maybe your favorite movie, and what you like to do in your spare time...	0	1	0	0
3	Communication in the New Age	Presentation	Context and Demand for Communication Interventions Explore top five social networking sites relevant to technology sector and present in the class, create and maintain online presence on Facebook, Google + or any other	0	1	0	0

MODULE II: BLOG DESIGNING & POSTING

S. No.	Topic	Pedagogy	Details	Instructional Hrs			
				Th	Pract	vide o	Proj
4	Step-by-Step to Writing a Blog - 1	Learning to Learn (Self-learning)	Researching	0	1	0	0
5	Step-by-Step to Writing a	Learning to Learn (Self-learning)	Brainstorming & Structuring	0	1	0	0

	Blog - 2						
6	Step-by-Step to Writing a Blog - 3	Learning to Learn (Self-learning)	Writing & Posting	0	1	0	0
7	Step-by-Step to Writing a Blog - 4	Learning to Learn (Self-learning)	Editing & Accessorizing	0	1	0	0
8	Blog	Workshop (Self-learning)	One Day Workshop On Blog Design (CUTM e-content)	0	1	1	0
9	Blog Design	Posting assignments/ weekly reports/share what he/she has learnt (Doing)	Assignment: "Me in a Minute" blog post, email your blog's web address to the facilitators and peer group	0	1	0	0
10	Photoshop - 2	Self- Learning & Peer Learning	Editing and Graphic Design	0	1	1	0
11	Photoshop - 3	Photoshop (FOSS) Training	Video tool www.spoken-tutorial.org	0	1	0	0
12	Photoshop	Workshop	One Day Workshop On Blog Design (CUTM e-content)	0	1	1	0

MODULE III: TECHNOLOGY AND COMMUNICATION

S. No.	Topic	Pedagogy	Details	Instructional Hrs			
				Th	Pract	vide o	Proj
13	Business Correspondence	Document Makeover, Web-based Exercises	Letters & Emails [Write to the point with correctness, conciseness, coherence and completeness]	0	1	0	0
14	Impress Presentation	Training and Practice	Language Laboratory Impress (FOSS)- Presentations (www.spoken-tutorial.org)	0	1	0	0
15	Enhancing presentation through slides and other visuals	Use of media for presenting the visual contents to reinforce the	Equip the learners with techniques where they feel more confident in front of	0	1	0	0

		message, and create online presence	an audience Assignment [Improve the slides] Slide Share/ Upload on YouTube or Google +				
16	Delivering High Impact Presentations	Video Recording & Peer Evaluation	Mastering the Art of Delivery, Preparing to Speak, Overcoming Anxiety, Handling Questions Watch-YouTube: Steve Jobs and iPod	0	1	0	0
17	Video Documentaries	Video documentary (Self- Learning)	Each student/group will make a short documentary movie (CSR, Facilities Labs, Student Projects etc.)	0	1	0	0
18	Making of Video Documentary	Workshop	One Day Workshop on Making Video Documentaries	0	1	1	0
19	Documentary Movie	10 min. video presentation by individuals/ groups	Feedback and Analysis	0	1	0	0
20	Video Conferencing	Free conference calls, webcam chat, video conferencing, group calls	Create Account & Practice [Skype, TeamViewer, Mobile]	0	1	0	0
21	Organize and Manage a Video Conference	Use video conference for business meetings Video conference etiquette & tips	Organise, Share & Collaborate	0	1	0	0

FCHU1207CAREER COMMUNICATION

Pre - requisites	Course Type	Credits
Nil	Workshop	2

OBJECTIVES

- Prepare the graduates to acquire their dream jobs.
- Build their mindset with right attitude, self-awareness, pro-activeness.
- Build confidence, and enhance their communication skills to handle all situations.

OUTCOMES

- Build the confidence of students
- Trigger the thinking and analyzing ability of the learners to solve problems.
- Readiness to work on their dream jobs.

List of Experiments

LAB 1: Introduction to Career Communication

LAB 2: Presentation on Corporate House

- Create an awareness and exposure on corporate life and culture.
- Learners get exposure to corporate life and culture.

LAB 3: Corporate Quiz

LAB 4: Telephonic Conversation

- Learners are equipped with basic knowledge and skill practice for improved telephonic communication.

LAB 5: Email Writing

- Learn the characteristics of successful e- mail messages.
- Create an effective e-mail message.

LAB 6: Mini Test on Email Writing

LAB 7: Learning Etiquette

- Understand what etiquette is & why it's important.
- Provide practical techniques and generally-accepted professional and ethical conduct or behaviour that will help create a favourable impression in social and professional life.
- Practice proper manners like greeting, saying 'please', 'thank you'.
- Appear professional and well groomed.

LAB 8 :Identifying Traits for Professional and Interpersonal Success

- Understand the importance of effective interpersonal communication and traits for professional success.
- Explore the significance of Active Listening, Problem Solving, Respect, Decision Making, Empathy, Co-operation and Non-verbal communication for professional success.

LAB 9: Job-Application -Cover Letter

- Develop the career writing skills of the learners with special emphasis on their interest in specific job positions, their strengths and what values they will bring to the organisation.

LAB 10: Job-Applications – CV

- Produce a polished and impressive CV that can be tailored to each specific job application.
- Develop the career writing skills of the learners with special emphasis on Statement of Purpose.
- Provide with tools to showcase Unique Selling Points for the specified job description.

LAB 11: Participating in Group Discussion (GD)

- Mock Interview on basic questions

LAB 12: Facing an Interview

EVALUATION SYSTEM (CONTINUOUS INTERNAL ASSESSMENT)

Methods	Presentation	Corporate Quiz	Telephonic Conversation	Email Writing	CV	GD	Interview	% of Marks 100(Best 5)
Total	20	20	20	20	20	20	20	100

SESSION PLAN: CAREER COMMUNICATION

S. No.	Topic	Pedagogy	Details	Instructional Hrs.			
				Th	Pract	vide o	Pro j
LA B-1	Introduction to Career Communication	Discussion	The Course introduces students to the resources and skills necessary for a successful job or internship search http://cutmlanguagelab.org/course/view.php?id=2	0	2	0	0
LA B-2	Presentation on Corporate House	Team Presentation OSLL (Moodle)	Create an awareness and exposure on corporate life and culture. Learners get exposure to corporate life and culture. http://cutmlanguagelab.org/course/view.php?id=2 https://www.youtube.com/watch?v=g_xABU21Yc	0	1	1	0
AB -3	Corporate Quiz	Quiz OSLL (Moodle)	This Corporate Quiz is an initiative to bring forth all the updates and insights from various industries. Through this quiz , students will be updated with the current happening in the present Corporate world http://cutmlanguagelab.org/course/view.php?id=2	0	2	0	0
LA B-4	Telephonic Conversation	Role play (Pair Work)	Learners are equipped with basic knowledge and skill practice for improved telephonic communication https://www.youtube.com/watch?v=mmXAqMQe0AI https://www.youtube.com/watch?v=6tfFRD0enV0	0	1	1	0
LA B-5	Email Writing	Doing	Learn the characteristics of successful e-mail messages. Create an effective e-mail message. http://cutmlanguagelab.org/course/view.php?id=2 https://www.youtube.com/watch?v=mmXAqMQe0AI	0	1	1	0
AB -6	Email Writing	Mini Test OSLL (Moodle)	(Questions from TCS) http://cutmlanguagelab.org/course/view.php?id=2 https://www.youtube.com/watch?v=LTKb5Fexcuk	0	2	0	0

S. No.	Topic	Pedagog	Details	Instructional Hrs.			
				Th	Pract	vide o	Pro j
LAB -7	Learning Etiquette	Demonstration Video Analysis	Understand what etiquette is & why it's important. Provide practical techniques and generally-accepted professional and ethical conduct or behaviour that will help create a favourable impression in social and professional life. http://cutmlanguagelab.org/course/view.php?id=2 https://www.youtube.com/watch?v=ieYuoQ9sM	0	1	1	0

			vA				
LAB -8	Identifying Traits for Professional and Interpersonal Success	Group Activity Video Analysis	Understand the importance of effective interpersonal communication and traits for professional success. Explore the significance of Active Listening, Problem Solving, Respect, Decision Making, Empathy, Co-operation and Non-verbal communication for professional success. http://cutmlanguagelab.org/course/view.php?id=2	0	1	1	0
LAB -9	Job-Application -Cover Letter	Document Makeover	Develop the career writing skills of the learners with special emphasis on their interest in specific job positions, their strengths and what values they will bring to the organisation. http://cutmlanguagelab.org/course/view.php?id=2 https://www.youtube.com/watch?v=37TbhadX0C8	0	2	0	0

FCHU1208PERSONALITY DEVELOPMENT

Pre - requisites	Course Type	Credits
Nil	Workshop	2

The laboratory aims at the promotion of the strategies for the personality development of the participants. The rationale behind this endeavor is the recognition of the multifaceted influence of the personality of the participants.

A student is required to take up five laboratory tests of 100 marks.

COURSE OBJECTIVE

Project the force of inner self, assert individuality, influence others and power to success.

COURSE OUTCOME

Learners develop a positive attitude and graceful personality.

LIST OF EXPERIMENTS

Lab 1: Self-Discovery/Self-Analysis

Identifying strengths and weaknesses through games and activities

Lab 2: Impression Management

Formation of impression, first and lasting impression, change: warm-up discussion

Lab 3: Body Language and Communication Style Profile Test

Lab 4 : Working on Attitude: Assertive, Aggressive, Passive

Measure your attitude, case study and role plays

Lab 5: Build Your Skills

Interpersonal Communication and Self

Lab 6: Team Building and Teamwork

Ice-breaker, test your team skills, exercise on stages of formation and effective teams

Lab 6: Explore Your Personality

Lab 7 : Motivation and Success

Ted talks, invited talks and success stories

Lab 8: Time Management

Identifying important time wasters, time management exercises

Lab 10 : Stress Management

Case-based discussions to identify causes of stress, and manage stress

Lab 11: Etiquette and Manners

Test your etiquette and manners, practice good manners

Lab 12 : Personality and Career Choice

Matching your career & personality

TEXT BOOKS:

Basic Managerial Skills for All, 9th Edition, E.H. McGrath, S.J.

Personality Development by Harold R. Wallace & L. Ann Masters, 2006.

REFERENCES:

Personality Development by [John Aurther](#) .Reprint, 2009.

[Personality Development - Transform Yourself](#) by [Rajiv K. Mishra](#), 2004.

[Power of One - Personality and Self-Development](#) by [Dr. Abhishek Mishra](#), 2007.

EVALUATION SYSTEM (CONTINUOUS INTERNAL ASSESSMENT)

Met hods	Self- introductio n in sales pitch	Debate/ Extempo re	Presentati on (USP)	Group Activity (Communicati on)	Public Speakin g on	Case- based Discussio ns	Motiv a-tion Spec h	% of Marks 100
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					Current Topic			(Best 5)
Total	20	20	20	20	20	20	20	100

SESSION PLAN: PERSONALITY DEVELOPMENT

S. No.	Topic	Pedagogy	Details	Instructional Hrs			
				Th	Pract	vide o	Proj
1	Self-Discovery/ Self-Analysis	Activity Based Learning	Game	0	2	0	0
2	Impression Management	Videos and interactions	19 tips to impress others https://www.buzzfeed.com/carolynkylstra/impress-literally-everyone-you-meet?utm_term=.nbz2MKVQJO#.qywdZLkQXO	0	1	1	0
3	Body Language and Communication Style Profile Test	Understanding of different postures and gestures through online test	http://www.queendom.com/queendom_tests/transfer	0	1	1	0
4	Working Attitude Assertiveness Aggressive Passive	Role Plays students Encouraged to watch videos	https://www.youtube.com/watch?v=O6eyUUkpoU8 Role plays	0	1	1	0
5	Build Your Skills	Videos	https://www.youtube.com/watch?v=w97dR3OJB1k http://www.investopedia.com/video/play/interpersonal-skills/	0	1	1	0
6	Team Building and Teamwork	Activity Based Learning	Coin Logo Time Required: 5-10 minutes Begin by asking all participants to empty their pockets, purses, and wallets of any coins they may have and place them on the table in front of them. If someone doesn't have any coins or only has very few, others in the room can share their coins with them. Instruct each person to create their own personal logo using the coins in front of them in just one minute. Other materials they may have on them, such	0	1	1	0

			as pens, notebooks, wallets, etc. can also be used in creation of the logo. If there is a particularly large group, people can be broken up into teams of 3-6 people and instructed to create a logo that represents them as a team or the whole room can gather to use the coins to create a logo for the organization/group/department/etc. Each solitary participant can explain their logo to the group or if the room was split into groups, the leader can have each group discuss what led to the team logo and what it says about them. Not only does this activity promote self and mutual awareness, but it also enables participants to get to know each other on a more personal level. http://www.livestrong.com/article/219775-team-building-exercises-for-small-groups/				
7	Explore Your Personality	videos	https://www.16personalities.com/free-personality-test	0	1	1	0
8	Motivation and Success	videos	https://www.youtube.com/watch?v=ILEg5EZw3iQ https://www.youtube.com/watch?v=g-PNJHhf-ag	0	1	1	0
9	Stress Management	Classroom Exercise	Time Wasters Exercise.pdf	0	1	0	0
10	Etiquette and Manners	videos	https://www.youtube.com/watch?v=55cXVve0Ipw for table manners https://www.youtube.com/watch?v=VLqKVfSG-bk for interview etiquette. https://www.youtube.com/watch?v=4-8AriF908 for manners.	0	1	1	0

S. No.	Topic	Pedagogy	Details	Instructional Hrs			
				Th	Pract	vide	Proj
11	Personality and Career Choice	Classroom exercise	rs_self-assessment.pdf	0	1	0	0
12	Time	Group	How long is a minute?	0	1	0	0

	Management	Activity	<p>At the beginning of session ask people to close their eyes for 30 seconds and after that to open it. Nobody can watch the clock and don't measure the time. Ask of participants to open their eyes after what they believe has been 30 seconds.</p> <p>Of course, they all open them at different times. Afterwards, we talk about our understanding of time. Even though everyone has an equal (24 hours a day or 30 seconds for exercise), in fact, we experience it and use it in different ways. Some of us experienced it as a short period, other as a long. This always works as a good opener.</p> <p>2) Cover all the clocks in the room, then ask participants to remove their wrist watches and stand up. Instruct them to sit down when they think 1 minute has elapsed after you shout "Start" to begin the countdown. You will be surprised with the results. Just enjoy the fun that follows this activity</p>				
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FCHU1209 SEMINAR AND TECHNICAL WRITING

Pre - requisites	Course Type	Credits
Nil	Workshop	2

Seminar allows students the opportunity to put all of information together. The students are required to prepare technical reports including oral presentations supported by written technical papers. Seminar is designed to assist students in preparing for their career.

COURSE OBJECTIVES

- Understand the requirements and ethics of technical writing in the 21st Century workplace.

- Work professionally, individually and in a team to produce effective technical documents incorporating verbal, visual, and multimedia materials as necessary.
- Communicate effectively by analyzing audience, organizing documents, writing clearly and precisely with no grammar errors and presenting the document with skillful design.
- Locate, evaluate, and incorporate pertinent information.
- Write clear, intelligent technical reports
- Make seminar presentations

COURSE OUTCOMES

- Understand how technical communication is used in the workplace.
- Understand and use the principles of design in business and technical communication.
- Apply useful descriptive language to your technical documents.
- Students will gain experience in preparing a technical report including an oral presentation supported by a written technical paper.

MODULE-I: TECHNICAL COMMUNICATION ESSENTIALS

COURSE OUTCOMES

- Describe the writing process most useful in today's technical writing environment.
- Analyze an audience and consider appropriate writing situations to meet the audience's needs.
- Understand the ethics of the workplace and apply those ethics to their technical and business writing.

OUTLINE: Communicating in the Workplace, Technical Writing Process Today, Readers and Contexts of Use, Ethics in the Technical Workplace

MODULE- II: DOCUMENT DESIGN

COURSE OUTCOMES

- Create and use graphics that complement your business and technical communication.

OUTLINE: Designing Documents and Interfaces, Creating and Using Graphics

MODULE-III: TECHNICAL COMMUNICATION STRATEGIES AND RESEARCHED REPORT WRITING

COURSE OUTCOMES

- Define terms clearly in technical documents.
- Explain instructions and processes clearly.
- Write clear proposals for business and technical situations.
- Research and manage information.
- Write an analytical report.

OUTLINE: Researching and Managing Information, Organizing and Drafting, Technical Definitions, Technical Descriptions, Instructions and Documentation, Proposals, Analytical Reports

MODULE-IV: SEMINAR PRESENTATION

COURSE OUTCOME

- Students will not only learn from the experience gained in preparing and presenting their seminar, but will have the opportunity to observe and participate in the seminar given by their classmates.

OUTLINE: Technical Report, Seminar Presentation

(Planning, Preparing, Organizing and Seminar Presentation are the 4 stages of this module)

TEXT BOOK:

Gerson, Sharon J. and Gerson, Steven M. (2007). Technical Writing Process and Product. Delhi: Pearson Education.

REFERENCES:

Effective Technical Communication, M. Ashraf Rizvi, TMH Publications.

Business Communication Today, Courtland L Bovee, John V Thill & Mukesh Chaturvedi, Pearson Education.

EVALUATION SYSTEM (CONTINUOUS INTERNAL ASSESSMENT)

Methods	Proposal Writing	Report Writing	Organizing Seminar	Document Formatting	Preparing a Technical Paper	Seminar Presentation-I	Seminar Presentation-II	% of Marks 100 (Best 5)
Total	20	20	20	20	20	20	20	100

SESSION PLAN: SEMINAR AND TECHNICAL WRITING

S. No.	Topic	Pedagogy	Details	Instructional Hrs			
				Th	Pract	vide o	Proj
1	Introduction to Technical Writing	Activity Based Learning	Writing Genres: Technical versus non-technical writings https://www.youtube.com/watch?v=LTDsgdOytbE	0	1	0	0
2	Preparing to Write	Doing	Audience Analysis Brainstorming Organizing information Link: https://www.youtube.com/watch?v=wxKJTI3EhuM	0	1	0	0
3	Gathering information	Google Search	How do we gather information? Ways, techniques and tools	0	2	0	0
4	Focusing on Writing Skills	Workshop	Brainstorming , Drafting , Editing	0	2	0	0
5	Technical Writing Conventions	Analysis and Discussion	Analysis of different case studies	0	1	0	0
6	Reporting	Learning to Learn Analysis and Discussion	FORMAT: Preliminary pages, Summary, Main section, Conclusion, Recommendations References	0	2	0	0

S. No.	Topic	Pedagogy	Details	Instructional Hrs			
				Th	Pract	vide o	Proj

7	Using and interpreting Graphics	Group work and Discussion	Matching Games : Texts and graphic types	0	2	0	0
8	Document Formatting	Workshop	Layouts Use of MS Word for Documenting Document templates APA Format (6th) - Microsoft Word 2010 https://www.youtube.com/watch?v=aWT9zgMPyiY	0	2	0	0
9	Documentation	Workshop	Documenting Sources: https://www.youtube.com/watch?v=-H2fRG_Rtns	0	2	0	0
10	Introduction to Seminar	Discussion	Seminar : Needs and ways of preparation Video : https://www.youtube.com/watch?v=-Rz2II40tQuI	0	1	0	0
11	Questioning Skills	Workshop	Asking and Responding to questions in Seminars TED TALK: https://www.youtube.com/watch?v=-PkcHstP6Ht0	0	2	0	0
12	Analysis of various Seminars	Videos and Discussion	Analysis of Seminars: Pros and Cons How to make a seminar effective? https://www.youtube.com/watch?v=x7qPAY9JqE4	0	1	1	0
13	Preparing for a Seminar	Group Work	Grouping Selection of topics	0	1	0	0
14	Collection of Information	Workshop	Primary and secondary sources Preparing sample PPTs	0	2	0	0
15	Seminar Presentation-I	Group Work	Demonstration and Discussion	0	2	0	0
16	Seminar Presentation-II		Demonstration and Discussion	0	2	0	0

FCHU1210PROFESSIONAL ETIQUETTE

Pre - requisites	Course Type	Credits
Nil	Workshop	2

Etiquette begins with meeting and greeting. Good professional etiquettes indicate that you are a mature responsible, adult who can aptly represent any organization. Etiquettes center upon respect.

COURSE OBJECTIVES

- To recognize the importance of proper etiquette at workplace
- To understand the elements and characteristics of proper etiquette
- To behave professionally and gain respect
- To develop an action plan to improve professionalism

COURSE OUTCOMES

At the end of this course students would be able to learn:

- Professional behavior, standards for appearance, action and attitude in a business environment
- Handle a variety of social and business situation
- Different styles of communication based on different situations.

MODULE- I: MEETING AND GREETING ETIQUETTE, OFFICE ETIQUETTE (7hrs)

- Personal Branding and First Impressions
- Introducing yourself and introducing a guest
- Professionalism at office
- Language styles, tone and attitude

MODULE-II: COMMUNICATION EXCELLENCE (7hrs)

- Techno Etiquette
- Phone Etiquette
- Email Etiquette
- Social Media Etiquette

MODULE-III: NETWORKING ETIQUETTE (6hrs)

- Business Card Etiquette
- Names
- Titles
- Net Etiquette
- Proper Introductions

MODULE-IV: BUSINESS ETIQUETTE (7)

- Presentation Etiquette
- Meeting Etiquette
- Dining Etiquette
- Global Etiquette

TEXT BOOK:

The New Etiquette, Real Manners for Real People in Real situations- An A-to-Z Guide by Marjabella Young Stewart, St. Martin Griffin.

Soft Skills, Know Yourself and the World, K.Alex.

REFERENCES:

Do's and Taboos of Hosting International Visitors, Roger E. Axtell, John Wiley & Sons, Inc.

Breaking through Culture Shock: What You Need to Succeed in International Business by Elisabeth Marx.

Dos and Taboos of International Trade by Roger E. Axtell, John Wiley & Sons, Inc.

The Art of Writing Effective E-mails, Jayprakash, Sajitha, Himalayan Publications.

International Communication Management-Individual & Organizational Outcomes by Antonio Ragus, Bookboon, 2010.

Business Communication for Success by Scott Mac Lean, Flat World Knowledge, 2010.

Effective Technical Communication, M. Ashraf Rizvi, TMH Publications.

EVALUATION SYSTEM (CONTINUOUS INTERNAL ASSESSMENT)

Methods	Introducing others, Small Talk	Role Play in formal & informal situations	Presentation	Telephonic interview	Email	Mock Meeting	Quiz on Professional Etiquette	% of Marks 100(Best 5)
Total	20	20	20	20	20	20	20	100

LESSON PLAN: PROFESSIONAL ETIQUETTE

S. No.	Topic	Pedagogy	Details	Instructional Hrs			
				Th	Prac t	vide o	Pro j
MODULE 1: MEETING & GREETING ETIQUETTE, OFFICE ETIQUETTE							
1	Personal Introduction	Role play on formal situation with proper introduction	http://smallbusiness.chron.com/first-impressions-business-etiquette-2908.html	0	1	0	0
2	Introducing Others	Knowing each other Fish bowl game	http://www.fasset.org.za/download/Office_Etiquette_Material/Handbook_Essential_Office_Etiquette.pdf				
3	Basics of Etiquette	Video clips Small skits	http://www.fasset.org.za/download/Office_Etiquette_Material/Handbook_Essential_Office_Etiquette.pdf	0	1	0	0
4	Interpersonal Etiquette	Video clips Activity on using speech acts with appropriate body language	http://www.fasset.org.za/download/Office_Etiquette_Material/Handbook_Essential_Office_Etiquette.pdf	0	1	0	0

		Guessing game					
5	Professionalism And Front Office Etiquette	Video Clips Role play on front office management on their dream company Quiz	http://careerplanning.about.com/od/workplacesurvival/a/professionlalism.htm http://www.octech.edu/sites/www/Uploads/files/TRIO/Professionalism%20in%20the%20Workplace.pdf	0	1	0	0
6	Professional Conduct	Conversational practice and SWOT Analysis in pair/group task	http://www.fasset.org.za/downloads/Office_Etiquette_Material/Handbook_Essential_Office_Etiquette.pdf	0	1	0	0
7	Professionalism And Front Office Etiquette	Video Clips Role play on front office management on their dream company Quiz	http://careerplanning.about.com/od/workplacesurvival/a/professionlalism.htm http://www.octech.edu/sites/www/Uploads/files/TRIO/Professionalism%20in%20the%20Workplace.pdf	0	1	0	0
8	Formal & Informal Attire	Communication Game Quiz	http://www.fasset.org.za/downloads/Office_Etiquette_Material/Handbook_Essential_Office_Etiquette.pdf	0	1	0	0
9	Language Etiquette And Attitude	Enactment in different formal situations with appropriate communication styles	http://www.english.wisc.edu/rfyoung/336/attitudes.pdf https://blog.udemy.com/communication-styles/ http://www.english.wisc.edu/rfyoung/336/attitudes.pdf	0	1	0	0
10	Techno Etiquette	Conversational practice and Small skits	http://theedgeexecutivecoaching.com/articles/etiquette/techno-etiquette/# Question & Answers http://www.workforce.com/article/s/q-a-about-techno-etiquette	0	1	0	0
11	Smart Phone Etiquette	Dialogue Exchange Telephonic Quiz	http://www.talkenglish.com/LessonPractice.aspx?ALID=483	0	1	0	0
12	Email Etiquette Social Media Etiquette	Video Clips Written task practice Group work Debate	http://www.businessemail etiquette.com/business-e-mail-etiquette-basics/ http://www.realsimple.com/work-life/work-life-etiquette/manners/social-media-etiquette	0	0	1	0

			http://www.moneycrashers.com/social-media-etiquette-tips-personal-business/ Video : https://www.youtube.com/watch?v=RFZwtkoNGrk https://www.youtube.com/watch?v=ootxiibcOWc				
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MODULE II: COMMUNICATION EXCELLENCE (7 HOURS)

S. No.	Topic	Pedagogy	Details	Instructional Hrs			
				Th	Pract	vide o	Pro j
10	Techno Etiquette	Conversational practice and Small skits	http://theedgeexecutivecoaching.com/articles/etiquette/techno-etiquette/# Question & Answers :http://www.workforce.com/articles/q-a-about-techno-etiquette	0	1	0	0
11	Smart Phone Etiquette	Dialogue Exchange Telephonic Quiz	http://www.talkenglish.com/LessonPractice.aspx?ALID=483	0	1	0	0
12	Email Etiquette Social Media Etiquette	Video Clips Written task practice Group work Debate	http://www.businessemailletiquette.com/business-e-mail-etiquette-basics/ http://www.realsimple.com/work-life/work-life-etiquette/manners/social-media-etiquette http://www.moneycrashers.com/social-media-etiquette-tips-personal-business/ Video : https://www.youtube.com/watch?v=RFZwtkoNGrk https://www.youtube.com/watch?v=ootxiibcOWc	0	0	1	0

MODULE-III NETWORKING ETIQUETTE (6HRS)

S. No.	Topic	Pedagogy	Details	Instructional Hrs			
				Th	Pract	vide o	Pro j
13	Netiquette	Written Assignment Drafting Email	http://jillbremer.com/articles/etiquette/techno-etiquette/ http://www.slideshare.net/MarcellineChitolie/techno-etiquette-final-copy	0	1	1	0

14	Business Card Etiquette	Presentations and small group work	http://www.careerealism.com/3-rules-to-smart-business-card-etiquette/	0	1	1	0
15	Forms of Addressing	Written assignment Scrabble and puzzles	http://www.talkenglish.com/LessonPractice.aspx?ALID=483	0	1	1	0

MODULE IV: BUSINESS ETIQUETTE (7 hours)

S. No.	Topic	Pedagogy	Details	Instructional Hrs			
				Th	Pract	vide o	Pr oj
16	Presen tation Etique tte	Demonstration	http://dianegottsman.com/2013/11/business-etiquette-9-powerful-presentation-tips/ http://dianegottsman.com/2012/07/stand-and-deliver-ten-tips-to-delivering-a-powerful-presentation/	0	1	1	0
17	Meeti ng Etique tte	Mock Meeting	http://businessculture.org/northern-europe/uk-business-culture/meeting-etiquette/ http://www.fasset.org.za/downloads/Office_Etiquette_Material/Handbook_Essential_Office_Etiquette.pdf	0	1	1	0
18	Dinni ng Etique tte	Activity on-Playing the role of the Host/Hostess, Playing the role of the Guest	Rizvi, ETC, pp.139-164 Soft Skill, Dr.K.Alex-pp-203-219	0	1	1	0

S. No.	Topic	Pedagogy	Details	Instructional Hrs			
				Th	Pract	vide o	Pr oj
19	Golden Rules of Global Etiquette	Discussion and Activity	Developing intercultural skill http://www.kwintessential.co.uk/cultural-services/articles/international-business-etiquette.html http://www.kwintessential.co.uk/resources/country-profiles.html http://www.forbes.com/sites/susanadams/2012/06/15/business-etiquette-tips-for-international-travel/ http://www.marcaria.com/international-business-etiquette-customs-and-culture.asp	0	1	1	0

20	Doubt Clearing	One-to-One Interaction	Practice	0	1	0	0
21	Recap	Discussion	Performance Analysis	0	1	0	0

FCHU1211 CREATIVE WRITING

Pre - requisites	Course Type	Credits
Nil	Workshop	2

The aim of the course is to prepare students for careers in a workplace that is information-rich and that increasingly values communication skills and the ability to think creatively and critically. The class time will be devoted to writing workshop, innovation exercises, and the critical appreciation of write-ups. The Creative Writing course will focus on

- Reading
- Writing Creatively
- Presentations

Thus the main objective is to breed a culture of learning where students learn a variety of approaches to creative writing in a cooperative learning environment.

COURSE OBJECTIVES

- Develop thinking skills
- Acquire basic skills and techniques to develop a suitable practice of creative writing in context
- Use a constructive approach to critique his/her own work, as well as work by his/her peers
- Organize, prepare and present spoken presentations clearly and expressively

COURSE OUTCOMES

Upon the Completion of the course, a student will

- Create Blog/ Online Presence
- Submit works for publication
- Compose a variety of written responses for different purposes and audiences
- Collaborate by sharing ideas, examples and insights, productively and respectfully in informal conversations and discussions.
- Students will put into practice the learning into the personal, professional and technical sphere.

MODULE -I: WRITING CREATIVELY (12hrs)

Foundational activities

- Introduction to Class Standards
(Workshops, peer conferencing, blogging, reading outside the classroom)
- Collaborative Creation of Classroom Philosophy

- Basics of Creative Writing

Different forms of expression

- Memoirs/Writing the Personal Narratives
- Situational Writing/ Writing for the Target Audience
- Dialogues, Essay, Poetry Slam
- Script Writing
- Writing for Blogs
- Cooking Up Interview Stories

Writing from visuals

- Pictures, Graphs, Images, Diagrams and Designs, Cartoons
- Brochures and Newsletters

(This module will be facilitated through creative writing and speaking activities)

MODULE-II: READING AND CRITICAL APPRECIATION (8hrs)

- Book

(Independent Study: Two Master Piece)

- Article
- Movie

(Student Work: Free Choice, Discussion and Oral/ Written Critiquing, Editing/ Revision

- Publication/ Sharing, Short Report on Two Authors

(This module will be facilitated through reading activities and critical appreciation)

MODULE-III: POWER OF LATERAL THINKING TO CREATE NEW IDEAS (7hrs)

- General Concepts: Creativity and Lateral Thinking
- Using the Technique of Lateral Thinking in Writing
- Idea Generation Games and Activities
- Six Thinking Hats

(This module will be facilitated through idea generation activities and presentation)

TEXT BOOKS

Creative Writing: A Workbook with Readings- Linda Anderson

Creative Writing- By DevAnjanaNeira

REFERENCES

The Cambridge Companion to Creative Writing by David Morley, Philip Neilsen

Creative Writing- By Adele Ramet

The Creative Writing Mfa Handbook: A Guide for Prospective Graduate Students By Tom Kealey

EVALUATION SYSTEM (CONTINUOUS INTERNAL ASSESSMENT)

Methods	Memoirs	Essay/ Dialogue Writing	Slam Poetry	Script Writing	Writing for Blog	Presentation from Visuals	Cooking up Interview Stories	% of Marks 100(Best 5)
Total	20	20	20	20	20	20	20	100

SESSION PLAN: CREATIVE WRITING MODULE-1 : WRITING CREATIVELY (12 hours)

S. No.	Topics	Pedagogy	Details	Instructional Hrs			
				Th	Pra ct	Vid eo	Proj
1	Foundational activities Introduction to Class Standards (Workshops, peer conferencing,	Conversatio nal practice, Role Plays	https://www.teachingchannel.org/videos/peer-conferencing https://blogging.org/	0	2	0	0

	blogging, reading outside the classroom)						
2	Collaborative Creation of Classroom Philosophy	Group tasks	http://writing-speech.dartmouth.edu/teaching/first-year-writing-pedagogies-methods-design/collaborative-learning-learning-peers	0	2	0	0
3	Basics of Creative Writing	Video links /Practice	https://www.earlham.edu/media/894432/creative_writing_rules.pdf http://www.idiotsguides.com/education/creative-writing/creative-writing-basics/ https://www.youtube.com/watch?v=syuwXYpV4zA	0	2	0	0
4	Different forms of expression Memoirs/Writing the Personal Narratives Situational Writing/ Writing for the Target Audience	Group work, writing, video links ,	http://classroom.synonym.com/difference-between-memoir-personal-narrative-1729.html https://www.quia.com/files/quia/users/learningcircle/Situational-Writing-Tips https://www.youtube.com/watch?v=PLHkuSpJxPs https://www.youtube.com/watch?v=ZA3xtoKkWas	0	2	0	0
5	Dialogues, Essay, Poetry Slam	Role Plays, Written tasks	https://www.youtube.com/watch?v=zJGX2raiafU https://en.wikipedia.org/wiki/Poetry_slam Examples of poetry slams : http://www.poetrysoup.com/poems/best/slam	0	2	0	0
6	Script Writing Writing for Blogs	Writing tasks individual/pairs Video links Blog writing practice	https://www.writersstore.com/how-to-write-a-screenplay-a-guide-to-scriptwriting/ https://www.youtube.com/watch?v=XZszextv6yE BLOGS : https://www.youtube.com/watch?v=t21sKonfylk	0	2	0	0
7	Cooking Up Interview Stories		https://www.themuse.com/advice/6-types-of-stories-you-should-have-on-hand-for-job-interviews http://lifehacker.com/prepare-these-15-stories-for-your-next-job-interview-1610270959	0	1	0	0

			https://www.themuse.com/advice/the-interview-technique-you-should-be-using				
8	Writing from visuals Pictures, Graphs, Images, Diagrams and Designs, Cartoons Brochures and Newsletters		https://twp.duke.edu/uploads/assets/Using%20Visual%20Rhetoric%20in%20Academic%20Writing.pdf https://www.youtube.com/watch?v=r6ZVGBQYNXE	0	1	0	0

MODULE-II: READING AND CRITICAL APPRECIATION (8 HOURS)

S. No.	Topics	Pedagogy	Details	Instructional Hrs			
				Th	Pract	Vid eo	Proj
9	Book (Independent Study: Two Master Piece)		http://www.howtolearn.com/2012/08/different-reading-techniques-and-when-to-use-them/	0	2	0	0
10	Article writing			0	2	0	0
11	Movie Review (Student Work: Free Choice, Discussion and Oral/ Written Critiquing, Editing/ Revision)			0	1	1	0
12	Publication/ Sharing, Short Report on Two Authors		https://www.elsevier.com/authors/book-authors/science-and-technology-book-publishing/overview-of-the-publishing-process	0	2	0	0

MODULE-III: POWER OF LATERAL THINKING TO CREATE NEW IDEAS (7hrs)

S. No.	Topics	Pedagogy	Details	Instructional Hrs			
				Th	Pract	Vid eo	Proj
13	General Concepts: Creativity and Lateral Thinking	Role Plays/ Oral Presentations Practice	www.brainstorming.co.uk/tutorials/definitions.html http://www.trainingcoursematerial.com/free-training-articles/creativity-problem-solving-decision-making-and-lateral-thinking/defining-lateral-thinking-parallel-thinking-creativity-and-innovation	0	1	1	0

			Video https://www.youtube.com/watch?v=H7PyFNzPSVY				
14	Idea Generation Games and Activities	Pair/group activities	http://study.com/academy/lesson/what-is-idea-generation-definition-process-techniques.html	0	1	1	0
15	Six Thinking Hats	Group task	http://www.debonogroup.com/six_thinking_hats.php	0	1	1	0
16	DOUBT CLEARING			0	1	0	0

FCHU1212ENGLISH FOR COMPETITION (GRE/GMAT/TOEFL/IELTS)

Pre - requisites	Course Type	Credits
Nil	Workshop	2

COURSE OBJECTIVE

- Familiarize the learners with the pattern of the TOEFL/GMAT/IELTS/GRE examination and improve overall English skills to face the competitive exams confidently.

COURSE OUTCOME

- Learners understand the pattern of the TOEFL, IELTS and GRE examination and apply test-taking strategies in exams.

A student is required to take up five laboratory tests of 100 marks.

LIST OF EXPERIMENTS

1: TOEFL Listening

Developing Listening Comprehension by taking notes after the short recorded conversations.

2: TOEFL Speaking

Developing test taking strategies to face speaking test of TOEFL exam through role play and Mock Interview.

3: TOEFL Reading

Practicing and improving student's confidence in completing the various sections of reading test in TOEFL examination.

4: TOEFL Writing

Learning and enhancing writing skills required for TOEFL writing test.

5: IELTS Listening

Practicing the listening comprehension of the students and handling questions while listening the recorded conversations.

6: IELTS Speaking

Developing test taking strategies to face speaking test of IELTS examination through role plays and mock interviews.

7: IELTS Writing

Summarizing or explaining information presented in a graph, chart, table or diagram.

8: IELTS Reading

Understanding and interpreting the text in its particular use of language, ideas and style.

9: GRE Reading Comprehension

Taking GRE Reading Comprehension examination with confidence utilizing the methods and strategies.

10: GRE SENTENCE COMPLETION

Developing sentence completion strategies through logical thinking.

11: GRE SENTENCE EQUIVALENCE

Learning and developing strategies to deal with sentence equivalence questions.

12: GRE VOCABULARY

Understanding and using appropriate choice of vocabulary in GRE vocabulary section.

13. GRE Vocabulary & Verbal-Sentence Corrections

14. GMAT Verbal-Critical Reasoning

15. GMAT Verbal- Reading Comprehension

(The entire lab will be facilitated through online quizzes, and practice sets available in language lab))

TEXT BOOKS:

NorthStar Building Skills for the TOEFL iBT, High Intermediate Level (Pearson Education).

NorthStar Building Skills for the TOEFL iBT, Intermediate Level (Pearson Education).

McGraw-Hill's New GRE: 2011-2012 Edition

Princeton Review: Cracking the New GRE 2012

REFERENCES:

Longman Preparation Course for the TOEFL Test – iBT Speaking (Pearson Education).

Longman Preparation Course for the TOEFL Test – iBT Listening (Pearson Education).

Longman Preparation Course for the TOEFL Test – iBT Writing (Pearson Education).

Longman Preparation Course for the TOEFL Test – iBT Reading (Pearson Education).

NorthStar Building Skills for the TOEFL iBT, Advanced Level (Pearson Education).
 Achieve IELTS Workbook: Intermediate to Upper Intermediate: English for International Education (Achieve IELTS Intermediate/Upper) (Paperback).
 Kaplan New GRE Premier 2011-2012
 Barron's New GRE 19th Edition Grade
 Manhattan GRE
 Gruber's Complete GRE Guide 2012
 Nova's GRE Prep Course Grade
 ETS's Official Guide to the GRE Revised General Test
 Barron's GRE Verbal Workbook
 Barron's IELTS with Audio CD: International English Language Testing System (Paperback)
 Achieve IELTS Teacher's Book: Intermediate to Upper Intermediate: English for International Education (Achieve IELTS Intermediate/Upper) (Paperback)
 Step Up to IELTS Self-study Student's Book [STUDENT EDITION] (Paperback)
 IELTS Collected Papers: Research in speaking and writing assessment (Studies in Language Testing) (Paperback)
 EVALUATION SYSTEM (CONTINUOUS INTERNAL ASSESSMENT)

M e t h o d s	Listening & fill-up blanks, short answers, Multiple-choice	JAM/ Questions & Responses	Vocabulary Quiz, Sentence Completion & Re-order paragraphs	Reading Comprehension	Summarize/Data Comment	Essay Writing	Analytical Writing	% of Marks 100 (Best 5)
T o t a l	20	20	20	20	20	20	20	100

SESSION PLAN: ENGLISH FOR COMPETITION

S. No.	Topic	Pedagogy	Details	Instructional Hrs			
				Th	Prac t	vide o	Pro t
1	TOEFL Listening	Listening Activity Based Learning	http://www.examenglish.com/TOEFL/toefl_listening.htm	0	1	1	0
2	TOEFL Speaking	Listening and speaking activity	http://www.examenglish.com/TOEFL/TOEFL_Speaking_paragraph5.htm	0	1	1	0
3	TOEFL Reading & Writing	Reading and Writing Practice	http://www.examenglish.com/TOEFL/TOEFL_reading1.htm (Reading)	0	2	0	0

			https://www.englishclub.com/esl-exams/ets-toefl-practice-writing.htm http://www.time4writing.com/toefl/ (Writing)				
4	IELTS Listening	Listening Practice	http://takeielts.britishcouncil.org/prepare-your-test/free-ielts-practice-tests/listening-practice-test-1	0	1	1	0
5	IELTS Speaking	Speaking Practice	http://takeielts.britishcouncil.org/prepare-your-test/free-practice-tests/speaking-practice-test-1	0	2	0	0
6	IELTS Writing & Reading	Writing & Reading Practice	http://takeielts.britishcouncil.org/prepare-your-test/free-practice-tests/writing-practice-test-1-ielts-academic http://takeielts.britishcouncil.org/sites/default/files/Writing_practice_test_1_IELTS_Academic_questions.pdf (writing) http://takeielts.britishcouncil.org/prepare-test/practice-tests/reading-practice-test-1-academic (Reading)	0	2	0	0
7	GRE Reading Comprehension	Reading Practice	http://gre.graduateshotline.com/reading_comprehension_practice.html#.V2kJDRITXCM https://www.ets.org/gre/revised-general/prepare/verbal_reasoning/reading_comprehension/sample_questions	0	2	0	0
8	GRE Sentence Completion & Sentence Equivalence	Online practice	http://gre.graduateshotline.com/gre_sentence_completion.pl https://www.ets.org/gre/revised-general/prepare/verbal_reasoning/text_completion/sample_questions http://www.examfocus.com/gre/pt/verbal/sentence-equivalence-1.html	0	2	0	0
9	GRE Vocabulary	Online practice	http://gre.graduateshotline.com/	0	2	0	0
10	GMA Verbal-Sentence Corrections	Online practice	http://freemattest.net/Questions http://www.majortests.com/gmat/sentence_correction.php	0	2	0	0
11	GMAT	Online practice	http://www.majortests.com/gmat	0	2	0	0

	Verbal-Critical Reasoning		/critical_reasoning_test01				
12	GMAT Verbal-Reading Comprehension	Online practice	http://www.majortests.com/gmat/reading_comprehension_test01	0	2	0	0

FCHU1213BE A CONTRIBUTOR

Pre - requisites	Course Type	Credits
Nil	Workshop	2

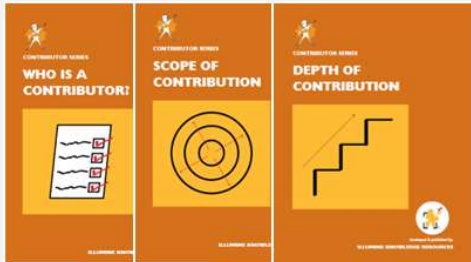

PROGRAM OBJECTIVES:

1. Build consciousness of ‘contributor thinking’ in students systematically by exposing them to the essential building blocks of contributor thinking. [The 4 sets of the program represent the 4 fundamental building block of the program]
2. Through projects expose students to the ‘realness’ of contributor way of thinking in the world around them.

SESSION PLAN:

Semester 1 of program delivery	SET 1: CONTRIBUTOR BASICS	
	UNIT 1: Who is a Contributor?	~5hrs
	UNIT 2: Scope of Contribution (Self, Organization, Society)	~5hrs
	UNIT 3: Depth of Contribution (From ‘opportunities to contribute’ to a ‘life of Purpose’)	~5hrs
	SET 2: BASIC AXIOMS OF LIFE	
	UNIT 4: The Contributor’s Response (From ‘victim’ to ‘creator of my destiny’)	~5hrs
	UNIT 5: The Contributor’s Identity (From ‘static identities’ to ‘dynamic identities’)	~5hrs
Semester 2 of program delivery	UNIT 6: The Contributor’s Vision of Success & Career (From an ‘acquisitive vision’ to a ‘contributive vision’)	
	SET 3: CONTRIBUTOR EFFECTIVENESS	
	UNIT 7: Engage Deeply	~5hrs
	UNIT 8: Design Solutions	~5hrs
	UNIT 9: Create Value	~5hrs
	SET 4: CONTRIBUTOR CONDUCT	
	UNIT 10: Thinking Win-win (Enlightened Self-Interest)	~5hrs
	UNIT 11: Thinking Human-impact (Imaginative Sympathy)	~5hrs
UNIT 12: Building Trust-surplus (Trust Behaviors)	~5hrs	
Full program duration		~60hrs

1.0 | Faculty can utilise the 5 hours of classroom as follows –

<p>i. The Class Engagement Books (for each unit)</p>  <p>Students fill in the book, in the class, while going through a class engagement</p>	
<p>ii. The Program App (Channel Illumine App)</p>  <p>The app is used along with the book to create a rich learning experience</p> <p>Participants scan the QR-code given in the book to open the relevant app unit.</p>	<p>~ 4hrs for Book and App engagement.</p>
<p>iii. Projects (for each unit)</p> <p>Students can do 1-2 projects in each semester. The project is done out of class. In-class time is only for student presentation.</p>	<p>~1hr for project presentations</p>

Source: This document is an abridged version of ‘Overview of Become a Contributor Program’ given in your Facilitator Guide. It is strongly recommended that faculty refer the detailed Facilitator Guide for more details.

EVALUATION PARAMETERS (Total-100 Marks)

A] ENGAGEMENT IN CLASS		40 marks
1	Regular attendance across classes	10 marks
2	Quality of class participation (involvement in discussions, asking thoughtful questions, sharing examples, etc.)	15 marks
3	In-class assignments <ul style="list-style-type: none"> • Students can be asked to submit their filled books for specific in-class assignments (Illumine can provide a list of which class engagements in each book, can be checked for this) • Any 4 books (one from each set), can be considered for marking. 	15 marks
B] PROJECT WORK		30 marks
<ul style="list-style-type: none"> • Project assignments are provided by Illumine for the course. • Mark students on their best 3, from these project assignments. 		
1	Completion & submission of assigned projects, with basic quality	10 marks
2	Design and execution of the project (Methodology of project work) (students present how they went about the project – their approach, method, documentation of research work)	10 marks
3	Project presentation & project output uploads (assessed against the project goal)	10 marks
C] PRE & POST TEST		20 marks
1	Completion of pre-test	5 marks
2	Completion of post-test	5 marks
3	Improvement (sent by Illumine, based on test results)	10 marks
D] APP USAGE (sent by Illumine, based on app usage pattern)		10 marks

FCHU0213 LIFE SKILLS DEVELOPMENT-I [Aptitude & Reasoning]

Pre - requisites	Course Type	Credits
Nil	Practice	2

OBJECTIVES

- To provide ample opportunities for practice.
- To make the students solve each & every question within 30-40 seconds.
- To make the students visit all the questions in any exam.
- To make them learn the art of skipping questions which require more time.
- To make the students eligible to score 70% or more in each written tests.

OUTCOMES

- Quantitative Ability skills will be increased.
- Calculation & Logical thinking skills will be increased.
- Time spent per questions will be minimized.
- Students will be able to score minimum of 70%.
- Improved skills to qualify all competitive exams like Campus Written tests, Banking Exams, SSC Exams, Railway Exams, GATE Exams.

MODULE I: (12 HOURS)

S. No.	Topic	Pedagogy	Details	Instructional Hrs			
				Th	Pract	vide o	Proj
1	Speed Math-1	Classroom Practice	Multiplication tricks, Square, cube, square root, Cube root tricks	0	1	0	0
2	Speed Math-2	Classroom Practice	Speed Calculations	0	1	0	0
3	Number System-01	Classroom Practice	Operation on Numbers, Classification of Numbers, Tests of Divisibility, Unit Digit Calculation	0	2	0	0
4	Number System-02	Classroom Practice	Factors & Factorials, Trailing Zeroes, Remainder Theorem	0	2	0	0
5	Series-1	Classroom Practice	Arithmetic Progression, Geometric Progression, Number series (Missing & Wrong)	0	2	0	0
6	Series-2	Classroom Practice	Letter, Alpha numeric, Miscellaneous series	0	2	0	0
	Internal-I	Online / Offline Test	Test & Discussion	0	2	0	0

MODULE-2 (14 HOURS)

S. No.	Topic	Pedagogy	Details	Instructional Hrs			
				Th	Pract	vide o	Proj
	HCF & LCM	Classroom Practice	Concepts, short tricks, question discussion	0	3	0	0
	Average	Classroom Practice	Concepts, short tricks, question discussion	0	2	0	0
	Coding & Decoding	Classroom Practice	Letter Coding, Number coding, Message coding, Substitution coding, Conditional coding	0	3	0	0
	Word Problem	Classroom Practice	Analogy, Odd man out, word formation, letter pair	0	2	0	0
	Logical Thinking	Classroom Practice	Brain Riddles	0	2	0	0
	Internal-II	Online / Offline Test	Test & Discussion	0	2	0	0

EVALUATION SYSTEM: INTERNAL ASSESSMENT (50) + EXTERNAL ASSESSMENT (50)

Methods	Online/Offline Test-I	Online/Offline Test-II	Attendance	Assignment	% of Marks 50
Total	15	15	10	10	100

FCHU0214 LIFE SKILLS DEVELOPMENT-II [Aptitude & Reasoning]

Pre - requisites	Course Type	Credits
LSD-I	Practice	2

OBJECTIVES

- To provide ample opportunities for practice.
- To make the students solve each and every question within 30-40 seconds.
- To make the students visit all the questions in any exam.
- To make them learn the art of skipping questions which require more time.
- To make the students eligible to score 70% or more in each written tests.

OUTCOMES

- Quantitative Ability skills will be increased.
- Calculation & Logical thinking skills will be increased.
- Time spent per questions will be minimized.
- Students will be able to score minimum of 70%.
- Improved skills to qualify all competitive exams like Campus Written tests, Banking Exams, SSC Exams, Railway Exams, GATE Exams.

SESSION PLAN: APTITUDE MODULE I: (13 HOURS)

S. No.	Topic	Pedagogy	Details	Instructional Hrs			
				Th	Pract	video	Proj
1	Percentage-01	Classroom Practice	Basics of Percentage, Effective percentage, shortcuts	0	2	0	0
2	Percentage-02	Classroom Practice	Advanced questions and discussions	0	2	0	0
3	Profit & Loss-01	Classroom Practice	Basics and advanced questions of Profit & Loss and shortcuts	0	2	0	0
4	Profit & Loss-02	Classroom Practice	MRP, Discount, Successive discount	0	1	0	0
5	Order & Ranking	Classroom Practice	Ranking & Sequence	0	2	0	0
6	Direction Sense Test	Classroom Practice	Shortest Distance, Angular movement concept and Dusk & Dawn	0	2	0	0
7	Internal-I	Online / Offline Test	Test & Discussion	0	2	0	0

MODULE II: (13 HOURS)

S. No.	Topic	Pedagogy	Details	Instructional Hrs			
				Th	Pract	vide	Pro
1	Ratio & Proportion	Classroom Practice	Types of ratios, Basics & Advanced Question	0	2	0	0
2	Age	Classroom Practice	Concepts & Shortcuts	0	1	0	0
3	Partnership	Classroom Practice	Concepts & Shortcuts	0	1	0	0
4	Mixture & Allegations	Classroom Practice	Rule of Alligation, Basics & Advanced question, Short tricks	0	2	0	0
5	Clock	Classroom Practice	Concepts of Angle, Reflex angle, Right angle Opposite, Coincide and Incorrect clock	0	2	0	0
6	Calendar	Classroom Practice	All concepts & Shortcuts	0	1	0	0
7	Blood Relation	Classroom Practice	Jumbled-up descriptions, coded relations, Relation Puzzles	0	2	0	0
8	Internal-II	Online / Offline Test	Test & Discussion	0	2	0	0

EVALUATION SYSTEM: INTERNAL ASSESSMENT (50) + EXTERNAL ASSESSMENT (50)

Methods	Online/Offline Test-I	Online/Offline Test-II	Attendance	Assignment	% of Marks
Total	15	15	10	10	50
					100

FCHU0215 LIFE SKILLS DEVELOPMENT – III [Aptitude & Reasoning]

Pre - requisites	Course Type	Credits
LSD-II	Practice	2

OBJECTIVES

- To provide ample opportunities for practice.
- To make the students solve each and every question within 30-40 seconds.
- To make the students visit all the questions in any exam.
- To make them learn the art of skipping questions which require more time.
- To make the students eligible to score 70% or more in each written tests.

OUTCOMES

- Quantitative Ability skills will be increased.
- Calculation & Logical thinking skills will be increased.
- Time spent per questions will be minimized.
- Students will be able to score minimum of 70%.
- Improved skills to qualify all competitive exams like Campus Written tests, Banking Exams, SSC Exams, Railway Exams, GATE Exams.

SESSION PLAN: APTITUDE MODULE I: (14 HOURS)

S. No.	Topic	Pedagogy	Details	Instructional Hrs			
				Th	Pract	video	Proj
1	Time, Speed, Distance	Classroom Practice	Concepts, Problems based on relations, Average speed, Stoppage time,	0	2	0	0
2	Trains	Classroom Practice	Relative Speed & All types of train problems	0	1	0	0
3	Boats & Streams	Classroom Practice	Basics, Upstream, Downstream & Shortcuts	0	1	0	0
4	Race	Classroom Practice	All concepts & Shortcuts	0	1	0	0
4	Time & Work	Classroom Practice	Time & Work (Efficiency, wages, alternative day, chain rule)	0	3	0	0
5	Pipes & Cistern	Classroom Practice	Pipes & Cisterns (-ve & +ve work)	0	1	0	0
6	Cubes & Dices	Classroom Practice	All concepts & Shortcuts	0	1	0	0
7	Cubes & Cuboids	Classroom Practice	All concepts & Shortcuts	0	1	0	0
8	Embedded Figure & Figure series	Classroom Practice	All concepts & Shortcuts	0	1	0	0
9	Internal-I	Online / Offline Test	Test & Discussion	0	2	0	0

MODULE II: (13 HOURS)

S. No.	Topic	Pedagogy	Details	Instructional Hrs			
				Th	Pract	vide o	Proj
1	SI	Classroom Practice	Concepts & Shortcuts on Simple Interest & Installments	0	2	0	0
2	CI	Classroom Practice	Concepts & Shortcuts on Compound Interest & Installments	0	2	0	0
3	Logarithm	Classroom Practice	All Formulae, concepts & Shortcuts	0	1	0	0
4	Equation	Classroom Practice	Linear & Quadratic	0	2	0	0
5	Figure Puzzle & Figure grouping	Classroom Practice	All concepts & Shortcuts	0	1	0	0
6	Figure Counting	Classroom Practice	All concepts & Shortcuts	0	1	0	0
7	Mirror & Water Image	Classroom Practice	All concepts & Shortcuts	0	1	0	0
8	Paper Cutting & Paper folding	Classroom Practice	All concepts & Shortcuts	0	1	0	0
9	Internal-II	Online / Offline Test	Test & Discussion	0	2	0	0

EVALUATION SYSTEM: INTERNAL ASSESSMENT (50) + EXTERNAL ASSESSMENT (50)

Methods	Online/Offline Test-I	Online/Offline Test-II	Attendance	Assignment	% of Marks 50
Total	15	15	10	10	100

FCHU0216 LIFE SKILLS DEVELOPMENT – IV [Aptitude & Reasoning]

Pre - requisites	Course Type	Credits
LSD-III	Practice	2

OBJECTIVES

- To provide ample opportunities for practice.
- To make the students solve each and every question within 30-40 seconds.
- To make the students visit all the questions in any exam.
- To make them learn the art of skipping questions which require more time.
- To make the students eligible to score 70% or more in each written tests.

OUTCOMES

- Quantitative Ability skills will be increased.
- Calculation & Logical thinking skills will be increased.
- Time spent per questions will be minimized.
- Students will be able to score minimum of 70%.
- Improved skills to qualify all competitive exams like Campus Written tests, Banking Exams, SSC Exams, Railway Exams, GATE Exams.

SESSION PLAN: APTITUDE MODULE I: (14 HOURS)

S. No.	Topic	Pedagogy	Details	Instructional Hrs			
				Th	Pract	video	Proj
1	Permutation	Classroom Practice	All concepts & Shortcuts on factorial, fundamental principles of counting	0	2	0	0
2	Combination	Classroom Practice	All concepts & Shortcuts on Selection (Groups/teams)	0	2	0	0
3	Probability	Classroom Practice	Terms related to Probability, Event, Theorems related Probability, Conditional Probability. Shortcuts on coins, dices, balls, cards, etc	0	2	0	0
4	Sitting Arrangement	Classroom Practice	Circular, Square, Rectangular, Linear, Triangular	0	2	0	0
5	Puzzle	Classroom Practice	Box, Floor, Month, Day	0	2	0	0
6	Advanced Puzzle	Classroom Practice	3 variable	0	2	0	0
7	Internal-I	Online / Offline Test	Test & Discussion	0	2	0	0

MODULE II: (14 HOURS)

S. No.	Topic	Pedagogy	Details	Instructional Hrs			
				Th	Pract	vide o	Proj
1	Data Interpretation	Classroom Practice	(Bar/Pi-Chart /Line graph)	0	2	0	0
2	Mensuration	Classroom Practice	Area & Volume	0	2	0	0
3	Height & Distance	Classroom Practice	Lines of Sight, Horizontal line, Angle of Elevation, Angle of Depression	0	1	0	0
4	Logical Venn Diagram	Classroom Practice	All concepts & Shortcuts	0	1	0	0
5	Syllogism	Classroom Practice	All concepts & Shortcuts	0	2	0	0
6	Statement Assumption	Classroom Practice	All concepts & Shortcuts	0	1	0	0
7	Statement Conclusion	Classroom Practice	All concepts & Shortcuts	0	1	0	0
8	Data Sufficiency	Classroom Practice	All concepts & Shortcuts	0	2	0	0
9	Internal-II	Online / Offline Test	Test & Discussion	0	2	0	0

EVALUATION SYSTEM: INTERNAL ASSESSMENT (50) + EXTERNAL ASSESSMENT (50)

Methods	Online/Offline Test-I	Online/Offline Test-II	Attendance	Assignment	% of Marks 50
Total	15	15	10	10	100

FCMG0114 ECONOMICS

Pre - requisites	Course Type	Credits
Nil	Theory	2

Course Objective:

In today's dynamic economic environment, effective managerial decision making requires timely and efficient use of information. The basic purpose of this course is to provide students with a basic understanding of the economic principles, methodologies and analytical tools that can be used in business decision making problems. It provides an understanding of the economic environment and its impact on strategy formulation. The course also focuses on the impact of economic policies on managerial decision-making by providing an understanding of fiscal policy, and national and global economic issues affecting business.

The language of science (and all analytical thinking) is mathematics. Since economics is a social science, use of some mathematical tools, basically the constrained and un-constrained optimization techniques will help in measuring and solving the basic economic problems and thus improves decision-making. It becomes difficult and totally un-practicable to solve business (economic) problems logically and systematically without use of mathematics. The basic objective is to solve problems mathematically and interpret the results economically.

Module-1: Micro Economics

Introduction to economics: Scarcity, Choice and Efficiency, Fundamental issues of what, how and for whom to produce to make the best use of economics. Demand for a commodity: Law of demand, Demand schedule and demand curve, Individual and market demand, Change in demand, Consumer behavior: Analysing law of demand through Marshallian utility analysis, Indifference curve technique and Consumer Surplus.

Elasticity of demand: Price Elasticity of demand: Estimation, Types, Elasticity and revenue, Factors affecting price elasticity of demand. Income elasticity, Cross elasticity, Uses of different concepts of elasticity in business decisions.

Analysis of Supply: Law of Supply, Supply schedule and supply curve, Change in supply, Price elasticity of supply, Equilibrium of demand and supply: Equilibrium with demand and supply curves, Effect of a shift of demand and supply curves.

Production Function: Production function with one variable input, Production function with two variable inputs, optimal combination of inputs, Returns to scale

Cost Theory: Types of costs, Production and cost, Short-run cost functions, Long-run cost functions, Economies of scale and scope, Cost-Volume-profit Analysis

Market: Meaning, types and characteristics of different market structure (Perfect competition, Monopoly, Monopolistic competition and Oligopoly)

Module: 2: Macro Economics

National Income Accounting: Circular flow of Income, National Income Concept, Eight variants of national product aggregates, Measurement (Income, Value Added and Expenditure), Real and Nominal GNP, Difficulties in measuring the national income, Uses of National income statistics, Money and Inflation: Demand for and supply of money. Causes and consequences of Inflation. Commercial and central banking: Role and functions of commercial banks and R.B.I., Monetary Policy and Fiscal policy: Objectives and Instruments, Balance of Payment (BoP): Meaning, BoP Account, Disequilibrium in BoP, Measures to correct disequilibrium in BoP, Foreign Exchange: Floating Exchange Rate and Fixed Exchange Rates

Books & Reference:

1. Managerial Economics in a Global Economy, by D. Salvatore, Sixth Edition, OUP, 2008
2. Managerial Economics, Truett&Truett, Wiley Publication.
3. Managerial Economics, by Petersen Craig H. Cris Lewis and S.K. Jain, Pearson, 2007
4. Modern Micro Economics, Koutsoyiannis, (1975), A, Macmillan Press
5. Managerial Economics, Mehta, P. L (1999), Sultan Chand & Sons
6. Principles of Microeconomics, Mankiw, N. G (2006), Cengage Learning
7. Macroeconomics, Mankiw, N. G, (2009), Worth Publishers
8. Macroeconomics, Theory and Policy, Dwivedy, D.N (2007), Tata McGraw Hill
9. Macroeconomics, D'Souza, E (2008), Pearson Education
10. Macroeconomic Analysis, Shapiro, E (2003), Galgotia Publications
11. Environmental Economics in Theory and Practice – Hankey N, Shogren J F, and White B – 1999 – Macmillan Indian Limited
12. Indian Economy, Mishra &Puri (2011), Himalaya Publishing House

FCMG0102 ACCOUNTING AND FINANCE

Pre - requisites	Course Type	Credits
Nil	Theory	2

Course Objective:

- To familiarize the students with basic terms of accounting, accounting principles, concepts and convention.
- To equip the students with various concepts, tools and techniques of Cost accounting as well as Management accounting essential for managerial decision making process.
- To aware students overview of Time Value of Money, Working Capital and Stock Market

Course outcomes:

On the successful completion of this paper the students should be able composed the information about:

- Develop a basic understanding of accounting and financial ratio analysis.
- Students will be able to create, balance and deliver a budget and use budget information for planning and decision purposes.
- Undertake various costing techniques and information for planning and decision-making
- Demonstrate time management by understand various financial funding options for project planning and working capital management of an organizations.
- Know how financial markets as well as the global economy are impacting their organization today and how they will impact their organization into the future.

Module 1:

Basic Accounting Concepts and Conventions, Basic Accounting Equation, Accounting Mechanism: Journals, Ledgers, Trial Balance, Basic Financial Statements: Analysis of Items found in Balance Sheet and Income Statement, Ratio Analysis

Module 2:

Cost Concepts and Cost Terms: Financial Accounting vrs. Cost Accounting, Direct and Indirect Costs, Fixed, Variable and Semi-variable Costs, Standard, Budgeted and Actual Costs, Controllable and Non-controllable costs, Preparation of Cost Sheet, Cost-Volume-Profit Analysis:

Concept of Marginal Cost and Contribution, Concept of Break Even Analysis, Applications of Marginal Costing

Module 3:

Time Value of Money: Concept, Simple and Compound Interest, Present Value of a Single Amount, Present Value of an Uneven Series, Future Value of an Annuity, Present Value of an Annuity

Working Capital Management: Meaning and Components of Working Capital, Determinants of Working Capital, Profitability-Risk Trade-off, Types of Working Capital, Importance of Working Capital, Operating Cycle: Concept and Estimation
 Stock Market: Types of Capital Issues: Initial Public Offer, Follow-on Public Offer, Rights Issues, Preferential Issues, Red-herring Prospectus, Free Pricing of Issues, Greenshoe Option, Lock-in Period, Safety Net, Listing of Securities on Stock Exchanges

Books Recommended:

1. Accounting for Management—Ashok Sehgal, Taxxman
2. Financial Accounting -- A managerial Perspective, R. Narayanswamy, PHI
3. Khan & Jain – Management Accounting, TMH.
4. Horngren ,Datar, Foster- Cost Accounting, Pearson.
5. Financial Accounting, Jain/Narang/Agrawal, Kalyani.
6. Basic Financial Accounting for Management, Shah, Oxford.
7. Financial Management by I. M. Pandey
8. Financial Management – Theory and Practice by Chandra
9. Financial Management – Text and Problems by Khan & Jain

FCMG0103 MANAGEMENT PROCESSES AND ORGANIZATIONAL BEHAVIOR

Pre - requisites	Course Type	Credits
Nil	Theory	2

Course Objectives:

Management as a subject of study has brought a new paradigm in managing organizations. The young professionals has to learn and reflect the basic principles of management. Along with it the knowledge of Individual and group behaviour and its impact at the workplace is vital. Organizational Behavior (OB) is a field of study that investigates the impact that individuals, groups, and structure have on behavior within an organization. Then it applies that knowledge to make organizations work more effectively. This course will expose students to gain knowledge on the basic principles of management and organization behavior.

Course Introduction

Management as a subject of study has brought a new paradigm in managing organizations. The young professionals has to learn and reflect the basic principles of management. Along with it the knowledge of Individual and group behaviour and its impact at the workplace is vital. Organizational Behavior (OB) is a field of study that investigates the impact that individuals, groups, and structure have on behavior within an organization. Then it applies that knowledge to make organizations work more effectively. This course will expose students to gain knowledge on the basic principles of management and organization behavior.

Course Content

Unit: I

Emergence of Management as a discipline, Principles of management, (Planning, organizing, staffing and controlling) Contributions to management by Luther Gullick , Henri Fayol and Peter F. Drucker and Introduction: Concept and models of OB, Approaches to OB (Systems, Human resource and Contingency)

Unit: II

Individual System: Learning, Perception, Personality and Motivation,

Unit: III

Social System: Group Dynamics and Leadership.

Books Recommended:

1. Robins & Sanghii; Organizational Behavior, Pearson
2. Luthans ,F; Organizational Behavior-TMH
3. Udai Pareek ; Understanding Organizational Behavior, Oxford
4. Prasad,L.M; Organization behavior, S.Chand.
5. K. Aswathappa; Organization behaviour
6. Prasad.L.M ; Principles of Management,

FCMG0104 PRODUCTION AND OPERATION MANAGEMENT

Pre - requisites	Course Type	Credits
Nil	Theory	2

Course Objective:

The course is designed to acquaint the students with decision making in production and operation function of an organization.

Course Outcomes :

- Acquire a working understanding of the roles/functions of production management in the context of business enterprise.
- The learner will have a deep knowledge of the fundamental theory and mathematical principles involved in Production and Operation Management.
- They can use specialized knowledge in Operations Management to solve business processes.
- They will be capable of applying these principles to solve relevant production or service system problems.

Module 1:

Operations Management- An Introduction : Primary topics in Operations Management, Operations Function and Transformation process . Manufacturing Strategy and Mass customization, Product Development and Service Design , New Product design, Product life cycle, Process design, Process life cycle

Module 2:

Project scheduling Models: Project Network, Critical path Method (CPM), Programme Evaluation Review Technique (PERT).

Scheduling: Objective of Scheduling, Sequencing, Sequencing model: "n" jobs 1 machine, "n" jobs 2 machines.

Module 3:

Inventory Management: Concept of inventory with independent demand: Inventory cost structure, Deterministic inventory model - EOQ models, instantaneous receipt, Inventory model with discounts.

Module 4:

Quality Management: Concept of quality; Quality of design, Conformance & performance; Cost of poor process performance and quality. Statistical Quality Control - Process Control (X-bar, R & P chart, np chart).

Concept of TQM, Just in Time and Lean Production Basic element in JIT, Pull system, Push system

Books Recommended:

- 1) Chase, Jacobs, Aquilano, Agarwal, - "Operations Management", TMH
- 2) Krajewski, Ritzman, Kansal, - "Operations Management", Pearson
- 3) Everette. Adam Jr., Ronald J. Ebert, - "Production and Operations Management", PHI
- 4) Roberta S. Russell & Bernard W. Taylor III, - "Operations Management", Pearson/ PHI
- 5) Aswathappa & Sridhar Bhat, - "Production and Operations Management", HPH
- 6) Gaither, Frazier- Operations Management

FCMG0105 MARKETING MANAGEMENT

Pre - requisites	Course Type	Credits
Nil	Theory	2

Course Objective:

- a) To familiarize the students with the concepts and theories and strategies of marketing.
- b) To focus on the application of these concepts to various marketing contexts
- c) To focus on the emerging areas of marketing

Course outcomes :

- The students will understand the various marketing approach in today's competitive scenario.
- The students will learn the application of various marketing tools for solving business problems
- The students will acquire and develop the marketing skills to be a successful marketing person

Module 1:

Introduction to marketing; What is marketing?, Importance of marketing function, Process of marketing, Concepts like need, want, value, satisfaction etc, Elementary idea of marketing mix. Understanding Marketing Environment; Factors affecting marketing environment (PESTEL), Porter's five forces model, Introduction to market research

Module 2:

Segmentation, Targeting & positioning (STP); What is market segmentation?, Criteria for effective segmentation, Targeting selected markets, Targeting strategies, Positioning, Effective positioning strategies, Positioning of brands and repositioning, introduction to consumer behavior.

Module 3:

Product Management; Classification of products, Product life cycle (PLC), Brand and branding. Pricing; Meaning & objective, steps in setting the price, pricing policies. Promotion; What is promotion, types of promotion, advertising, sales promotion, integrated marketing communication Place; Marketing channels, Channel conflict management, Distribution system. Introduction to services marketing, Emerging concepts like green marketing, e-marketing & social marketing.

Books Recommended:

1. Marketing Management: A South Asian Perspective- Phillip Kotler, Kevin Lane Keller, Abraham Koshy and MithileshwarJha, 13th Edition Pearson, Education Publication
2. Marketing Mangement: Fourth edition- RajanSaxena
3. Positioning: The Battle for Your Mind- Al Ries& Jack Trout, Warner Books USA

FCMG0108 INTRODUCTION TO RESEARCH

Pre - requisites	Course Type	Credits
Nil	Theory	2

Course Objectives:

- To introduce the students about research, methods and techniques.
- To understand the process and apply in other areas.

Course outcome:

- Students will be able to understand the process of doing a research.
- Students will be able to write a research report.

Course Contents:

Module: I Science and Social Science as Knowledge

Common sense view of Science, Seeing is believing?, Visual Experiences, Relevant Facts, Facts precede theory, Observation, Experiment as an adequate basis of Science, Deductive and inductive logic, falsification-A logical view,

Module: II Process of doing Research

Overview: Problem Definition, hypothesis and its function, Types of Research, Literature Review, Research Design, Sampling: Census and sample survey, different types of sample design, Measurement: Measurement and scaling techniques, Methods of Data Collections: Experimentation, observation, interview, Survey, case study; Data Analysis and Interpretation: Qualitative and quantitative data, data presentation, central tendency and dispersion, association, test of significance.

Module: III Report Writing and Presentation

Significance of report writing, different steps in report writing, layout of research report & Types of Report, Presentation, Ethics in Report Writing.

Books Recommended

1. Ranjit Kumar, 2011, Research Methodology: A Step by Step Guide, Sage South Asia Publication.

FCMG0113 INDIAN SOCIETY AND CULTURE

Pre – requisites	Course Type	Credits
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Nil	Theory	2
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Course Objectives:

- a) Develop an understanding social environment
- b) Develop an understanding of cultural environment
- c) Understanding the linkages among social, cultural and business environment

Course outcomes :

- Students would develop an idea about the socio-cultural environment in which they would be working as scientists, researchers and entrepreneurs.
- More specifically, they would get an appreciation of how societal and cultural issues interface with technology and science in the context of overall development of the country.
- Attempt is also made to familiarise students with the science and technology policies that would benefit modern India.

Course Contents:

Module 1: Introduction to Indian Society

Indian Society - Roots of Indian Society , Social Structure – Rural and Urban Contexts, Social Institutions in Indian Society, Caste, Tribe, Dalits and Other Excluded Groups, Power and Conflicts

Module 2: Introduction to Culture in Indian Society

Culture in Ancient, Medieval and Modern India, Languages and Literature in India, Culture Change and its Impact on Indian Society

Module 3: Social Movements

Reformers and Radicals – Rammohan Roy, Syed Ahmed Khan, JotiroPhule, Gopal Krishna Gokhale, BalGangadharTilak, TarabaiShinde, DayanandaSaraswatiand Vivekananda Nurturing a Nation – M. K. Gandhi, RabindraNath Tagore, B R Ambedkar, Mohammad Ali Jinnah, EV Ramaswami, Jawaharlal Nehru, RammanoharLohia, Jayaprakash Narayan, Verrier Elwin Peasant, Tribal, Women and Environment movement

Module 4: Social Issues in Modern India

Poverty, Gender Inequality, Disparity and Social Exclusion: SC, ST, Women, Child, Challenged

Module 5: Science, Technology and Society

Science, Technology and Development Linkage, Appropriate Technology, Science and Technology Policy

Books Recommended:

1. Indian Society and Culture: Continuity and Change – by N. Hasnain
2. Social and Cultural History of India – O.M. Prakash
3. Makers of Modern India – RamachandraGuha

Introduction to Human Rights

Course	Code	Type of course	Credit
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Introduction to Human Rights	FCMG1203	Workshop	2
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Objective

- The course is an introduction to human rights. Human beings are rational beings. They by virtue of their being human possess certain basic and inalienable rights which are commonly known as human rights. Human Rights are defined as all those rights which are essential for the protection and maintenance of dignity of individuals and create conditions in which every human being can develop his or her personality to the fullest extent. The purpose of this course is for students to gain a holistic view of human rights

Course outcome

- Develop an understanding of human rights, its history, characteristics and types,
- Gain a nuanced understanding of protection, violation and the legal framework for their protection - International Human Rights Law, Council of Human Rights, Universal Declaration of Human Rights, Legal Effects of the Declaration, International Humanitarian Law

Course outline

Module I	Introduction to Human Rights
Topic	Meaning and Definition, History, Principles, Characteristics, Types
Pedagogy	Example: lecture (ppt), videos, etc
Lab/Activity	
Assignment/practice	
No. of hours	6
Reference materials: Book/e-content/ online source	

Module 2	Human Rights Law
Topic	Protection, violation and the legal framework for their protection - International Human Rights Law, Council of Human Rights, Universal Declaration of Human Rights, Legal Effects of the Declaration, International Humanitarian Law
Pedagogy	Example: lecture, videos, Case studies, etc
Lab/Activity	
Assignment/practice	
No. of hours	8
Reference materials: Book/e-content/ online source	

Module 3	Conflicts of Rights: Challenges of the past and challenges for the future
Topic	Persistence of discrimination, poverty, and inequality in the region, efforts in the search for justice for past violations, continued struggle for human rights and accountability

Pedagogy	Example: lecture, videos, case studies, etc
Lab/Activity	
Assignment/practice	
No. of hours	16
Reference materials: Book/e-content/ online source	

Reference

E-content:

Text Books:

1. Arihants UGC NET Human Rights and Duties
2. Kapoor, S. K. Central Law Agency's Human Rights under International Law and National Law

Reference Books:

1. Ciapham Andrew, 2015, Human Rights: A Very Short Introduction, Oxford University Press
2. Smith Rhona, 2015, Textbook on International Human Rights, Oxford University Press

Online Source:

8 Human Rights Study Books you can download for free

<https://www.humanrightscareers.com/.../10-human-rights-study-books-you-can-download>

<https://www.humanrightscareers.com/courses/>

Session Plan

Topic coverage and Internal Test	No. of Sessions (in hrs.)	Activity (lecture, tutorial, lab practice, field studies/field-trip, Workshop etc.)	Assignment (project, assignment, field study, seminar, etc.)	Suggested Reading (Book, Video, Online source, etc.)
Module 1				
Meaning and Definitions of Human Rights	2	Lecture		Lecture Notes and reference in books, online resources
History of Human Rights?	2	Lecture		Lecture Notes and reference in books, online resources
Principles, Characteristics and Types	2	Lecture		Lecture Notes and reference in books, online resources
Module 2				
Introduction - Protection, violation and the legal framework for the protection of Human Rights	2	Lecture		Lecture Notes and Articles, online resources
International Human Rights Law	2	Lecture		Lecture Notes and Articles, online resources
Council of Human Rights and Universal Declaration of Human Rights	1	Lecture		Lecture Notes and Articles, online resources
Legal Effects of the Universal Declaration of Human Rights	1	Lecture		Lecture Notes and Articles, online resources
International Humanitarian Law	2	Lecture		Lecture Notes and Articles, online resources
Module 3				
Persistence of discrimination, poverty, and inequality in the region	2	Lecture		Handouts and online resources
Efforts in the search for justice for past violations	2	Lecture		Handouts and online resources
Continued struggle for human rights and accountability	2	Lecture		Handouts and online resources
Project work and presentations	8 hours			

Introduction to Ethics

Course	Code	Type of course	Credit
Introduction to Ethics	FCMG1204	Workshop	2

Course Objective

- The course is an introduction to Ethics. This course will introduce to the meaning of ethics and the historical development – utilitarianism, ethical relativism and virtue ethics. Will also examine some current ethical issues. Questions which will be considered are: what is the good life? Do we have a moral duty to act in certain ways? Are there such things as natural human rights? Are some values more compelling than

Course outcome

- Demonstrate knowledge of important ethical systems
- Demonstrate their respect of different ethical perspectives
- Critique some aspects of an ethical position
- Clearly formulate their ethical position on an issue and develop arguments based on sound inferences and clear premises (through project)

Course outline

Module I	Introduction to Ethics
Topic	What is the study of ethics, Introduction to Indian and Western Ethics
Pedagogy	lecture (ppt),
Lab/Activity	
Assignment/practice	
No. of hours	6
Reference materials: Book/e-content/ online source	

Module 2	Different Ethical systems and Perspectives
Topic	Ethical relativism and its implications, utilitarianism, duty ethics and virtue ethics
Pedagogy	lecture, Case studies, small group work
Lab/Activity	
Assignment/practice	
No. of hours	8
Reference materials: Book/e-content/ online source	

Module 3	Critique of various aspects of ethical positions
Topic	Critique an ethical issue/ problem and formulate own ethical position on the issue/ problem
Pedagogy	lecture, small group work
Lab/Activity	
Assignment/practice	
No. of hours	16
Reference materials: Book/e-content/ online source	

Reference

E-content:

https://youtu.be/3_t4obUc51A

Text Books:

1. Frankena, WK, 1973, Ethics (2nd Edition), Pearson.

Reference Books:

2. Singer, P. 2011, Practical Ethics (3rd ed), Cambridge University Press.
3. Smart, JJC and Williams, B. 1973, Utilitarianism: For and Against, Cambridge University Press.

Session Plan

Topic coverage and Internal Test	No. of Sessions (in hrs.)	Activity (lecture, tutorial, lab practice, field studies/field-trip, Workshop etc.)	Assignment (project, assignment, field study, seminar, etc.)	Suggested Reading (Book, Video, Online source, etc.)
Module 1				
Meaning and Definitions of Ethics	2	Lecture		Lecture Notes and reference in books, online resources
Introduction to Indian and Western Ethics	4	Lecture		Lecture Notes and reference in books, online resources
Module 2				
Ethical Relativism and its implications	2	Lecture		Lecture Notes and Articles, online resources
Utilitarianism and its implications	2	Lecture		Lecture Notes and Articles, online resources
Duty ethics and its implications	2	Lecture		Lecture Notes and Articles, online resources
Virtue ethics and its implications	2	Lecture		Lecture Notes and Articles, online resources
Module 3				
Critique of various aspects of ethical positions	4	Lecture		Handouts and online resources
How to formulate an ethical position on an issue	4	Lecture		Handouts and online resources
Project work and presentations	8 hours			

FCMG1201 DISASTER MANAGEMENT

Pre – requisites	Course Type	Credits
Nil	Workshop	2

Course Objective
<p>The aim is to impart knowledge on</p> <ul style="list-style-type: none"> To provide students an exposure to disasters, their significance, types & Comprehensive understanding on the concurrence of Disasters and its management. To ensure that students begin to understand the relationship between vulnerability, disasters, disaster prevention, risk reduction and the basic understanding of the research

<p>methodology for risk reduction measures.</p> <ul style="list-style-type: none"> • Equipped with knowledge, concepts, and principles, skills pertaining to Planning, Organizing, Decision-making and Problem solving methods for Disaster Management. • The course also facilitates students to globally share their views, ideas and information pertaining to Disaster Management on a common platform. • To develop rudimentary ability to respond to their surroundings with potential disaster response in areas where they live, with due sensitivity. 			
GUIDELINES ON GRADING AND STANDARDS OF ASSESSMENT			
A continuous evaluation system will be adopted to evaluate the students. There will be an individual and group assignments, presentations and written test.			
COURSE CONTENT			
Module - 1			
UNIT I – Introduction to Disaster Management (2hrs)			
Session	Topic	Coverage	Reading/Reference
4hrs	Disaster & Emergencies : Concept & Fundamentals of Disaster Management	<ul style="list-style-type: none"> • Introduction/ Brain storming/ Group formation • History of Disasters • Concepts and Definitions • Hazard, Risk, Vulnerability, Capacity, Disaster & Equations of Disaster Management 	
		<ul style="list-style-type: none"> • Types & Classification of Disasters • Factors responsible for disasters like flood, cyclone and Earthquake. 	
UNIT II – Effect and Impact of Disaster (4 Hrs)			
1hr	Effect and Impacts of Disasters (Group work)	<ul style="list-style-type: none"> • Disasters Impact – Social, Economic, Political, Environmental, Health, Psychosocial, etc. • Differential impacts- in terms of Caste, Class, Gender, Age, Location, Disability. 	Disaster Mgmt. and India: Responding Internally and Simultaneously in Neighboring Countries Kailash Gupta, BE (Elec.), MBA(IIMA)
1 hr	Disaster vs Development	<ul style="list-style-type: none"> • Disaster is the causes of destruction • Disaster leads to development 	
2 hrs	Global warming and climate change	<ul style="list-style-type: none"> • Concept and understanding of 	

		<p>global warming and climate change</p> <ul style="list-style-type: none"> • Causes and factors • Remedial measures 	
Module – II		•	
UNIT III – Disaster Risk Management - (6 hours)			
2 hrs	<p>Community Managed Disaster Risk Reduction And Village Contingency Plan (Group work)</p> <p>Role of Task force/ ODRAF/ NDRF for DRR at community level.</p>	<ul style="list-style-type: none"> • Hazard analysis and assessment • Vulnerability analysis • Resource capability assessment • Mapping & Seasonality Calendar • Structural and Non Structural assessment. • Task forces with various roles for DRR. 	<p>CBDRM for Local Authorities: PARTICIPANT'S WORKBOOK – adpc www.adpc.net</p>
2 hours	Rapid Need Assessment Pre and Post Disaster (Group work and Practical demo)	<ul style="list-style-type: none"> • Meaning and Importance • Rapid Need Assessment in emergency and its significance • Process and Methods 	
2 hrs	Stress Management	<ul style="list-style-type: none"> • Causes and consequences of Stress • What are the best ways to handle pressure • Psychosocial Support 	
UNIT IV – Disaster Management (8 hrs)			
2 hrs	Disaster Management Cycle	<ul style="list-style-type: none"> • Disaster Management Cycle • Phases of Disasters • Prevention, Mitigation Preparedness, Warning, Response, Rehabilitation, Reconstruction 	
2 hrs	Fire safety (Practical)	• Practical	
2 hours	First Aid & Driving Learning (Theory and Practical)	<ul style="list-style-type: none"> • ABCD of First Aid • Dressing and Bandages Practical session 	

		<ul style="list-style-type: none"> Emerging need and importance of learning driving 	
2hrs	Building Rescue operation or Demonstration of ODRAF/NDRAF rescue materials	<ul style="list-style-type: none"> Practical 	
Module – III		•	
UNIT V – Humanitarian Charter and Minimum Standards in Humanitarian Response (4 hrs)			
2hrs	Sphere Standards (Group Work)	<ul style="list-style-type: none"> The Humanitarian Charter Protection Principles Core Standards 	
2hrs	Restoring Life Line Services (WASH) (Group work)	<ul style="list-style-type: none"> Water , Sanitation & Hygiene Promotion Food Security & Nutrition Health Services Health Services Shelter and Settlement 	The Sphere Project , Humanitarian Charter and Minimum Standards In Humanitarian Response
UNIT VI – Disaster Management Projects –(6 hours)			
6hrs	Seminars / Workshop	<ul style="list-style-type: none"> Adapting Climate Change Disaster Resilience Structures and Buildings IT in Disaster Management Inter-relationship between Disasters and Development Urban Disaster Rain Water Harvesting Inclusions – Disability, Aged, Social etc 	
		•	
		•	

- Team of 10 – 15 members would be formed
- Each Team would take up a project work in one of the topics above or related topics with prior approval : 2 Weeks
- Each Team would organize one Seminar / Workshop during the session

FCMG1202MS Excel

Pre – requisites	Course Type	Credits
Nil	Workshop	2

Course Objective	
<p>The aim is to impart knowledge on</p> <ul style="list-style-type: none"> • Indicate the names and functions of the Excel interface components. • Enter and edit data. • Format data and cells. • Construct formulas, including the use of built-in functions, and relative and absolute references. • Create and modify charts. • Preview and print worksheets. • Use the Excel online Help feature. 	
Course Outcome	
<ul style="list-style-type: none"> • Navigate your way around Microsoft Excel • Work with data analysis and presentation • Create and work with formulas and functions, understand and use formula cell • Use Excel for Business application 	
GUIDELINES ON GRADING AND STANDARDS OF ASSESSMENT	
A continuous evaluation system will be adopted to evaluate the students. There will be an individual and group assignments and presentations.	

Course Contents:

Unit 1: Excel Introduction, direct right, The Excel Interface, direct right, Basic Navigation and Editing,

Unit 2: Getting Going, Orientation & efficiency, Editing, Viewing, Spreadsheet Structure, Cell References, Named Ranges, Basic Macros, Design

Unit 3: Administration, Customising Excel, Housekeeping, Connecting Workbooks Documentation, Protecting and Sharing, Google Docs, Excel Troubleshooting, Data Handling, Sorting and Filtering, Controlling User Input, - Working with Dates & Times

Unit 4: U- Working with Text, Lookup and Reference, Logical Functions, Data Analysis, Working with Numbers, Summarising Data, PivotTables 1 - Simple Summaries, PivotTables 2 - Manipulating Data,

Unit 5: PowerPivot: Handling Big Data, Formula Auditing, Advanced Macros and VBA, Modelling, Presentation, Cell Formatting, Number Formatting, Conditional Formatting, Graphs and Charts, Page and print setup

Introduction to Gender

Subject Name	Code	Type of course	Credit
Introduction to Gender	FCMG1205	Workshop	2

Objective

- In the traditional social order women have been assigned a subordinate status in society for centuries. They have been deprived of many social privileges and suffered from discriminations that prevented them from contributing to the development process. They have remained marginalized in society. To remedy the prevailing situation, gender concerns have become increasingly important in the development agenda in the last few decades. In spite of special policies and programmes being implemented, gender based injustice continues to exist and

Course outcome

- Develop an understanding of perspectives on gender and development
- Discuss in detail the gender question in selected development sectors and globalisation
- Familiarise with the different tools and techniques for gender planning, analysis and evaluation in the development sector

The course has three modules covering these three aspects of gender and

Course outline

Module I

UNDERSTANDING AND CONCEPTUALISING GENDER RELATIONS

Module II

GENDER ISSUES IN DEVELOPMENT SECTORS

Module III

GENDER ANALYSIS, TOOLS, TECHNIQUES AND FRAMEWORKS

References

- a) “Why Gender is a Development Issue”, Handout 4, Oxfam Gender Training Manual (1994)
- b) Freedman, Jane. (2002), “Introduction: Feminism or Feminisms?” in *Feminism*, Viva Books, N. Delhi.
- c) Chafetz, J.S. (1990), “The Coercive Bases of Gender Inequality”, in *Gender Equity: An Integrated Theory of Stability and Change*, Sage.
- d) Kabeer, Naila. (1994), “Connecting, Extending, Reversing: Development from a Gender Perspective”, in *Reversed Realities*, Verso, London.
- e) Moser, C.O.N. (1991), “Gender Planning in the Third World: Meeting Practical and Strategic Gender Needs”, in T. Wallace & C. March (eds.) *Changing Perceptions: Writings on Gender and Development*, Oxfam.
- f) Boonsue, K. (1992), “Development Models of WID, WAD and GAD” in *Women’s Development Models and Gender Analysis: A Review*, Gender Studies (AIT, Bangkok).
- g) Agarwal, B. (1994), “Conceptualising Gender Relations” in *A Field of One’s Own: Gender and Land Rights in South Asia*, Cambridge University Press.
- h) “Women and the Economy” in *Human Development in South Asia 2000: The Gender Question*, MahbubUIHaq Development Centre/OUP, Islamabad.
- i) Rajagopal, S. (1999), “Closing the Gender Gap in Education: The Shikshakarmi Programme” in N. Kabeer & R. Subrahmanian (eds.), *Institutions, Relations and Outcomes*, Kali for Women, Delhi.
- j) Thakur, S.G. (1995), “Access to Health Care – A Gender Perspective” *The Administrator*, Vol 11, April-June, pp 169-181.

- k) Kusum, K & Barua, K. (2001), "Gender Equality and Women's Health – A Human Rights Perspective", Indian Journal of Adult Education, Jan-Mar, pp 44-49.
- l) Mohanty, B. (1995), "Panchayati raj, 73rd Constitutional Amendment and Women", Economic and Political Weekly, Dec 30, 3346-3350.
- m) Kapoor, N. (2002), "Women and Governance", Participation & Governance, Vol. 8, No.23, pp 11.
- n) Resurreccion, B.P. (2005), "Women in-between: Gender, Transnational and Rural-Urban Mobility in the Mekong Region", Gender, Technology and Development, Vol.9, No.1, Jan-April, pp 31-51.
- o) Gender and Globalisation – A Note
- p) Overholt, C.A. et.al. (1991), "Gender Analysis Framework", in A. Rao et.al. (eds.), Gender Analysis in Development Planning, Kumarian Press.
- q) Handouts to be given in the class on Gender Assessment Study.
- r) The Gender Analysis Matrix: A Teaching Note.
- s) March. C. et.al (1999), "Women's Empowerment (Longwe) Framework", in A Guide to Gender Analysis Frameworks, Oxfam: Oxford.
- t) Gender and Organisations – Handout in the class.

1. Session Plan

Topic coverage and Internal Test	No. of Sessions (in hrs.)	Activity (lecture, tutorial, lab practice, field studies/field-trip, Workshop etc.)	Assignment (project, assignment, field study, seminar, etc.)	Suggested Reading (Book, Video, Online source, etc.)
Module 1				
Difference between Sex and Gender	1	Lecture		Lecture Notes and Book chapters
Why gender is a development issue?	1	Lecture		Lecture Notes and Book chapters
Gender system and inequality	1	Lecture		Lecture Notes and Book chapters
Understanding gender relations	1	Lecture		Lecture Notes and Book chapters
Gender planning – practical and strategic gender needs	1	Lecture		Lecture Notes and Book
Approaches to address gender inequality – WID, GAD and GID	1	Lecture		Lecture Notes and Monograph
Module 2				
Gender issues in the economic sector	1	Quiz 1 and Lecture		Lecture Notes and Articles
Gender issues in the education sector	1	Lecture		Lecture Notes and Articles
Gender issues in the health sector	1	Lecture		Lecture Notes and Articles

Gender issues in the governance sector	1	Lecture		Lecture Notes and Articles
Gender issues in globalisation	1	Lecture		Lecture Notes and Articles
Module 3				
Harvard Analytical Framework	1	Lecture		Handouts and Book chapter
Gender Assessment Study and Gender Analysis Matrix	1	Lecture		Handouts and Book Chapters
Gender Empowerment Framework	1	Quiz 2 and Lecture		Handouts and Book Chapters
Gender and Organisations	1	Lecture		Handouts and Book Chapters
Student Presentations based on group projects	Extra classes			
Total (hrs)	15 hours +3 hours			

Centurion University of Technology and Management Odisha

Choice Based Credit System

Course Structure & Syllabus

BASKET - IV



CENTURION UNIVERSITY OF TECHNOLOGY AND MANAGEMENT

School of Engineering & Technology

2019

Basket - IV Mechanical Engineering,

Course Code	Course Title	Type of course	C r	Pre. req	C O 1	C O 2	C O 3	C O 4	C O 5	C O 6	C O 7	PSO 1	PSO 2	PSO 3
MECC01 01	Quality Control and Reliability Engineering	Theory	2	Nil	H	M	M	H	H	H	M	H	L	L
MECC01 02	Fluid Power Control	Theory	2	Nil	H	H	H	M	H	M	M	H	L	L
MECC01 03	Introduction to Hybrid and Electric Vehicles	Theory	2	Nil	H	M	M	H	L	M	M	H	L	L
MECC01 04	Renewable Energy Systems	Theory	3	Nil	H	M	M	H	M	H	M	L	M	L
MECC04 01	Manufacturing Technology 1	Theory + Practic e	3	Wor ksh op Prac tice	H	M	M	M	H	H	M	M	M	L
MECC04 02	Manufacturing Technology 2	Theory + Practic e	4	Nil	H	M	M	M	H	H	M	M	M	L
MECC04 03	Design for Manufacturing	Theory + Practic e	4	Wor ksh op Prac tice	H	M	M	M	H	H	M	H	L	L
MECC04 04	Finite Element Analysis	Theory + Practic e	4	Stre ngth of Mat erial s	H	H	H	M	H	H	M	L	H	L
MECC04 05	Digital Manufacturing	Theory + Practic e	3	Nil	H	M	H	H	H	H	M	H	L	L
MECC04 15	Fundamentals of Heat Engine	Theory + Practic e	3	The rmo dyn amics	H	H	H	M	M	M	M	L	H	L

MECC04 07	Design Thermal Energy Systems	of	Theory + Practic e	3	The rmo dyn ami cs	H	H	M	M	H	H	M	M	M	L
MECC04 10	Mechanics Machines	of	Theory + Practic e	3	Nil	H	H	H	M	M	L	M	L	M	L
CECC04 11	Strength Materials	of	Theory + Practic e	3	Eng ineer ing Mec hani cs	H	H	H	M	L	L	M	L	M	L
MECC04 12	Design Transmission Systems	of	Theory + Practic e	3	Mec hani cs of Mac hine s	H	M	M	M	H	H	M	L	M	L
MECC04 14	Fluid Mechanics and Heat Transfer		Theory + Practic e	3	Bas ic Flui d Mec hani cs	H	H	H	M	M	H	M	L	H	L

Quality Control and Reliability Engineering

Course Title	Code	Type of course	T-P-P	Prerequisite
Quality Control and Reliability Engineering	MECC0101	Theory	2-0-0	Nil

Objective

- To introduce the concept of SQC
- To understand process control and acceptance sampling procedure and their application.
- To learn the concept of reliability

Course outcomes

- Upon successful completion of this course, the students can able to apply the concept of SQC in process control for reliable component production

Evaluation Systems

	Component	% of Marks	Method of Assessment
Internal Examination	Internal Theory	30	Written examination
	Assignment	5	Report or Presentation + Learning Record
	Attendance	5	Based on class attended
External Examination	External Theory	60	Written examination
Total		100	

Course Outline

Module I: Introduction to Quality Control (3Hrs)

Theory

Definition of Quality, Basic Concept of Quality, Definition of SQC, Benefits and Limitation of SQC, Quality Assurance, Quality Control: Quality Cost-Variation in process Causes of Variation

Module II: Control Charts (5Hrs)

Theory

Theory of Control Chart, Uses of Control Chart, Control Chart for Variables, X Chart, R Chart and σ Chart (Most of used in MINI TAB Software), Process Capability, Process Capability Studies and Simple Problems. Concepts of Six Sigma. Control Chart for Attributes, Control Chart for Non-conforming p- Chart and np- Chart; Control Chart for nonconformities– C and U Charts, (Most of used in MINI TAB Software) State of Control and Process out of Control Identification in Charts, Pattern Study.

Module III : Acceptance Sampling in Quality Control (6 Hrs.)

Theory

Lot by Lot Sampling Types, Probability of Acceptance in Single, Double, Multiple Sampling Techniques, O.C. Curves (Use for MINI TAB 17) , Producer's Risk and Consumer's Risk. AQL, LTPD, AOQL (Most of used in MINI TAB Software). Standard Sampling Plans for AQL and LTPD- uses of Standard Sampling Plans. (Most of used in MINI TAB Software), Single Sampling, Double Sampling.

Module IV: Reliability Concepts (5Hrs)

Theory

Reliability engineering fundamentals; Life testing – Objective – Failure data Analysis, Failure rate; Mortality Curve (Used in MINI TAB Software); Concept of burn in period; Useful life and wear out phase of a system; Mean Time to Failure (MTTF) (Used in MINI TAB Software); and Mean Time to Repair (MTTR) Reliability in terms of Hazard rate and failure density, Conditional Probability and Multiplication Rules.

Module V : Reliability Improvement (3Hrs)

Theory

Techniques, Use of Pareto Analysis, Design for Reliability, Redundancy Unit and Standby Redundancy, Optimization in Reliability.

Module VI: Total Productive Maintenance (TPM) (3Hrs)

Theory

Introduction, Content, Methods and Advantages. Product Design, Product Analysis, Product Development, Product Life Cycles, TQM& TPM.

Module VII :Total Quality Management TQM (5Hrs)

Theory

Introduction, Definitions and Principles of Operation, Tools and Techniques, such as, Quality Circles, 5 S Practice, Total Quality Control (TQC), Total Employee, Involvement (TEI), Problem Solving Process, Quality Function Deployment (QFD), Failure Mode and Effect Analysis (FMEA), Fault Tree Analysis (FTA), Kizen, Poka-Yoke, QC Tools, PDCA Cycle, Quality Improvement Tools, TQM Implementation and Limitations.

Text Books

1. Mahajan, M, Stastical Quality Control, 2016, Dhanpat Rai & Co.
2. Srinath, L S, Reliability Engineering, 2005, East West Press

Reference Books

1. Park, S H, Robust Design for Quality Engineering and Six Sigma, 2009, World Scientific Publisher.

Session Plan

Topic	No. of Sessions (in hrs.)	Activity	Assignment	Suggested Reading
Module I (3 Hrs)				
Introduction, Definition of Quality, Basic Concept of Quality	1	Lecture		Text Book(TB)1
Definition of SQC, Benefits and Limitation of SQC	1	Lecture		TB-1
Quality Assurance, Quality Control: Quality Cost-Variation in process Causes of Variation	1	Lecture	Assignment 1	TB-1
Module II (5 Hrs)				
Theory of Control Chart- Uses of Control Chart – Control Chart for Variables – X Chart, R Chart and σ Chart	1	Lab practice,(MINI TAB)		Reference Book(RB)1
Process Capability Studies and Simple Problems	1	Lecture		RB-1
Concepts of Six Sigma.	1	Lecture		RB-1
Control Chart for Attributes Control Chart for non-conforming p- Chart and np-Chart; Control Chart for nonconformities– C and U Charts	1	Lab practice,(MINI TAB)		RB-1
State of Control and Process out of Control Identification in Charts, Pattern Study	1	Lab practice,(MINI TAB)	Assignment 2	RB-1
Module III(6 Hrs)				
Lot by Lot Sampling – Types – Probability of Acceptance in Single, Double, Multiple Sampling techniques – O.C. curves	2	Lab practice,(MINI TAB)		RB-1
Producer’s Risk and Consumer’s Risk. AQL, LTPD, AOQL	2	Lab practice,(MINI TAB)		RB-1

Concepts Standard Sampling Plans for AQL	2	Lab practice,(MI NI TAB	Assignment 3	RB-1
Module IV (5 Hrs)				
LTPD- Uses of Standard Sampling Plans. Single Sampling, Double Sampling	1	Lab practice,(MI NI TAB		RB-1
Reliability Concepts: Reliability engineering fundamentals; Life testing – Objective – Failure data Analysis	1	Lecture		TB-1
Mortality Curve; Concept of burn in period; Useful life and wear out phase of a system; Mean Time to Failure (MTTF) and Mean Time to Repair (MTTR)	2	Lab practice,(MI NI TAB		TB-1
Reliability in terms of Hazard rate and failure density, Conditional Probability and Multiplication Rules	1	Lecture	Assignment 4	TB-1
Module V (3 Hrs)				
Reliability Improvements – Techniques- Use of Pareto Analysis	1	Lecture		TB-1
Design for Reliability – Redundancy Unit and Standby Redundancy –	2	Lab practice,(MI NI TAB	Assignment 5	RB-1
Module VI (3 Hrs)				
Introduction to Total Productive Maintenance (TPM): Introduction, Content, Methods and Advantages	1	Lecture		TB-1
Product Design – Product Analysis – Product Development – Product Life Cycles. TOM& TPM	2	Lecture	Assignment 6	TB-1
Module VII (5 Hrs)				
Total Quality Management TQM: Introduction, Definitions and Principles of Operation, Tools and	1	Lecture		RB -1

Techniques, such as, Quality Circles, 5 S Practice, Total Quality Control (TQC),				
Total Employee Involvement (TEI), Problem Solving Process, Quality Function Deployment (QFD), Failure Mode and Effect analysis (FMEA),	2	Lecture		TB-1
Fault Tree Analysis (FTA), Kizen, Poka-Yoke, QC Tools, PDCA Cycle, Quality, Improvement Tools, TQM Implementation and Limitations.	2	Lecture	Assignment 7	TB- 2
Total	30			

Fluid Power Control

Course Title	Course Code	Type of Course	T-P-Pr	Prerequisite
Fluid Power Control	MECC0102	Theory	2-0-0	Nil

Objective

- To impart knowledge to students on fundamentals of hydraulic and pneumatic power and their circuits with industrial applications

Course Outcomes

- Students will be able to identify various elements used in fluid power systems and will be able to deliver fluid power circuit diagrams

- Students will be able to design and test various control circuits using Fluidsim software
- Students will be able to apply the knowledge in PG program related to thermal field.

Evaluation System

Evaluation	Component	Marks	Method of Evaluation
Internal Evaluation	Internal Theory	30	Written examination
	Assignment	5	Report or Presentation + Learning Record
	Attendance	5	Based on class attended
External Evaluation	External Theory	60	Written examination
Total Marks		100	

Course Outline

Module I : Hydraulic Power Generating Systems (04 Hours)

Introduction to fluid power system-Hydraulic Fluids- Functions, Types, Properties, Selection & Application; **Power Generating Elements:** Hydraulic Turbines- Classification, Working and application of different turbines such as Pelton Wheel, Reaction turbine, Selection of turbines (No Numerical to be asked in examination) Pumps, Classification, Working of different Pumps such as Gear, Vane, Piston (Axial and Radial), Pump Performance or Characteristics, Pump Selection Factors

Module II : Hydraulic Power Utilizing Elements (03 Hours)

Fluid Power Actuators: Linear Hydraulic Actuators- Types and Construction of Hydraulic Cylinders-Single Acting, Double Acting, Special Cylinders like Tandem, Rod less, Telescopic, Cushioning Mechanism, Hydraulic Motors, Types- Gear, Vane, Piston (Axial & Radial)- Performance of Motors

Module III: Hydraulic Valves and Accessories (05 Hours)

Hydraulic Valves: Directional, Pressure and Flow Control Valves-Types and Applications; **Intensifier:** Applications of Intensifier-Intensifier Circuit; **Servo Systems:** Hydro Mechanical Servo Systems, Electro Hydraulic Servo Systems and Proportional Valves; **Accessories:** Switches, Filters, Seals, Fittings and other Accessories; **Accumulators:** Types and Applications

Module IV: Pneumatic Systems (07 Hours)

Introduction, Comparison with Hydraulic Systems and Electrical Systems, Construction, Operation, Characteristics and Symbols of Pneumatic Components, Air Treatment-Principles and Components; **Fluidics:** Introduction to Fluidic Devices, Simple Circuits, Introduction to Elector Pneumatic Logic Circuits, Ladder Diagrams For Various Fluid Power applications; **Pneumatic Sensors:** Types, Characteristics and Applications

Module V: Fluid Power Circuit (6 Hours)

Hydraulic/Pneumatic circuit: Design of Hydraulic/Pneumatic Circuit For Various Valves, Actuators, Filters, Pumps, Simple Reciprocating, Regenerative, Speed Control(Meter in ,meter Out and Bleed Off),Sequencing, Synchronization, Transverse and Feed, Cascading Circuit (two and Three Cylinders),Automatic Reciprocating, fail Safe Circuit, Counter balance Circuit, Actuator Locking (**Most of topics will be taught through practice in Fluid sim software**)

Module VI: Applications (2 hours)

Industrial Circuits: Riveting Machine, Actuator Locking, Hydraulic Press, Unloading Circuit and Material handling systems

Module VII: Maintenance and Trouble Shooting (3 Hours)

Maintenance and Troubleshooting: Maintenance in fluid Power Systems, Preventive and Break down Maintenance Procedures. Trouble Shooting of Fluid Power Systems -Fault Finding Process, Equipment/Tools Used Causes and Remedies, Safety Aspects Involved

Text Books

1. Oil Hydraulic Systems: Principles and Maintenance by S.R Majumdar, Tata McGraw Hill.
2. Pneumatic Systems: Principles and Maintenance by S.R Majumdar, Tata McGraw Hill.

Reference Books:

1. Hydraulics and pneumatics by Andrew Parr, Jaico Publishing House.
2. Fundamentals of Pneumatics by FESTO Vol I, II, III.
3. Fluid Power with applications by Anthony Esposito Prentice Hall International.

Session Plan

Topics	No. of Sessions (in hrs.)	Activity	Assignment	Suggested Reading
Module I: Hydraulic power generating systems (4 Hours)				

Introduction to fluid power system-Hydraulic Fluids- Functions, Types, Properties, Selection & Application	1	Lecture	Assignment - 1.1	Text Book(TB)-1 Chapter(Ch)-1,2
Hydraulic Turbines- Classification, Working and application of different turbines such as Pelton Wheel, Reaction turbine, Selection of turbines	1	Lecture	Assignment - 1.2	TB-1 Ch-2
Pumps, Classification, Working of different Pumps such as Gear, Vane, Piston (Axial and Radial), Pump Performance or Characteristics, Pump Selection Factors	2	Lecture	Assignment - 1.3	TB-1 Ch-4
Module II : Hydraulic Power Utilizing Elements (03 Hours)				
Linear Hydraulic Actuators- Types and Construction of Hydraulic Cylinders-Single Acting, Double Acting, Special Cylinders like Tandem, Rod less, Telescopic, Cushioning Mechanism	2	Lecture	Assignment - 2.1	TB-1 Ch-8
Hydraulic Motors, Types- Gear, Vane, Piston (Axial & Radial)- Performance of Motors	1	Lecture	Assignment - 2.2	TB-1 Ch-9
Module III: Hydraulic Valves and Accessories (05 Hours)				
Directional, Pressure and Flow Control Valves-Types and Applications	1	Lecture	Assignment - 3.1	TB-1 Ch-5,6
Applications of Intensifier- Intensifier Circuit	1	Lecture	Assignment - 3.2	TB-1 Ch-7
Hydro Mechanical Servo Systems, Electro Hydraulic Servo Systems and Proportional Valves	1	Lecture	Assignment - 3.3	TB-1 Ch-7
Switches, Filters, Seals, Fittings and other Accessories	1	Lecture	Assignment - 3.4	TB-1 Ch-13,14
Accumulators: Types and Applications	1	Lecture	Assignment - 3.5	TB-1 Ch-11
Module IV: Pneumatic Systems (07 Hours)				
Introduction, Comparison with Hydraulic Systems and Electrical Systems, Construction, Operation, Characteristics and Symbols of Pneumatic Components, Air Treatment-Principles and Components	3	Lecture	Assignment - 4.1	TB-2 Ch-6,7

Introduction to Fluidic Devices, Simple Circuits, Introduction to Elector Pneumatic Logic Circuits, Ladder Diagrams For Various Fluid Power applications	3	Lecture	Assignment - 4.2	TB-2 Ch-9
Pneumatic Sensors: Types, Characteristics and Applications	1	Lecture	Assignment - 4.3	TB-2 Ch-11
Module V: Fluid Power Circuit (6 Hours)				
Design of Hydraulic/Pneumatic Circuit For Various Valves, Actuators, Filters, Pumps,	2	Lecture+ Practice (Fluid Sim software will be used to design the circuits)	Assignment - 5.1	TB-2 Ch-10,11
Simple Reciprocating, Regenerative, Speed Control(Meter in ,meter Out and Bleed Off)	2		Assignment - 5.2	TB-2 Ch-10,11
Sequencing, Synchronization, Transverse and Feed, Cascading Circuit (two and Three Cylinders)	1		Assignment - 5.3	TB-2 Ch-10,11
Automatic ,Reciprocating, fail Safe Circuit, Counter balance Circuit, Actuator	1		Assignment - 5.4	TB-2 Ch-10,11
Module VI: Applications (2 hours)				
Industrial Circuits: Riveting Machine, Actuator Locking, Hydraulic Press, Unloading Circuit and Material handling systems.	2	Lecture	Assignment - 6.1	TB-1 Ch-15
Module VII: Maintenance and Trouble Shooting (3 Hours)				
Maintenance in fluid Power Systems, Preventive and Break down Maintenance Procedures.	1	Lecture	Assignment - 7.1	TB-2 Ch-12
Trouble Shooting of Fluid Power Systems -Fault Finding Process, Equipment/Tools Used Causes and Remedies. Safety Aspects Involved.	2	Lecture	Assignment - 7.2	TB-2 Ch-12
TOTAL SESSIONS	30			

Introduction to Hybrid and Electric Vehicles

Course Title	Course Code	Type of Course	T-P-Pr	Pre-requisite
Introduction to Hybrid and Electric Vehicles	MECC0103	Theory	2-0-0	Nil

Objective

- To teach the students on principles, technology and applications of electric and hybrid vehicles

Course Outcomes

- Students will acquire knowledge regarding the testing and performance of electric vehicles
- Students will learn the skill to carry out basic maintenance of these vehicles

Evaluation Systems

	Component	% of Marks	Method of Assessment
Internal Examination	Internal Theory	30	Written examination
	Assignment	5	Report or Presentation + Learning Record
	Attendance	5	Based on class attended
External Examination	External Theory	60	Written examination
Total		100	

Course outline

Module I: Introduction to Hybrid Vehicles (5 Hours)

Theory

Introduction to Hybrid Vehicles: History of Hybrid Vehicles, Pollution Comparison, Social and Environmental Importance, Roadway Fundamentals, Impact of Modern Drive-Train on Energy Supplies, Working Principle of Hybrid Vehicles.

Module II: Hybrid Drive-Trains (4 Hours)

Theory

Hybrid Drive-Trains: Basic Concept of Hybrid Traction, Types of Drive Train in Hybrid Vehicles, Power Flow Control in Hybrid Drive-Train Topologies.

Module III: Introduction to Electric Vehicles (4 Hours)

Theory

Introduction to Electric Vehicles: Reasons for Electric Vehicle Development, Advantages, Main Components of Electric Vehicles (Battery, Motor, Controller, DC To DC Converter), Working of Main Components.

Module IV: Energy Storage (5 Hours)

Theory

Energy Storage: Energy Storage Requirements in Electric Vehicles, Battery Monitoring and Charging Control, Combination of Batteries, Sizing of Battery Cell, Principles of Operation of Fuel Cell, Regenerative Braking System.

Module V: Energy Management Strategies (4 Hours)

Theory

Energy Management Strategies: Introduction to Energy Management Strategies Used in Hybrid and Electric Vehicles, Classification of Different Energy Management Strategies, Comparison of Different Energy Management Strategies, Implementation Issues of Energy Management Strategies.

Module VI: Electric Propulsion Unit (4 Hours)

Theory

Electric Propulsion Unit: Introduction to Electric Components Used in Hybrid and Electric Vehicles, DC Motor, Control of DC Motor Drives, BLDC (Brushless DC) Motor

Module VII: Types of Motors and Drives (4 Hours)

Theory

Types of Motors and Drives: Induction Motor and Drives, Permanent Magnet Synchronous Motor Drives, Switched Reluctance Motor Drives.

Text Books

1. Hussein Iqbal, Electric and Hybrid Vehicles, Design Fundamentals, CRC Press

2. Chan C.C., Chau K.T., Modern Electric Vehicle Technology, Oxford Science Publications

Reference Books

1. Ehsani Mehrdad, Gao Yimi, Gay Sebastian E., Emadi Ali, Modern Electric Hybrid Electric and Fuel Cell Vehicles: Fundamentals, Theory and Design, CRC Press
2. Laminie James, Lowry Jhon, Electric Vehicle Technology Explained, Wiley

Online Source: <http://nptel.iitm.ac.in>

Session Plan

Topics	No. of Sessions (in hrs.)	Activity	Assignment	Suggested Reading
Module I: Introduction to Hybrid Vehicles (5 Hours)				
History of Hybrid Vehicles, Pollution Comparison, Social and Environmental Importance, Roadway Fundamentals, Impact of Modern Drive-Train on Energy Supplies, Working Principle of Hybrid Vehicles	5	Lecture	Assignment-1	Text Book(TB)- 1, Chapter(Ch)- 1,10 https://www.youtube.com/watch?v=pMTPUjfiQQw http://nptel.iitm.ac.in
Module II: Hybrid Drive-Trains (4 Hours)				
Basic Concept of Hybrid Traction, Types of Drive Train in Hybrid Vehicles, Power Flow Control in Hybrid Drive-Train Topologies,	4	Lecture	Assignment-2	TB-1,Ch-9 https://www.youtube.com/watch?v=axzTZZKm3mc http://nptel.iitm.ac.in
Module III: Introduction to Electric Vehicles (4 Hours)				
Reasons for electric vehicle development, Advantages and disadvantages of electric vehicle, Main components of electric vehicles (Battery, Motor, Controller, DC to DC converter),	4	Lecture+Practice	Assignment -3	TB-1,Ch-1 https://www.youtube.com/watch?v=ytVyj10p0BI http://nptel.iitm.ac.in

Working of main components				
Module IV: Energy Storage (5 Hours)				
Energy storage requirements in electric vehicles, Battery monitoring and charging control, Combination of batteries. Sizing of battery cell, Principles of operation of Fuel cell, Regenerative braking system	5	Lecture+Practice	Assignment-4	TB-1,Ch-5 https://www.youtube.com/watch?v=N10IPLUxNWM https://www.youtube.com/watch?v=uLrCFStQQUU https://www.youtube.com/watch?v=2SQ2SYhVaaE http://nptel.iitm.ac.in
Module V: Energy Management Strategies (4 Hours)				
Introduction to Energy Management Strategies Used in Hybrid and Electric Vehicles, Classification of Different Energy Management Strategies, Comparison of Different Energy Management Strategies, Implementation Issues of Energy Management Strategies.	4	Lecture	Assignment-5	TB-1,Ch-7 https://www.youtube.com/watch?v=0DqPmACIeKA https://www.youtube.com/watch?v=gK6UUY3nTko http://nptel.iitm.ac.in
Module VI: Electric Propulsion Unit (4 Hours)				
Introduction to Electric Components Used in Hybrid and Electric Vehicles, DC Motor, Control of DC Motor Drives, BLDC	4	Lecture+Practice	Assignment-6	TB-1,Ch-5 https://www.youtube.com/watch?v=jAGTEAtPEzY https://www.youtube.com/watch?v=bCEiOnuODac https://www.youtube.com/watch?v=LtJoJBUSE28 https://www.youtube.com/watch?v=Vk2jDXxZIhs&list=P

(Brushless DC) Motor				LMHo_80Gkmb0ZNvZ4hV Solj7JrUf56wPN https://www.youtube.com/watch?v=dAW8e3N9xDE http://nptel.iitm.ac.in
Module VII: Types of Motors and Drives (4 Hours)				
Induction motor and drives, Permanent magnet synchronous motor drives, Switched reluctance motor drives	4	Lecture+ Practice	Assignment-7	TB-1,Ch-6 TB-2
Total (hrs)	30			

Renewable Energy Systems

Course Title	Code	Type of course	T-P-P	Prerequisite
Renewable Energy Systems	MECC0104	Theory	3-0-0	Nil

Objective

- To expose the students about energy demand and supply situation in India
- To expose students about Renewable energy systems in use

Course outcomes

- To have a knowledge of energy scene in India
- To acquire the skill of analyzing and designing renewable energy systems

Evaluation Systems

Evaluation	Component	Marks	Method of Evaluation
Internal Evaluation	Internal Theory	30	Written examination
	Assignment	5	Report or Presentation + Learning Record
	Attendance	5	Based on class attended
External Evaluation	External Theory	60	Written examination
Total		100	

Course outline

Module I: Energy Demand and Supply Situation in India, Introduction to Energy System (7 Hours)

Theory

Energy Demand and Supply Situation in India: Sectorial energy demands in India, Different Energy sources in India, Systems view of energy, Institutions and policies affecting energy systems.

Introduction to Energy System: Basic Principle of solar energy and its conversion to thermal and electrical energy.

Geothermal Energy: Structure of earth, Geothermal Regions, Geothermal Power generation.

Ocean Energy: Principle of ocean Thermal energy conversion, Ocean thermal power plants, important components of a Tidal Power plant.

Module II: Photovoltaic System (6 Hours)

Theory

Photovoltaic System: Principle of Photovoltaic effect, Types and Application: Domestic and Industrial, Photovoltaic system and its Components, PV system and its Design, PV system

Installation and Testing.

All the topics to be taught through practice mode.

Module III: Solar Thermal System (6 Hours)

Theory

Solar Thermal System: Types of Collector and its Application, Design of different types of Collectors, Testing and Installation of Solar Thermal System.

All the topics to be taught through practice mode.

Module IV: Wind Energy (5 Hours.)

Theory

Wind Energy: Basic Principle of Wind Energy Conversion, Wind Data and Energy Estimation, Wind Energy Sources and Potential, Wind Power Systems: System components, Types of Turbine, Turbine Rating, Choice of Generator.

Module V: Controlling Systems of Wind Turbine Generator (6 Hours.)

Theory

Controlling Systems of Wind Turbine Generator: Variable speed operation, maximum power operation, control systems, Application of Wind energy in different sectors, system design features, testing and installation of Wind systems.

All the topics to be taught through practice mode.

Module VI: Bio Energy (5 Hours.)

Theory

Bio Energy: Basic Principle of Biomass Generation and Conversion, Sources and Potential of Bio- Gas, Application of Bio-Gas in different Sectors.

ModuleVII: Conversion of Energy (7 Hours.)

Theory

Conversion of Energy: Thermo chemical Process, and Fermentation: Aerobic and Anaerobic digestion, Design and Construction details of Main Digester, Testing and Installation of Bio-Gas Plant. Alternative Liquid Fuels, Bio Diesel Production.

All the topics to be taught through practice mode.

Practice

1. Photo-Voltaic Power Output Vs Tilt Angle, Ambient Temperature and Shade.
2. Solar PV System Installation and Performance test.
3. Thermal Analysis of Solar Flat Plate Collector Using ANSYS.
4. Performance Test of a Solar Dryer.
5. Simulation for Wind Turbine Generator with DC Motor in Solar/Wind Energy Mobile Workstation.
6. Performance Testing of Bio gas Plant.
7. Energy Analysis of Different Biomass Products.

8. Preparation of Biodiesel.

Text Books

1. Rai G.D. Non-conventional Energy sources: Khanna Publishers, fifth edition, 2011.
2. Kothari D.P, Singal K.C and Ranjan Rakesh. Renewable Energy Sources and Emerging Technologies: PHI Learning private limited, Third edition, 2013.

References

1. Sukhatme S.P and Nayak J K: Solar Energy Principles of Thermal collection and Storage: MCGRAW Hill Education (India) Private Limited, Third edition, 2008.
2. Solanki C.S. Solar Photovoltaic Fundamentals, Technologies and Applications: PHI Learning private limited, Second edition, 2015
3. Online Source: NPTEL, You tube

Session Plan

Topic coverage and Internal Test	No. of Sessions (in hours)	Activity	Assignment	Suggested Reading
Module I: Energy Demand and Supply Situation in India, Introduction to Energy System (7 Hours)				
Energy demands in India, Energy sources in India	1	Lecture	Assignment 1.1	Text Book (TB)-2, Chapter (Ch)-1
Systems view of energy, Institutions and policies affecting energy systems	1	Lecture	Assignment 1.2	TB-2, Ch-1
Introduction to Energy system: Solar Energy Basic Principle of solar energy and its conversion to thermal and electrical energy. Geothermal Energy: Structure of earth, Geothermal Regions.	2	Lecture	Assignment 1.3	TB-2, Ch-3
Geothermal Power generation. Ocean Energy: Principle of	2	Lecture	Assignment 1.4	TB-2, Ch-10,11

ocean Thermal energy conversion				
Ocean thermal power plants, important components of a Tidal Power plant.	1	Lecture	Assignment 1.5	TB-2,Ch-11
Module II: Photovoltaic System (6 Hours)				
Photovoltaic system: Principle of Photovoltaic effect, Types and application: domestic and industrial	1	Lecture	Assignment 2.1	Ref.- 2 ,Ch-13 https://www.youtube.com/watch?v=Rq5Nzv_6v98
Photovoltaic system and its components	1	Lecture	Field study	https://www.youtube.com/watch?v=f1QSPBTJs5I
PV system and it design	2	Lecture	Assignment 2.2	Ref.- 2,Ch-14 https://www.youtube.com/watch?v=q7hW9XQLf6g
PV system installation and testing	2	Lecture	Field study	https://www.youtube.com/watch?v=Q5X6sMScwvM https://www.youtube.com/watch?v=ffmsR_xdRkY
Module III: Solar Thermal System (6 Hours)				
Solar thermal system: Types of Collector and its application	2	Lecture	Assignment 3.1	TB-1,Ch-3
Design of different types of collectors	2	Lecture	Assignment 3.2	TB-1, Ch-3 https://www.youtube.com/watch?v=wvl0QAQCJyc
Testing and installation of solar thermal system	2	Lecture	Field study	
Module IV: Wind Energy (5 Hours)				
Wind Energy: Basic Principle of Wind Energy Conversion, Wind Data and Energy Estimation,	3	Lecture	Assignment 4.1	TB-1,Ch-6,sec-6.3.6.4,6.5

wind energy sources and potential				
Wind power systems: system components, Types of Turbine, Turbine rating. Choice of generators	2	Lecture	Assignment 4.2	TB-1, Ch- 6 https://www.youtube.com/watch?v=LNXTm7aHvWc https://www.youtube.com/watch?v=DILJJwsFl3w
Module V: Controlling Systems of Wind Turbine Generator (6 Hours)				
Controlling systems of Wind Turbine Generator: Variable speed operation, maximum power operation, maximum power operation, control systems, Application of Wind energy in different sectors	3	Lecture	Assignment 5.1	TB-1, Ch- 6
System design features, testing and installation of Wind systems.	3	Lecture	Assignment 5.2	
Module VI: Bio Energy (5 Hours)				
Bio Energy Basic Principle of Biomass Generation and Conversion	1	Lecture	Assignment 6.3	TB-1,Ch-7
Sources and potential of Bio- Gas	1	Lecture	Assignment 6.4	TB-1,Ch-7,sec.-7.9
Application of Bio-Gas in different sectors	1	Lecture	Assignment 6.5	TB-1, Ch-7,sec.- 7.11
Testing and installation of Bio-Gas Plant	2	Lecture	Field study	https://www.youtube.com/watch?v=PmBx5Zo8KZo
ModuleVII: Conversion of Energy (7 Hours)				
Types of Conversion: Thermal, Thermo chemical Process	2	Lecture	Assignment 7.1	TB-1,Ch-7, sec.- 7.27,7.28
Fermentation: Aerobic and Anaerobic digestion	2	Lecture	Assignment 7.2	TB-1 ,Ch-7

Design and Construction details of Main Digester, Testing and Installation of Bio-Gas Plant. Alternative Liquid Fuels, Bio Diesel Production.	3	Lecture	Field study	https://www.youtube.com/watch?v=24Zxr2KHW6s
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Manufacturing Technology I

Course Title	Code	Type of course	T-P-P	Prerequisite
Manufacturing Technology I	MECC0401	Theory+ Practice	2-1-0	Workshop Practice

Objective

- To understand the importance of manufacturing processes like primary shaping/forming processes and joining/fabrication processes
- To impart knowledge on practical applications of the technologies through actual experiments and to make Products

Course Outcomes

- Students will have knowledge and skills to understand actual manufacturing processes used in industry and will be able to correlate a specific process with the part / component being produced
- Students will be able to select the most optimum manufacturing process for a specific product design and application
- Students will be able to apply their knowledge of manufacturing in their higher

Evaluation Systems

Internal Examination	Component	% of Marks	Method of Assessment
	Internal Theory	20	Written examination
	Internal Practice	30(20+10)	Lab work + Learning Record
External Examination	External Theory	30	Written examination
	External Practice	20	Lab work
Total		100	

Course Outline

Module I: Metal Casting Process (9 Hours)

Theory

Introduction, Basic Factors Involved in Casting, Patterns (Classifications, Allowances and Considerations), Mold Materials & Mould Making, Principles of Gating Design, Principles of Risers, Core Making Process, Chills and Chaplets, Solidification of Castings, Inspection and Defects in Castings.

Practice

1. Pattern & Mold Making in Sand Casting.

Module II: Special Casting Processes (9 Hours)

Theory

Permanent Mould Casting, Die Casting, Slush Casting, Centrifugal Casting, Investment Casting, Carbon Dioxide Casting, Stir Casting, Continuous Casting, Shell and Plaster Molding Process, Full Mould Process, Vacuum Sealed Molding Process, Ceramic Mould Casting.

Practice

2. To Prepare a Green Sand Mould for gear manufacturing.
3. Furnace Operation & Aluminum Melting to Pour a Casting.
4. Casting Simulation in CATIA.

Module III: Fundamentals of Arc and Gas Welding (9 Hours)

Theory

Physics of Welding, Welding Classification & Applications, Welding Positions, Edge Preparation, Gas Welding and Cutting, Types of Flame, Flux and Filler, Arc Welding: SMAW Principle and Power Source, Types of Electrodes, Functions of Flux Coatings and AWS Classification and Coding.

Practice

5. Butt Joint by using Oxy Acetylene Gas Welding.
6. Edge Preparation to make Lap Joint and Butt Joint.

Module IV: Welding Processes (9 Hours)

Theory

GTAW, GMAW, SAW, Resistance Welding (Spot, Seam, Projection & Flash Butt), Solid State Welding (Forge, Friction & Explosive), Thermit Welding, Radiant Energy Welding (LBW, EBW, Ultrasonic), Brazing and Soldering.

Practice

7. Bead on Plate Varying Current & Voltage for SMAW using E6013.
8. GTAW Torch Assembly and Bead on Aluminum Plate without & with Filler.
9. Joining of Sheets using Spot Welding.
10. Soldering & Brazing Practice.
11. Welding of Two Cylindrical Jobs using Friction Welding.

Module V: Defects, Testing & Economics of Welding (5 Hours)

Theory

Heat Affected Zone, Weld Defects, Testing of Weldments, Economics of Welding (Welding Costs, Standard Time).

Practice

12. Testing of Tensile Strength of a Welded Job.
13. Testing of Weld by Liquid Dye Penetrate.

Module VI: Metal Forming: Rolling & Forging of Metals (9 Hours)

Theory

Plastic Deformation and Yield Criteria, Relation between Tensile and Shear stress, Cold and Hot Working, Rolling: Principle and mechanism, Defects, Types of Rolling Mills, Forging: Classification, Open-Die Forging, Impression-Die and Closed-Die Forging, Drop and Press Forging, Forging defects.

Practice

14. Making a hexagon Section from 20mm Round MS Bar.

Module VII: Metal Forming: Drawing, Extrusion & Sheet Metalworking (10 Hours)

Theory

Drawing: Methods and Variables, Wire Drawing, Extrusions: Advantages and Disadvantages, Direct, Indirect, Impact and Hydrostatic Extrusion and their Applications, Extrusion of Tubes, Extrusion Defects.

Sheet Metal Work: Bending, Forming and Deep drawing, Shearing, Punching and Blanking-Method and Application.

Practice

15. Shearing of 2 mm MS Sheet to Manufacturing a Washer.

Text Books

1. Rao, PN, Manufacturing Technology, Volume 1, 2015, 4th Edition, Tata Mc-Graw Hill Education Private Limited, India.
2. Ghosh, A & Mallik, AK, Manufacturing Science, 2010, 2nd Edition, Pearson India.

Reference Books

1. Kaushish, J P, Manufacturing Processes, 2010, 2nd Edition, PHI Learning Pvt. Ltd.
2. Sharma, P C, A Text Book of Production Technology (Manufacturing Processes), 2014, 8th Edition, S. Chand & Company Pvt. Ltd.

Session Plan

Topic	No. of Sessions (in hrs.)	Activity	Assignment	Suggested Reading (Book, Video, Online source, etc.)
Module I (9 Hrs)				
Basic Factors Involved in Casting.	01	Lecture	Field study	1. http://nptel.ac.in/courses/112107144/13 2. https://www.youtube.com/watch?v=YtksJ12suFM 3. https://www.youtube.com/watch?v=rL3dLQYKEYKw 4. Text Book (TB)-1, Page- 59
Patterns Classifications Design Allowances, Design Considerations.	01	lecture	Assignment 1.1	1. http://nptel.ac.in/courses/112107144/15 2. https://www.youtube.com/watch?v=-g18ycqbLJY 3. https://www.youtube.com/watch?v=Yf-71Y1_FPI 4. https://www.youtube.com/watch?v=khEvhjlh_SM

				5. Text Book (TB)-1, Page-64; R2, Page- 84
Technology of Mould making.	01	Lecture	Field study	1. https://www.youtube.com/watch?v=6ZuxO--vNDU 2.nptel.ac.in/courses/112107215/11 3. Text Book (TB)-1, Page- 81
Principles of Gating Design.	01	Lecture	Assignment 1.2	1. https://www.youtube.com/watch?v=CoO_akMDBbo 2. https://www.youtube.com/watch?v=IJF426aMCJA 3. https://www.youtube.com/watch?v=GyN6DRjPnxs 4.http://nptel.ac.in/courses/112107144/metalcasting/lecture13&14.htm 5. Text Book (TB)-1, Page- 125
Principles of Risers, Problem solving.	01	Lecture	Assignment 1.3	1. https://www.youtube.com/watch?v=2UzsJNikZxY http://nptel.ac.in/courses/112107239/13 2.http://nptel.ac.in/courses/112107215/25 3. Reference Book (RB)-1, Page-248
Solidification of castings.	01	Lecture		1. https://www.youtube.com/watch?v=pvmu9Sk2gXk 2. https://www.youtube.com/watch?v=8xVDy8OzeKc 3. https://www.youtube.com/watch?v=wTbcEu8SdAY 4. Reference Book (RB)-1, Page-262
Inspection of Castings.	01	lecture	<u>Assignment 1.4</u>	1. https://mechanicalengineering.com/methods-inspection-finding-out-defects-in-casting/ 2. https://www.youtube.com/watch?v=l8LQShYjsHg 3. Text Book (TB)-1, Page-187
Practice 1	2	Lab. Practice		
Practice 2	2	Lab. Practice		
Module – II (9 Hrs)				
Permanent Mould Casting, Die Casting.	01	Lecture	Assignment 2.1	1. http://nptel.ac.in/courses/112107078/7 2. https://www.youtube.com/watch?v=CuRiFL4UZQ0

				<p>3.http://nptel.ac.in/courses/112107219/24</p> <p>4.http://nptel.ac.in/courses/112107144/metalcasting/lecture7.htm</p> <p>5.https://www.youtube.com/watch?v=ps2cWctKLBQ</p> <p>6. Text Book (TB)-1, Page-213</p>
Slush Casting, Centrifugal Casting, Investment Casting.	01	Lecture	Assignment 2.2	<p>1.https://www.youtube.com/watch?v=ps2cWctKLBQ</p> <p>2.https://www.youtube.com/watch?v=oNZrxFvODtw</p> <p>3.https://www.youtube.com/watch?v=U81LJAdzFsY</p> <p>4. Text Book (TB)-1, Page-223</p>
Carbon Dioxide Casting, Stir Casting, Continuous Casting.	01	Lecture	Assignment 2.3	<p>1.https://pdfs.semanticscholar.org/3937/3d4257ff9cb366a1690ebc3151b692740744.pdf</p> <p>2.https://www.youtube.com/watch?v=vnNKYYsY4Wc</p> <p>3.http://nptel.ac.in/courses/112104221/23</p> <p>4.https://www.youtube.com/watch?v=ytOUkOdra3E</p> <p>5.http://nptel.ac.in/courses/113104059/33</p> <p>6.https://www.youtube.com/watch?v=6WIABd84404</p>
Shell and Plaster Molding Process, Full Mould Process, Vacuum Sealed Molding Process.	01	Lecture	Assignment 2.4	<p>1.http://nptel.ac.in/courses/112107078/11</p> <p>2.https://www.youtube.com/watch?v=tDYF2Q1r78Q</p> <p>3.http://nptel.ac.in/courses/112107144/21</p> <p>4.http://nptel.ac.in/courses/112107215/15</p> <p>5.https://www.youtube.com/watch?v=ZSie37pNqak</p> <p>6.https://www.youtube.com/watch?v=ZmAkMgl3V3w</p>
Graphite & Ceramic Mould Casting, Semi-solid Metal Casting.	01	lecture	Assignment 2.5	<p>1.www.nptel.ac.in/courses/112101005/downloads/Module_3_Lecture_2_final.pdf</p> <p>2.http://thelibraryofmanufacturing.com/ceramic_mold_casting.html</p>
Practice 3	02	Lab. Practice		
Practice 4	02	Lab. Practice		

Practice 5	02	Lab. Practice		
Module III (9 Hrs)				
Physics of Welding, Welding Classification Applications of various welding processes.	01	Lecture	Field study	1. https://www.youtube.com/watch?v=lzTj9FRyUM0 2. https://www.youtube.com/watch?v=CCzhT81GrBo 3. https://www.youtube.com/watch?v=AvXoEp53zAY 4. https://www.youtube.com/watch?v=3nX0oYHnzy0 5. http://nptel.ac.in/courses/112107144/27 6. Text Book (TB)-1, Page-359
Gas Cutting & Brazing Gas Flames.	01	Lecture	Field study	1. https://en.wikipedia.org/wiki/Oxy-fuel_welding_and_cutting 2. https://www.youtube.com/watch?v=3EtEM17C6MI 3. Text Book (TB)-1, Page- 370
SMAW Principle and Power Source.	01	Lecture	Field study	1.nptel.ac.in/courses/112107090/module4/lecture1/lecture1.pdf 2. http://nptel.ac.in/courses/112107089/14 3. https://www.youtube.com/watch?v=5hRgwnejWPs 4. https://www.youtube.com/watch?v=yOdXvagHK_M 5. Text Book (TB)- 1, Page-374
Types of Electrodes, Functions of Flux Coatings and AWS Classification and Coding.	01	Lecture	Field study	1. http://nptel.ac.in/courses/112107144/welding/lecture5&6.htm
Practice 6	2	Lab. Practice		
Practice 7	2	Lab. Practice		
Module – IV (9 Hrs)				
GTAW, GMAW, SAW & Flux-cored Arc Welding.	02	Lecture	Field study	1. http://nptel.ac.in/courses/112107089/16 2. https://www.youtube.com/watch?v=Vg1UXBHNh6U 3. http://nptel.ac.in/courses/112107089/20 4. http://nptel.ac.in/courses/112107089/19 5. https://www.youtube.com/watch?v=TPSQJXqSwTg

				<p>6.https://www.weldguru.com/support-files/flux-cored-arc-welding.pdf</p> <p>7.http://nptel.ac.in/courses/112107078/30</p> <p>8.https://www.youtube.com/watch?v=Zc3Fu1AVCjc</p> <p>9. Reference Book (RB)-1, Page-538</p>
<p>Resistance Welding, Spot and Seam welding Flash Butt</p> <p>Thermit welding, Friction welding.</p>	01	Lecture	Assignment 3	<p>1.https://www.youtube.com/watch?v=Op68bH0bi6I</p> <p>2.http://www.avio.co.jp/english/products/assem/principle/welding/index.html</p> <p>3.https://www.youtube.com/watch?v=66-RK0DPXfU</p> <p>4.https://www.youtube.com/watch?v=pcF7i297aZE</p> <p>5.https://www.youtube.com/watch?v=bg_fDRr7tUc</p> <p>6.https://www.youtube.com/watch?v=8LQULzSwc-k</p> <p>7.https://www.youtube.com/watch?v=-wNMHFWCJ88</p> <p>8.https://www.youtube.com/watch?v=amaHurtwYTc</p> <p>9.https://www.youtube.com/watch?v=gXp3aRKO4Yc</p> <p>10.https://www.youtube.com/watch?v=M2zdRBcDZWY</p> <p>11.https://www.youtube.com/watch?v=-aEuAK8bsQg</p>
<p>Plasma Arc, Laser Beam, Electron Beam, Ultrasonic Explosive Welding, Diffusion bonding.</p>	01	Lecture	Assignment 4	<p>1.https://www.youtube.com/watch?v=mgaukC25Hqk</p> <p>2.https://www.youtube.com/watch?v=588EJInHLsc</p> <p>3.https://www.youtube.com/watch?v=hX2SMbewGwo</p> <p>4.https://www.youtube.com/watch?v=o4W8nsrvQ6E</p> <p>5.nptel.ac.in/courses/112107077/35</p> <p>6.nptel.ac.in/courses/112107077/module4/lecture3/lecture3.pdf</p> <p>7.nptel.ac.in/courses/112107213/24</p> <p>8.https://www.youtube.com/watch?v=ykf2Zckqcl4</p> <p>9.https://www.youtube.com/watch?v=ERrUlzcaqMw</p>

Brazing and Soldering.	01	Lecture	Field Study	1. https://www.youtube.com/watch?v=_mbXkA5FH2U 2. https://www.youtube.com/watch?v=B-vKcEVO4AE 3. https://www.youtube.com/watch?v=0v2SNH_ho08 4. Reference Book (RB)-1, Page-610
Practice 8	2	Lab. Practice		
Practice 9	2	Lab. Practice		
Module – V (5 Hrs)				
Welding Positions, Edge Preparation in Butt & Fillet Welding.	01	Lecture	Field study	1. https://www.youtube.com/watch?v=IWVPbib_HwI 2. https://www.youtube.com/watch?v=l3b6mcCS-1c 3. https://www.youtube.com/watch?v=avyy_iEJKxY 4. https://www.youtube.com/watch?v=0c6PESMOazI 5. Text Book (TB)-1, Page- 421
Destructive and NDT Welding Defects, Design considerations in welding.	01	Lecture	Assignment 5	1. https://www.youtube.com/watch?v=WoHiE5eGaD4 2. https://www.youtube.com/watch?v=DK1dItmI8mM 3. Reference Book (RB)-1, Page-583
Practice10 Practice 11	04	Lab. Practice		
Practice12	02	Lab. Practice		
Practice 13	02	Lab. Practice		
Module VI (9 Hrs)				
Plastic deformation and Yield criteria, Relation between Tensile and Shear stress Cold and Hot working.	01	Lecture	Assignment 6.1	1. https://www.youtube.com/watch?v=MdQDS7BwrtA 2. nptel.ac.in/courses/112106153/Module%202/Lecture%204/Module_2_Lecture_4.pdf 3. http://nptel.ac.in/courses/112107145/4# 4. https://www.youtube.com/watch?v=dNbVsmVgOnM 5. Text Book (TB)-2, Page- 104
Rolling: principle and mechanism, defects, types of rolling mills.	02	lecture	Assignment 6.2	1. https://www.youtube.com/watch?v=Xf08dgnlwXg 2. https://www.youtube.com/watch?v=ZD8gW_OzkCQ

				3.nptel.ac.in/courses/112106153/Module%204/Lecture%205/Module_4_Lecture_5.pdf 4.www.nptel.ac.in/courses/112106153/22
Forging: classification. Analysis of Forging, Drop and Press forging, Forging defects.	01	lecture	Assignment 6.3	1. https://www.youtube.com/watch?v=dFnN1YtomNc 2. http://nptel.ac.in/courses/112107145/5 3. https://www.youtube.com/watch?v=bgMPuYn2ips 4. Reference Book (RB)-1, Page-693
Practice 14	02	Lab. Practice		
Module – VII(10 Hrs)				
Sheet metal work: Bending, Forming and deep drawing, shearing, Punching and blanking-method and application.	02	Lecture	Field Study	1. https://www.youtube.com/watch?v=8yBZkwR5fukhttps://www.youtube.com/watch?v=lqgInojazXA 2. https://www.youtube.com/watch?v=JgNaSII8Obo 3. https://www.youtube.com/watch?v=o5zTUo2t7_w&list=PL4OEy4gx0_rfIEo6TXvZMeMptbMfQdYr7 4. https://www.youtube.com/watch?v=xlLxCVuplis 5. http://nptel.ac.in/courses/112106153/29 6. Text Book (TB)-1, Page-300
Drawing: methods and variables, wire drawing.	02	Lecture	Assignment 7.1	1. https://www.youtube.com/watch?v=9RtAis5pnq4 2. https://www.youtube.com/watch?v=pd4Uk8vk09c 3.nptel.ac.in/courses/112106153/.../Module_8_SheetMetalDrawing-Lecture_1.pdf 4.nptel.ac.in/courses/112106153/Module%206/.../Module_6_Drawing-Lecture_2.pdf 5.nptel.ac.in/courses/116102010/28
Extrusions, Direct, Indirect, Impact and Hydrostatic extrusion Applications, Extrusion of Tubes, defects.	02	Lecture	Assignment 7.2	1. https://www.youtube.com/watch?v=773oOz38wJM 2. https://www.youtube.com/watch?v=743fHkOvOkA 3.nptel.ac.in/courses/112106153/23

				4.nptel.ac.in/courses/107103012/module4/lec1.pdf 5. Text Book (TB)-1, Page- 279
Practice 15	2	Lab. Practice		
Repeat /Test-1	2			
Total	60			

Manufacturing Technology II

Course Title	Code	Type of Course	T-P-P	Prerequisite
Manufacturing Technology II	MECC0402	Theory+ Practice	2-2-0	Nil

Objective

- To understand the importance and application of conventional & unconventional machining processes
- To understand the basic classification, components and functions of conventional and NC machine tools used in manufacturing

Course Outcomes

- Students will be to do machining of usable products
- Students will have knowledge in computer-aided part programming and ISO coding system

Evaluation Systems

Internal Examination	Component	% of Marks	Method of Assessment
	Internal Theory	20	Written examination
	Internal Practice	30(20+10)	Lab work + Learning Record
External Examination	External Theory	30	Written examination
	External Practice	20	Lab work
Total		100	

Course Outline

Module I: Conventional Machining (15 Hours)

Theory

Mechanics of Metal cutting; Cutting Tool Materials (Principal Tool Materials, Advanced Tool Materials, Indexable Inserts, Tool Coatings); Cutting Fluids and Lubricants (Characteristics, Types, Selection Criteria, Dry machining, MQL).

Practice

1. Kinematic study of machine tools.
2. Chip characteristics study.
3. Measurement of Cutting Tool Temperature using Thermocouple.

Module II: Machine Tools and Machining Processes (20 Hours)

Theory

Tool Signature, Theory of Machinability (Tool Life, Cutting Forces, Power Consumption, Surface Roughness, Thermal Aspects).

Metal Cutting using Single Point Cutting Tool- Lathe & Operations, Shaper, Planer and Slotter; Metal Cutting using Multipoint Cutting Tool- Milling Machine, Shaper Machine and Drilling Machine.

Practice

4. Measurement of Cutting Forces using Dynamometer.
5. Design of single point cutting tool in CATIA.
6. Measurement of Surface Roughness using Talysurf.
7. Process Optimization using Minitab and Matlab.

Module III: Finishing Operations (5 Hours)

Theory

Abrasives, Grinding Process, Super-finishing Operations, Deburring Operations

Practice

8. Grinding of Single Point Cutting Tool.

Module IV: Unconventional Machining (10 Hours)

Theory

Unconventional Machining Process, Principle and Equipment (Electro-Chemical Machining; Electric Discharge Machining, Abrasive Jet Machining, Laser Beam Machining; Electron Beam Machining).

Practice

9. Study of EDM working Principle and Process Parameters. Die Sinking, micro-hole drilling

Module V: Additive Manufacturing (10 Hours)

Theory

Additive Manufacturing (3D Printing, Rapid Prototyping); Developments in Additive Manufacturing; Classifications of Additive Manufacturing systems.

Practice

10. Component Manufacturing Using 3D Printer.

Module VI: Computer Aided Manufacturing (25 Hours)

Theory

CAM-Introduction, Types- NC, CNC, DNC, Machining Centers, Adaptive Control, Part Programming G-Codes, M-Codes, Programming & Machining for Simple Components, Automation.

Practice

11. Manual Programming Related to Facing, Turning, Drilling, Boring & Pocketing in CNC Machines.
12. Simple Contouring Operation using CNC Milling Machine.
13. 3D Modeling & Product Design with CATIA and Solidworks (3D Experience)
14. Generation of NC Program and Product Manufacturing by Using Master CAM Software.
15. Process Planning, Programming, Simulation and Optimization of Machining Processes Using DELMIA.

Module VII: Micro-manufacturing & Surface Treatment (5 Hours)**Theory**

Film Deposition, Oxidation, Lithography, Etching, Vapor Deposition, Thermal Spraying.

Text Books:

1. Rao, P N, Manufacturing Technology, Volume 2, 2015, 4th Edition, Tata Mc-Graw Hill.
2. Chattopadhyay, A B, Machining & Machine Tools, 2011, Wiley India.
3. Groover, M P, CAD/CAM: Computer Aided Design & Manufacturing by M P Groover, 1st Edition, 2003, Pearson Education.

Reference Books:

1. Shaw, M C, Metal Cutting Principles, 2005, 2nd Edition, Oxford University Press.
2. Bhattacharya, A, Metal Cutting -Theory and Practice, 2008, New Central Book Agency.
3. Raghuvanshi, B S, A Course in Workshop Technology, Volume 2, 2013 by B S, Dhanpat Rai & Co.

Session Plan

Topic	No. of Sessions (in hrs.)	Activity	Assignment	Suggested Reading (Book, Video, Online source, etc.)
Module I (15 Hrs)				
Mechanics of Metal cutting	1	Lecture		1. https://www.youtube.com/channel/UCCqGTvGZgWw8mFX5KYTHCkw NPTEL: 2. http://nptel.ac.in/courses/112105127/ 3. Text Book (TB)-1, Page-5; T2, Page-6
Cutting Tools-Types, Materials	1	Lecture	Assignment 1.1	1. http://nptel.ac.in/courses/112105127/ 2. Text Book (TB)-1, Page-26
Cutting Fluids and Lubricants (Characteristics, Types, Selection Criteria, Dry Machining, MQL)	1	Lecture	Assignment 1.2	1. http://nptel.ac.in/courses/112105127/ 2. https://www.youtube.com/watch?v=81Fdif5e85c 3. nptel.ac.in/courses/112104225/21 4. Text Book (TB)-1, Page-50
Practice 1	4	Lab. Practice		

Practice 2	4	Lab. Practice		
Practice 3	4	Lab. Practice		
Module II (20 Hrs)				
Tool Signature & Machinability	2	Lecture	Assignment 2	1. http://nptel.ac.in/courses/112105127/ 2. https://www.youtube.com/watch?v=OnGXJA7oX 3. https://www.youtube.com/watch?v=x_4Feo_ETWk 4. Text Book (TB)-2, Page- 27
Metal cutting using single point cutting tool	1	Lecture		1. Text Book (TB)-2, Page-35
Metal cutting using multi point cutting tool	1			1. Text Book (TB)-2, Page-35
Practice 4	4	Lab. Practice		
Practice 5	4	Lab. Practice		
Practice 6	4	Lab. Practice		
Practice 7	4	Lab. Practice		
Module III (05 Hrs)				
Super-finishing Operations	1	Theory	Assignment 3	1. Text Book (TB)-1, Page-242
Practice 8	4	Lab. Practice		
Module IV (10 Hrs)				
Electro-Chemical Machining; Electric Discharge Machining, Abrasive Jet Machining, Laser Beam Machining; Electron Beam Machining.	4	Practice	Assignment 4	1. https://www.youtube.com/watch?v=KXFpTb9cBpY 2. https://www.youtube.com/watch?v=Hc6mfNWT8oQ 3. http://nptel.ac.in/courses/112105126/41 4. http://nptel.ac.in/courses/112107078/23 5. https://www.youtube.com/watch?v=mgaukC25Hqk 6. https://www.youtube.com/watch?v=ptEmX9O4nDw
Practice 9	6	Lab. Practice		
Module V (10 Hrs)				

Additive Manufacturing (3D Printing, Rapid Prototyping)	1	Lecture	Assignment 5.1	1. http://nptel.ac.in/courses/112104204/47 2. http://nptel.ac.in/courses/112107078/37 3. https://www.youtube.com/watch?v=cwguTQEKdOY 4. https://www.youtube.com/watch?v=NkC8TNts4B4
Developments in Additive Manufacturing; Classifications of Additive Manufacturing systems.	1	Lecture	Assignment 5.2	1. https://www.ntnu.no/documents/10401/.../92ff1f88-c0cb-4b28-b605-21c354301281
Practice 10.	8	Lab. Practice		
Module VI (25 Hrs)				
Types- NC, CNC, DNC, Machining Centers, Adaptive Control	2	Lecture	Assignment	1. https://www.youtube.com/watch?v=KXFpTb9cBpY 2. https://www.youtube.com/watch?v=gG0IHYSIQsU 3. Text Book (TB)-3, Page-224, 315
Part Programming– G Codes, M-Codes	3	Practice		1. Text Book (TB)-3, Page-175
Practice 11.	4	Lab. Practice		
Practice 12.	4	Lab. Practice		
Practice 13.	4	Lab. Practice		
Practice 14.	4	Lab. Practice		
Practice 15.	4	Lab. Practice		
Module VII (5 Hrs)				
Film Deposition, Oxidation, Lithography, Etching	2			1. https://nptel.ac.in/courses/113106062/Lec26.pdf
Vapor Deposition, Thermal Spraying.	3			1. textofvideo.nptel.ac.in/112107248/lec54.pdf
Total (hrs)	90			

Design for Manufacturing

Course Title	Code	Type of course	T-P-P	Prerequisite
Design for Manufacturing	MECC0403	Theory+ Practice	2-2-0	Workshop Practice

Objective

- To provide the students detailed understanding of primary manufacturing processes and product design from concept-to-mass production
- To impart knowledge on use and application of software to solve design engineering problems in metal casting, forging and sheet metal forming processes

Course outcomes

- Students will be able to select appropriate manufacturing technology and process to produce a product effectively with quality and optimized production cost
- Students will have skills and knowledge to use software's like CATIA, Nova flow and Solid CV, ProCAST, Flow-3D Cast, DEFORM-3D and PAM-STAMP 2G

Evaluation Systems

Internal Examination	Component	% of Marks	Method of Assessment
	Internal Theory	20	Written examination
	Internal Practice	30(20+10)	Lab work + Learning Record
External Examination	External Theory	30	Written examination
	External Practice	20	Lab work
Total		<i>100</i>	

Course Outline

Module I: Introduction (8 Hrs)

Theory

Introduction to Design: Problem and Solutions, Design as Model-making, Design, Creativity, Innovation and Invention, Concept of DFMA, The Boothroyd Dewhurst Design for Manual Assembly Method, Product Complexity, Product Variants, Reusable/ Modularity/Standard Design, Product Costs, Quality , Regulatory & Safety Requirements, Aesthetic and Ergonomic Considerations in Design, Design for Maintenance.

Module II: Selection of Materials & Manufacturing Processes (10 Hrs)

Theory

Assembly, Shipping, Maintenance, Design Efficiency, Materials Selection, Manufacturing Considerations in Design: Role of Processing in Design, Types of Manufacturing Processes,

Design for Manufacturability, Design for Castings, Forgings, Sheet Metal Forming, Design for Machining, Powder Metallurgy, Welding, Heat Treatment, Assembly, Corrosion Resistance, Designing with Plastic Processing.

Module III: Cost-Efficient Design (6 Hrs)

Theory

Economics of Manufacturing: Product Target Cost Evaluation: Categories of Costs, Methods of Developing Cost Estimates, Cost Indexes, Cost Capacity Factors, Estimating Plant Cost, Design to Cost, Manufacturing Costs, Value Analysis in Costing.

Module IV: Design for Metal Casting (15 Hrs)

Theory

Design for Castability; Introduction to Casting, Types of Casting, Mathematical Modeling of Liquefying the Material, Viscosity and Fluidity Parameter included as Flow Equation, Casting Microstructure and Defects, Casting Design Process; Sprue, Gate, Runner Design according to Flow Equations, Analysis Prediction for Metal Casting, Liquid Phase Fraction, Shrinkage Prediction, Calculating Feeder, Secondary Dendrite Arm Spacing (SDAS).

Module V: Simulation of Casting Process (15 Hrs)

Theory

STL Part Design Generation from CAD Package, Simulation of Solidification, Calculation of Riser, Design of Gating and Simulation of Mold Filling, Simulation of Riser and Gating System. Components: Die Casting Design and Simulation of Casting of Engine Block using Aluminum Alloy Specifically Al-Si-Cu-Mg-Fe Alloy. Simulation of Casting for Shell Housing.

Practice

1. Casting Design & Analysis using CATIA, Novaflow and Solid CV, ProCAST, Flow-3D Cast.

Module VI: Design for Forging (15 Hrs)

Theory

Design Aspect of Forging and its Significance, Procedure of Working out of Forging Drawing and Technology for Open and Close Die Forgings. Developing the Forging Drawing of Some Jobs. Factors Affecting the Metal Flow in Closed Dies. Forgeability, Friction and Lubrication, Die Temperature, Size and Shape Factor, Flash and Gutter. Designing Performing, Finisher, Trimming and Punching Dies; Selection of Forging Equipments; Die Wear, Die Materials, Forging Defects, Heat Treatments of Dies and Forgings.

Practice

2. Forging Design & Flow Simulation using CATIA and DEFORM-3D.

Module VII: Design for Sheet Metalworking (15Hrs)

Theory

Design for Formability; Formability of Sheet Metal, Press for Sheet Metal Process, Die & Punch, High Energy Rate Forming Process, Extrusion Process and Bulk Deformation Process. Blank Holder Force Estimation, Incremental Forming Analysis Residual Stress Vs Blanking Force Analysis and Optimization, Hot Stamping Process.

Analysis Prediction: Differential heating and Differential Cooling in Hot Forming Process, Force Required for Product Shape. Components: B-pillar Trim, Bonnet, Suspension Rocker Arms, Roof Liner, Body Side Outer.

Practice

3. Sheet Metal Tool Design in CAD.
4. Use of CATIA and PAM-STAMP 2G.

Text Books

1. Boothroyd, G, Dewhurst, P, & Knight A W, Product Design for Manufacture & Assembly, 2011, 3rd Edition, CRC Press.
2. Chitale, A K, Gupta, R C, Product Design & Manufacturing, 2013, 6th Edition, PHI Learning Pvt. Ltd.

Reference Books

1. Bralla, J G, Design for Manufacturability Handbook, 1998, 2nd Edition, Tata McGraw-Hill.
2. Ulrich, K T & Eppinger, S D, Product Design & Development, 2008, 3rd Edition, Tata McGraw-Hill.

Session Plan

Topic	No. of Sessions (in hrs.)	Activity	Assignment	Suggested Reading
Module I (8 Hrs)				
Introduction to Design, Problem and Solutions	02	Lecture		1. http://nptel.ac.in/courses/112101005/ 2. Text Book (TB) -1, Page-01
Design as Model-making, Design, Creativity, Innovation and Invention. The Concept of DFM/A,	02	Lecture		1. Text Book (TB)-1, Page-19

The Boothroyd Dewhurst Design for Manual Assembly Method,	02	Lecture		1. Text Book (TB)-1, Page-22
Product Complexity, Product Variants, Reusable/Modularity/Standard Design, Product Costs, Quality, Regulatory & Safety Requirements, Design for Maintenance	02	Lecture	Assignment 1	1. Text Book (TB)-1, Page-28
Module II (10 Hrs)				
Assembly, Shipping, Maintenance, Design Efficiency	02	Lecture		1. http://nptel.ac.in/courses/112101005/20
Materials Selection, Manufacturing Considerations in Design: Role of Processing in Design, Types of Manufacturing Processes, Economics of Manufacturing	02	Lecture		1. http://nptel.ac.in/courses/112101005/4 2. Text Book (TB)-1, Page-29
Design for Castings, Forgings, Sheet Metal Forming, Design for Machining	03	Lecture		1. Text Book (TB)-2, Page-100 2. http://nptel.ac.in/downloads/112101005/

Powder Metallurgy, Welding, Heat Treatment, Assembly, Corrosion Resistance	03	Lecture	Assignment 2	1. http://nptel.ac.in/downloads/112101005/ 2. Text Book (TB)-1, Page-461
Module III (6Hrs)				
Product Target Cost Evaluation: Categories of Costs, Methods of Developing Cost Estimates, Cost Indexes, Cost Capacity Factors,	03	Lecture		1. http://www.nptel.ac.in/courses/110101010/downloads/mod3/Module%20III-Lec1.pdf
Estimating Plant Cost, Design to Cost, Manufacturing Costs, Value Analysis in Costing.	03	Lecture	Assignment 3	1. http://www.nptel.ac.in/courses/110101010/downloads/mod3/Module%20III-Lec1.pdf
Module IV (15 Hrs)				
Design for Castability; Introduction to Casting, Types of Casting	02	Lecture		1. efoundry.iitb.ac.in/TechnicalPapers/1999/1999Sourcecon_DesignForCasting.pdf 2. nptel.ac.in/courses/112101005/12 3. Text Book (TB)-1, Page-527
Mathematical Modelling of Liquefying the Material, Viscosity and Fluidity Parameter included as Flow Equation	03	Lecture		1. Text Book (TB)-1, Page-545
Casting Design Process; Sprue, Gate, Runner Design according	10	Lecture	Assignment 4	1. Text Book (TB)-1, Page-527

Flow Equations, Simulation of Casting Process				
Module V (15 Hrs)				
Simulation of Casting Process; STL Part Design Generation from CAD Package, Simulation of Solidification	03	Practice		
Calculation of Riser, Design of Gating and Simulation of Mold Filling, Simulation of Riser and Gating System.	03	Lecture		1. Text Book (TB)-2, Page- 101
Analysis Prediction: Liquid Phase Fraction, Shrinkage Prediction, Calculating Feeds, Secondary Dendrite Arm Spacing (SDAS).	03	Practice		
Components: Die Casting Design and Simulation of Casting of Engine Block using Aluminium Alloy Specifically Al-Si- Cu-Mg-Fe Alloy.	03	Practice	Assignment 5	
Simulation of Casting for Shell Housing. Casting Design & Analysis using CATIA, Novaflo and Solid CV, ProCAST, Flow-3D Cast	03	Practice	Lab. Practice	

Module VI (15 Hrs)				
Forging Design: Design Aspect of Forging and their Significance. Procedure of Working out of Forging Drawing and Technology for Open and Close Die Forgings.	03	Lecture		1. Text Book (TB)-1, Page-599
Developing the Forging Drawing of Some Jobs. Factors Affecting the Metal Flow in Closed Dies. Forgeability, Friction and Lubrication	03	Lecture		2. Text Book (TB)-1, Page-599
Die Temperature, Size and Shape Factor, Flash and Gutter. Designing Performing, Finisher, Trimming and Punching Dies; Selection of Forging Equipments; Die Wear, Die Materials, Forging Defects	03	Lecture		1. nptel.ac.in/courses/107103012/module4/lec7.pdf
Heat Treatments of Dies and Forgings.	03	Lecture	Assignment 6	
Forging Design & Flow Simulation using CATIA and DEFORM-3D	03	Practice	Lab. Practice	
Module VII (15 Hrs)				
Sheet Metal: Design for Formability;	02	Lecture		1. web.mit.edu/2.810/www/files/lectures/2015.../lec6-sheet-metal-forming-

Die & Punch, High Energy Rate Forming Process, Extrusion Process and Bulk Deformation Process.	02	Lecture		<ol style="list-style-type: none"> http://nptel.ac.in/courses/112101005/downloads/Module_3_Lecture_5_final.pdf Text Book (TB)-1, Page-375
Blank Holder Force Estimation, Incremental Forming Analysis Residual Stress vs Blanking Force Analysis and Optimization, Hot Stamping Process. `	02	Lecture		<ol style="list-style-type: none"> Text Book (TB)-1, Page-375
Analysis Prediction: Differential heating and Differential Cooling in Hot Forming Process, Map of Meso Patch on the component, Force Required for Product Shape	02	Lecture		
Components: B-pillar Trim, Bonnet, Suspension Rocker Arms, Roof Liner, Body Side Outer.	01	Lecture	Assignment 7	
Sheet Metal Tool Design in CAD	03	Practice	Lab. Practice	
Use of CATIA and PAM-STAMP 2G	03	Practice	Lab. Practice	
Total	84 hrs			

Finite Element Analysis (FEA)

Subject Name	Code	Type of course	Credit	Prerequisite
Finite Element Analysis	MECC0404	Theory+ Practice	3-1-0	Strength of materials

Course Objective

- To Teach the Students Principles and Applications of Finite Element Analysis

Course Outcome

- Students will Acquire Knowledge Application of Matrix Algebra
- Students will Learn the Skill of using Finite Element Technique to solve Physical and Thermal Problems of Solids and Fluids
- Students will be able to apply the knowledge to undertake different research project related to Design and Thermal Engineering.

Evaluation Systems

Evaluation	Component	Marks	Method of Evaluation
Internal Evaluation	Internal Theory	20	Written Examination
	Internal Practice	30 (20+10)	Lab Work + Learning Record
External Evaluation	External Theory	30	Written Examination
	External Practice	20	Lab Work
Total Marks		100	

Course Outline

Module I: Introduction to FEA (8 Hours)

History of FEA; Need for Studying FEA; Types of Analysis; Discretization of a Structure; Element Shapes, Nodes and Degrees of Freedom; Mesh Refining, Element Aspect Ratio, Use of Symmetry and Principle of Convergence; General Procedure of FEA; Review of Matrix Algebra and Simultaneous Linear Equations.

Module II: Analysis through Simulation (10 Hours)

Role of Computer; General Steps of Commercial Software Packages; Preprocessing: Type of Analysis, Geometric Modelling, Material Properties, Mesh Generation and Refining, Load Data, Boundary Conditions; Solution/Analysis; Post processing: Graphical Output, Contour Plot, Animation; Result Interpretation; Report Generation.

Practice

1. Introduction to ANSYS Workbench
2. Defining Material Properties

Module III: Static Structural Analysis (10 Hours)

Field Variable, Shape Functions, Element Stiffness Matrix and Load Vector, Element and Global Equations, Material Assignment and Imposition of Boundary Conditions.

Practice

3. Part Modelling I
4. Part Modelling II
5. Part Modelling III
6. Mesh Generation and Material Assignment

Module IV: Analysis of Bar and Spring (10 Hours)

1D Finite Element Modelling; Shape Functions and Element Stiffness Matrix of 2-noded linear bar/spring element; Uniform and Tapered Bar under Axial Load; Consideration of Self-weight and Temperature Effect. Truss and Beam Elements.

Practice

7. Solution of Axially Loaded Bar/Spring Problems
8. Solution of Strut/Column Problems

Module V: Analysis of Truss and Beam (12 Hours)

Stiffness Matrix for a Truss and Beam Element; Transverse Loading on Beams with Point, UDL and UVL loads.

Practice

9. Solution of Plane Truss Problems
10. Solution of Beam/Frame Problems

Module VI: Dynamic Analysis (13 Hours)

Fundamentals of Vibration; Consistent and Lumped Mass Matrix; Evaluation of Natural Frequencies and Mode Shapes (Eigenvalues and Eigenvectors); Non-linear Analysis, Fatigue Analysis.

Practice:

11. Dynamic Analysis of Spring-mass System
12. Dynamic Analysis of Bar/Truss/Beam Problems
13. Analysis of Material and Geometric Non-linear Problems
14. Solution of Fatigue Analysis Problems

Module VII: Heat Transfer and Fluid Flow Analysis (12 Hours)

Modes of Heat Transfer; 1D Steady-state Heat Transfer; Element Stiffness Matrix for Conduction and Convection; Fluid Flow in Pipes, Formulation of Fluid Flow Problems.

Practice

15. Thermal Analysis of Heat Transfer Problems
16. Analysis of Fluid Flow Problems

Text Books

1. Senthil S., Panneerdhass R., Finite Element Analysis, Lakshmi Publication, Chennai, 2016.
2. Tickoo Sham, ANSYS Workbench A Tutorial Approach, CADCIM Technologies, USA, 2012,
3. Bhavikatti S.S., Finite Element Analysis, New Age International Limited Publishers, New Delhi, 2005.

Reference Books

1. Hutton D.V, Fundamental of Finite Element Analysis, McGraw-Hill Publishing Company Limited, USA, 1st edition, 2004.
2. Moaveni S., Finite Element Analysis, Theory and Application with ANSYS, Pearson Prentice Hall, New Delhi, 3rd edition, 2011.

Session Plan

Topic	No. of Sessions	Activity	Assignment	Suggested Reading
Module I				
History of FEA	01	Lecture	Field study	Text book(TB)-1 Chapter (Ch)-1
Need for studying FEA	01	Lecture	Field study	TB-1 Ch-1
Types of Analysis	01	Lecture	Field study	TB-1 Ch-1
Discretization of a Structure; Element Shapes, Nodes, Degrees of Freedom	01	Lecture	Assignment 1.1	TB-1 Ch-1
Mesh Refining, Element Aspect Ratio, Use of Symmetry, Principle of Convergence	01	Lecture	Assignment 1.2	TB-1 Ch-1
General Procedure of FEA	01	Lecture	Assignment 1.3	TB-1 Ch-1
Review of Matrix Algebra, Simultaneous Linear Equations	02	Lecture	Assignment 1.4	TB-1 Ch-1
Module II				
Analysis through Simulation: Role of Computer; General Steps of Commercial Software Packages;	02	Lecture	Assignment 2.1	TB-2 Ch-1,2
Preprocessing: Type of Analysis, Geometric Modeling, Material Properties, Mess	02	Practice	Assignment 2.2	TB-2 Ch-1,2

Generation and Refining, Load Data, Boundary Conditions				
Solution/Analysis; Post processing: Graphical Output, Contour Plot, Animation	03	Practice	Assignment 2.3	TB-2 Ch-1,2
Result Interpretation; Report Generation	03	Practice	Assignment 2.4	TB-2 Ch-1,2
Module III				
Static Structural Analysis: Field Variable, Shape Functions, Element Stiffness Matrix and Load Vector, Element and Global Equations, Material Assignment and Imposition of Boundary Conditions.	2	Lecture	Assignment 3.1	TB-1 Ch-2,3
Part Modeling I	2	Practice	Assignment 3.2	TB-2 Ch-3,4,5
Part Modeling II	2	Practice	Assignment 3.3	TB-2 Ch-3,4,5
Part Modeling III	2	Practice	Assignment 3.4	TB-2 Ch-3,4,5
Mess Generation and Material Assignment	2	Practice	Assignment 3.4	TB-2 Ch-6,7,8
Module IV				
Analysis of Bar and Spring: 1D Finite Element Modeling; Shape Functions and Element Stiffness Matrix of 2-noded linear bar/spring element	3	Lecture	Assignment 4.1	TB- Ch-2,3 TB-3 Ch-11
Uniform and Tapered Bar under Axial Load; Consideration of Self-weight and Temperature	3	Lecture	Assignment 4.2	TB-3 Ch-11

Effect. Truss and Beam Elements				
Solution of Axially loaded Bar/Spring problems	2	Practice	Assignment 4.3	TB-3 Ch-2,3
Solution of Strut/Column Problems	2	Practice	Assignment 4.3	TB-1 Ch-2,3
Module V				
Analysis of Truss and Beam: Stiffness matrix for a Truss and Beam element	2	Lecture	Assignment 5.1	TB-1 Ch-3
Transverse Loading on Beams with Point, UDL and UVL loads.	3	Lecture	Assignment 5.2	TB-1 Ch-3
Solution of Plane Truss Problems	3	Practice	Assignment 5.3	TB-1 Ch-3 TB-2 Ch-3,4,5
Solution of Beam/Frame Problems	4	Practice	Assignment 5.4	TB-2 Ch-3,4,5
Module VI				
Dynamic Analysis: Fundamentals of Vibration; Consistent and Lumped Mass Matrix	2	Lecture	Assignment 6.1	TB-1 Ch-4
Evaluation of Natural Frequencies and Mode Shapes (Eigenvalues and Eigenvectors)	1	Lecture	Assignment 6.2	TB-1 Ch-4
Non-linear Analysis, Fatigue Analysis.	1	Lecture	Assignment 6.3	TB-1 Ch-4
Dynamic Analysis of Spring-mass System	2	Practice	Assignment 6.4	TB-1 Ch-1 TB-2
Dynamic Analysis of Bar/Truss/Beam Problems	2	Practice	Assignment 6.5	TB-2 Ch-6,7,8

Analysis of Material and Geometric Non-linear Problems	2	Practice	Assignment 6.6	TB-2 Ch-6,7,8
Solution of Fatigue Analysis Problems	3	Practice	Assignment 6.7	TB-2 Ch-6,7,8
Module VII				
Heat Transfer and Fluid Flow Analysis: Modes of Heat Transfer	1	Lecture	Assignment 7.1	TB-1 Ch-5
1D Steady-state Heat Transfer;	1	Lecture	Assignment 7.2	TB-1 Ch-5
Element Stiffness Matrix for Conduction and Convection	2	Lecture	Assignment 7.3	TB-1 Ch-5
Fluid Flow in Pipes, Formulation of Fluid Flow Problems	2	Lecture	Assignment 7.4	TB-1 Ch-5
Thermal Analysis of Heat Transfer Problems	3	Practice	Assignment 7.5	TB-1 Ch-5
Analysis of Fluid Flow Problems	3	Practice	Assignment 7.6	TB-1 Ch-5
Total Hours	75			

Digital Manufacturing

Course Title	Code	Type of course	T-P-P	Prerequisite
Digital Manufacturing	MECC0405	Theory + Practice	1-2-0	Nil

Objective

- To Educate the Students on Entire Stages of Product Life Cycle Beginning From Concept Stage, Design, Testing, Validation, Manufacturing and Servicing etc.
- To Educate the Students on Industry 4.0 Standards

Course Outcomes

- Students will be Able to Use Modern Software Like DELMIA-Quest (Dassault System) to Conceptualise and Create 3D Factory Layouts and Optimise Resource Planning
- Students will be Able to Do Simulation of Manufacturing Processes Using Software Tools

Evaluation Systems

Internal Examination	Component	% of Marks	Method of Assessment
	Internal Theory	20	Written examination
	Internal Practice	30(20+10)	Lab work + Learning Record

External Examination	External Theory	30	Written examination
	External Practice	20	Lab work
Total		<i>100</i>	

Course Outline

Module I: Digital Manufacturing (8 Hours)

Theory

Overview, Industry challenges, End to End solution for various industry, Digital Twin, Benefits, Industry Case studies, Introduction of Industry 4.0, Convention & Emerging Technological Solution.

Practice

1. Product Design and Development Software Tools.
2. Tear Down of Existing Product and Its Bench Marking.

Module II: Product Life Cycle (PLM) (8 Hours)

Theory

Overview of PLM, Design & Manufacturing BOM, Model & Variants

Practice

3. Study of System and Subsystem and Preparing BOM.
4. Designing and Development of Systems and Subsystems.
5. Product Validation by Using Simulia and Product Integration

Module III: Digital Twin (7 Hours)

Theory

Introduction of Facility/Layout Planning, Digital Factory with Plant Facilities & resources, Assembly/Di-assembly

Practice

6. Creation of Facility Layout.
7. Creation of Manufacturing Resources.

Module IV: Plant Layout Design (7 Hours)

Theory

Importance of plant layout, Objective of plant layout, factors influencing plant layout, Types of layout- fixed position layout, product layout, process layout, combined or group layout.

Practice

8. Creation of Manufacturing Support System.
(Tools : Creating a Catalog, Creating a Template, Defining the Resources, Managing a Resource footprint, positioning the Resources, Snapping the Resources, Repositioning the Resources.)

Module V: Process Planning (10Hours)

Theory

Manufacturing planning, types of production-job, batch and mass production, steps involved in process planning, calculation of man and machine hour, computer aided process planning

Practice

- 9. Introduction to DELMIA APP.
- 10. Manufacturing Item Definition.
- 11. Preparation of Process Planning.

(Tools: Setting up the Working Environment, Creating the Process Planning, Time Analysis, Planning Premises, Creating Automatic Line Balancing, Managing a Multi-model)

Module VI: Work Study (8 Hours)

Theory

Method study, objective of method and work study, Basic procedure for method study, Recording technique used in method study.

Practice

- 12. Defining the Manufacturing Resources in Equipment Allocation.
 - 13. Simulation of Resources using Delmia.
- (Tools: Equipment Allocation)

Module VII: Digital Machining (12 Hours)

Theory

Introduction to Machining, 3 axis and 5 axis CNC machining, Tools used in CNC machining, Machining parameters, DNC, FMS, Lean Manufacturing, Computer integrated manufacturing system.

Practice

- 14. Modeling of Manufacturing Support System and Application of Kinematics to It.
- 15. Modeling of NC Machine and its Simulation.
- 16. Generation of NC codes and its validation.

Textbooks

- 1. Zahou, Z, Fundamentals of Digital Manufacturing Science, 2012, Springer Series.
- 2. Jain, R K, Production Technology, 2004, 17th Edition, Khanna Publishers.

Reference Books

- 1. Kalpakjian, S, & Schmid, S R, Manufacturing Engineering & Technology, 2018, 7th Edition, Pearson Education.
- 2. Adithan, M, Process Planning & Cost Estimation, 2007, New Age International.

Session Plan

Sl. No	Topic	No. of Sessions (in hrs.)	Activity	Assignment	Suggested Reading (Book, Video, Online source, etc.)
Module-I (8 Hrs)					

1	Digital Manufacturing: Overview, Industry challenges, End to End solution for various industry, Digital Twin, Benefits, Industry Case studies, Introduction of Industry 4.0, Convention & Emerging Technological Solution.	2	Lecture	Assignment 1	1. https://www.youtube.com/watch?v=G3s4aPgcniw
2	Practice 1	3	Lab. Practice		
3	Practice 2	3	Lab. Practice		
Module-II (11 Hrs)					
4	Product Life Cycle (PLM): Overview of PLM, Design & Manufacturing BOM, Model & Variants	2	Lecture	Project	1. https://www.youtube.com/watch?v=HPRURtORnis
5	Practice 3	3	Lab. Practice		
6	Practice 4	3	Lab. Practice		
7	Practice 5	3	Lab. Practice		
Module-III (7 Hrs)					
8	Introduction of Facility/Layout Planning, Digital Factory with Plant Facilities & resources, Assembly/Di-assembly	1	Lecture		1. https://www.youtube.com/watch?v=8MeHL0j-oKE 2. https://www.youtube.com/watch?v=TPkhxWAJvPw 3. https://www.youtube.com/watch?v=m-ni_0no-JE 4. https://www.youtube.com/watch?v=SiJXVDfCCiA
9	Practice 6	3	Lab. Practice		
10	Practice 7	3	Lab. Practice		
Module-IV(7 Hrs)					
11	Importance of plant layout, Objective of plant layout, factors influencing plant layout, Types of layout-fixed position layout, product layout, process layout, combined or group layout.	4	Lecture		1. https://www.youtube.com/watch?v=r_2GRLxAsEs 2. https://www.youtube.com/watch?v=SK9fxHw-Nxk 3. https://www.youtube.com/watch?v=UZs-cCsMqaI 4. https://www.youtube.com/watch?v=l_ePLMV7NnA 5. https://www.youtube.com/watch?v=11ttgmRJFOk

12	Practice 8	3	Lab. Practice		
Module-V (12 Hrs)					
13	Manufacturing planning, types of production-job, batch and mass production, steps involved in process planning, calculation of man and machine hour, computer aided process planning	3	Lecture		1. https://www.youtube.com/watch?v=zGQP6sURiLQ 2. https://www.youtube.com/watch?v=kBby1Cdc44M 3. https://www.youtube.com/watch?v=wvfxlzV2mIc Reference Book (RB)-2 Page-49
14	Practice 9	3	Lab. Practice		
15	Practice 10	3	Lab. Practice		
16	Practice 11	3	Lab. Practice		
Module- VI (8 Hrs)					
17	Method study, objective of method and work study, Basic procedure for method study, Recording technique used in method study.	2	Lecture		1. https://www.youtube.com/watch?v=iFydS5Hq1SY Reference Book (RB)-2 Page-1
18	Practice 12	3			
19	Practice 13	3			
Module-VII (12 Hrs)					
20	Introduction to Machining, 3 axis and 5 axis CNC machining, Tools used in CNC machining, Machining parameters, DNC, FMS, Lean Manufacturing, Computer integrated manufacturing system.	3	Lecture		1. https://www.youtube.com/watch?v=PusvVnC_4Uc 2. https://www.youtube.com/watch?v=nFu4FFgbMY4 3. https://www.youtube.com/watch?v=IRGlR3FD0U
21	Practice 14	3	Lab. Practice		
22	Practice 15	3	Lab. Practice		
23	Practice 16	3	Lab. Practice		
Total Hours		64			

Fundamentals of Heat Engines

Course Title	Code	Type of Course	T-P-P	Prerequisite
Fundamentals of Heat Engines	MECC0415	Theory +Practice	2-1-0	Thermodynamics

Objective

- To teach the students about various parameters and variables of IC engines.
- To enable students to learn about various systems used in IC engines and applications of IC engines.

Course Outcomes

- On successful completion of course, Students will acquire good knowledge on the basics of IC engines, influence of various parameters on performance of IC Engines.
- Students will be applying the knowledge while perusing PG in Thermal Science.

Evaluation Systems

Evaluation	Component	Marks	Method of Evaluation
Internal Evaluation	Internal Theory	20	Written examination
	Internal Practice	30(20+10)	Lab work + Learning Record
External Evaluation	External Theory	30	Written examination
	External Practice	20	Lab work
Total		100	
Marks			

Course outline

Module I: Heat Engine, Its Characteristics and Performance Parameters (12 Hours)

Theory

Heat Engine, Its Characteristics and Performance Parameters: Introduction to Heat Engine, Classification of Heat Engines, Indicated and Brake Power, Engine Efficiency, Engine Performance Characteristics, ECU, Variables Affecting Performance Characteristics, Methods of Improving Engine Performance, Heat Balance.

Practice

1. Heat Balance Study of Petrol Engine.
2. Heat Balance Study of Diesel Engine.
3. Load Test on Petrol Engine.
4. Load Test on Diesel Engine

Module II: Fuel (6 Hours)

Theory

Fuel: Fuels of SI and CI Engine, Properties, Potential and Advantages of Alternative Fuels (Liquid and Gaseous) for SI and CI Engines.

Practice

5. Determination of Flash Point and Fire Point of a Liquid Fuel.
6. Determination of Calorific Value by Using Bomb Calorimeter.

Module III: Mechanical Injection Systems (8 Hours)

Theory

Mechanical Injection Systems: Functional Requirements of an Injection System, Classification of Injection Systems, Fuel Feed Pump, Injection Pump, Governor, Fuel Injector, Nozzle.

Practice

7. Determination of Sensitivity of a Governor.

Module IV: Electronic Injection Systems (6 Hours)

Theory

Electronic Injection Systems: Multi-Point Fuel Injection (MPFI) System, Injection Timing, Gasoline Injection System, CRDI.

Module V: Ignition (6 Hours)

Theory

Ignition: Energy Requirement for Ignition, Battery Ignition Systems, Modern Ignition Systems, Firing Order.

Practice

8. Study of Electric Circuit and Ignition System of Automobile.

Module VI: Combustion (12 Hours)

Theory

Combustion: Stages of Combustion in SI and CI Engines, Flame Propagation and Ignition Delay, Abnormal Combustion, Phenomena of Knock in SI and CI Engines, Detonation, Diesel Knock & Methods to Control Diesel Knock. SI And CI Engine Combustion Chambers.

Practice

9. To Verify the Combustion Characteristics of Diesel in VCR Engine.
10. To Verify the Characteristics of Pressure Rise During Combustion in VCR Engine.
11. Performance Test on Variable Compression Ratio I. C. Engine.

Module VII: Cooling, Lubrication, Engine Emission and Control Systems (10 Hours)

Theory

Cooling and Lubrication System: Air Cooling and Water Cooling Systems, Properties of Lubricants and Different Types of Lubricating System.

Engine Emission and Control Systems: Mechanism of Pollutant Formation and its Harmful Effects. Methods of Measuring Pollutants and Control of Engine Emission.

Practice

12. Study of air cooling and water cooling system
13. Exhaust emission analysis by using exhaust gas analyser.

Text Books

1. Ganesan V., Internal Combustion Engines, TMH, 3rd Edition
2. Rajput R. K., A Textbook of Internal Combustion Engine, LP.

Reference Books

1. Domkundwar V.M., A Course in IC Engines, Dhanpat Rai and Sons.
2. Heywood J.B., Internal Combustion Engine Fundamentals, McGraw Hill Book Co.

Session Plan

Topics	No. of Sessions (in hrs.)	Activity	Assignment	Suggested Reading
Module I: Heat Engine, Its Characteristics and Performance Parameters (12 Hours)				
Introduction to Heat Engine, Classification of Heat Engines, Indicated and Brake Power, Engine Efficiency, Engine Performance Characteristics, ECU, Variables Affecting Performance Characteristics, Methods of Improving Engine Performance, Heat Balance.	12	Lecture+ Practice	Assignment -1	Text Book(TB)-1, Chapter(Ch)-1 https://www.youtube.com/watch?v=PgvD9mx9Do <u>o</u>
Module II: Fuel (6 Hours)				

Fuels of SI and CI Engine, Properties, Potential and Advantages of Alternative Fuels (Liquid and Gaseous) for SI and CI Engines.	6	Lecture+ Practice	Assignment -2	TB-1, Ch-6
Module III: Mechanical Injection Systems (8 Hours)				
Functional Requirements of an Injection System, Classification of Injection Systems, Fuel Feed Pump, Injection Pump, Governor, Fuel Injector, Nozzle.	8	Lecture+ Practice	Assignment -3	TB-1, Ch-9 https://www.youtube.com/watch?v=P5-yxENaLDU&t=49s
Module IV: Electronic Injection Systems (6 Hours)				
Multi-Point Fuel Injection (MPFI) System, Injection Timing, Gasoline Injection System, CRDI.	6	Lecture	Assignment -4	TB-2, Ch-10
Module V: Ignition (6 Hours)				
Energy Requirement for Ignition, Battery Ignition Systems, Modern Ignition Systems, Firing Order.	6	Lecture+ Practice	Assignment -5	TB-1,Ch-11
Module VI: Combustion (12 Hours)				
Stages of Combustion in SI and CI Engines, Flame Propagation and Ignition Delay, Abnormal Combustion, Phenomena of Knock in SI and CI Engines, Detonation, Diesel Knock & Methods to Control Diesel Knock. SI and CI Engine Combustion Chambers.	12	Lecture+ Practice	Assignment -6	TB-2,Ch-12 https://www.youtube.com/watch?v=ZxkLgv8c3OE
Module VII: Cooling, Lubrication, Engine Emission and Control Systems (10 Hours)				

Air Cooling and Water Cooling Systems, Properties of Lubricants and Different Types of Lubricating System.	6	Lecture+ Practice	Assignment -7.1	TB-2,Ch-13
Mechanism of Pollutant Formation and its Harmful Effects. Methods of Measuring Pollutants and Control of Engine Emission.	4	Lecture+ Practice	Assignment -7.2	TB-2,Ch-15
Total (Hrs)	60			

Design of Thermal Energy Systems

Course Title	Code	Type of course	T-P-P	Prerequisite
Design of Thermal Energy Systems	MECC0407	Theory + Practice	2-1-0	Thermodynamics

Objective

- To educate the students on principles, technology and applications of various thermal energy systems as used in industry
- To impart technical knowledge and skills on design of various thermal energy systems

Course Outcomes

- Students will be able to identify and select, design and implement appropriate thermal energy system corresponding to specific need
- Students will be able to take up testing, maintenance of thermal energy systems with minimum additional input

Evaluation Systems

Evaluation	Component	Marks	Method of Evaluation
Internal Evaluation	Internal Theory	20	Written examination
	Internal Practice	30(20+10)	Lab work + Learning Record
External Evaluation	External Theory	30	Written examination
	External Practice	20	Lab work
Total		100	

Course outline

Module I: Power Cycles, Power Generating Systems (8 Hours)

Theory

Power Cycles: Introduction, Power Cycles, Carnot Vapor Cycle and its Limitations, Rankine Cycle, Means of Increasing Rankine Cycle Efficiency, Reheat Cycle, Regenerative Feed Heating Cycle, Binary Vapor Cycle, Gas-Vapor Coupled Cycles.

Power Generating Systems: Types of steam turbines, Thermodynamics of steam Turbine Elements, steam Turbine operation, Turbine Performance at Varying Load, Performance of supersonic Turbine Nozzles.

Module II: Heat Transfer Systems (12 Hours)

Theory

Heat Transfer Systems: Classification and Thermal Design of Heat Exchangers, Overall Heat Transfer Coefficient, Fouling Factor or Dirt Factor, Temperature Profiles in Heat Exchangers, LMTD Correction Factor, Pressure Drop in Heat Exchanger, Correlation for Tube Side Pressure Drop, Correlation for Shell Side Pressure Drop, Heat Transfer Effectiveness and Number of Transfer Units, Calculation and Designing of the Heat Exchanger, Double-Pipe Heat Exchanger.

Practice

1. Determination of Overall Heat Transfer Coefficient of Concentric Tube Heat Exchanger.
2. Determination of Effectiveness and Efficiency of Cross Flow Heat Exchanger.
3. Determination of Overall Heat Transfer Coefficient of Shell and Tube Heat Exchanger.
4. Ansys Fluent analysis of Double pipe Heat exchanger.

Module III: Types of Refrigerants and Environmental Safety (6 Hours)

Theory

Types of Refrigerants and Environmental Safety: Introduction, Unit of Refrigeration, Coefficient of Performance, Characteristics of Different Refrigerants, Types of Refrigerants, Refrigerants with the least environmental impact, Ozone Depletion Potentials, Green House Potential Refrigerants, Natural Organic Refrigerants, Use of Non-Polluting Refrigerants.

Module IV: Vapor Compression System (12 Hours)

Theory

Vapor Compression System: Analysis of Theoretical Vapor Compression Cycle, Representation of Cycle on T-S and P-H Diagram, Simple Saturation Cycle, Sub-Cooled Cycle and Super-Heated Cycle, Effect of Suction and Discharge Pressure on Performance.

Practice

5. Determination of C.O. P of Vapor Compression Refrigeration System
6. Determination of C.O.P and Capacity of an Ice Plant.
7. Leak Detection and Charging of Refrigerants in a Domestic Refrigerator.
8. Hands on Practice on Soldering and Brazing.

Module V: Vapor Absorption System (4 Hours)

Theory

Vapor Absorption System: Simple Ammonia Absorption System, Improved Absorption System, Electrolux Refrigerator, Lithium-Bromide Absorption Refrigeration System.

Module VI: Air Conditioning (10 Hours)

Theory

Air Conditioning: Factors Affecting the Air Quality, Dry Bulb Temperature, Wet Bulb Temperature, Relative Humidity, Dew Point Temperature, Specific Humidity, Absolute Humidity, Specific Enthalpy, Pressure, Ventilation, Study on Psychometric Chart. HVAC System.

Practice

9. Calculation of C.O.P. Of Air Conditioning System
10. Performance Test of Window Type Air Conditioner
11. To Carry Out Cooling Process of Fresh Air and Find Out Relevant Parameter of Air
12. To Carry Out Heating Process of Fresh Air and Find Out Relevant Parameter of Air

Module VII: Heating and Cooling Load Calculation (8 Hours)

Theory

Heating and Cooling Load Calculation Building: Heat and Cooling Load Calculation, Air Distribution System, Calculation for Duct Size, Water and Air Cooled Chillers, Cooling Towers.

Practice

13. Determination of Efficiency of Cooling Tower
14. Calculation of Cooling Load of a Confined Space

Text Books

1. Holman J.P. and Bhattacharyya Souvik. Heat Transfer: McGraw-Hill Education, 10th Edition, 2016.
2. Nag P.K. Engineering Thermodynamics: Tata McGraw Hill Companies, fourth edition, 2008.

References

1. Raj put R.K. Refrigeration and Air Conditioning: Kataria and sons, 2005.

Session Plan

Topic coverage and Internal Test	No. of Sessions (in hours)	Activity	Assignment	Suggested Reading
Module I: Power Cycles, Power Generating Systems (8 Hours)				
Introduction, Power Cycles, Carnot Vapor	8	Lecture	Assignment, 1	Text book (TB)-3, Chapter (Ch)-2,3

<p>Cycle and its Limitations, Rankine Cycle, Means of Increasing Rankine Cycle Efficiency, Reheat Cycle, Regenerative Feed Heating Cycle, Binary Vapor Cycle, Gas-Vapor Coupled Cycles.</p> <p>Types of steam turbines, Thermodynamics of steam Turbine Elements, steam Turbine operation, Turbine Performance at Varying Load, Performance of supersonic Turbine Nozzles.</p>				<p>https://www.youtube.com/watch?v=ouWOhk1INjo https://www.youtube.com/watch?v=ZJtobHM iXyQ https://www.youtube.com/watch?v=HtXjbA3h3wQ</p>
Module II: Heat Transfer Systems (12 Hours)				
<p>Classification and Thermal Design of Heat Exchangers, Overall Heat Transfer Coefficient, Fouling Factor or Dirt Factor, Temperature Profiles in Heat Exchangers, LMTD Correction Factor, Pressure Drop in Heat Exchanger, Correlation for Tube Side Pressure Drop, Correlation for Shell Side Pressure Drop, Heat Transfer Effectiveness and Number of Transfer Units, Calculation and Designing of the Heat Exchanger, Double-Pipe Heat Exchanger.</p>	<p>12 (Th-6, Pr-6)</p>	<p>Lecture+practice</p>	<p>Assignment, 2</p>	<p>TB-1,Ch-10 https://www.youtube.com/watch?v=-AdmxCJIWBk https://www.youtube.com/watch?v=eraQJ3Z9Mb8 https://www.youtube.com/watch?v=o0UJDQfwPaM</p>
Module III: Types of Refrigerants and Environmental Safety (6 Hours)				

Introduction, Unit of Refrigeration, Coefficient of Performance, Characteristics of Different Refrigerants, Types of Refrigerants, Refrigerants with the least environmental impact, Ozone Depletion Potentials, Green House Potential Refrigerants, Natural Organic Refrigerants, Use of Non-Polluting Refrigerants.	6	Lecture	Assignment, 3	TB-1,Ch1 https://www.youtube.com/watch?v=-AdmxCJIWBk https://www.youtube.com/watch?v=eraQJ3Z9Mb8 https://www.youtube.com/watch?v=o0UJDQfwPaM
Module IV: Vapor Compression System (12 Hours)				
Analysis of theoretical vapor compression cycle, representation of cycle on T-S and p-h diagram, simple saturation cycle, sub-cooled cycle and super-heated cycle, effect of suction and discharge pressure on performance	12 (Th-4,Pr-8)	Lecture + Practice	Assignment, 4	Ref.-1,Ch-3,4 https://www.youtube.com/watch?v=cobFAMZDS0o
Module V: Vapor Absorption System (4 Hours)				
Simple ammonia absorption system, improved absorption system, electrolux refrigerator, lithium-bromide absorption refrigeration system	4	Lecture	Assignment, 5	Ref.-1,Ch-5 https://www.youtube.com/watch?v=Ll8Ku-mFQxE https://www.youtube.com/watch?v=TFxbHp8uIyQ
Module VI: Air Conditioning (10 Hours)				

Factors Affecting the Air Quality, Dry Bulb Temperature, Wet Bulb Temperature, Relative Humidity, Dew Point Temperature, Specific Humidity, Absolute Humidity, Specific Enthalpy, Pressure, Ventilation, Study on Psychometric Chart.HVAC System.	10 (Th-3, Pr-7)	Lecture + Practice	Assignment, 6.1	Ref.-1,Ch-12 https://www.youtube.com/watch?v=fqvo7bSr6t8 https://www.youtube.com/watch?v=YrDZ9u2_GAQ
Module VII: Heating and Cooling Load Calculation (8 Hours)				
Building Heat and Cooling Load Calculation, Air Distribution System, Calculation for Duct Size, Water and Air Cooled Chillers, Cooling Towers.	8 (Th-4, Pr-4)	Lecture + Practice	Assignment, 7.1	Ref.-1,ch-18 https://www.youtube.com/watch?v=jygiuS-9ubU https://www.youtube.com/watch?v=1cvFIBLo4u0
Total (hrs)	60			

Mechanics of Machines

Subject Name	Code	Type of course	Credit	Prerequisite
Mechanics of Machines	MECC0410	Theory +Practice	3(2-1-0)	NIL

Objective

- To teach the students on basic theories, concepts and methods used for study and analysis of commonly used mechanisms in various applications
- To teach the students on some of the widely used mechanical power transmission elements

Course Outcomes

- Students will have knowledge and skills to analyse, design and develop mechanisms suiting specific applications
- Students will have knowledge skills to study and understand working of complex mechanisms and machines enabling them to safely operate and maintain such installations

Evaluation Systems

Internal Examination	Component	% of Marks	Method of Assessment
	Internal Theory	20	Written examination
	Internal Practice	30(20+10)	Lab work + Learning Record
External Examination	External Theory	30	Written examination
	External Practice	20	Lab work
Total		<i>100</i>	

Course Outline

Module I: MECHANISMS (09 Hours)

Theory

Planar Mechanisms: Kinematic Link, Pair, Chain and Mechanism, Types of Links and Joints, Degree of Freedom, Grashof's Law for four bar Mechanism; Inversions of four bar Mechanism, Single Slider Crank Mechanism and Double Slider Crank Mechanism;

Practice

1. Position Analysis of Grashof and Non-Grashof four bar Mechanism
2. Position Analysis of Slider Crank Mechanism, Scotch Yoke Mechanism and Elliptical Trammel

Module II: MOTION ANALYSIS (14 Hours)

Theory

Instantaneous Centre of Rotation, Number and Types of Instantaneous Centers, Kennedy Theorem, Relative Velocity Method, Velocities in Four Bar and Slider Crank Mechanism, Crank and Slotted Lever Mechanism, Angular Velocity Ratio Theorem, Acceleration Diagram of Single Slider-Crank Mechanism, Coriolis Component of Acceleration;

Practice

3. Instantaneous Center Method to Find Velocity of Various Mechanisms

4. Klein's Construction for Determination of Velocity and Acceleration of Reciprocating Parts
5. Velocity Analysis of Grashof and Non-Grashof Four Bar Mechanism
6. Velocity Analysis of Slider Crank Mechanism and Scotch Yoke Mechanism
7. Acceleration Analysis of Slider Crank Mechanism

Module III: GEARS (09 Hours)

Theory

Classification and Basic Terminology, Fundamental Law of Gearing, Standard forms of Tooth, Length of Path of Contact and Arc of Contact, Contact Ratio, Interference in Involute Gears. Gear trains: Simple, Compound, Reverted and Epi-Cyclic Gear Trains;

Practice

08. Study of Various Gear Trains in Automobiles

Module IV: CAMS (07 Hours)

Theory

Various Types of Cams and Followers; Displacement, Velocity and Acceleration Diagrams for Different Follower Motions; Nomenclature of Cam Profile;

Practice

09. Construction of cam profile using Solid works software
10. Cam analysis of a Knife edge follower mechanism

Module V: INERTIA FORCES (05 Hours)

Theory

Inertia forces in reciprocating parts: Velocity and Acceleration of a Piston, Angular Velocity and Angular Acceleration of Connecting Rod, Engine Force Analysis, Dynamically Equivalent System.

Module VI: GYROSCOPE (08 Hours)

Theory

Gyroscopic Couple, Gyroscopic Effect on Naval Ships and Aeroplanes, Stability of four wheeler Vehicles. Static and Dynamic Balancing, Balancing of Several Masses Revolving in the Same Plane and Different Planes, Balancing of Reciprocating Mass, Partial Primary Balancing, Partial Balancing of four wheeler;

Practice

11. Determine Gyroscopic Couple on Motorized Gyroscope Balancing
12. Balancing of Several Masses Revolving in the Same and Different Planes
13. Balancing of Reciprocating masses by Simulation

Module VII: VIBRATION (08 Hours)

Theory

Basic Concepts and Types of Vibration, Methods of Vibration Analysis, Free Undamped Longitudinal, Transverse and Torsional Vibrations, Damped Free Vibrations, Logarithmic Decrement, Forced Vibration with Harmonic Excitation, Vibration Isolation and Transmissibility;

Practice

13. Determination of Critical or Whirling Speed of Shaft
14. Simple and Compound Pendulum

Text Book

1. Bansal R. K, Theory of Machines, Laxmi Publication
2. Rattan S.S, Theory of Machines, Tata McGraw-Hill.

Reference Books

1. Singh. S, Theory of Machines, Khanna publishers
2. Norton R.L, Design of Machinery, McGraw-Hill

Lesson Plan

Topics and Coverage	No.of Sessions (in hrs.)	Activity	Assignment (Project, assignment, field study, seminar, etc.)	Suggested Reading(Books, Online source)
MODULE –I				
Kinematic link, pair, chain and mechanism; types of links and joints, degree of freedom; Grashof's law for four bar mechanism	3	Lecture	Assignment 1.1	Text book (TB)- 1 Chapter (Ch)-1 http://mm-nitk.vlabs.ac.in/index .
Inversions of four bar mechanism	2	Lecture	Assignment 1.2	TB- 1 Ch-1

Single slider crank mechanism Double slider crank mechanism.	4	Lecture	Assignment1.3	TB- 1 Ch-1 http://mm-nitk.vlabs.ac.in/index.html
MODULE II				
Instantaneous center of rotation, number and types of instantaneous centers, Kennedy theorem, relative velocity method	3	Lecture	Assignment2.1	TB-1 Ch-3
Velocities in four bar ,slider crank mechanism, crank and slotted lever mechanism	2+2	Lecture	Assignment2.2	TB-1 Ch-3 http://mm-nitk.vlabs.ac.in/index.html# http://mm-nitk.vlabs.ac.in/index.html#
Angular velocity theorem	1	Lecture	Assignment2.3	TB-1 Ch-3
Acceleration diagram of single slider crank mechanism	2+2	Lecture Practice	Assignment2.4	TB-1 Ch-4 http://mm-nitk.vlabs.ac.in/index.html
Coriolis component acceleration	2	Lecture		TB-1 Ch-4
MODULE -III				
Classification And basic terminology, fundamental law of gearing	2	Lecture	Assignment3.1	TB- 1 Ch-9 https://www.youtube.com/watch?v=Z1f29M4
Standard forms of tooth, Length of path of contact Arc of contact, contact ratio, Interference in involute gears.	3	Lecture		TB- 1 Ch-9
Simple, compound, reverted and epi-cyclic gear trains.	2+2	Lecture+ Practice		TB- 1 Ch-9

MODULE IV				
CAM: Cams and followers	1	Lecture	Assignment4.1	TB-1 Ch-18 https://www.youtube.com/watch?v=YbjmphKVVpA
Displacement, velocity and acceleration diagrams for different follower motions; nomenclature of cam profile+	2+2+2	Lecture+ Practice		TB-1 Ch-18 https://youtu.be/Wn7CW9y42Pg Cam profile practice by Solid works
MODULE - V				
Velocity and acceleration of a piston, Angular velocity and angular acceleration of connecting rod	3	Lecture	Assignment5.1	TB- 2 Ch-13
Engine force analysis, dynamically equivalent system	2	Lecture		TB- 2 Ch-13
MODULE - VI				
Gyroscope: Gyroscopic couple, Gyroscopic effect on naval ships	1+2	Lecture+ Practice	Assignment6.1	TB- 2 Ch-17
Gyroscopic effect on airplanes Stability of two wheeler vehicles	1	Lecture		https://www.youtube.com/watch?v=ZsaVIW1BFUQ
Balancing: Static and dynamic balancing.	1+1	Lecture +Practice		TB- 2 Ch-14 https://youtu.be/4jk9H5AB4IM https://youtu.be/QA-ffR0XV-Q
Balancing of several masses revolving in different planes	1	Lecture	Assignment6.2	https://www.youtube.com/watch?v=_CwACU8Zfug

Balancing of reciprocating mass. Partial primary balancing	1	Lecture		https://www.youtube.com/watch?v=Eg9AwoxvwIQ https://youtu.be/4jk9H5AB4IM
MODULE -VII				
Vibration: Basic concepts and types of vibration. Methods of vibration analysis Free vibrations Longitudinal, transverse and torsional vibrations	2+2	Lecture+Practice	Assignment7.1	TB- 2 Ch-18 https://www.youtube.com/watch?v=qV65LJ6LpI4 https://youtu.be/02w9lSii_Hs https://youtu.be/3uZ_Boyt_AI
Damped free vibrations, Logarithmic decrement	2	Lecture		https://www.youtube.com/watch?v=Zp9g0Xbv7G4
Forced Vibrations with harmonic excitation Vibration isolation and transmissibility	2	Lecture		https://www.youtube.com/watch?v=cGFjNhbGwUY
Total (hrs)	60			

Strength of Materials

Course Title	Code	Type of course	T-P-P	Prerequisite
Strength of Materials	CECC0411	Theory + Practice	1-2-0	Engineering Mechanics

Objective

- To teach the Students on basic theories behind Mechanics of Solids
- To teach the Students on using ANSYS for analysis of various mechanical structures and load transmitting elements

Course Outcomes

- Students will have Knowledge and practical engineering skills in analysis of mechanical strength of structures and load transmission elements and will be able to design them based on input data
- Students will be able to deploy ANSYS to develop mechanical design solutions

Evaluation Systems

1. Evaluation Systems

Evaluation	Component	Marks	Method of Evaluation
Internal Evaluation	Internal Theory	20	Written Examination
	Internal Practice	30 (20+10)	Lab Work + Learning Record
External Evaluation	External Theory	30	Written Examination
	External Practice	20	Lab Work
Total Marks		100	

Course Outline

Module I: Analysis of beams (07 Hrs)

Theory

Shear and Bending Moment in Beams: Types of Beams and Loads, Concept of Shear force, Bending moment and Sign Conventions, Relation Between Load, Shear force and Bending moment, Procedure for Drawing Shear force and Bending moment Diagrams, Point of Contra Flexure.

Practice

1. Simulation (Using ANSYS): Evaluate Shear Force and Bending Moment
2. Simulation (Using ANSYS): Beam Analysis with Point Load, UDL, UVL and Moment

Module II: Stresses in Beams (04 Hrs)

Theory

Simple or Pure Bending, Flexure Formula, Section Modulus, Neutral Axis, Determination Bending Stresses, Shear Stress Distribution for Different Sections.

Practice

3. Simulation (Using ANSYS): To Analyze The Bending Stress of a Cantilevered and Simply Supported Beam

<https://www.youtube.com/watch?v=ekKQvGna0ig>

Module III: Deflection of Beams (05 Hrs)

Theory

Equation of Elastic Curve, Direct Integration Method, Strain Energy Method, Castigliano's Theorem

Practice

4. Stress & Deflection Analysis of Mechanical Component (Using ANSYS)
5. Double Shear Test and Deflection Test Using UTM

Module IV: Analysis of Column and Shaft (06 Hrs)

Theory

Column Analysis: Failure of a Column, End Conditions, Euler's Critical Load for Long Columns, Rankine's Empirical Formula, Effective Length and Slenderness Ratio, Eccentric Loading and Secant Formula.

Practice

6. Simulation (Using ANSYS): Buckling Analysis of a Square Column, I-Beam and RCC Beam

Module V: Torsion (06 Hrs)

Theory

Torsion Equation, Design of Shafts, Power Transmitted by Shafts, Composite Shafts, Combined Bending and Torsion, Closed-Coiled Helical Springs, Spring Connected in Series and Parallel.

Practice

7. Simulation (Using ANSYS): Static and Dynamic Analysis of Shaft
8. Simulation (Using ANSYS): Spring Structural Analysis
<https://www.youtube.com/watch?v=rJ2e4DximL0>
9. Simulation (Using ANSYS): Stress Analysis of Suspension System
https://www.youtube.com/watch?v=xI-NqAKZ_60
10. Stiffness Test of a Helical Spring

Module VI :Theories of Failure (06 Hrs)

Theory

Failure Under Biaxial Loading, Rankine's Theory, Guest's or Tresca's Theory, Von Mises Theory, Graphical Representation of Failure, Safety Factors, Prevention of Failure in Design Stage, Diagnosis of Failure In Post-Manufacturing Stage.

Practice

11. Simulation: Spur Gear Fatigue Analysis in Ansys
<https://www.youtube.com/watch?v=2SGqcLZISQ0>
12. Simulation: Chair Structural Analysis in ANSYS
<https://www.youtube.com/watch?v=DIII8bI-ea8>
13. Simulation(Using ANSYS): Bicycle Frame Structural Analysis
https://www.youtube.com/watch?v=p-CUK_pEfR4

Module VII: Fatigue (11 Hrs)

Theory

Failure under Cyclic Loading, Endurance Limit. S-N Curve, Stress Concentration, Goodman and Soderberg Criteria.

Practice

14. Fatigue Failure Analysis (Using ANSYS)
<https://www.youtube.com/watch?v=ywDsB3umK2Y>
15. Fatigue Analysis of a Plate with Hole (Using ANSYS)
<https://www.youtube.com/watch?v=c3yM5fT5Ztc>
16. Fatigue Analysis (Using ANSYS) of Crankshaft of Two Wheeler

Text Books

1. Rattan S.S. , Strength of materials, Tata Mc-Graw Hill Publication.
2. Bansal R K , Strength of materials, Laxmi Publication (P) Ltd.

Reference Books

1. Boresi A.P. and Schmidt R.J., Advanced mechanics of materials, Willey India
2. P. Popov Egor Engineering Mechanics of Solids, Pearson publication
Online Source: YouTube, NPTEL

Session Plan

Topic	No. of Sessions (in hrs.)	Activity	Assignment	Suggested Reading (Book, Video, Online source, etc.)
Module-I				
Shear And Bending Moment In Beams: Types of Beams and Loads, Concept of Shear force, Bending moment and Sign Conventions	1		Assignment-1.1	Text book (TB)-1, chapter(Ch) no-4, page-99
Relation Between Load, Shear force and Bending moment, Procedure for Drawing Shear force and Bending moment Diagrams, Point of Contra Flexure.	2		Assignment-1.2	TB1, chapter no-4, page-103

Simulation (Using ANSYS): Evaluate Shear Force and Bending Moment Simulation (Using ANSYS): Beam Analysis with Point Load, UDL, UVL and Moment	2	Lab practice	Assignment-1.3	
Module-II				
Stresses in beams: Simple or Pure Bending, Flexure Formula, Section Modulus, Neutral Axis, Determination Bending Stresses, Shear Stress Distribution for Different Sections.	2		Assignment-2.1	TB ₁ ,chapter-5,page-129 2. https://www.youtube.com/watch?v=ekKQvGna0ig
Simulation(Using ANSYS): To Analyze The Bending Stress of a Cantilevered and Simply Supported Beam	2	Lab practice	Assignment-2.2	
Module-III				
Deflection of beams: Equation of Elastic Curve, Direct Integration Method, Strain Energy Method,	1			TB 2 ,chapter-12,page-511

<p>Stress & Deflection Analysis of Mechanical Component(Using ANSYS)</p> <p>Double Shear Test and Deflection Test Using UTM</p>	4	Lab practice	Assignment-3.1	
Module-IV				
<p>Column analysis: Failure of a Column, End Conditions, Euler's Critical Load for Long Columns, Rankine's Empirical Formula, Effective Length and Slenderness Ratio, Eccentric Loading and Secant Formula.</p>	4		Assignment-4.1	TB ₁ , chapter-12,page-388
<p>Simulation(Using ANSYS): Buckling Analysis of a Square Column, I-Beam and RCC Beam</p>	2	Lab practice	Assignment-4.2	

<p>Torsion: Torsion Equation, Design of Shafts, Power Transmitted by Shafts, Composite Shafts, Combined Bending and Torsion, Closed-</p>	3		Assignment-5.1	<p>RB₂, chapter-6,page no-200</p> <p>2.https://www.youtube.com/watch?v=rJ2e4DximL0</p> <p>3.https://www.youtube.com/watch?v=xI-NqAKZ_60</p>
<p>Simulation (Using ANSYS): Spring Structural Analysis. Stiffness Test of a Helical Spring.</p>	4	Lab practice	Assignment-5.2	
Module-VI				
<p>Theories of failure: Failure Under Biaxial Loading, Rankine's Theory, Guest's or Tresca's Theory, Von Mises Theory, Graphical Representation of Failure, Safety Factors, Prevention of Failure in Design Stage, Diagnosis of Failure In Post-Manufacturing Stage.</p>	2		Assignment-6.1	<p>TB₁, chapter-3,page-91.</p> <p>2.https://www.youtube.com/watch?v=2SGqcLZISQ0</p> <p>3.https://www.youtube.com/watch?v=p-CUK_pEfR4</p> <p>4.https://www.youtube.com/watch?v=hETp6TDi7-k</p>

Simulation:Spur Gear Fatigue Analysis in Ansys. Simulation(Using ANSYS): Bicycle Frame Structural Analysis	5	Lab practice	Assignment-6.2	
Module-VII				
Fatigue: Failure Under Cyclic Loading, Endurance Limit. S-N Curve, Stress Concentration, Goodman and Soderberg Criteria.	3		Assignment-7.1	RB1,chapter-16,page no-567.
Fatigue Analysis of a Plate With Hole(Using ANSYS). Fatigue Analysis(Using ANSYS) of Crankshaft of Two Wheeler	6	Lab practice	Assignment-7.2	
Tensile Test, Compression Test	2	Lab practice	Assignment-7.4	
Total (hrs)	45			

Design of Transmission Systems

Course Title	Code	Type of course	T-P-P	Prerequisite
Design of Transmission Systems	MECC0412	Theory + Practice	2-1-0	Mechanics of Solids

Objective

- To Familiarize the Various Mechanical Power Transmission Elements and Systems as used in Industry
- To Enable the Students to Design Basic Transmission Elements using prior theoretical Knowledge

Course outcomes

- To convert basic Input Data into Engineering Design and drawing using CATIA and ANSYS

Evaluation System

Evaluation	Component	Marks	Method of Evaluation
Internal Evaluation	Internal Theory	20	Written examination
	Internal Practice	30(20+10)	Lab work + Learning Record
External Evaluation	External Theory	30	Written examination
	External Practice	20	Lab work
Total Marks		<i>100</i>	

Course outline

Module I: Basic Power Transmission Elements (10 Hrs)

Theory

Design of Shaft Coupling: Keys and Splines; Strength of a Sunk Key; Rigid and Flexible Coupling, Hooke's Joint and Constant Velocity Joint; Fluid Coupling.

Practice

1. Design of Flange Coupling using CATIA
2. Design of Hooke's Joint using CATIA

Module II: Design of Belt, Rope and Chain Drives (10 Hrs.)

Theory

Flat, V-Belt and Rope Belts; Slip and Creep of Belt; Velocity Ratio of Belt Drives; Centrifugal and Initial Tension; Maximum Power Transmission Through a Belt Drive, Power Transmitting Chains.

Practice

3. Design of Flat belt pulley using CATIA
4. Design of V-belt pulley using CATIA

Module III: Design of Gears (10Hrs)

Theory

Selection of Materials; Force Analysis, Beam Strength of Gear Tooth, Gear Tooth Failure.

Practice

4. Computer aided spur gear design and analysis using CATIA and ANSYS
5. Computer aided helical gear design and analysis using CATIA and ANSYS
6. Gear Box Used in Automobiles, Machine Tool, etc.

Module IV: Clutch & Brake (12 Hrs)

Theory

Clutch: Friction, Centrifugal, Vacuum and Free Wheel Clutch, Construction and Working Principle.

Brakes: Single and Double Shoe Brake, Internal Expanding Brake, Band Brake, Electromagnetic Brakes, Concept of Regenerative Braking.

Practice

5. Disc type and Drum types Brakes used in Automobiles
6. Power Transmission using Cardan Shaft in Rolling Mills and Conveyors

Module V: Application of Tribology (06 Hrs)

Theory

Lubrication, Tribology in Design - Mechanical design of oil seals and gasket - Tribological design of oil seals and gasket, Tribology in Industry (Maintenance), Rolling Contact Bearing, Journal Bearings - Finite Bearings. Friction Theory.

Practice

7. Journal Bearing Test: Experimental measurement of the pressure distribution and
8. frictional torque in the journal bearing for different applied load

Module VI: Material Handling Systems (06Hrs)

Theory

Load handling attachments, Standard forged hook, Hook weights, Hook bearings, Cross piece and casing of hook, Crane grab for unit and piece loads, Carrier beams and clamps, Load platforms and side dump buckets, Electric lifting magnets, Grabbing attachments for loose materials, Crane attachments for handling liquid materials.

Practice

9. Conveyor with the Application of Belt Drives
10. Electric Overhead Cranes and Goods/Passenger Lifts Using Rope Drives
11. Ball Screw Mechanisms Used in CNC Machines

Module VII: Mechanical Handling Equipment (6 Hrs)

Theory

Different drives of hosting gears like individual and common motor drive for several mechanisms, Traveling gear, Traveling mechanisms for moving trolleys and cranes on runway rails, Mechanisms for trackless, Rubber-tyred and crawler cranes motor propelled trolley hoists and trolleys, Rails and traveling wheels;

Practice

12. Measurement of Torque and Power using Rope Brake Dynamometer

Text Book

1. Kannaiah P., Machine Design, Scitech Publication Pvt. Ltd.
2. Khurmi R.S., Gupta J.K., Machine Design, S.Chand Publication
3. Jalaludeen S.Md., Design Data Handbook, Anuradha Publications
4. Ray Siddhartha., Material Handling, New Age Publications

Reference Book

1. Bhandari V.B., Design of Machine Elements, Tata McGraw Hill Education Private Limited

Session Plan

Topic coverage and Internal Test	No. of Sessions (in hrs.)	Activity (lecture, tutorial, lab practice, field studies/field -trip, Workshop etc.)	Assignment (Project, assignment, field study, seminar, etc.)	Suggested Reading (Book, Video, Online source, etc.)
Module I (10 Hrs)				
Keys and Splines; Strength of a Sunk Key	02	Lecture	Assignment 1.1	Text book(TB) -1 Chapter(Ch) -14 TB-3 Ch-5 https://www.youtube.com/watch?v=S8Qmy4fGnnE
Rigid and Flexible Coupling	03	Lecture	Assignment 1.2	TB-1 Ch-15 TB-3 Ch-6

				<p>2. https://www.youtube.com/watch?v=CwiaS075YzQ</p> <p>3. https://www.youtube.com/watch?v=9idc0CzMjCo</p>
Hooke's Joint and Constant Velocity Joint; Fluid Coupling	01	Lecture	Assignment 1.3	<p>TB-2 Ch-13</p> <p>2. https://www.youtube.com/watch?v=EJL9qHhQing.</p> <p>3. https://www.youtube.com/watch?v=LCMZz6YhbOQ</p>
Design of Flange Coupling using CATIA, Design of Hooke's Joint using CATIA	04	Lab Practice		<p>TB-2 Ch-13</p>
Module – II (10 Hrs)				
Flat, V-Belt and Rope Belts; Slip and Creep of Belt; Velocity Ratio of Belt Drive	04	lecture	Assignment 2.1	<p>TB-1 Ch-20 TB-3 Ch-21,22</p> <p>2. https://www.youtube.com/watch?v=0mb_XMGja_c</p> <p>3. https://www.youtube.com/watch?v=j7njM22izc</p>
Centrifugal and Initial Tension; Maximum Power Transmission Through a Belt Drive, Power Transmitting Chains	02	lecture	Assignment 2.2	<p>TB-1 Ch-20,21 TB-3 Ch-21,22</p> <p>2. https://www.youtube.com/watch?v=4PsJkXO70Xc</p>
Design of Flat belt pulley using CATIA, Design of V-belt pulley using CATIA	04	Lab. Practice		<p>TB-1 Ch-20,21</p>
Module III (10 Hrs)				

Selection of Materials; Force Analysis, Beam Strength of Gear Tooth, Gear Tooth Failure	03	lecture	Assignment 3.1	TB-1 Ch-22 TB-3 Ch-25 2. https://www.youtube.com/watch?v=P4rNX0gCm3E
Computer aided spur gear design and analysis using CATIA and ANSYS Computer aided helical gear design and analysis using CATIA and ANSYS Gear Box Used in Automobiles, Machine Tool, etc	07	Lab. Practice		TB-1 Ch-22
Module – IV (12 Hrs)				
Friction, Centrifugal, Vacuum and Free Wheel Clutch, Construction and Working Principle	04	lecture	Assignment 4.1	TB-1 Ch-26 TB-3 Ch-17 2. https://www.youtube.com/watch?v=devo3kdSPQY 3. https://www.youtube.com/watch?v=pqF-aBtTBnY&t=108s
Single and Double Shoe Brake, Internal Expanding Brake, Band Brake, Electromagnetic Brakes, Concept of Regenerative Braking.	05	lecture	Assignment 4.2	TB-1 Ch-27 TB-3 Ch-18 2. https://www.youtube.com/w45s
Disc type and Drum types Brakes used in Automobiles. Power Transmission using Cardan Shaft in Rolling Mills and	03	Lab Practice		TB-1 Ch-27

Conveyors				
Module – V (6 Hrs)				
Lubrication, Tribology in Design - Mechanical design of oil seals and gasket - Tribological design of oil seals and gasket, Tribology in Industry (Maintenance), Rolling Contact Bearing, Journal Bearings - Finite Bearings. Friction Theory	2	lecture	Assignment 5.1	TB-1 Ch-19 TB-3 Ch-19,20
Journal Bearing Test: Experimental measurement of the pressure distribution and frictional torque in the journal bearing for different applied load	4	Lab Practice		TB-1 Ch-19
Module – VI (6 Hrs)				
Load handling attachments, standard forged hook, hook weights, hook bearings, cross piece and casing of hook, crane grab for unit and piece loads, carrier beams and clamps, load platforms and side dump buckets, electric lifting magnets, grabbing attachments for loose materials, crane attachments for handling liquid materials	2	Lecture	Assignment 6.1	TB-4 Ch-1 Materials Handling Equipment – N. Rudenko , Envee Publishers, New Delhi
Conveyor with the Application of Belt Drives,	4	Lab Practice		TB-4 Ch-3,6

Electric Overhead Cranes and Goods/Passenger Lifts Using Rope Drives, Ball Screw Mechanisms Used in CNC Machines				
Module – VII (6 Hrs)				
Different drives of hosting gears like individual and common motor drive for several mechanisms, traveling gear, traveling mechanisms for moving trolleys and cranes on runway rails, mechanisms for trackless, rubber-tyred and crawler cranes motor propelled trolley hoists and trolleys, rails and traveling wheels	2	Lecture	Assignment 7.1	TB-4 Ch-5 Materials Handling Equipment – N. Rudenko , Envee Publishers, New Delhi
Measurement of Torque and Power using Rope Brake Dynamometer.	4	Lab Practice		TB-4 Ch-7
Total	60			

Fluid Mechanics and Heat Transfer

Course Title	Code	Type of Course	T-P-P	Prerequisite
Fluid Mechanics and Heat Transfer	MECC0414	Theory + Practice	2-1-0	Basic Fluid Mechanics

Objective

- To teach the students about concepts of fluid mechanics and Heat Transfer useful in different field of engineering applications
- To provide a good exposure for the students to various phenomena associated with fluid flow and different modes of heat transfer

Course Outcomes

- Students will be able to analyze and design various Equipment used in industry using principles of Fluid Mechanics and Heat Transfer

Evaluation Systems

Evaluation	Component	Marks	Method of Evaluation
Internal Evaluation	Internal Theory	20	Written Examination
	Internal Practice	30(20+10)	Lab Work + Learning Record
External Evaluation	External Theory	30	Written Examination
	External Practice	20	Lab Work
Total Marks		100	

Course Outline

Module I: Compressible flow (12 Hours)

Theory

Compressible flow: Basic Equations of Compressible Fluid Flow: Continuity Equation and General Energy Equation, Velocity of Pressure Wave in a Fluid, Subsonic, Sonic and Supersonic Flow, Mach Number, Wave Propagation in Compressible Fluid, Stagnation Properties. Introduction to Air Foil Theory.

Module II: Compressors (8 Hours)

Theory

Compressors: Introduction to Centrifugal and Reciprocating Compressor, Classification of Compressors, Multistage Compression with Intercooling, Advantages of Multi Stage Compression. Uses of Compressors.

Practice

1. Determination of Efficiency of Reciprocating Compressor.
2. Determination of Efficiency of Centrifugal Compressor.

Module III: Conduction (8 Hours)

Theory

Conduction: Fourier's Law of Conduction, General Heat Conduction Equation in Different Coordinate Systems (No Derivation), One Dimensional Steady State Conduction in Plane Wall, Composite Wall, One Dimensional Steady State Conduction in Composite Cylinders and Composite Spheres With Convective Atmosphere. Electrical Analogy, Conduction with Internal Heat Generation.

Practice

3. Determination of Overall Heat Transfer Coefficient of Composite Slab.
4. Determination of Thermal Conductivity of Liquid.

Module IV: Fins and Transient Conduction (10 Hours)

Theory

Fins and Transient Conduction: Overall Heat Transfer Coefficients, Critical Thickness of Insulation, Heat Transfer from Extended Surfaces, Effectiveness and Efficiency, Unsteady State Heat Conduction, Lumped Heat Capacity System and Lumped Capacitance Method.

Practice

5. Experiment on Transient Heat Conduction Apparatus.
6. Determination of Efficiency and Effectiveness of Pin Fin.

Module V: Convection (10 Hours)

Theory

Convection: Hydrodynamic and Thermal Boundary Layer, Principles and Governing Equations, Forced Convection: External Flow over a Flat Plate, Cylinder, Sphere and Non-Circular Ducts, Use of Empirical Relations, Internal Flow Through Pipe, Annular Spaces and Non-Circular Conduits, Natural Convection: Vertical, Horizontal, Inclined Surfaces. Different Types of Heat Exchangers, Parallel Flow and Counter Flow Heat Exchangers.

Practice

7. Determination of Heat Transfer Coefficient in Forced Convection.
8. Determination of Heat Transfer Coefficient in Natural Convection.

9. Determination of Effectiveness and Efficiency of Parallel Flow and Counter Flow Heat Exchanger.
10. Simulation of Boundary Layer for Flow over a Flat Plate Using ANSYS FLUENT.

Module VI: Radiation (5 Hours)

Theory

Radiation: Electromagnetic Spectrum, Black Body Emission, Emissive Power, Laws of Radiation, Nature of Black And Grey Bodies, Concepts, Radiation Shape Factor, Thermal Resistance and Electrical Analogy, Radiation Heat Transfer Between Two Surfaces, Reradiating Surface, Radiation Shield.

Practice

11. Determination of Surface Emissivity.
12. Verification of Stefan Boltzmann's Law.

Module VII: Heat Transfer with Phase Change (7 Hours)

Theory

Heat Transfer with Phase Change: Film Wise and Drop Wise Condensation, Boiling Heat Transfer, Regimes of Boiling.

Practice

13. Determination of Critical Heat Flux during Boiling Heat Transfer.
14. Determination of Heat Transfer in Drop and Film Wise Condensation.

Text Books

1. Bansal,R.K., Fluid Mechanics and Hydraulic Machines, Laxmi Publications.
2. Rajput,R.K., Heat Transfer, Laxmi Publication.

Reference Books

1. Sachdeva, R.C., Fundamentals of Heat and Mass Transfer
2. Modi,P.N., Seth, S.N., Hydraulics & Fluid Mechanics, Rajsons Publications.

Session Plan

Topics	No. of Sessions (in hrs)	Activity	Assignment	Suggested Reading
Module-I: Compressible flow (12 Hours)				
Basic Equations of Compressible Fluid Flow: Continuity Equation and General Energy Equation, Velocity of Pressure Wave in a Fluid, Subsonic, Sonic and Supersonic Flow, Mach Number, Wave Propagation in Compressible Fluid, Stagnation Properties. Introduction to Air Foil Theory.	12	Lecture	Assignment -1	Text Book(TB)-1, Chapter(Ch)-15 https://www.youtube.com/watch?v=5ltjFEei3AI
Introduction to Centrifugal and Reciprocating Compressor, Classification of Compressors, Multistage Compression with Intercooling, Advantages of Multi Stage Compression. Uses of Compressors.	8	Lecture+ Practice	Assignment-2	TB-1 https://www.youtube.com/watch?v=JH3l-NliCkM
Module III: Conduction (8 Hours)				
Fourier's Law of Conduction, General Heat Conduction Equation in Different Coordinate Systems (No Derivation), One Dimensional Steady State Conduction in Plane Wall, Composite Wall, One Dimensional Steady State Conduction in Composite Cylinders and Composite Spheres With Convective Atmosphere. Electrical Analogy, Conduction with Internal Heat Generation.	8	Lecture+ Practice	Assignment-3	TB-2.Ch-2 https://www.youtube.com/watch?v=4EADzHBIjtE

Module IV: Fins and Transient Conduction (10 Hrs)				
Overall Heat Transfer Coefficients, Critical Thickness of Insulation, Heat Transfer from Extended Surfaces, Effectiveness and Efficiency, Unsteady State Heat Conduction, Lumped Heat Capacity System and Lumped Capacitance Method.	10	Lecture+ Practice	Assignment-4	TB-2,Ch-2,4 https://www.youtube.com/watch?v=gcY6832h_Nw https://www.youtube.com/watch?v=bA3EzToAWOE https://www.youtube.com/watch?v=pRnURDgfByE https://www.youtube.com/watch?v=Atnjo7dD_bA http://nptel.ac.in/courses/112108149/pdf/M1/Student_Slides_M1.pdf https://www.youtube.com/watch?v=VO_3WW6ZcWw https://www.youtube.com/watch?v=zFkJy_VocCk
Module V: Convection (10 Hours)				
Convection: Hydrodynamic and Thermal Boundary Layer, Principles and Governing Equations, Forced Convection: External Flow over a Flat Plate, Cylinder, Sphere and Non-Circular Ducts, Use of Empirical Relations, Internal Flow Through Pipe, Annular Spaces and Non-Circular Conduits, Natural Convection: Vertical, Horizontal, Inclined Surfaces. Different Types of Heat Exchangers, Parallel Flow and Counter Flow Heat Exchangers.	10	Lecture+ Practice	Assignment-5	TB-2,Ch-5,7,8 http://nptel.ac.in/courses/112108149/pdf/M6/Student_Slides_M6.pdf
Module VI: Radiation (5 Hours)				

Electromagnetic Spectrum, Black Body Emission, Emissive Power, Laws of Radiation, Nature of Black And Grey Bodies, Concepts, Radiation Shape Factor, Thermal Resistance and Electrical Analogy, Radiation Heat Transfer Between Two Surfaces, Reradiating Surface, Radiation Shield.	5	Lecture+ Practice	Assignment-6	TB-2,Ch-11,12 https://www.youtube.com/watch?v=5GoZZKcNZiQ https://www.youtube.com/watch?v=tZliZyoYT80 http://nptel.ac.in/courses/112108149/pdf/M9/Student_Slides_M9.pdf
Module VII: Heat Transfer with Phase Change (7 Hours)				
Film Wise and Drop Wise Condensation, Boiling Heat Transfer, Regimes of Boiling.	7	Lecture+ Practice	Assignment-7	TB-2,Ch-9
TOTAL(Hrs)	60			

The following colour represents the syllabus revision, skill, employability and entrepreneurship.

Green : Skill

Pink : Employability

Sky : Entrepreneurship

Domain - Automobile Engineering

Sl. No.	Course Code	Course Title	Course Type	Credits
1	DEAE0101	Introduction to Automobile Engineering	Theory	3
2	DEAE0102	Entrepreneurship Opportunities in Automobile Trade	Theory	2
3	DEAE0204	Maintenance of Automobile	Practice	5
4	DEAE0205	Design of Basic Automobile Components	Practice	2
5	DEAE0401	Subsystems of Automobile	Theory + Practice	5
6	DEAE0402	Design and Maintenance of Electric Vehicles	Theory + Practice	3
7	DEET0300	Project		6
8	DEET0800	Internship		4
Total				30

Domain Objectives:

- The students will gain knowledge about different systems and subsystems of automobile.
- Students will acquire basic skills in the maintenance of automobile.
- It will help them to explore the opportunities available in the industry or to start their own micro enterprises with great results.

Importance:

Automobile Engineering is a branch of engineering which deals with designing, manufacturing and operating automobiles that incorporates elements of mechanical, electrical, electronic, software and safety engineering as applied to the design, manufacture and operation of automobiles and their engineering subsystems. It also includes

modification of vehicles. Automobile Engineering domain deals with the creation and assembling the whole parts of automobiles. The automotive engineering field is research intensive and involves direct application of mathematical models and formulas.

Employment Opportunities:

- The students can get jobs in automobile manufacturing companies in India and abroad.
- There are large number of job opportunities in automobile designing, research & development, sales & service.
- The students can also successfully run their own business in this field.

Courses Covered: The students will be taught the basics of automobile in introduction to automobile course. Then they will be exposed to different subsystems of automobile with requisite practices in subsystems of automobile course. The students will know the design, manufacturing and maintenance of electric vehicle in electric vehicle course. Students will be acquainted with various opportunities for business in entrepreneurship opportunities in automobile trade subject. They will learn the basic, periodic and preventive maintenance of two and four wheeler with trouble shooting in maintenance of two and four wheeler course. The students will be taught the maintenance and operation of forklift in diesel forklift course. Finally they will do a project on automobile and go for internship in automobile companies.

Approach of Delivery: The subjects in this domain will be taught either in ‘theory+ practice’ mode or ‘practice’ mode. After learning the theory, the students will do hands on practice. They will disassemble and assemble each system of automobile and will learn the maintenance of each part which creates good opportunities for employability in automobile in

Introduction to Automobile Engineering

Course Title	Course Code	Type of Course	T-P-PJ	Prerequisite
Introduction to Automobile Engineering	DEAE0101	Theory	3-0-0	Nil

Objective

- To understand the working of automobiles and its sub-systems
- To learn the modern technologies used in automobiles

Course Outcomes

- Familiarise and explain working principles of automobile and its sub-systems

Evaluation System:

	Component	% of Marks	Method of Assessment
Internal Examination	Internal Theory	30	Written examination
	Assignment	5	Report or Presentation + Learning Record
	Attendance	5	Based on class attended
External Examination	External Theory	60	Written examination
Total		100	

Module I: Automobile Architecture and Stability of Vehicles (7 Hours)

Automobile Architecture: Definition and Classification of Automobiles, Major Units of the Automobile, Types of Automobile Layouts, Automobile Chassis Types and Components, Automobile Body Types and Components, Automobile Safety Parameters, Automobile Regulatory Bodies in India.

Stability of Vehicles: Load Distribution, Calculation of Tractive Effort and Reactions for Different Drives, Stability of a Vehicle on a Slope, on a Curve and on Banked Road.

Module II: Various Units of an Automobile(7 Hours)

Various Units of an Automobile: Various Units of Automobile, Engine and its Subsystems, Transmission System, Steering System, Suspension System, Brake System, Automotive Electrical System, Automobile Battery.

ModuleIII: Engine (5 Hours)

Engine:Classification of Engine, Engine Nomenclature, Components of Engine, Valve Timing Diagram of SI & CI Engines, Variable Valve Timing, Modern Engine Combustion Technologies (CRDI, GDI, HCCI, Dual Fuel Engine, Stratified Charge Engine).

ModuleIV: Carburetion & Fuel Injection (8 Hours)

Carburetion: Air-Fuel Ratio, Mixture Requirements for Different Load Conditions, Factors Affecting Carburetion, Principle of Carburetion, Limitations of Simple Carburettor, Additional Systems in Carburettor, Concept of Electronic Carburettor.

Fuel Injection: Construction and Working of Fuel Feed Pumps for Petrol and Diesel Engines, Types of Fuel Injection Pumps, Control of Fuel Injection Pumps, Types of Electronic Injection Systems for Petrol and Diesel Engines, Direct and Indirect Fuel Injection.

Module V: Transmission System (7 Hours)

Transmission System: Layout of Power Flow from Engine to Wheels, Brief Construction and Working Principles of - Clutch, Transmissions, Propeller Shaft, Final Drive and Differential, Front and Rear Axles.

ModuleVI: Cooling and Lubrication System (6 Hours)

Cooling and Lubrication System: Direct Air Cooled and Indirect Liquid Cooled Cooling Systems, Types and Components of Liquid Cooled Cooling System, Viscous Fan Drive, Engine Coolant and Antifreeze Solution, Desired Properties of Lubricants, Types of Lubricant, API System of Lubricant Classification, Construction, Working Principles and Components of Various Types of Lubricating Systems.

ModuleVII:Super Charging &Turbo Charging(5 Hours)

Super Charging &Turbo Charging: Naturally Aspirated and Forced Induction Engine, Effect of Forced Induction, Method of Supercharging, Typesof Super Chargers, Working Principles, Components Principle and Types of Turbo Charging, Turbocharger Boost Pressure Control and Wastegate Turbocharger, Turbo Lag, Concept of Variable Geometry Turbocharging.

Text Books

1. Gupta R. B., Automobile Engineering, SatyaPrakashan New Delhi.
2. GiriN. K., Automobile Technology, Khanna Publishers.

Reference Books

1. Gupta H. N., Fundamentals of Internal Combustion Engines, PHI Learning.

Session Plan

Topics	No. of Sessions (in hrs.)	Activity	Assignment	Suggested Reading

Module I: Automobile Architecture and Stability of Vehicles(7 hours)				
Definition and classification of automobiles, Major units of the automobile, Types of automobile layouts, Automobile chassis types and components, Automobile body types and components.	4	Lecture	Assignment-1	Text Book (TB)-1 Chapter(Ch)-1
Load distribution, Calculation of tractive effort and reactions for different drives, Stability of a vehicle on a slope, on a curve and on banked road.	3	Lecture	Assignment-1.1	TB-2 Ch-1
Module II: Various Units of an Automobile(7 Hours)				
Various units of automobile, Engine and its subsystems, Transmission system, Steering system, Suspension system, Brake system, Automotive Electrical system, Automobile Battery.	7	Lecture	Assignment-2	TB-2 Ch-2
ModuleIII: Engine (5 Hours)				
Classification of engine, Engine nomenclature, Components of engine, Valve timing diagram of SI & CI Engines, Variable	5	Lecture	Assignment-3	TB-1 Ch-2
ModuleIV: Carburetion & Fuel Injection (5 Hours)				

Air-fuel ratio, Mixture requirements for different load conditions, Factors affecting carburetion, Principle of carburetion, Limitations of simple carburetor, Additional systems in carburetor, Concept of electronic carburetor.	4	Lecture	Assignment-4	TB-1 Ch-10
Construction and working of fuel feed pumps for petrol and diesel engines, Types of fuel injection pumps, Control of fuel injection pumps, Types of electronic injection Systems for petrol and diesel engines, Direct and indirect fuel injection	4	Lecture	Assignment-4.1	TB-1 Ch-8
Module V: Transmission System (7 Hours)				
Layout of power flow from engine to wheels, Brief construction and working principles of - Clutch, Transmissions, Propeller shaft, Final drive and differential, Front and Rear axles.	7	Lecture	Assignment-5	TB-2 Ch-19,20,21,22
ModuleVI: Cooling and Lubrication System (6 Hours)				

Direct air cooled and Indirect liquid cooled cooling systems, Types and components of liquid cooled cooling system, Viscous fan drive, Engine coolant and antifreeze solution, Desired properties of lubricants, Types of lubricant, API system of lubricant classification, Construction, working principles and components of various types of lubricating systems.	6	Lecture	Assignment-6	TB-1 Ch-11
ModuleVII:Super Charging & Turbo Charging(5 Hours)				
Naturally aspirated and forced induction engine, Effect of forced induction, Method of supercharging, Types of super chargers, Working principles, components principle and types of turbo charging, Turbocharger boost pressure control and Wastegate turbocharger, Turbo lag, Concept of Variable geometry turbocharging.	5	Lecture	Assignment-7	TB-2 Ch-6

Entrepreneurship Opportunities in Automobile Trade

Course Title	Course Code	Type of Course	T-P-PJ	Pre-Requisite
Entrepreneurship Opportunities in Automobile Trade	DEAE0102	Theory	2-0-0	Nil

Objective

- To expose students to various opportunities in Automobile trade
- To provide basic knowledge on Entrepreneurship
- To expose them to business environment through Projects and Internship

Course Outcomes

- Explore various opportunities in Automobile trade
- Start their own business in Automobile sector

Evaluation System

	Component	% of Marks	Method of Assessment
Internal Examination	Internal Theory	30	Written examination
	Assignment	5	Report or Presentation + Learning Record
	Attendance	5	Based on class attended
External Examination	External Theory	60	Written examination
Total		100	

Module I: Opportunities in Trading (5 Hours)

Opportunities in Trading: Opportunities in Trading - Battery, Lubricant, Spares, Tyres, Paints, Upholstery, Welding & Machining Consumables, Hardwares, Oil Seals, Hoses, Tools, Garage Equipment, Inventory Management & Control.

Module II: Opportunities in Service & Repair Work Shops (4 Hours)

Opportunities in Service & Repair Work Shops: Layout, Location, Water, Electricity, Drainage, Manpower & HR, Financing, Reports & Records, Management Info Systems, Sales & Marketing, Customer Relationship Management.

Module III: Opportunities in Operating Dealerships (3 Hours)

Opportunities in Operating Dealerships: Opportunities in Operating Dealerships in Sales, Service & Spare.

Module IV: Preparation of Project Report (5 Hours)

Preparation of Project Report: Long Term Fund - Land, Building, Furniture & Fixtures, Machinery & Tools, Working Capital - Stock, Work In Progress, Receivables, Advance To Suppliers, Investment - Debt Equity Ratio, Debt Servicing Coverage Ratio, Break Even Point - Capacity & Capacity Utilization, Return On Investment - Gestation Period.

Module V: Basic Accounting (4 Hours)

Basic Accounting: Revenue Expenditure, Capital Expenditure, Debit, Credit & Journal Entry, Heads of Accounts, Trial Balance, Study of Balance Sheet, PL Account, Depreciation, Provisioning & Taxes.

Module VI: Banking (5 Hours)

Banking: Current Account, Savings Account, Loan Account, Term Loan, Cash Credit Loan, Bank Guarantee, Letter of Credit, Demand Draft, NEFT, Negotiable Instrument Act, Primary Security, Collateral Security, CGTMSE, Insurance.

Module VII: Statutory Laws and Compliance (4 Hours)

Statutory Laws and Compliance: Shop & Establishment Act, Labour Laws, Pollution Control, GST, Income Tax, Weight & Measure, Packaged Commodities Act.

Text Book

1. Arora M.N., Accounting for Management, Himalaya Publishing House.
2. Gordon and Natarajan, Banking Theory Law and Practice, Himalaya Publishing House.

Reference Book

1. Entrepreneurship Development, Small Business Enterprises, Chavantimath, Pearson.
2. The Dynamics of Entrepreneurial Development & Management, Vasant Desai, HPH. Entrepreneurship, Roy, Oxford

Session Plan

Topics	No. of Sessions	Activity	Assignment	Suggested Reading
Module I: Opportunities in Trading (5 Hours)				
Opportunities in Trading - Battery, Lubricant, Spares, Tyres, Paints	5	Lecture	Assignment-1	Text Book(TB)-1 Chapter(Ch)-1
Module II: Opportunities in Service & Repair Work Shops (4 Hours)				
Layout, Location, Water, Electricity, Drainage, Manpower & HR , Financing, Reports & Records, Management Info Systems, Sales & Marketing, Customer Relationship Management.	4	Lecture	Assignment-2	TB-1 Ch-6, Ch-17
Module III: Opportunities in Operating Dealerships (3 Hours)				
Opportunities in Operating	3	Lecture	Assignment-3	TB-1 Ch-1

Dealerships in Sales, Service & Spare.				
Module IV: Preparation of Project Report (5 Hours)				
Long Term Fund - Land, Building, Furniture & Fixtures, Machinery & Tools, Working Capital - Stock, Work in Progress, Receivables, Advance to Suppliers,	5	Lecture	Assignment-4	TB-1 Ch-6
Module V: Basic Accounting (4 Hours)				
Revenue expenditure, Capital Expenditure, Debit, Credit & Journal Entry, Heads of Accounts, Trial Balance, Study of Balance Sheet, PL Account, Depreciation, Provisioning & Taxes.	5	Lecture	Assignment-5	TB-1 Ch-7
Module VI: Banking (5 Hours)				
Current account, Savings Account, Loan Account, Term Loan, Cash Credit Loan, Bank Guarantee, Letter of Credit, Demand Draft, NEFT, Negotiable Instrument Act, Primary Security, Collateral Security, CGTMSE, Insurance.	5	Lecture	Assignment-6	TB-2 Ch-1,6
Module VII: Statutory Laws and Compliance (4 Hours)				
Shop & Establishment Act, Labour Laws, Pollution Control, GST, Income Tax, Weight & Measure,	5	Lecture	Assignment-7	TB-2 Ch-33

Packaged Commodities Act.				
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Maintenance of Automobile

Course Title	Course Code	Type of Course	T-P-PJ	Pre-Requisite
Maintenance of Automobile	DEAE0204	Practice	0-5-0	Nil

Objective

- To be aware with the basic maintenance of four wheeler and two wheeler
- To learn the overhauling of each system of four wheeler and two wheeler

Course Outcomes

- Disassemble and assemble each system of an automobile
- To detect faults in various systems of automobile

Evaluation System

Evaluation	Component	Marks	Method of Assessment
Internal Evaluation	Internal Practice	50 (40+10)	Lab work + Learning Record
External Evaluation	External Practice	50	Lab work
Total		100	

Practice

1. Safety Precautions in Automobile Maintenance.
2. Identification and Functions of Various Tools and Equipments used in Automobile Workshop.
3. Identification of Vehicle Chassis No. & Engine No, Identification of Different Parts Of Engine.
4. Disassembling and Assembling of Engine of a Four Wheeler.
5. Disassembling and Assembling of Engine of a Two Wheeler.
6. Engine Troubleshooting.
7. Nomenclature of a Spark Plug and Spark Plug Reading, Testing and Cleaning of Spark Plug.
8. Checking and Replenishing Lubricating Oil, Engine Coolant, Power Steering Hydraulic Oil and Wind Screen Wiper Water.
9. Overhauling and Servicing of Fuel System including Air Filter.
10. Overhauling and Servicing of Cooling System.
11. Disassembling and Assembling Of Clutch, Clutch Troubles And Remedies.
12. Repairing and Adjustment of Brake System.
13. Disassembling and Assembling of Propeller Shaft.

14. Inspection and Servicing of Gear Box.
15. Inspection and Servicing Of CVT.
16. Tire Change Operation, Wheel Balancing, Wheel Alignment, Tire Inspection (Tubeless & Tube) and Inflation.
17. Overhauling of Suspension System.
18. Disassembling and Assembling of Steering System and Adjustment of Drag Link.
19. Dismantling and Assembling Starter Motor.
20. Preparation of Electrical Circuits using Switches and Fuses.
21. Checking of Battery Terminal Voltage, Electrolyte Level and Specific Gravity.
22. Inspection of Different Electrical Circuits and ECU.
23. Setting Valve Timing, Engine Remounting on Two-Wheeler.
24. Checking of Ignition System Circuit & Components.

Reference Book:

1. Training Manual Of Four Wheeler Maintenance (Ashok Leyland)
2. Training Manual Of Two Wheeler Maintenance (Yamaha).

Design of Basic Automobile Components

Course Title	Course Code	Type of Course	T-P-PJ	Pre-Requisite
Design of Basic Automobile Components	EAE0205	Practice	0-2-0	Nil

Objective

- To Convert Basic Input Data into Engineering Design and Drawing using CATIA
- To Enable the Students to Design Basic Automobile Components using Prior Theoretical Knowledge.

Course Outcomes

- Understand the Advance Automobile Design Process
- Undertake Automobile Design Project

Evaluation System

Evaluation	Component	Marks	Method of Assessment
Internal Evaluation	Internal Practice	50 (40+10)	Lab work + Learning Record
External Evaluation	External Practice	50	Lab work
Total		100	

Practice

1. Design of Piston using CATIA.
2. Design of Crankshaft using CATIA.
3. Design of Connecting Rod using CATIA.
4. Design of Flywheel using CATIA.
5. Design of a Single Plate Clutch using CATIA.
6. Design of Differential using CATIA.
7. Design of Propeller Shaft using CATIA.
8. Design of Universal Joint using CATIA.
9. Design of Gear Box using CATIA.
10. Design of Air Conditioning System of E-Rickshaw
11. Design of Battery Pack for E-Rickshaw
12. Design of Bumper of a car.
13. Design of Frame of a Car.
14. Design of Pitman Arm of Steering System.

Subsystems of Automobile

Course Title	Course Code	Type of course	T-P-PJ	Pre-Requisite
Subsystems of Automobile	DEAE0401	Theory + Practice	3-2-0	Nil

Objective

- To understand the construction and working principle of different sub-systems of automobile
- To get knowledge on latest technologies used in automobile engineering

Course Outcomes

- Identify various subsystems of automobiles including their components
- Will be able to disassemble and assemble major aggregates of the automobile

Evaluation Systems

Internal Examination	Component	% of Marks	Method of Assessment
	Internal Theory	20	Written examination
	Internal Practice	30(20+10)	Lab work + Learning Record
External Examination	External Theory	30	Written examination
	External Practice	20	Lab work
Total		<i>100</i>	

Module I: Engine Emissions (10 Hours)

Theory

Engine Emissions: Sources of Air Pollution from Automobiles and Their Control, Crank Case Emission Control System, Evaporative Emission Control System, Exhaust Emission Control System: Air Injection, EGR, Catalytic Converters, Selective Catalytic Reduction (SCR) Technology, EURO/Bharat Stage Norms: I, II, III, IV, V And VI, Road Map for Implementation of Bharat Stage Norms In India.

Practice

1. Identification of Different Sub-Systems of Automobile.
2. Studies of Exhaust Gas Recirculation System (EGR) in KNOW Vehicle.

Module II: Ignition System (10 Hours)

Theory

Ignition System: Effect of Spark Timing on Emission And Ignition Timing Controls, Drawbacks of Conventional Ignition Systems, Electronic Ignition Systems (TCI And CDI), Engine Cylinder Numbering Scheme and Firing Order of Multi Cylinder Engines.

Practice

3. Study of Battery Ignition and Magneto Ignition System.
4. Disassembly and Assembly of 6-Cylinder Diesel Engine

Module III: Transmission System, Clutch System And Gear Box (20 Hours)

Theory

Transmission System: Power Transmission in Automobile (Front Wheel Drive, Rear Wheel Drive, Four-Wheel Drive, All-Wheel Drive).

Clutch System: Key Design Considerations of Clutches, Types of Clutches, Construction and Working Principle of Single Plate Friction Clutch, Diaphragm Clutch, Cone Clutch, Centrifugal Clutch, Dog Clutch, Vacuum Clutch, Hydraulic Clutches. Construction and Working Principle of Overrunning or Free Wheel Clutch.

Gear Box: Purpose of Gear Box, Types of Automobile Gear Boxes, Construction and Working Principle of Sliding Mesh, Constant Mesh, Synchronizer Mechanism and Synchromesh Gear Boxes, Planetary Gear Mechanism, Fluid Coupling and Torque Converter, Construction and Working Principle of Automatic Transmission, Construction and Working Principle of Continuously Variable Transmission (CVT) and Automated Manual Transmission (AMT).

Practice

5. Study of Single Plate Friction Clutches (Coil Spring Type And Diaphragm Type).
6. Study of Synchronizer Mechanism And Synchromesh Gear Box, Continuously Variable Transmission (CVT).

Module IV: Propeller Shaft, Differential and Axles (20 Hours)

Theory

Propeller Shaft: Function and Need of Propeller Shaft, Hotchkiss Drive and Torque Tube Drive, Construction of Propeller Shaft, Universal/Hooke's Joints, Slip Joint, Types of Propeller Shafts, Need and Types of Constant Velocity (CV) Joints.

Differential: Constructional Features and Working Principle of Differential Mechanism, Types of Differentials (Locking Type Differential, Limited Slip Differential).

Axles: Types of Automotive Axles, Constructional Features, Types and Working Principle of Front Axles, Lift Axles, Rear Axle, Third Differential in Tandem Axle Vehicles, Construction and Working Principle of Manual Transaxles and Transfer Cases.

Practice

7. Study of Propeller Shaft, Universal Joints, Slip Joints, Centre Bearing.
8. Study of Front Axle System.
9. Study of Rear Axle System Including Differential Mechanism.
10. Disassembly and Assembly of Manual Transaxle of Front Wheel Drive Car.

Module V: Steering and Braking System (15 Hours)

Theory

Steering System: Purpose of Steering System, Components of Steering System, Steering Geometry (Castor, Camber, Toe-In, Toe-Out, King Pin Inclination, Ride Height, Turning Radius, Thrust Angle And Thrust Line), Types of Steering Gear Boxes and Their Construction and Working Principles, Hydraulic and Electrically Power Assisted Steering Systems.

Braking System: Requirement and Key Design Parameters of Braking System, Classification and Types of Braking Systems, Mechanical Brake, Hydraulic Brake, Air Brake, Vacuum Brake, Disc Brake. Construction, Working Principle and Components of Anti-Lock Braking System (ABS), Electronic Brake Force Distribution System.

Practice

11. Study of Steering Gear Box And Hydraulic Power Assisted Steering System.
12. Identifying the Different Components and Working Of Drum Brake, Disc Brake, Hydraulic Brake, Air Brake System.
13. Study of Anti-Lock Braking System (ABS) In KNOW Vehicle.

Note:“Study” Includes Understanding The Construction, Working Principle and Identifying Various Parts of the Sub-System.

Module VI: Auto Electric System & Suspension System (10 Hours)

Theory

Auto Electric System: Wiring Diagram of Horn Circuit, Lighting Circuit, Cut-Out Circuit, Voltage and Current Regulator Circuit in Commutator Type Generator, Combined Three-Unit Regulator Circuit, Voltage and Current Regulator In Alternating Current Type Generator And Flasher Circuit (Sketch And Description), Common Ignition Troubles And Its Remedies, Basic Electronic Ignition Trouble Shooting Charts, Spark Plugs: Purpose, Construction and Specifications.

Suspension System: Purpose and Classification of Suspension Systems, Sprung and Unsprung Mass, Major Components of Suspension System, Description of the Conventional Suspension Systems for Rear and Front Axle. Panhard Rod, Macpherson Strut, Double Wishbone Suspensions. Description of Independent Suspension System Used In Cars (Coil Spring And Torsion Bars), Constructional Features and Working of Air Suspension System, Anti-Roll Bars, Constructional Features, Types and Working of Telescopic Shock Absorber.

Practice

14. Identification of Different Types of Suspension Systems: Coil Spring, Tension and Telescopic Suspension System.

Module VII: Trouble Shooting and Vehicle Maintenance (10 Hours)

Theory

Trouble Shooting and Maintenance: Onboard Diagnostic System, Symptoms for Engine Trouble and their Remedies.

Vehicle Maintenance: Types of Maintenance, Engine Tuning, Maintenance of Fuel And Air Filters, Monitoring of Lubricants and Other Fluids, Maintenance of Battery, Maintenance of Tyres.

Central Motor Vehicle Rules: Scope, Classification of Various Classes of Vehicles, GVW And GCW of Medium And Heavy Commercial Vehicles (Twin-Axle, Multi-Axle).

Checklist Preparation: Checklist for Daily Operator, Checklist for Accident Prevention, Checklist for Safety Precautions.

Automobile Technical Specification Sheets: Study of “Technical Specification Sheets”, Operation and Maintenance Manuals of Selected Car and Commercial Vehicle Models (Manufacturers in India And Abroad).

Text Book

1. Gupta R. B., Automobile Engineering, SatyaPrakashan New Delhi
2. GiriN. K., Automobile Technology, Khanna Publishers

Reference Book

1. Crouse William Hand Donald Anglin, Automotive Mechanics, Tata Mcgraw Hill Publications.
2. Newton K., Steeds W, and Garrett T K, The Motor Vehicle, Butterworth Heinemann

Session Plan

Topics	No. of Sessions (in hrs.)	Activity	Assignment	Suggested Reading

Module I: Engine Emissions (10 hours)				
Sources of Air pollution from automobiles and their control, Crank case emission control system, Evaporative emission control system, Exhaust emission control system: Air injection, EGR, Catalytic Converters, Selective Catalytic Reduction (SCR) Technology, EURO/Bharat Stage Norms: I, II, III, IV, V and VI, Road map for implementation of Bharat Stage norms in India.	Th-6, Pr-4	Lecture +Practice	Assignment- 1	Text Book (TB)-1 Chapter (Ch)-1
Module II: Ignition System (10 Hours)				
Effect of Spark Timing on Emission And Ignition Timing Controls, Drawbacks of Conventional Ignition Systems, Electronic Ignition Systems (TCI And CDI), Engine Cylinder Numbering Scheme and Firing Order of Multi Cylinder Engines.	Th-3, Pr-4	Lecture+ Practice	Assignment- 2	TB-1 Ch-1
Module III: Transmission System, Clutch System And Gear Box (20 Hours)				

Power transmission in Automobile (Front wheel drive, Rear wheel drive, Four-wheel drive, All-wheel drive).	2	Lecture	Assignment-3	TB-1 Ch-20
Key design considerations of clutches, Types of clutches, Construction and Working principle of Single plate friction clutch, Diaphragm clutch, Cone clutch, Centrifugal clutch, Dog clutch, Vacuum clutch, Hydraulic clutches. Construction and Working principle of Overrunning or Free wheel clutch	Th-6, Pr-2	Lecture+ Practice	Assignment-3.1	TB-1 Ch-19

Purpose of gear box, Types of automobile gear boxes, Construction and working principle of Sliding mesh, Constant mesh, Synchronizer mechanism and Synchromesh gear boxes, Planetary gear mechanism, Fluid Coupling and Torque Converter, Construction and Working principle of Automatic transmission, Construction and working principle of Continuously Variable Transmission (CVT) and Automated	Th-8, Pr-2	Lecture+ Practice	Assignment- 3.2	TB-1 Ch-20
Module IV: Propeller Shaft, Differential and Axles (20 Hours)				
Function and Need of Propeller shaft, Hotchkiss drive and Torque tube drive, Construction of Propeller shaft, Universal/Hooke's	Th-3, Pr-2	Lecture+ Practice	Assignment-4	TB-1 Ch-22
Constructional features and working principle of differential mechanism, Types of differentials (Locking type differential, Limited slip differential).	3	Lecture	Assignment- 4.1	TB-1 Ch-22 TB-2 Ch-8

Types of automotive axles, Constructional features, types and working principle of Front axles, Lift axles, Rear axle, Third differential in Tandem axle vehicles, Construction and working principle of manual Transaxles and Transfer cases.	Th-6, Pr-6	Lecture + Practice	Assignment- 4.2	TB-1 Ch-24
Module V: Steering and Braking System (15 Hours)				
Purpose of Steering system, Components of Steering system, Steering geometry (Castor, Camber, Toe-in, Toe-out, King pin inclination, Ride height, Turning radius, Thrust angle and Thrust line), Types of Steering gear boxes and their construction and working principles, Hydraulic and Electrically power assisted steering systems.	Th-4, Pr-2	Lecture + Practice	Assignment-5	TB-1 Ch-24
Requirement and key design parameters of braking system, Classification and types of braking systems, Mechanical brake, Hydraulic brake, Air brake, Vacuum brake, Disc brake. Construction, working principle and components of Anti-lock braking system (ABS), Electronic	Th-5, Pr-4	Lecture +Practice	Assignment- 5.1	TB-2 Ch-7

Brake Force Distribution System				
Module VI: Auto Electric System & Suspension System (10 Hours)				
Wiring diagram of horn circuit, Lighting circuit, Cut-out circuit, Voltage and Current regulator circuit in Commutator type generator, Combined Three-unit regulator circuit, Voltage and Current regulator in Alternating current type generator and Flasher circuit (Sketch and description), Common ignition troubles and its remedies, Basic electronic ignition trouble shooting charts, Spark plugs: purpose, construction and specifications	Th-4, Pr-2	Lecture +Practice	Assignment- 6	TB-1 Ch-18
Purpose and Classification of Suspension systems, Sprung and Unsprung mass, Major components of suspension system, Description of the conventional suspension systems for rear and front axle. Panhard rod, Macpherson strut, Double wishbone suspensions. Description of independent suspension system used in cars (coil spring and torsion bars), Constructional features and working	4	Lecture +Practice	Assignment- 6.1	TB-1 Ch-25

of Air suspension system, Anti-roll bars, Constructional features, types and working of telescopic shock absorber				
Module VII: Trouble Shooting and Vehicle Maintenance (10 Hours)				
<p>Onboard Diagnostic system, Symptoms for Engine Trouble and their remedies.</p> <p>Types of maintenance, Engine tuning, maintenance of fuel and air filters, monitoring of lubricants and other fluids, maintenance of battery, maintenance of tyres.</p> <p>Scope, Classification of various classes of vehicles, GVW and GCW of Medium and Heavy Commercial vehicles (Twin-axle, Multi-axle).</p>	6	Lecture	Assignment-7	TB-1 Ch-28

<p>Checklist for daily operator, Checklist for accident prevention, Checklist for Safety precautions.</p> <p>Study of “Technical Specification sheets”, Operation and Maintenance manuals of selected Car and Commercial Vehicle Models (Manufacturers in India and abroad).</p>	4	Lecture		
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Design and Maintenance of Electric Vehicles

Course Title	Course Code	Type of Course	T-P-PJ	Pre-requisite
Design and Maintenance of Electric Vehicles	DEAE0402	Theory+ Practice	2-1-0	Nil

Objective

- To study electric drive vehicles & its applications
- To study fundamentals of component design of electric vehicle
- To know the basic maintenance of different parts of electric vehicle

Course Outcomes

- Understand the importance of EVs for environment, energy sustainability and climate change
- Decide the power rating of electric vehicle

Evaluation System

Evaluation	Component	Marks	Method of Evaluation
Internal Evaluation	Internal Theory	20	Written Examination
	Internal Practice	30 (20+10)	Lab Work + Learning Record
External Evaluation	External Theory	30	Written Examination
	External Practice	20	Lab Work
Total Marks		100	

Module I: Principles of Energy and Conventional Vehicles (8Hours)

Theory

Principles of Energy: Motion, Force, Power, Work, Energy, Efficiency, Units of Forces (Drag, Lift, Inertia), Power and Energy.

Conventional Vehicles: Basics of Vehicle Performance, Vehicle Power Source Characterization, Performance Characteristics.

Practice:

1. Determination of Performance Parameters of Conventional Vehicle.

Module II: Introduction to Electric Vehicles (8Hours)

Theory

Introduction to Electric Vehicles: History of EV, EV Advantages and Disadvantages, EV Market and Promotion, Main Components of Electric Vehicle and Its Functions (Electrical and Mechanical).

Practice:

2. Study of Different Components of E-Rickshaw and Assembling Methods.
3. Working of Circuits in Controllers with respect to Current and Voltage Rating.

Module III: Electric Vehicle Drive Trains(4 Hours)

Theory

Electric Vehicle Drive Trains:EV Transmission Configurations, Basic Architecture of Electric Drive Trains, Single and Multi-Motor Drives, In Wheel Drives.

Module IV: Energy Sources(10 Hours)

Theory

Energy Sources: Working Principle of Battery, Types Of Batteries, Lead-Acid Battery, Nickel-Cadmium Battery, Nickel-Metal-Hydride (Nimh) Battery, Lithium Batteries, Battery Parameters, Fuel Cells,

Practice:

4. Maintenance of Lead Acid Batteries.
5. Wiring & Harnessing of Battery Circuit.

Module V: Electric Motors (15 Hours)

Theory

Electric Motors: Classification of Electric Motors, DC Motor, Types of DC Motors, Brushless DC Motor, AC Motor, Types of AC Motors, Induction Motor, Synchronous Motor, Regenerative Braking.

Practice:

6. Study of Different Parts of D.C. Motor and Make Connection.
7. Performance Characteristics of a Shunt and Series DC Motor
8. Load Test on Three Phase Induction Motor.
9. Speed Control of DC Shunt Motor by Armature and Field Control.

Module VI: Electric Vehicle Maintenance & Safety (10 Hours)

Theory

Electric Vehicle Maintenance & Safety: Maintenance & Trouble Shooting of Different Components of EV, High Voltage Electrical Safety, Tool and Equipment Usage, High Voltage Safety Rules, Electrical Isolation.

Practice:

10. Maintenance of BLDC Motor.
11. Maintenance of Hub Motor.
12. Maintenance & Trouble Shooting Of Electric Circuit

Module VII: Design of Electric Vehicle (5 Hours)

Theory

Design of Electric Vehicle:Power and Torque Calculation of Electric Vehicles, Sizing of Components, Initial Acceleration, Maximum Velocity, Maximum Gradability.

Text Book

1. HusseinIqbal, Electric and Hybrid Vehicles: Design Fundamentals, CRC Press

2. Chau K. T., Electric Vehicle Machines and Drives: Design, Analysis and Application, Wiley.

Reference Book

1. Chan C.C. and Chau K.T., Modern Electric Vehicle Technology, London: Oxford University.

Session Plan

Topics	No. of Sessions (in hrs.)	Activity	Assignment	Suggested Reading
Module I: Principles of Energy and Conventional Vehicles (8Hours)				
Motion, Force, Power, Work, Energy, Efficiency, Units of Forces (drag, lift, inertia), power and energy.	3	Lecture	Assignment-1	Text Book(TB)-1 Chapter(Ch)-1
Basics of vehicle performance, Vehicle power source characterization, Performance characteristics.	Th-3, Pr-2	Lecture+ Practice	Assignment-1.1	TB-1 Ch-1
Module II: Introduction to Electric Vehicles (8Hours)				
History of EV, EV advantages and disadvantages, EV market and promotion, Main components of electric vehicle and its functions (electrical and mechanical).	Th-4, Pr-4	Lecture+ Practice	Assignment-2	TB-1 Ch-1
Module III: Electric Vehicle Drive Trains(4 Hours)				

EV transmission configurations, Basic architecture of electric drive trains, Single and multi-motor drives, In wheel drives.	4	Lecture	Assignment-3	TB-1 Ch-2
Module IV: Energy Sources(10 Hours)				
Working principle of battery, Types of batteries, Lead-Acid battery, Nickel-Cadmium battery, Nickel-Metal-Hydride (NiMH) battery, Lithium batteries, Battery Parameters, Fuel Cells,	Th-6, Pr-4	Lecture+ Practice	Assignment-4	TB-1 Ch-3
Module V: Electric Motors (15 Hours)				
Classification of electric motors, DC motor, Types of DC motors, Brushless DC motor, AC motor, Types of AC Motors, Induction motor, synchronous motor, Regenerative braking.	Th-7, Pr-8	Lecture+ Practice	Assignment-5	TB-1 Ch-5
Module VI: Electric Vehicle Maintenance & Safety (10 Hours)				

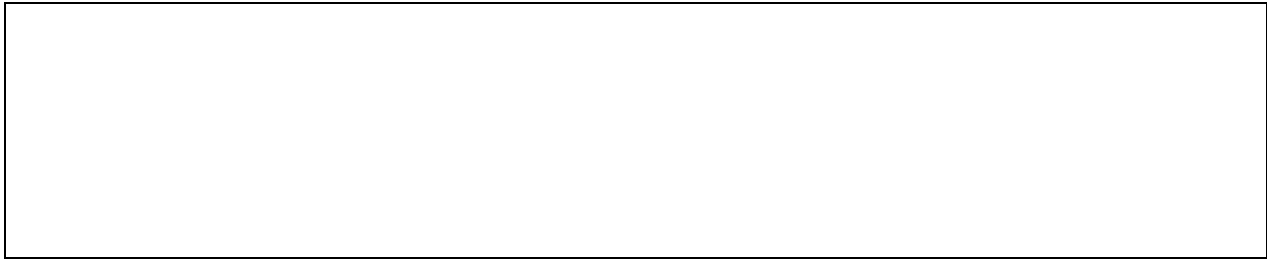
Maintenance & trouble shooting of different components of EV, High voltage electrical safety, Tool and equipment usage, High voltage safety rules, Electrical isolation.	Th-4, Pr-6	Lecturer	Assignment-6	TB-2 Ch-6
Module VII: Design of Electric Vehicle (5 Hours)				
Power and torque calculation of electric vehicles, Sizing of components, Initial Acceleration, Maximum Velocity, Maximum Gradability.	5	Lecturer	Assignment-7	TB-1 Ch-7

The following colour represents the syllabus revision, skill, employability and entrepreneurship.

Green : Skill

Pink : Employability

Sky : Entrepreneurship



**Conventional Machining & CNC
Basket -V**

Course Code	Course Title	Course Nature	Credits	Remarks
DECM0101	Jigs and Fixtures	Theory	3	
DECM0102	Process Planning and Cost Estimation	Theory	3	
DECM0201	Conventional Machining for Cylindrical Shape Component	Practice	3	
DECM0202	Conventional Machining for Prismatic Shape Component	Practice	3	
DECM0203	Wood Engineering	Practice	2	
DECM00603	CNC Machining	Practice+Project	3	
DECM0604	Non-traditional Machining and 3D Printing	Practice+Project	3	
DECM0300	Project		6	
DECM0800	Internship		4	
			30	

Jigs and Fixtures

Course Name	Code	Type of course	T-P-PJ	Prerequisite
Jigs and Fixtures	DECM0101	Theory	3-0-0	Nil

Course Objectives

- To learn basic concepts, functions and design principles of Jigs and Fixtures
- To know the importance of work piece location & clamping

Course Outcomes

- Necessitate the need of jigs, fixtures and special tools in modern day production
- Identify appropriate combination of tools, jigs and fixture, suitable for a particular machining operation

Evaluation System

	Component	% of Marks	Method of Assessment
Internal Examination	Internal Theory	30	Written examination
	Assignment	5	Report or Presentation + Learning Record
	Attendance	5	Based on class attended
External Examination	External Theory	60	Written examination
Total		100	

Course Outline

Module I Introduction to Jigs & Fixtures (5 Hrs)

Theory

Fundamental Concept and Need of Jigs and Fixtures; Jigs and Fixtures Design Principles and Factors; Materials used in Jigs & Fixtures.

Module II Locators (10 Hrs)

Theory

General Principles of Degrees of Freedom and Constraints; Foolproofing; Basic Rules for Location; Locating Methods, Types of Locators.

Module III Clamps & Indexing Devices (8 Hrs)

Theory

Principles of Clamping, Types of Clamps, Linear Indexing, Precision Linear Indexing and Rotary Indexing

Module IV Drilling Jigs (5 Hrs)

Theory

Components of Jigs, Types of Jigs, Selection of Jigs

Module VMilling Fixtures (6 Hrs)

Theory

Salient Features of Milling Fixtures, Classification of Milling Fixtures, Facing Fixtures, Slotting Fixtures.

Module VIOther types of Fixtures(8 Hrs)

Theory

Turning (Standard Chucks, Spring Collets, Cylindrical Liners, Mandrels, Turning Fixtures), Grinding, Broaching, Welding and Modular Fixtures

Module VII Economics of Jigs & Fixtures(3 Hrs)

Theory

Calculation of Annual Cost, Relative Economics Analysis

Text Books

1. Joshi, P H, Jigs & Fixtures, 2010, 3rd Edition, McGraw Hill.
2. Nagpal, G R, Tool Engineering & Design, 2000, Khanna Publishers.

Reference Books

1. Venkataraman, K, Design of Jigs, Fixtures & Press Tools, 2015, Wiley & Sons
2. Mehta, N K, Metal Cutting and Design of Cutting Tools, Jigs & Fixtures, 2015, McGraw Hill

Session Plan

Topic	No. of Sessions (in hrs.)	Activity	Assignment	Suggested Reading (Book, Video, Online source, etc.)
Module I (5 Hrs)				
Fundamental Concept and Need of Jigs and Fixtures	2	Lecture		1.Text Book (TB)-1, Page-1
Jigs and Fixtures design principles and factors	2	Lecture	Assignment 1	1. Text Book (TB)-1, Page-1
Materials used in jigs & Fixtures			Assignment 1	1. Text Book (TB)-1, Page-5
Module II (10 Hrs)				
General Principles of Degrees of Freedom and Constraints	2	Lecture		

Foolproofing; Basic rules for location; Locating methods, Types of locators.	8	Lecture		
Module III (8 Hrs)				
Principles of clamping, Types of clamps	4	Lecture		1.Text Book (TB)-1, Page-39
Liner indexing, precision linear indexing and rotary indexing	4	Lecture	Assignment 2	1.Text Book (TB)-1, Page-73
Module IV (5 Hrs)				
Components of Jigs, Types of Jigs, Selection of Jigs	5	Lecture	Assignment 3	1.Text Book (TB)-1, Page-85
Module V (6 Hrs)				
Salient features of milling fixtures, Classification of milling fixtures	3	Lecture		1.Text Book (TB)-1, Page-115
Facing fixtures, Slotting Fixtures.	3	Lecture	Assignment 4	
Module VI (8 Hrs)				
Turning(Standard chucks, Spring collets, Cylindrical liners, Mandrels, Turning Fixtures),	4	Lecture		1.Text Book (TB)-1, Page-135
Grinding, broaching, welding and modular fixtures	4	Lecture	Assignment 5	1.Text Book (TB)-1, Page-159
Module VII (3 Hrs)				
Calculation of annual cost, Relative economics analysis	3	Lecture		1.Text Book (TB)-1, Page-217
Total	45			

Process Planning and Cost Estimation

Course Name	Code	Type of course	T-P-PJ	Prerequisite
Process Planning and Cost Estimation	DECM0102	Theory	3-0-0	Nil

Course Objective

- To learn fundamentals and execution of process planning and cost estimation for a component need to be manufactured

Course Outcomes

- To pick out best operational sequence with profitable outcome
- To create appropriate process plan chart for manufacturing of a component

Evaluation System

	Component	% of Marks	Method of Assessment
Internal Examination	Internal Theory	30	Written examination
	Assignment	5	Report or Presentation + Learning Record
	Attendance	5	Based on class attended
External Examination	External Theory	60	Written examination
Total		100	

Course Outline

Module I Process Planning: Introduction (5 Hrs)

Theory

Objectives and Approaches to Process Planning; Process Planning Activities; Process Planning & Production Planning; Operating Sequences, Setup Documents for Process Planning.

Module II Selection Process (5 Hrs)

Theory

Factors Affecting Process Selection; Process & Equipment Selection Procedure; Process Sheet; Routing & Route Sheet; Determination of Man, Machine & Material Requirement.

Module III Material Requirement (10 Hrs)

Theory

Bill of Material, Selection of Machinery, Process Time Calculation, Selection of Cost Optimal Process; Breakeven Point & Breakeven Analysis

Module IV Computer Aided Process Planning (5 Hrs)

Theory

Shortcomings of Traditional Process Planning, Retrieval Type & Generative Process Planning; CAPP Developments and Trends; Group Technology

Module V Introduction to Cost Estimation(5 Hrs)**Theory**

Objectives of Cost Estimation; Components of a Cost Estimate; Cost Estimation Procedure; Classification of Costing; Elements of Cost; Expenses; Cost Accounting

Module VI Cost Estimation Methods (5 Hrs)**Theory**

Types of Cost Estimates; Methods of Cost Estimates; Data Requirements and Sources of Information; Allowances in Estimation (of Standard Time)

Module VII Production Cost Estimation (10 Hrs)**Theory**

Estimation of Material Cost, Labor Cost and Overhead; Cost Estimation in Foundry Shop (Casting); Cost Estimation in Welding Shop (Weldments & Welded joints); Cost Estimation in Forging Shop (Forging); Cost Estimation in Machine Shop (Machined components); Overhead Expenses; Allocation of Overhead Expenses or Distribution of Overhead Costs; Types of Overhead Costs.

Text Books

1. Kesavan, R, Process Planning and Cost Estimation, 2008, New Age Publication.
2. Nagpal, G R, Tool Engineering & Design, 2000, Khanna Publishers

Reference Books

1. Adithan, M, Process Planning & Cost Estimation, 2007, New Age Publication.
2. Groover, M P, CAD/CAM: Computer-Aided Design and Manufacturing, 2006, Pearson Education.

Session Plan

Topics	No. of Sessions (in hrs)	Activity	Assignment	Suggested Reading
Module I: Introduction (5 Hrs)				
Objectives and Approaches to Process Planning; Process Planning Activities	2	Lecture	Assignment 1	1. Text Book (TB)-1 Ch-1.7

Process Planning & Production Planning	1	Lecture		Text Book (TB)-1 Ch-1.7
Operating Sequences, Setup Documents for Process Planning	2			Text Book (TB)-1 Ch-1.7
Module II: Selection Process (5 Hrs)				
Factors affecting process selection; Process & Equipment selection procedure	2	Lecture	Assignment 2	Text Book (TB)-1 Ch-1.8
Process sheet; Routing & route sheet; Determination of man, machine & Material requirement.	3	Lecture		Text Book (TB)-1 Ch-1.8
Module III: Material Requirement (10 Hrs)				
Bill of Material, Selection of machinery	2	Lecture	Assignment 3	Text Book (TB)-1 Ch-1.9
Process time calculation, Selection of cost optimal process	6	Lecture		Text Book (TB)-1 Ch-1.9
Breakeven point & breakeven analysis	2	Lecture	Assignment 3.1	Text Book (TB)-1 Ch-1.13
Module IV: Computer Aided Process Planning (5 Hrs)				
Shortcomings of traditional process planning	2	Lecture		Reference Book (RB)- 2 Ch-13.1

Retrieval type & generative process planning; CAPP developments and trends; Group technology	3	Lecture	Assignment 4	Reference Book (RB)- 2 Ch-13.2
Module V: Introduction to Cost Estimation (5 Hrs)				
Objectives of Cost Estimation; Components of a Cost Estimate	2	Lecture		.Text Book (TB)-1 Ch-2.1
Cost Estimation Procedure; Classification of Costing; Elements of Cost; Expenses; Cost accounting	3	Lecture	Assignment 5	.Text Book (TB)-1 Ch-2.16
Module VI: Cost Estimation(5 Hrs)				
Types of Cost Estimates; Methods of Cost Estimates	3	Lecture		.Text Book (TB)-1 Ch-2.24
Data Requirements and Sources of information; Allowances in Estimation (of Standard Time)	2	Lecture	Assignment 6	.Text Book (TB)-1 Ch-2.24
Module VII: Production Cost Estimation (10 Hrs)				
Estimation of material cost, labour cost and overhead; Cost Estimation in Foundry Shop (Casting); Cost Estimation in Welding Shop (Weldments& Welded joints); Cost Estimation in Forging Shop (Forging)	5	Lecture		.Text Book (TB)-1 Ch-3.2
Cost Estimation in Machine Shop (Machined components); Overhead Expenses; Allocation of Overhead Expenses or Distribution of overhead costs: Types of Overhead	5	Lecture	Assignment 7	Text Book (TB)-1 Ch-4.1
Total	45			

Conventional Machining for Cylindrical Shape Component

Course Name	Code	Type of course	T-P-PJ	Prerequisite
Conventional Machining for Cylindrical Shape Component	DECM0201	Practice	0-3-0	Nil

Course Objective

- To Practise Principles & Requirements of Machining and Machine Tools to Get Cylindrical Surfaces

Learning Outcome

- To Operate Machine effectively & efficiently.
- To Produce a Component by Executing Various Operations with Desired Tolerance

Evaluation System

Internal Examination	Component	% of Marks	Method of Assessment
	Internal Practice	50 (40+10)	Lab work + Learning Record
External Examination	External Practice	50	Lab work
Total		100	

Course Outline

1. Cylindrical Turning Operations (Both Internal and External), Knurling, Thread Cutting, Stepped Turning)
2. Kinematic Study of Centre Lathe
3. Hole Making Operation in Turret Lathe
4. Work Holding and Tool Holding Devices For Turning Operations
5. Kinematic Study of Pillar Drilling Machine, Radial Drilling Machine and Boring Machine
6. Counter Boring , Counter Sinking and Threading Operations
7. Finishing Operations

Text Books

1. Rajput, R K, A Text Book of Manufacturing Technology, 2007, 1st Edition, Laxmi Publications.
2. Rao, P N, Manufacturing Technology, Volume 2, 2009, 2nd Edition, McGraw Hill.

Reference Books

1. Abdel, H, Fundamentals of Machining Processes: Conventional and Nonconventional Processes, 2008, CRC Press.
2. Sharma, P C, A Text Book of Production Technology: Manufacturing Processes, 2009, S Chand Publishers.

Session Plan

Topic	No. of Sessions (in hrs.)	Activity	Assignment	Suggested Reading (Book, Video, Online source, etc.)
Module I (80Hrs)				
Cylindrical Turning Operations (Both Internal and External), Knurling, Thread Cutting, Stepped Turning)	15	Lab. Practice		
Kinematic Study of Centre Lathe	10	Lab. Practice		
Hole Making Operation in Turret Lathe	10	Lab. Practice		
Work Holding and Tool Holding Devices For Turning Operations	10	Lab. Practice		
Kinematic Study of Pillar Drilling Machine, Radial Drilling Machine and Boring Machine	10	Lab. Practice		
Counter Boring , Counter Sinking and Threading Operations	15	Lab. Practice		
Finishing Operations	10	Lab. Practice		
Total	80			

Conventional Machining for Prismatic Shape Component

Course Name	Code	Type of course	T-P-PJ	Prerequisite
Conventional Machining for Prismatic Shape Component	DECM0202	Practice	0-3-0	Nil

Course Objective

- To Practise Principles & Requirements of Machining and Machine Tools to Get Plane Surfaces

Course Outcome

- Able to Produce a Component by Executing Various Operations with Desired Tolerance Limits

Evaluation System:

Internal Examination	Component	% of Marks	Method of Assessment
	Internal Practice	50 (40+10)	Lab work + Learning Record
External Examination	External Practice	50	Lab work
Total		100	

Course Outline

1. Kinematic Study of Shaping Machines and Planning Machine
2. Work Holding and Tool Holding Devices Used for Shapers, Planers and Grinders
3. Machining Operations Using Flat Grooves, Flat and Bevel Surfaces, Dovetailed Surfaces
4. Kinematic Study of Horizontal Milling Machine, Vertical Milling Machine
5. Surface Grinding Machines
6. Work Holding and Tool Holding Devices Employed in Milling Machines
7. Flats, Grooves, Slots and Keyways Cutting Using Milling Machine
8. Gear Cutting Using Milling Machine
9. Process Planning of Prismatic Components, Logical sequencing of Operations
10. Estimation of Machining Operations Time and Cost

Text Books

3. Rajput, R K, A Text Book of Manufacturing Technology, 2007, 1st Edition, Laxmi Publications.
4. Rao, P N, Manufacturing Technology, Volume 2, 2009, 2nd Edition, McGraw Hill.

Reference Books

3. Abdel, H, Fundamentals of Machining Processes: Conventional and Nonconventional Processes, 2008, CRC Press.
4. Sharma, P C, A Text Book of Production Technology: Manufacturing Processes, 2009, S Chand Publishers.

Session Plan

Topic	No. of Sessions (in hrs.)	Activity	Assignment	Suggested Reading
Module I (80Hrs)				
Kinematic Study of Shaping Machines and Planning Machine	08	Lab. Practice		
Work Holding and Tool Holding Devices Used for Shapers, Planers and Grinders	08	Lab. Practice		
Machining Operations Using Flat Grooves, Flat and Bevel Surfaces, Dovetailed Surfaces	08	Lab. Practice		
Kinematic Study of Horizontal Milling Machine, Vertical Milling Machine	08	Lab. Practice		
Surface Grinding Machines	08	Lab. Practice		
Work Holding and Tool Holding Devices Employed in Milling Machines	08	Lab. Practice		
Flats, Grooves, Slots and Keyways Cutting Using Milling Machine	08	Lab. Practice		

Gear Cutting Using Milling Machine	08	Lab. Practice		
Process Planning of Prismatic Components, Logical sequencing of Operations	08	Lab. Practice		
Estimation of Machining Operations Time and Cost	08	Lab. Practice		
Total	80			

Wood Engineering

Course Name	Code	Type of course	T-P-PJ	Prerequisite
Wood Engineering	DECM0203	Practice	0-2-0	Nil

Course Objective

- To Provide In-Depth Technical Training & Knowledge of Latest Processing Technologies and Machineries Used in Wood Science and Engineering Which Strengthen The Industrial-Institutional Partnership

Course Outcome

- Develop manufacturing logic and knowledge
- Operate machines and to use jigs-fixtures effectively
- Build small-scale structures of wood having broader social and institutional context of sustainability

Evaluation Criteria

Internal Examination	Component	% of Marks	Method of Assessment
	Internal Practice	50 (40+10)	Lab work + Learning Record
External Examination	External Practice	50	Lab work
Total		100	

Course Outline

1. Introduction, Safety and serviceability, Measurements & Marking
2. Identification of Timber & Hand Tools
3. Maintenance & Sharpening of Tools, Fasteners Carpentry hand tools and their maintenance.
4. Wood joints and Structural assemblies
5. Advanced Tools in Tool Engineering (Basic working principles and Operations)
6. Product Development: Interior Designs, Furniture, Structures & construction.

Text Books

1. Williamson, T G, Wood Engineering and Construction Handbook, 2016, McGraw Hill.
2. Garg, S K, Comprehensive Workshop Technology (Manufacturing Processes), 2008, Laxmi Publications.

Reference

1. John, K C, Mechanical Workshop Practice, 2nd Edition, 2010, PHI Learning Pvt.Ltd.
2. Hasluck, P N, Working with Hand Tools: Essential Techniques for Woodworking, 2012, Skyhorse Publishing.

Session Plan

Topic	No. of Sessions (in hrs.)	Activity	Assignment	Suggested Reading (Book, Video, Online source, etc.)
Module I (45Hrs)				
Introduction, Safety and serviceability, Measurements & Marking	03	Lab. Practice		
Identification of Timber & Hand Tools	03	Lab. Practice		
Maintenance & Sharpening of Tools, Fasteners Carpentry hand tools and their maintenance.	05	Lab. Practice		
Wood joints and Structural assemblies	04	Lab. Practice		
Advanced Tools in Tool Engineering (Basic working principles and Operations)	15	Lab. Practice		
Product Development: Interior Designs, Furniture, Structures & construction.	15	Lab. Practice		
Total	45			

CNC Machining

Course Name	Code	Type of course	T-P-PJ	Prerequisite
CNC Machining	DECM0603	Practice + Project	0-2-1	Nil

Course Objectives

- To acquire CNC operations skills and accomplish various jobs with desired dimensional accuracy

Course Outcomes:

- Do manual part programming effectively
- Operate CNC machine to produce component with desired dimensional accuracy

Evaluation Criteria:

Internal Examination	Component	% of Marks	Method of Assessment
	Internal Practice	50(40+10)	Lab Work + Learning Record
	Internal Project	50	Project Work
External Examination	External Practice	50	Lab Work
	External Project	50	Project Work + Report
Total		200	

Course Outline

Module I Introduction to CNC (5 Hrs)

Numerical control, Functions of Machine Tool, Concept of numerical control, Feature of CNC, Machine control unit for CNC, Classification of CNC Machine Tool.

Module II CNC Fanuc Controller (15 Hrs)

CNC Fanuc Controller: Fanuc Control Panel, Modes of Control Panel, Hard Key, Soft Key, Chock, Hard Jaw, Soft Jaw, Job setting.

Module III Cutting Tools (10 Hrs)

Nomenclature of CNC Cutting Tools, Identification of Cutting Tools, Manual Cutting Operations, Offsetting and its Types.

Module IV Production Drawing (10 Hrs)

Concept of Projection, Understanding the Views, Orthographic view & Isometric View, Reading of Dimensional Tolerance and Geometrical Tolerance.

Module V CNC Programming (25 Hrs)

Developing program for Facing, Turning, Taper Turning, Drilling, Boring and Threading by following Process Plan.

Module VI CNC Milling (5 Hrs)

Fundamentals of CNC Milling, Tool Magazine, ATC, Manual Part Programming for Pocketing.

Module VII 5-Axis Machining (5 Hrs)

Fundamentals of 5-Axis Machining and Turn-Mill Machining.

Text Books

1. Groover, M P, CAD/CAM Computer-Aided Design and Manufacturing, 2008, Pearson Education.
2. Radhakrishnan, P, CAD/CAM/CIM, 2018, New Age International.

Reference Books

1. Jain, R K, Production Technology, 2008, 17th Edition, Khanna Publishers.
2. Agarwal, P M, CNC Fundamentals & Programming, 2014, 2nd Edition, Charotar Publishers.

Session Plan

Topic	No. of Sessions (in hrs.)	Activity	Assignment	Suggested Reading (Book, Video, Online source, etc.)
Module I (9 Hrs)				
Numerical control, Functions of Machine Tool, Concept of numerical control, Feature of CNC, Machine control unit for CNC, Classification of CNC Machine Tool.	05	Lab. Practice		
Module II (15 Hrs)				
CNC Fanuc Controller: Fanuc Control Panel, Modes of Control Panel, Hard Key, Soft Key, Chock, Hard Jaw, Soft Jaw, Job setting.	15	Lab. Practice		
Module – III (10Hrs)				

Nomenclature of CNC Cutting Tools, Identification of Cutting Tools, Manual Cutting Operations, Offsetting and its Types.	10	Lab. Practice		
Module IV (10Hrs)				
Concept of Projection, Understanding the Views, Orthographic view & Isometric View, Reading of Dimensional Tolerance and Geometrical Tolerance.	10	Lab. Practice	Field study	
Module – V (25Hrs)				
Developing program for Facing, Turning, Taper Turning, Drilling, Boring and Threading by following Process Plan.	25	Lab. Practice		
Module – VI (5 Hrs)				
Fundamentals of CNC Milling, Tool Magazine, ATC, Manual Part Programming for Pocketing.	05	Lab. Practice		
Module VII (5Hrs)				
Fundamentals of 5-Axis Machining and Turn-Mill Machining.	05	Lab. Practice		
Total	75			

Non-Traditional Machining and 3D Printing

Course Title	Code	Type of course	T-P-PJ	Prerequisite
Non-traditional Machining and 3D Printing	DECM0604	Practice + Project	0-2-1	Nil

Course Objectives

- To understand the principle, mechanism of metal removal of various unconventional Machining processes

Course Outcomes

- Identify different Non-traditional machines and its working principle
- Choose suitable non-traditional machine by identifying different man-machine-material limitations

Evaluation System

Internal Examination	Component	% of Marks	Method of Assessment
	Internal Practice	50(40+10)	Lab Work + Learning Record
	Internal Project	50	Project Work
External Examination	External Practice	50	Lab Work
	External Project	50	Project Work + Report
Total		200	

Course Outline

Module I Introduction (5 Hrs)

Need of Non -traditional Machining, Classification of NTM.

Module II Electric Discharge Machining (25 Hrs)

Electric Discharge Machining Fundamentals, Machine Structure, Machine Control Panel, Machine Input and Output Parameters.

Module III EDM Process Parameters (5 Hrs)

Machining Parameters, Plotting of Output graphs, Machining of Brass and Bright Steel. Performance Characteristics, Dielectric Fluid.

Module IV Wire EDM (5 Hrs)

Fundamentals of Wire-EDM, Machine Control Panel, Performance Characteristics by varying input parameters.

Module V Additive Manufacturing (10 Hrs)

Concept, Rapid Prototyping Process, Various Rapid Prototyping Technologies: SLA, LOM, SLS and FDM.

Module VI 3D Printing (25 Hrs)

Fundamentals of 3D Printing, Machine structure and its Controller. Advantage, Disadvantage and its Applications, Performance Evaluation.

Module VII Hybrid Machining Technology (3 Hrs)

Concept, Classification & benefits; Elements of hybrid machining

Text Books

1. Pandey, P C, Modern Machining Processes, 2008, McGraw Hill
2. Jain, V K, Advanced Machining Processes, 2010, Allied Publishers

Reference Books:

1. Abdel, H, Advanced Machining Processes: Nontraditional and Hybrid Machining Processes, 2005, McGraw Hill
2. Rao, P N, Manufacturing Technology, Volume 1, 2009, Tata McGraw Hill Publication.

Session Plan

Topic	No. of Sessions (in hrs.)	Activity	Assignment	Suggested Reading
Module I (5Hrs)				
Need of Non - traditional Machining, Classification of NTM.	05	Lab. Practice		
Module II (25 Hrs)				
Electric Discharge Machining Fundamentals, Machine Structure, Machine Control Panel, Machine Input and Output Parameters.	25	Lab. Practice		
Module – III (5Hrs)				

Machining Parameters:Plotting of Output graphs, Machining of Brass and Bright Steel. Performance Characteristics, Dielectric Fluid.	5	Lab. Practice		
Module IV (5Hrs)				
Wire EDM:Fundamentals of Wire-EDM, Machine Control Panel, Performance Characteristics by varying input parameters.	5	Lab. Practice	Field study	
Module – V (10Hrs)				
Additive Manufacturing:Concept, Rapid Prototyping Process, Various Rapid Prototyping Technologies: SLA, LOM, SLS and FDM.	10	Lab. Practice		
Module – VI (25Hrs)				
3D Printing:Fundamentals of 3D Printing, Machine structure and its Controller. Advantage, Disadvantage and its Applications, Performance Evaluation.	25	Lab. Practice		
Module VII (3Hrs)				
Concept, Classification & benefits; Elements of hybrid machining	3	Lab. Practice		
Total	78			

The following colour represents the syllabus revision, skill, employability and entrepreneurship.

Green : Skill

Pink : Employability

Sky : Entrepreneurship

Domain - Welding & Inspection

Course Code	Course Title	Pedagogy	Credit	Prerequisite
DEWD0102	Metal Transfer & Weld Metallurgy	Theory	3	Workshop Practice
DEWD0101	Design of Welded Joints (CATIA)	Theory	3	Geometric Drawing
DEWD0201	Arc welding, Gas welding & Brazing	Practice	3	
DEWD0403	Joining Processes & Technology	Theory+ Practice	4	
DEWD0603	Welding of Stainless Steel , Aluminium, Copper, Cast Iron and Hard Surfacing	Practice+ Project	4	

DEWD0604	Testing of Welded Joints (DT,NDT & Microstructure)	Practice +Project	3	
DEWD0300	Project	Project	6	
DEET0800	Internship		4	
	Total		30	

Domain Objectives:

- To develop skill & knowledge of B. Tech students for seamless induction into the production organisations.
- Additionally students pursuing this domain will be better prepared for higher education and research in Welding Engineering.

Importance:

Welding has tremendous potential for further development. The challenges emerging in this field are joining of new alloys, tiny components and process automation. Many industrial sectors like high pressure boilers manufacture, ship building, automobile, space engineering and cross country pipelines require welding skill for successful manufacture. Hazardous materials handling systems, high pressure equipment rely on welded joints for safe functioning. Thus quality and reliability too are important criteria to be met by welded joints. Thus it is apparent that Welding Technology is destined to play substantial role in future. More specifically, this domain will expose students on technological and institutional aspects of welding, both in theory and practice.

Employment Opportunities:

- Welding certification will make the candidate recognised in national and international levels in industry.
- He/she can be self employed by opening a small scale welding shop to a medium scale industry.

Courses covered:

The students will be taught the basics of Joining Processes and Welding Technology. They will learn different welding techniques along with metal transfer technology and weld metallurgy. Students will be taught Design for Welded Joints using CATIA and Welded joint testing as per ASME standard. They will learn by doing the welding of Stainless Steel structural joints, Aluminium, Copper, Cast Iron parts and Hard Surfacing methods. Students will be trained as certified welder in Destructive Testing (DT) and Non-Destructive Testing (NDT).

Approach of Delivery:

All the papers will be taught either in (Theory + Practice), (Practice + Project) or pure practice mode. One certification course also has been added to the curriculum. A student will be undergoing rigorous practice session to gain hands on skill experience after learning related theory of it. This domain is intended to create good opportunities for employability in welding industries.

Metal Transfer and Weld Metallurgy

Course Name	Code	Type of course	T-P-PJ	Prerequisite
Metal Transfer and Weld Metallurgy	DEWD0102	Theory	3-0-0	Nil

Learning Objectives:

- To learn the Basic Welding Processes and related Bead Geometry
- To learn the Effect of Metal Transfer on Bead Appearance

Course Outcomes:

- Suggest suitable Welding Parameter like Current, Voltage and Welding Speed for a Weld Bead
- Identify Welding Defects and Rectify

Evaluation System:

	Component	% of Marks	Method of Assessment
Internal Examination	Internal Theory	30	Written examination
	Assignment	5	Report or Presentation + Learning Record
	Attendance	5	Based on class attended
External Examination	External Theory	60	Written examination
Total		100	

Module-I: Metal transfer (8 Hours)

Theory

Metal Transfer in AC and DC Arc Welding, Metal Transfer in TIG, MIG and MAG Welding, Study of different modes of Metal Transfer in MIG welding (Practice).

Practice

1. Metal transfer in TIG welding
2. Different modes of Metal transfer in MIG welding
3. Welding defects in TIG welding
4. Welding defects in MIG welding

MODULE-II: Diffusion in Soldering and Brazing (2 Hours)

Theory

Theory and Principle of Process, Key Variables, Intermediate Materials

Module-III: Weld Metallurgy (3 Hours)

Theory

Fe-C Equilibrium Diagram, Cooling Curve, HAZ, Microstructure, Pre Heat & Post Heat, Stress Relieving and Normalizing.

Practice

5. Practice on Stress Relieving and Normalising in Welding
6. Experiments for demonstrating Weld-ability

Module-IV:Weldability(9 Hours)**Theory**

Concept and significance, Percentage equivalence of Carbon in Weldability, Weldability of Carbon Steels, HCS.

Module -V:Defects in welded joints (9 Hours)**Theory**

Welding Defects due to improper Metal Transfer and improper Filler Material, Hot Cracks and Cold Cracks, Porosity, Embrittlement, Lamellar Tearing, Distortion etc.

Practice

7. Identification of general Welding Defects

Module -VI:Weldability(7 Hours)**Theory**

Weldability of stainless steels, Weldability of Titanium and Alloys, Weldability of High Strength Low Alloy Steels.

Module -VII: Heat treatment of welded structures(9 Hours)**Theory**

Shot Pinning, Stress Reliving through Vibration. Ultra-sonic Welding for Dissimilar Metals.

Practice:

8. Heat treatment of Welded Structures

Text books:

1. Welding Processes and Technology by R. S. Parmar. 3rd Edition, Reprint 2011, Khanna Publishers,
2. Welding Metallurgy by J.F. Lancaster, 6th Edition, WOODHEAD Publishing Limited

References:

1. Manufacturing Engineering and Technology, Serape. K. Kalpak Jain Pearson Edison

S. No.	Topics	No. of sessions (in Hrs)	Activity	Assignment	Suggested Reading
Module-I: Metal transfer (8 Hours)					
1	Metal Transfer in AC and DC Arc Welding,	2	Theory	Assignment-	TB-1 Ch-6.4
	Metal Transfer in TIG, MIG and MAG welding	3	Theory+ Practice	Assignment-1.1	TB-1 Ch- 6.5
	Study of different modes of Metal Transfer in MIG Welding (Practice)	3	Practice	Assignment-1.1	TB-1 Ch- 6.5
MODULE-II: Diffusion in Soldering and Brazing (2 Hours)					
2	Theory and Principle of Process, Key Variables, Intermediate Materials,	2	Theory	Assignment-2	TB-1 Pg-44
Module-III: Weld Metallurgy (3 Hours)					
3	Fe-C equilibrium Diagram, Cooling Curve, HAZ, Microstructure, Pre heat & Post Heat, Stress Relieving and Normalizing	3	Theory+ Practice	Assignment-3	TB-2 Pg-150
Module-IV: Weldability (9 Hours)					
4	Concept and significance, Percentage equivalence of Carbon in Weldability, Weldability of Carbon Steels, HCS	9	Theory	Assignment-4	TB-1 Ch-1
Module -V: Defects in welded joints (9 Hours)					
5	Welding Defects due to Improper Metal Transfer and Improper Filler Material, Hot Cracks and Cold Cracks, Porosity, Embrittlement, Lamellar Tearing, Distortion etc	9	Theory+ Practice	Assignment-5	TB-1 Ch-5
Module -VI: Weldability (7 Hours)					

6	Weldability of Stainless Steels, Weldability of Titanium and Alloys, Weldability of High Strength Low Alloy Steels	7	Theory	Assignment-6	TB-1 Ch-1
Module -VII: Heat treatment of welded structures (9 Hours)					
7	Shot pinning, Stress Relieving through Vibration. Ultra-sonic Welding for dissimilar Metals.	9	Theory+ Practice	Assignment-7	TB-1 Ch-4
		47			

Design of Welded Joints (CATIA)

Course Name	Code	Type of course	T-P-PJ	Prerequisite
Design of Welded Joints	DEWD0101	Theory	3-0-0	Nil

Learning Objectives:

- To learn about Design of Welded Joint according to Strength
- To know the use of Welding module in CATIA

Course Outcomes:

- Suggest suitable Welds based on Strength, Failure and Reliability
- Can produce Welding Design as per requirement

Examination System:

	Component	% of Marks	Method of Assessment
Internal Examination	Internal Theory	30	Written examination
	Assignment	5	Report or Presentation + Learning Record
	Attendance	5	Based on class attended
External Examination	External Theory	60	Written examination
Total		100	

Module: I: Design of weld joints (7 Hours)

Theory

Introduction to Design; Engineering Properties of Steels; Type of Welds and Weld Joints.

Module: II: Weld description (7 Hours)

Theory

Description of Welds: Terminology, Definitions and Weld Symbols; Edge Preparation; Sizing of Welds in Structure.

Module: III: Weld Calculations (5 Hours)

Theory

Design for Static Loading, Weld Calculations in Lap, Butt and Fillet Welds; Design for Fatigue Loading.

Practice

1. Design of Lap Joint

Module: IV: Fatigue (6 Hours)

Theory

Introduction to Fatigue; Nature of the Fatigue Process; Fatigue Strength; Factors Affecting Fatigue Life; Improvement Methods for Fatigue Strength; Reliability Analysis and Safety Factors applied to Fatigue Design.

Module: V: Failure mechanism (6 Hours)

Theory

Failure Mechanisms in Welded Joints, How to Design Various Kinds of Welding Joints. Design of a Butt Joint, the main Failure Mechanism of Welded Butt Joint.

Practice

2. Design of Butt Joint

Module-VI: Tensile failure of weld(7 Hours)

Theory

Design of Transverse Fillet Joint, Shear Mechanism in Fillet Weld, Design Stresses of Welds
Use of CATIA Weld Design Module

Practice:

3. Tensile Testing of Welded Joints
4. Bend Test of Welded Joints

Module-VII (7 Hrs):

ASME & IBR Evaluation, All Weld Tensile, Transverse Tensile, Bend Test 180° and 90°
Evaluation of Test Plate (Practice)

Text Books:

1. Lecture Notes , ASME section IX, IBR ,REFERENCE SOFTWARE: CATIA

S. No.	Topics	No. of Sessions (in Hrs)	Activity	Assignment	Suggested Reading
Module: I: Design of weld joints (7 Hours)					
1	Introduction to Design; Engineering Properties of Steels; Type of Welds and Weld Joints	7	Lecture	Assignment-1	Lecture notes
Module: II: Weld description (7 Hours)					
2	Description of Welds: Terminology, Definitions and Weld Symbols; Edge Preparation; Sizing of Welds in Structure	7	Lecture	Assignment-2	Lecture notes
Module: III: Weld Calculations (5 Hours)					
3	Design for Static loading, Weld Calculations in Lap, Butt and Fillet Welds; Design for Fatigue Loading	5	Lecture+ Practice	Assignment-3	Lecture notes
Module: IV: Fatigue (6 Hours)					
4	Introduction to Fatigue; Nature of the Fatigue Process; Fatigue Strength; Factors Affecting Fatigue Life; Improvement Methods for Fatigue Strength; Reliability Analysis and Safety Factors applied to Fatigue Design.	6	Lecture	Assignment-4	Lecture notes
Module: V: Failure mechanism (6 Hours)					
	Failure Mechanisms in Welded Joints, How to Design Various Kinds of Welding Joints. Design of a Butt Joint, the Main Failure Mechanism of Welded Butt Joint	6	Lecture+ Practice	Assignment-5	Lecture notes
Module-VI: Tensile failure of weld (7 Hours)					

5	Tensile Failure of Weld, Design of Transverse Fillet Joint, Shear Mechanism in Fillet Weld, Design Stresses of Welds Use of CATIA Weld Design Module.	7	Lecture+ Practice	Assignment-6	Lecture notes
Module-VII: Weld Evaluation (7 Hrs)					
6	ASME & IBR Evaluation, All Weld Tensile, Transverse Tensile, Bend Test 180° and 90°. Evaluation of Test Plate (Practice)	7	Lecture	Assignment-7	Lecture notes
		45			

ARC Welding, Gas Welding & Brazing

Course Name	Code	Type of course	T-P-PJ	Prerequisite
Arc Welding, Gas Welding & Brazing	DEWD0201	Practice	0-3-0	Nil

Learning Objectives:

- To Know about Welding Safety
- To Practice Basic Welding Processes such as gas Welding & Brazing, SMAW, GTAW and GMAW to obtain hands on experience

Course Outcomes:

- Suggest suitable Welding Parameters
- Perform simple welding

Examination System:

Internal Examination	Component	% of Marks	Method of Assessment
	Internal Practice	50 (40+10)	Lab work + Learning Record
External Examination	External Practice	50	Lab work
Total		100	

Practices:

Expt. 1. **Welding Safety Practice:** Welding Fumes, Eye Protection, Personal Protective Equipment, Electrical Safety.

Expt. 2. **Brazing Practice:** Types and Equipment required, Preparation of Joints for Brazing, Cleaning, making of two types of Brazed Parts- Cu and Brass, A/C Tubes.

Expt. 3. **Soldering Practice:** Types of Solders, Equipment details, Preparation for Different Joints, making of two components through Soldering, viz. Electrical Elements, Electronics.

Expt. 4. **Gas welding Practice:** Gas Welding Equipment- Torch, Gas Cylinder, Hose, Three Types of Flames, Welding of M.S. Sheet and Pipe by Gas Welding process.

Expt. 5. **Gas Cutting Practice:** Oxy-acetylene cutting process Straight, Bevel & Circular Cutting on MS. Plate.

Expt. 6. **Shielded Metal Arc Welding–Manual Metal Arc Practice:** Welding of M.S. Plate in all position by SMAW process, Repair & Maintenance works.

Expt. 7. **GTAW Welding Practice:** GTAW Welding of M.S, SS & Aluminium Plate & Pipes.

Expt. 8. **GMAW Practice:** Welding Torch, Electrode, Shielding Gas, GMAW Welding on M.S

Sheet & M.S plate.

Expt. 9. **Resistance Welding Practice:** Operating skills of SPOT Welding machine, Resistance Welding Machine Operation and Parameters.

Expt. 10. AC, DC Welding, joint configuration and edge preparations for AC, DC welding.

Expt. 11. Identifying Defects and Remedial Measures for Welded Joints.

Expt. 12. PUG Cutting Machine, SAW and PAW Demonstration.

Text books:

1. Welding Technology by R. S. Parmar, 3rd Edition, Reprint 2011, Khanna Publishers,
2. Manufacturing Engineering and Technology by Serape, K. Kalpak Jain, Pearson Edison
3. Welding Science and Technology, AWS Hand Book, Volume- I, 9th Edition, American Welding Society, USA

S N	Topics	No. of Sessions (in Hrs)	Activ ity	Assign ment	Suggested Reading
1	Welding Safety Practice: Welding fumes, Eye protection, Personal Protective Equipment, Electrical Safety	4	Practi ce	Assign ment-1	
2	Brazing Practice: Types and Equipment required, Preparation of Joints for Brazing, Cleaning, making of two types of Brazed Parts- Cu and Brass, A/C tubes	4	Practi ce	Assign ment-2	
3	Soldering Practice: Types of Solders, Equipment Details, preparation for different Joints, making of two components through Soldering, viz. Electrical Elements, Electronics	4	Practi ce	Assign ment-3	
4	Gas welding Practice: Gas Welding Equipment- Torch, Gas Cylinder, Hose, three types of Flames, Welding of M.S. Sheet and Pipe by Gas Welding Process	4	Practi ce	Assign ment-4	
5	Gas Cutting Practice: Oxy-acetylene Cutting Process Straight, Bevel &	4	Practi ce	Assign ment-5	

	Circular Cutting on MS Plate				
6	Shielded Metal Arc Welding– Manual Metal Arc Practice: Welding of M.S. Plate in all position by SMAW Process, Repair & Maintenance Works	4	Practi ce	Assign ment-6	
7	GTAW Welding Practice: GTAW Welding of M.S, SS & Aluminium Plate & Pipes	4	Practi ce	Assign ment-7	
8	GMAW Practice: Welding Torch, Electrode, Shielding Gas, GMAW Welding on M.S Sheet & M.S Plate	4	Practi ce	Assign ment-8	
9	Resistance Welding Practice: Operating skills of SPOT Welding machine, Resistance Welding Machine Operation and Parameters	4	Practi ce	Assign ment-9	
10	AC, DC welding, Joint Configuration and Edge Preparations for AC, DC welding	4	Practi ce	Assign ment- 10	
11	Identifying Defects and Remedial Measures for Welded Joints	4	Practi ce	Assign ment- 11	
12	PUG Cutting Machine, SAW and PAW Demonstration	4	Practi ce	Assign ment- 12	
		48			

Joining Processes and Technology

Course Title	Code	Type of course	T-P-PJ	Prerequisite
Joining Processes & Technology	DEWD0403	Theory + Practice	2-2-0	Nil

Learning Objectives:

- To learn about basic Welding Processes such as Arc Welding, Solid Phase Welding, High Energy Density Welding
- To learn about Welding Power Source

Course Outcomes:

- Understand the basics of Welding and can suggest suitable Welding Processes and Techniques for a given Component.
- Propose suitable Power Source for given Material

Examination System:

Internal Examination	Component	% of Marks	Method of Assessment
	Internal Theory	20	Written examination
	Internal Practice	30(20+10)	Lab work + Learning Record
External Examination	External Theory	30	Written examination
	External Practice	20	Lab work
Total		100	

Module-I: Introduction to Welding (8 Hours)

Theory

Welding Classification, Advantages, Disadvantages and applications of various Welding Processes.

Module-II: Arc welding (8 Hours)

Theory

Physics of arc welding, SMAW Principle and Equipment, types of Electrodes, Functions of Coatings, TIG (GTAW), MIG (GMAW) & Flux-Cored Arc Welding, Submerged Arc Welding, Weld Cladding & Surfacing, Plasma Cutting and Spraying, Atomic Hydrogen Welding. Welding Positions, types of Joints, Residual Stress.

Practice:

1. Identification and Working of Arc Welding Equipment
2. Identification and Working of TIG Welding Equipment
3. Identification and Working of MIG Welding Equipment

Module-III:Gas Welding & Cutting (15 Hours)

Theory

Oxy-Acetylene Welding, Flux and Filler, types of Gas Flames, Gas Welding Techniques, difference between Gas Welding and Cutting Torch.

Practice:

4. Identification and working of gas welding equipment
5. Identification and working of gas cutting equipment

Module-IV: Resistance Welding (16 Hours)

Theory

Spot and Seam Welding Parameter, Projection Welding, different types of Resistance Welding Electrodes.

Practice:

6. Identification and working of Spot Welding Machine Parts

Module-V: Other Welding Methods (17 Hours)

Theory

Flash Butt Welding, Friction Welding, Explosive Welding Thermit welding of Rails, Electro-Slag Welding, Electro-Gas Welding, Stud Welding, Plasma Arc, Laser Beam, Electron Beam, Ultrasonic, Explosive Welding, Under Water Welding, high Frequency Resistance and Induction Welding.

Module-VI: Power Source &Welding Defects (13 Hours)

Theory

Electricity in Welding: Power Source and Equipment used for AC, DC Welding.

Welding Defects: Defects and remedial measures for Welded Joints.

Practice:

7. Identification and working of Power Source for Welding Equipment in AC and DC
8. Practice in different Welding Positions
9. Practice for producing different types of Welded Joints

Module-VII:AWS Classification and Coding(13 Hours)

Theory

ASME Section IX- WPS and PQR.

Text Books

1. Welding & Welding Technology by R.L.Little.1976. Tata McGraw Hill Education Privet Limited
2. Welding Technology by R. S. Parmar, 3rd Edition, Reprint 2011, Khanna Publishers,
3. AWS Hand Book, Volume- 1, 2 and 3 , 9th Edition, American welding society

References

1. Manufacturing Engineering and Technology by [SeropeKalpakjian](#) Pearson Edison

S. No	Topics	No. of Sessions	Activity	Assignment	Suggested Reading
Module-I: Introduction to Welding (8 Hours)					
1	Welding classification, advantages, disadvantages and applications of various Welding Processes.	8	Lecture	Assignment-1	TB-1 Ch-1
Module-II: Arc welding (8 Hours)					
	Arc welding: Physics of arc welding, SMAW Principle and equipment, types of electrodes, functions of coatings, TIG (GTAW), MIG (GMAW) & flux-cored arc welding, Submerged Arc Welding, Weld Cladding & Surfacing, Plasma Cutting and Spraying, Atomic Hydrogen Welding. Welding positions, types of Joints, Residual Stress	8	Lecture+ Practice	Assignment-2	TB-1 Ch-3
Module-III: Gas Welding & Cutting (15 Hours)					
2	Gas Welding & Cutting: Oxy-Acetylene Welding, Flux and Filler, types of Gas Flames, Gas Welding techniques, difference between Gas Welding and Cutting Torch	15	Lecture+ Practice	Assignment-3	TB-1 Ch-1
Module-IV: Resistance Welding (16 Hours)					
	Resistance Welding: Spot and Seam Welding Parameter, Projection Welding, different types of	16	Lecture+ Practice	Assignment-4	TB-1 Ch-4

	Resistance Welding Electrodes				
Module-V: Other Welding Methods (17 Hours)					
3	Flash Butt Welding, Friction Welding, Explosive Welding Thermit welding of Rails, Electro-slag welding, Electro-gas welding, Stud Welding, Plasma Arc, Laser Beam, Electron Beam, Ultrasonic, Explosive Welding, Under Water Welding, high Frequency Resistance and Induction Welding	17	Lectu re	Assignme nt-5	TB-1 Ch-4
Module-VI: Power Source & Welding Defects (13 Hours)					
4	Electricity in Welding: Power Source and equipment used for AC, DC Welding. Welding Defects: Defects and remedial measures for Welded Joints	13	Lectu re+ Practi ce	Assignme nt-6	TB-1 Ch-5
Module-VII: AWS Classification and Coding (13 Hours)					
5	AWS Classification and Coding: ASME Section IX- WPS and PQR	13	Lectu re	Assignme nt-7	TB-1 Ch-5
		90			

Welding of Stainless Steel, Aluminium, Cast Iron and Hard Surfacing

Course Title	Code	Type of course	T-P-PJ	Prerequisite
Welding of Stainless Steel, Aluminum, Copper, Cast Iron and Hard Surfacing	DEWD0603	Practice + Project	0-2-2	Nil

Learning Objectives:

- Learn to weld different materials and to study its parameters and procedure
- Welding Fault and Cure techniques

Course Outcomes:

- Can suggest suitable procedure and technique to Weld given Material.
- Can suggest methods to identify and troubleshoot faults

Evaluation System:

Internal Examination	Component	% of Marks	Method of Assessment
	Internal Practice	50(40+10)	Lab Work + Learning Record
	Internal Project	50	Project Work
External Examination	External Practice	50	Lab Work
	External Project	50	Project Work + Report
Total		200	

Module: I: Stainless Steel Welding (13 Hrs)

Theory

Stainless Steel-Types, properties of Stainless steels; Use in Industry, Type of Welds and Weld Joints; Austenite Promoter, Dilution.

Module: II: Weldability of Stainless Steel(10 Hours)

Theory

Weldability of Stainless Steel- δ -ferrite Schaeffer Diagram, DeLong Diagram, Ferritic Stainless Steels, Martensitic Stainless Steels, Austenitic Stainless Steels.

Practice

1. Weld ability of stainless steel

Module: III: Physical and Mechanical properties (8 Hours)

Sensitization, Hot Cracking, Precipitation Hardening Stainless Steels, Duplex Stainless Steels, Physical Properties, Mechanical Properties.

Practice:

2 Practice for Hot Cracking

Module: IV: Stainless steel welding (7 Hours)

Theory

Selection of a Stainless Steel, Design for Welding Stainless Steels, Selection of Filler Metals, Selection of a Welding Process, Procedures for Welding Stainless Steels.

Module: V: Aluminium Welding (13 Hours)

Theory

Properties of Aluminum, GTAW (TIG) Theory Fundamentals on Aluminum, AC Welding Machine Fundamentals, Shielding Gases (Purging), Filler Wire/Electrode Selection.

Practice:

3. Faults in welding and methods to solve them

Module: VI: Welding Procedure(12 Hours)

Theory

Material Preparation, Weld Faults (Causes and Cures), GTAW (TIG) Welding Techniques on Aluminum, SMAW Electrode for Aluminum.

Practice:

4. Selection of Electrode and its effect
5. Faults in Welding and methods to solve them

Module: VII: Hard facing, Cast Iron Crack Repair (27 Hours)

Theory

Surface Coating, Use of SMAW Electrode in Hard Facing, Flux Cored Wire Surfacing.

Practice:

6. Repair methods for Cast Iron Welded Parts
7. Surface Coating Procedure

Text Books:

1. AWS Hand Book, Volume- 4 and5 , 9th Edition, American welding society
2. **Lecture Notes**
3. **ASME section IX, IBR**

S. N	Topics	No. of Sessions (in Hrs)	Activity	Assignment	Suggested Reading
Module: I: Stainless Steel Welding (13 Hrs)					
1	Stainless Steel-Types, Properties of Stainless Steels; Use in industry, Type of Welds and Weld Joints; Austenite Promoter, Dilution	13	Lecture	Assignment-1	AWS Hand Book
Module: II: Weldability of Stainless Steel(10 Hours)					
2	Weldability of Stainless Steel- δ -ferrite Schaeffler Diagram, DeLong Diagram, Ferritic Stainless Steels, Martensitic Stainless Steels, Austenitic Stainless Steels	10	Lecture+ Practice	Assignment-2	AWS Hand Book
Module: III: Physical and Mechanical properties (8 Hours)					
3	Sensitization, Hot Cracking, Precipitation Hardening Stainless Steels, Duplex Stainless Steels, Physical Properties, Mechanical Properties	8	Lecture+ Practice	Assignment-3	AWS Hand Book
Module: IV: Stainless steel welding (7 Hours)					
	Selection of a Stainless Steel, Design for Welding Stainless Steels, Selection of Filler Metals, Selection of a Welding Process, Procedures for Welding Stainless Steels.	7	Lecture	Assignment-4	AWS Hand Book
Module: V: Aluminium Welding (13 Hours)					
4	Aluminium Welding Properties of Aluminum, GTAW (TIG) Theory Fundamentals on Aluminum, AC Welding Machine Fundamentals, Shielding Gases (Purging), Filler Wire/Electrode Selection	13	Lecture+ Practice	Assignment-5	AWS Hand Book
Module: VI: Welding Procedure(12 Hours)					
	Material Preparation, Weld Faults (Causes and Cures), GTAW (TIG) Welding	12	Lecture+ Practice	Assignment-6	AWS Hand Book

	Techniques on Aluminum, SMAW electrode for aluminum		ce		
Module: VII: Hard facing, Cast Iron Crack Repair (27 Hours)					
5	Surface Coating, Use of SMAW electrode in Hard Facing, Flux Cored Wire Surfacing.	27	Lectu re+ Practi ce	Assign ment-7	AWS Hand Book
		90			

Testing of Welded Joints (DT, NDT & Microstructure)

Course Title	Code	Type of course	T-P-PJ	Prerequisite
Testing of Welded Joints (DT, NDT & Microstructure)	DEWD0604	Practice + Project	0-2-1	Nil

Learning Objectives:

- To enable students to understand the Mechanical Strength and Metallurgical Properties of Welded Structure
- Knowledge about International Welding Standards

Learning Outcome:

- Perform destructive and Non-destructive test procedures as prescribed by AWS and ASNT standards

Examination System:

Internal Examination	Component	% of Marks	Method of Assessment
	Internal Practice	50(40+10)	Lab Work + Learning Record
	Internal Project	50	Project Work
External Examination	External Practice	50	Lab Work
	External Project	50	Project Work + Report
Total		200	

Destructive Tests:

Expt. 1-3: Tensile, Flexural, Impact and Bend tests using Standard Equipment.

Expt. 4-5: Hardness test using Standard Equipment

Non Destructive Tests:

Expt. 6: Visual Inspection

Expt. 7: Liquid Penetrant Test

Job 8: Magnetic Particle Inspection

Microstructure:

Expt. 9: Analysis of Microstructure by Image Analyser

Expt. 10: Analysis of Microstructure by SEM

Text books:

1. Lecture Notes

2. ASME section VIII and IX, IBR

S N	Topics	No. of Sessions (in Hrs)	Activ ity	Assign ment	Suggested Reading
1	Tensile test using Standard Equipment	6	Practi ce	Assign ment-1	
2	Flexural and Impact Tests using Standard Equipment	6	Practi ce	Assign ment-2	
3	Bend tests using Standard Equipment	6	Practi ce	Assign ment-3	
4	Hardness test using Standard Equipment	9	Practi ce	Assign ment-4	
5	Visual Inspection	6	Practi ce	Assign ment-5	
6	Liquid Penetrant Test	6	Practi ce	Assign ment-6	
7	Magnetic Particle Inspection	6	Practi ce	Assign ment-7	
8	Analysis of Microstructure by Image Analyser	9	Practi ce	Assign ment-8	
9	Analysis of Microstructure by SEM	9	Practi ce	Assign ment-9	
		63			

2020-21

The following colour represents the syllabus revision, skill, employability and entrepreneurship.

Green : Skill

Pink : Employability

Sky : Entrepreneurship



Centurion University of Technology and Management Odisha

Choice Based Credit System

Course Structure & Syllabus

Mechanical Engineering



CENTURION UNIVERSITY OF TECHNOLOGY AND MANAGEMENT

School of Engineering & Technology

2020

CBCS Structure

Basket	Basket Category	Minimum Credits to be acquired by Regular students	Minimum Credits to be acquired by Lateral Entry students
I	Foundation Courses in Sciences	17	06
II	Foundation Courses in Humanities & Management [A: 6 credit (choice), B: 6 credit (Compulsory)]	12	6(Job readiness) + 3
III	Smart Stack	25	25
IV	Foundation and Core Engineering Courses	58*	48
V	Domain/Skill/Internship/Minor Project/MOOC	48	32
	Total Credits	160	120

Course Structure

Basket I	Foundation Courses in Sciences		
Course Code	Course Title	Credit	Type (Theory+Practice+Project)
CUTM1001	Differential Equations and Linear Algebra	3	2+0+1
CUTM1002	Laplace & Fourier Transforms	3	2+0+1
CUTM1003	Complex Analysis & Numerical Methods	3	2+0+1
CUTM1004	Discrete Mathematics	3	2+0+1
CUTM1005	Probability & Statistics	3	2+0+1
CUTM1925	Calculus	3	2+0+1
CUTM1006	Mechanics for Engineers	3	2+1+0
CUTM1007	Optics and Optical Fibres	3	2+1+0
CUTM1008	Applied Analytical Chemistry	3	2+1+0
CUTM1009	Applied Engineering Materials	3	2+0+1
CUTM1010	Environmental Studies	2	0+0+2

Basket II	Foundation Courses in Humanities & Management [A: 6 credit (choice), B: 6 credit (Compulsory)]		
Course Code	Course Title	Credit	Type (Theory+Practice+Project)
CUTM1011	Optimisation Techniques	2	0-2-0
CUTM1012	Engineering Economics and Costing	3	2-0-1
CUTM1013	Project Management	3	2-0-1
CUTM1014	Gender, Human Rights and Ethics	3	1.5-0-1.5
CUTM1015	Climate Change, Sustainability and Organization	3	1.5-0-1.5
CUTM1016	Job Readiness	6	0-6-0

Basket III	Smart Stack		
Course Code	Course Title	Credit	Type (Theory+Practice+Project)
CUTM1017	Industrial IOT and Automation	6	3-2-1
CUTM1018	Data Analysis and Visualisation using Python	4	0-1-
CUTM1019	Machine Learning using Python	4	1-2-1
CUTM1020	Robotic automation with ROS and C++	4	1-2-1
CUTM1021	Basics of Design Thinking	2	0-0-2
CUTM1022	System Integration with DYMOLA	2	0-0-2
CUTM1023	Smart Engineering Project (G2M)	3	0-0-3

Basket IV	Core Courses_ Mechanical Engineering			
Course Code	Course Title	Credits	Type T+P+PJ	Prerequisite
CUTM1075	Computer Aided Drafting	3	0-2-1	
CUTM1076	Product Design and Development	2	1-1-0	
CUTM1077	Reverse Engineering and Rapid Prototype	4	1-2-1	
CUTM1078	Product Life Cycle Management	2	0-1-1	
CUTM1079	Manufacturing Process-process planning and Heat Treatment	3	2-1-0	
CUTM1080	Material in product design and development	2	1-10	
CUTM1081	Computer Aided Engineering	3	0-2-1	
CUTM1082	Quality Assurance	2	1-1-0	
CUTM1083	Applied Ergonomics	2	0-1-1	
CUTM1084	Computer Aided Manufacturing	2	0-2-0	
CUTM1085	CNC Programming & CNC Machining	2	0-2-0	
CUTM1086	Design of Tools, Jigs and Fixtures	3	2-1-0	
CUTM1087	Advance Metrology	2	1-1-0	
CUTM1088	Thermodynamics	3	2-1-0	
CUTM1089	Fluid Mechanics with Finite Volume Method	3	2-1-0	
CUTM1090	Hydraulic Machinery	2	1-1-0	
CUTM1091	Theory of Machines	3	2-1-0	
CUTM1092	Heat Transfer with FDM/FVM	3	2-1-0	
CUTM1062	Theories of Failure Using Finite Element Analysis	4	2-2-0	
CUTM1079	Optimisation Techniques	2	0-2-0	
CUTM1058	Programming in Java(Same as Java Technologies)	3	2-1-0	
CUTM1059	Database Management Systems	3	2-1-0	
	Total Credits	58		



Basket V: Domain/Skill/MOOC/Minor Project/Internship/Applied Courses

Domain:

- Manufacturing (Conventional, CNC and Additive)
- Welding and Inspection
- Automobile Engineering
- Computational Fluid Dynamics
- Composite Design and Manufacturing
- GO-TO-MARKET (Digital Manufacturing)



Centurion University of Technology and Management Odisha

CHOICE BASED CREDIT SYSTEM

COURSE STRUCTURE & SYLLABUS

BASKET - I



Centurion
UNIVERSITY
Shaping Lives...
Empowering Communities...

School of Engineering & Technology

2020



**Course Structure
Basket - I**

Course Code	Course Title	Credits	Course Type T+P+PJ
CUTM1001	Differential Equations and Linear Algebra	3	2+0+1
CUTM1002	Laplace & Fourier Transforms	3	2+0+1
CUTM1003	Complex Analysis & Numerical Methods	3	2+0+1
CUTM1004	Discrete Mathematics	3	2+0+1
CUTM1005	Probability & Statistics	3	2+0+1
CUTM1925	Calculus	3	2+0+1
CUTM1006	Mechanics for Engineers	3	2+1+0
CUTM1007	Optics and Optical Fibres	3	2+1+0
CUTM1008	Applied Analytical Chemistry	3	2+1+0
CUTM1009	Applied Engineering Materials	3	2+0+1
CUTM1010	Environmental Studies	2	0+0+2



Syllabus

Differential Equations and Linear Algebra

Code	Course Title	Credit	T-P-PJ
CUTM1001	Differential Equations and Linear Algebra	3	2-0-1

Objective

- Introduce students to how to solve linear Differential Equations with different methods.
- To solve the system of linear equations appearing in the problems of electrical engineering, mechanical engineering etc.
- To use Eigen values and Eigen vectors in Control theory, vibration analysis, electric circuits, advanced dynamics problems.
- Introduce students how to solve first order and second order differential equations

Course outcome

- Understand the importance of linear functions in mathematics.
- Solve systems of linear equations using Gauss- elimination to reduce to echelon form.
- Learn fundamental concepts of ODE theories and where and how such equations arise in applications to scientific and engineering problems.
- Be competent in solving linear/non-linear 1st & higher order ODEs using analytical methods to obtain their exact solutions

Course content

Module-I

First order linear differential equations and its applications(Kirchhoff's law)

Project-1:Some applications of differential equations in RL electrical circuit problems

Module-II:

Second order linear homogeneous differential equations (Real roots, Real equal roots, Complex conjugate roots) and its applications.

Project-2: RLC Circuit, Pendulum

Module-III:

Second order linear non-homogeneous differential equations, Finding particular integral consisting of exponential, trigonometric functions (Sine, cosine) using inverse operator method

Project-3: Simple mass-spring system, Damped vibration system

Module IV:

Basic concepts of a matrices, solution of linear system of equations by Gauss elimination method, linearly independent and dependent of a vectors, rank of a matrix.

Project-4

Report on finding the traffic flow in the net of one-way streets

Module V:

Determinants and Cramer's Rule, Fundamental theorem of linear system of equations.

Module VI:

Eigenvalues and Eigen vectors of a matrix

Project-5

(i) Find the limit states of the Markov process model.

(ii) Find the growth rate in the Leslie model

Module VII:

Symmetric, Skew-Symmetric, Orthogonal Matrices and Properties

Project-6

To make a report to show that the product of two orthogonal matrices is orthogonal, and so is the inverse of an orthogonal matrix. What does this mean in terms of rotations?

Text Books:

1. Advanced engineering mathematics by Erwin Kreyszig, 8th edition
Chapter-6 (6.1-6.6), Chapter-7 (7.1,7.2)
2. Higher Engineering by B.V. Ramana
Chapter-8(8.1,8.2,8.21), Chapter-9 (9.2,9.3,9.5)

Reference Books:

1. J. Sinha Roy and S. Padhy, A Course of Ordinary and Partial Differential Equations, Kalyani Publishers, New Delhi.
2. G.B. Thomas, M.D. Weir, J.R. Hass, Thomas' Calculus, Pearson Publication.
3. R.G. Bartle, D.R. Sherbert, Introduction to Real Analysis, Wiley Publication



Laplace and Fourier Transform

Code	Course Title	Credit	T-P-PJ
CUTM1002	Laplace and Fourier Transform	3	2-0-1

Objective

- To describe the ideas of Fourier and Laplace Transforms and indicate their applications in the fields such as application of PDE, Digital Signal Processing, Image Processing, Theory of wave equations, Differential Equations and many others.
- To use Fourier series for solving boundary value problems appearing in scientific & engineering problems.

Course outcome

- Solve differential equations with initial conditions using Laplace transform.
- Evaluate the Fourier transform of a continuous function and be familiar with its basic properties.

Course content

Module-I (T-3-Pj-2)

Laplace Transforms, Properties of Laplace transforms, Unit step function.

Project-1

Make a short draft of properties of Laplace transform from memory. Then compare your notes with the text and write a report of 2-3 pages on these operations and their significance in applications.

Module-II (T-2-Pj-2)

Second shifting theorem, Laplace transforms of Derivatives and Integrals

Project-2

Find the Laplace transform of the following functions

Module-III (T-3-Pj-2)

Derivatives and Integrals of Transforms, Inverse Laplace transform.

Project 3:

Application of Unit step function (RC- Circuit to a single square wave).

Module- IV (T-2-Pj-2)

Solution of Differential Equation by using Laplace Transform.

Project 4: Find the solution of differential equation by using Laplace Transform.

Module-V (T-4-Pj-2)

Periodic function, Fourier series, Fourier series expansion of an arbitrary period, Half range expansions.

Project-5

Find the Fourier series expansion of a 2π periodic function.

Module-VI(T-3-Pj-2)

Complex form of Fourier series, Fourier Integrals, Different forms of Fourier Integral.

Project-6

Find the Fourier sine and cosine integral of the following functions.

Module-VII(T-3)

Fourier Transforms, Fourier sine and cosine Transforms.

Text Books:

- E. Kreyszig , Advanced Engineering Mathematics, Johnwiley& Sons Inc-8th Edition.Chapters:5(5.1 to 5.4(without Dirac's delta function)),10(10.1,10.4 and 10.7-10.9(definitions only , no proofs))
- Highjer Engineering Mathematics by B.V.Ramana, Tata McGraw-Hill Education India, Inc-8th Edition.

Reference Books:

- 1) Advanced Engineering Mathematics by P.V.O' Neil Publisher: Thomson
- 2) Mathematical Methods by Potter & Goldberg ; Publisher : PHI



Complex Analysis and Numerical Methods

Code	Course Title	Credit	T-P-PJ
CUTM1003	Complex Analysis and Numerical Methods	3	2-0-1

Objective

- To understand about Complex variables and complex functions.
- To acquire the skill of evaluating contour integrals using Cauchy's integral formula and Cauchy's integral theorem.
- To understand the limitations of analytical methods and the need for numerical methods and the ability to apply these numerical methods to obtain the approximate solutions to engineering and mathematical problems.

Course Outcome

- To get equipped with the understanding of the fundamental concepts of functions of a complex variable along with the concepts of analyticity, Cauchy-Riemann relations and harmonic functions.
- Evaluate complex contour integrals applying the Cauchy integral theorem, Cauchy integral formula.
- Derive a variety of numerical methods for finding out solutions of various mathematical problems arising in roots of linear and non-linear equations, Solving differential equations with initial conditions and Evaluating real definite integrals.

Course Outline

Module I (T-3 hrs-P-0-hrs-P-0 hrs)

Functions of a complex variable, Analytic functions, Cauchy-Riemann equations (Without Proof), Harmonic and Conjugate harmonic functions, Cauchy's Integral Theorem (Without Proof).

Project-1 : Verification of Cauchy-Riemann equations for complex functions in Cartesian form and Polar form

Module II (T-3 hrs-P-0 hrs-P-2 hrs)



Cauchy's Integral Formula (Without Proof), Cauchy's Integral Formula for higher order derivatives (Without Proof), Taylor series.

Project-2 : Evaluation of contour integrals using Cauchy's Integral Formula

Module III (T-4 hrs-P-0 hrs-P-2 hrs)

Laurent series (Without Proof), Pole, Residue, Residue Theorem (Without Proof), Evaluation of Real integral Type-I.

Module – IV (T-2 hrs-P-0 hrs-P-2 hrs)

Interpolation, Lagrange interpolation polynomial.

Project-3 : Finding out the value of a given function at an interior point on an unequal interval using Lagrange interpolation polynomial

Module – V (T-3 hrs-P-0 hrs-P-2 hrs)

Forward and backward difference operators, Newton's forward and backward difference Interpolation formulae.

Project-4 : Finding out the value of a given function at an interior point on an equal interval using Newton's forward and backward difference interpolation formulae

Module – VI (T-2 hrs-P-0 hrs-P 2 hrs)

Numerical Integration, Trapezoidal rule, Simpson's one third rule.

Project-5 : Evaluation of real definite integrals using Trapezoidal rule and Simpson's one third rule

Module – VII (T-3 hrs-P-0 hrs-P-2 hrs)

Runge-Kutta 2nd & 4th order methods.

Project-6 : Finding out Numerical solutions of differential equations using Runge-Kutta 2nd& 4th order methods

Text Book:

1) Advanced Engineering Mathematics by E. Kreyszig Publisher: Johnwiley& Sons Inc-8th Edition Chapters : 12 (12.3, 12.4), 13 (13.2 to 13.4), 14.4, 15 (15.1 to 15.4 Only Type-I integral), 17 (17.3, 17.5), 19 (19.1).

Reference Books:

1) Advanced Engineering Mathematics by P.V. O'Neil Publisher: Thomson



- 2) Fundamentals of Complex Analysis (with Applications to Engineering and Science) by E.B. Saff & A.D. Snider Publisher: Pearson
- 3) Numerical Methods for Scientific and Engineering Computation by M. K. Jain, S. R. K. Iyengar & R.K. Jain; New Age International Publishers.
- 4) Introductory Methods of Numerical Analysis by S.S. Sastry; Third Edition, Prentice Hall India.

Discrete Mathematics

Code	Course Title	Credit	T-P-PJ
CUTM1004	Discrete Mathematics	3	2-0-1

Objective

- To understand mathematical reasoning in order to read, comprehend and construct Mathematical arguments as well as to solve problems, occurred in the development of programming languages
- To work with discrete structures such as graphs to study the structure of the world wide web, to model a computer network and to find the shortest path between two places in a transportation network

Course Outcome

- Apply the logical structure of proofs and work symbolically with connectives and quantifiers to produce logically valid, correct and clear arguments.
- Evaluate elementary mathematical arguments and identify fallacious reasoning
- Reformulate statements from common language to formal logic
- Apply truth tables and the rules of propositional and predicate calculus
- Model and solve real world problems using graphs, both quantitatively and qualitatively

Course Outline

Module -I

(4Hours)

Propositional Logic, Connectives, Truth tables of compound propositions, Propositional Equivalence.

Project 1: Given the truth values of the propositions p and q , find the truth values of the conjunction, disjunction, implication, bi-implication, converse, contrapositive and inverse.

Module -II (3Hours)

Theory of inference, Predicates and Quantifiers, Rules of Inference.

Project 2: Build valid arguments of a given set of propositional logics and quantified statements using rules of inferences.

Module -III (3 Hours)

Relations and its properties, Partial Ordering, POSET, Totally Ordered Set.

Project 3: Define the properties of a relation on a set using the matrix representation of that relation with examples.

Module -IV (3Hours)

Hasse Diagram, Maximal & Minimal Elements of a Poset, Greatest & Least Elements of a Poset, Supremum & Infimum of a Poset, Lattice.

Project 4: Find a Topological Sort of a Poset.

Module -V (3 Hours)

Introduction to Graph Theory, Graph Terminology and Special types of Graphs, Representation of Graphs.

Project 5: Describe how some special types of graphs such as bipartite, complete bipartite graphs are used in Job Assignment, Model, Local Area Networks and Parallel Processing.

Module -VI (3 Hours)

Graph Isomorphism, Connectivity, Euler and Hamiltonian Graphs, Planar Graphs, Graph Coloring.

Project 6(i): Describe the scheduling of semester examination at a University and Frequency Assignments using Graph Colouring with examples. Find also their Chromatic numbers.

Project 6(ii): List out 10 pairs of Non-isomorphic graphs and explain the reason behind it.

Project 6(iii): List out all features of Euler and Hamiltonian Graphs. Justify whether the given set of graphs are Euler and Hamiltonian. Construct a Gray Code where the code words are bit strings of length three.

Module -VII (4 Hours)

Trees and their Properties, Spanning Trees, Minimum Spanning Trees, Kruskal's Algorithm.



Project 7: Find a minimum spanning tree in a given weighted graph using Kruskal's Algorithm.

Text Books:

1. Discrete Mathematics and its Applications by K.H.Rosen, Publisher: TMH, Sixth Edition, 2009.
Chapters: 1(1.1, 1.2, 1.3, 1.5); 7(7.1, 7.6); 8(8.1 to 8.5, 8.7, 8.8); 9(9.1, 9.4, 9.5).

Reference Books:

1. Discrete Mathematical Structures with Applications to Computer Science, J. P. Trembkay, R. Manohar, Tata MC Graw – Hill Edition 38th reprint, 2010.
2. Discrete and Combinatorial Mathematics by R.P.Grimaldi Publisher: Pearson, 5th Edition, 2003.
3. Discrete Mathematics and Applications by Thomas Koshy Publisher: Elsevier, 2004.
4. Discrete Mathematical Structures by B. Kolman, R.C. Busby & S. Ross Publisher: PHI, 5th Edition, 2003

Probability and Statistics

Code	Course Title	Credit	T-P-PJ
CUTM1005	Probability and Statistics	3	2-0-1

Objective

- To translate real-world problems into probability models.
- To motivate students in an intrinsic interest in statistical thinking.
- To recognize the role and application of probability theory, descriptive and inferential statistics in many different fields of science and engineering.
- To apply probability and statistics in engineering and science like disease modeling, climate prediction and computer networks etc.

Course outcome

- Define and illustrate the concepts of sample space, events and compute the probability

and conditional probability of events.

- Define, illustrate and apply the concepts of discrete and continuous random variables, the discrete and continuous probability distributions.
- Define, illustrate and apply the concept of the expectation to the mean, variance and covariance of random variables.
- Compute probabilities based on practical situations using the Binomial, Poisson and Normal distributions.

Course content

Module I :(3 hrs+2 hrs)

Sample spaces and events; axiomatic definition of probability; Axioms of Probabilities

Project-1

A Report on Application of probability to control the flow of traffic through a highway system, a telephone interchange, or a computer processor

Module II :(3 hrs +2 hrs)

Mutually Exclusive Events, Dependent and Independent Events. Conditional Probability

Project-2

A Report on Dependent and Independent Events with Examples

Module III:(3 hrs +2 hrs)

Discrete random variables and probability distributions, Continuous random variables and probability

distributions , Mean ,Variance and Moment Generating Function of Distributions

Project-3

Application of random variables in Engineering Field

Module IV:(3 hrs +2 hrs)

Uniform Distribution, Binomial Distribution, Poisson Distribution

Project-4

Applications of Poisson distribution



Module V:(3 hrs +2 hrs)

Normal Distribution, Working with Normal Tables, Normal Approximation to the Binomial Distributions

Project-5

Normal Distribution utilized in statistics, business settings, and government entities.

Module VI:(3 hrs)

Statistics: Random Sampling, Population and Sample, Sample Mean and Variances, Point and Interval Estimations, Confidence Intervals

Module VII:(3 hrs +2 hrs)

Regression and Correlation Analysis: Correlation Coefficient, Co-variance independent random variables, linear regression of two variables

Project-6

Uses of Regression and Correlation Analysis in Business

Text Books:

1. Name of Author, Title, Publication, Edition

Advanced Engineering Mathematics by E. Kreyszig Publisher: John Willey & Sons Inc-8th Edition

Reference Books:

1.Statistical Methods by S.P. Gupta (31st Edition); Publisher: Sultan Chand & Sons.

2. Mathematical Statistics by S.C. Gupta & V.K. Kapur (10th Edition); Publisher: Sultan Chand & Sons.

Calculus

Code	Course Title	T-P-PJ	Prerequisite
CUTM1925	Calculus	2-0-1	

Objective

- To apply the concepts of derivative to find curvature and radius of curvature of a curve.
- To apply concepts of Vector Calculus to the problems related to models in work,

circulation and flux Problems, hydrodynamics and fluid dynamics etc.

Course Outcome

- Calculate curvature and radius of curvature for a given curve.
- Determine the important quantities associated with scalar and vector fields.
- Find gradient of a scalar point function, divergence and curl of a vector point function.
- Evaluate line integral, double integral and applying these concepts to find out work done by a force, volume of regions in space, center of gravity of a mass etc.
- Transform double integral to line integrals, triple integrals to surface integrals, surface integrals to line integrals and vice versa.

Course Outline

Module-I(3hr+0hr+2hr)

Curvature and Radius of curvature in Cartesian form.

Project 1: To find radius of curvature (Parametric form)

Module-II(2hr+0hr+4hr)

Vector algebra: Algebraic operations, Scalar product, Inner product, Vector product, Scalar and vector triple product.

Project 2: Problems based on inner product, scalar and vector triple products.

Project 3: To find angle between two vectors, area of triangle and parallelogram, volume of parallelepiped and tetrahedron using vector algebra.

Module III(2hr+0hr+4hr)

Gradient of scalar point function, Directional derivatives, Divergence and curl of vector point functions, second order differential operator: the Laplacian operator.

Project 4: To prove the identities with regards to Gradient, Divergence and Curl.

Project 5: To find normal vector to a plane using Gradient of scalar point function.

Module-IV: (3hr+0hr+0hr)

Line Integrals (path dependence and path independence), double integrals.

Module-V: (3hr+0hr+0hr)



Surface Integrals, Triple Integrals

Module-VI: (4hr+0hr+2hr)

Green's and Gauss's Theorems (without proof) and their applications to evaluate the integrals.

Project 6: To find center of gravity and moments of inertia of a mass density

Module-VII: (3hr+0hr+0hr)

Stokes' Theorem (without proof) and its applications to evaluate the integrals.

Text Books:

1. A Text book of Calculus Part – II by Shanti Narayan, Publisher: S. Chand & Company Ltd.
Chapters: 8 (Art. 24, 25 (only for Cartesian and parametric curves)).
2. Advanced Engineering Mathematics by E. Kreyszig, Publisher: John Willey & Sons Inc.- 8th Edition
Chapters: 8 (8.1 to 8.3, 8.9 to 8.11), 9 (9.1 to 9.7, 9.9).

Mechanics for Engineers

Code	Course Title	Credit	T-P-PJ
CUTM1006	Mechanics for Engineers	3	2-1-0

Objective

- To provide the students with a clear and thorough understanding on fundamentals of mechanics as applied to solve real-world problems.

Course outcome

- Use scalar and vector analytical techniques for analyzing forces in statically determinate structures.
- Analyze the frictional forces involved in planes, ladder friction and belt friction.
- Determine the centroid and moment of inertia of composite shapes.
- Apply fundamental concepts of kinematics and kinetics of particles to the analysis of simple, practical problems.
- Apply basic knowledge of mathematics and physics to solve real-world problems.

Course content

Module I: Force and Moment (4 Hrs. + 2 Hrs. practices)

Law of Transmissibility of a Force, Composition and Resolution of Forces, Resultant and Equilibrant, Resultant of Two and Several Forces, Moment of a Force and a Couple, Varignon's Principle of Moment

Practice-1: Verification of laws of parallelogram law of forces

Module II: Equilibrium

(3 Hrs. + 2 Hrs. practice)

System Isolation and Free Body Diagram, Particle Equilibrium, Lami's theorem, General Conditions of Equilibrium, Types of Supports and Support Reactions, Rigid Body Equilibrium.

Practice-2: To verify the condition of equilibrium by finding reactions at the support of a beam

Module III: Friction

(2 Hrs. + 2 Hrs. practice)

Basic Terms used in Dry Friction, Laws of Coulomb Friction, Equilibrium of Bodies on a Inclined Plane, Ladder Friction, Belt Friction

Practice-3: Determination of Angle of Repose



Module IV: Centroid

(2 Hrs.)

Axis of Symmetry, Centroid of Lines, Areas and Volumes, Centroid of Composite Section.

Module V: Moment of Inertia

(3 Hrs. + 2 Hrs. practice)

Rectangular and Polar Moment of Inertia, Radius of Gyration, Parallel Axis Theorem and Perpendicular Axis Theorem, Moment of Inertia of Composite Section

Practice-4: Determination of Moment of Inertia of a fly wheel.

Module VI: Kinematics of Linear Motion

(3 Hrs.)

Kinematics of a Particle, Uniform and Variable Acceleration, Motion under Gravity

Module VII: Kinetics of Linear Motion

(3 Hrs. + 4 Hrs. Practice)

Principles of Dynamics such as Newton's Second Law, Work-Energy Principle, Impulse-Momentum Principle, Law of Conservation Law of Momentum and Energy

Practice-5: Verification of Newton's second law of motion.

Practice-6: Verification of conservation of momentum in collision.

Text Books:

Engineering Mechanics; Statics and Dynamics by A. K. Tayal, Umesh Publications

Reference Books:

Engineering Mechanics by S. Timoshenko, D.H. Young and J.V. Rao, Tata McGraw Hill

Engineering Mechanics by D.S. Kumar, S.K. Kataria and Sons.

Optics and Optical Fibres

Code	Course Title	Credit	T-P-PJ
CUTM1007	Optics and Optical Fibres	3	2-1-0

Objective

- To train the students for the applications of the solar cell, laser and optical fiber in the field of engineering and technology.
- To learn and practice the techniques used by optical phenomenon so that these can be applied to actual field studies.

Course outcome

- Students should understand optical phenomena.
- Students should learn about different light sources and their use
- After completion of the course the students shall be able to understand the basic knowledge of solar cell, laser and optical fiber and instrumentation involved.
- Students should be able to understand optical fiber principle, operations and its applications.

Course outline

Module I: Reflection and Refraction (Derivation is not required) (3hours +2hours)

Reflection at plane surface, reflection at spherical mirrors, Paraxial rays and approximation. Sign convention, Location of the image formation, Spherical mirror equation, Refraction, Total internal reflection, Dispersion by a prism, Refraction through a prism.

Practice: 1

To determine the refractive index of glass slab using travelling microscope.

Module II: Lenses (Derivation is not required) (2hours+2hours)

Definition, Types of Lenses, Terminology associated with the Lens, Sign Convention Location of the image formation by graphical method for Lenses, Lens formula.

Practice: 2

To determine the dispersive power and Cauchy constants of the material of a prism using mercury source.

Module III: Interference (Derivation is not required) (2hours+2hours)

Superposition principle, definition of Interference, Coherence, Young's double slit experiment, Newton's rings theory- Determination of wave length of light.

Practice: 3

Newton's Rings-Refractive index of liquid

Module IV: Diffraction and Polarization (Derivation is not required) (3hours+2hours)

Types of diffraction, Fraunhofer diffraction at a single slit, Diffraction at N-parallel slits (plane diffraction grating) Polarisation, Types of polarized light and their representation, Brewster Law .Malus Law, polarization by double refraction, polarimeter, Applications of polarized light.

Practice: 4

To find grating element of a plan transmission diffraction grating.

Module V: Optical Properties and Laser (3hours+2hours)

Scattering, refraction, reflection, absorption & transmission, Introduction to optoelectronics, Concept of Light Emitting Diode, Stimulated and spontaneous emission, Basic principle of Lasers, Population inversion, Laser Pumping, Different levels of laser system, Ruby Laser, Applications of Lasers (Medicine, Metrology, Defenses, Nuclear energy, in communication, in consumer electronics industry)

Practice: 5

Wave length of LASER source by diffraction grating method

Module VI: Optical Fibers (3hours+1hours)

Introduction to fiber optics, structure of optical fibers, classification of optical fibers on the variation of refractive index, Classification of optical fibers on the variation of mode of transmission/core diameter, Numerical Aperture, Acceptance angle. Principle of optical fibers communication, optical communication (block diagram only),

Practice: 6

To find the numerical aperture of a given optic fiber and hence to find its acceptance angle.

Module VII: Optical Fibers (4hours+1hours)

Attenuation in optical fibers (Qualitative only-Scattering losses, Absorption losses, bending losses) Fiber Materials-Glass fibers, Plastic fibers, Light sources for fiber optics

V-number of an optical fiber, optical fiber cables design, optical fiber connection, fiber splices, fiber connectors. Application of optical fibers- Cable TV, Networking, Power companies, Imaging, Sensors, Medical (Dental surgery, Endoscopy, Surgery)

Practice: 7

Measurement of bending loss.

Text Books:

1. A Text Book of Optics by M.N. Avadhanulu, BrijLal, N. Subrahmanyam, S Chand; 23rd Rev. Edn. [Module I&II]
2. Engineering Physics, by D.Thirupathi Naidu, M.Veeranjaneyulu, V.G.S Book links,2017.[Module-III,IV]
3. Principles of Engineering Physics-2 by Md.Khan, S.Panigrahi, Cambridge University Press 2016. [module-V,VI&VII]

Reference Books:

1. Optics by AjoyGhatak, McGraw Hill Education; 6 edition, 2017.
2. Physics-I for engineering degree students by B.B. Swain and P.K.Jena.
3. Concepts in Engineering Physics by I Md. N. Kha, 2016.

Applied Analytical Chemistry

Code	Course Title	Credit	T-P-PJ
CUTM1008	Applied Analytical Chemistry	3	2-1-0

Course Objective

- Explain fundamental principles for environmental analytical methods (titration, electrochemistry, instrumentation and basic parameters of water, soil, fuel, etc)
- Point out suitable analytical techniques for analyzing a specific compounds in an environmental matrix

Course Outcome

- Apply quality control on chemical analysis and laboratory work and explain its importance
- Plan and carry out laboratory experiments, including data analysis and conclusions
- Point out suitable techniques for sampling and handling of environmental samples

Module-I(4Hrs)

Water analysis:

Water softening processes: Lime-Soda, Zeolite and Ion exchange methods. Removal of DO and dissolved CO₂ from water by De-aeration method, Desalination of Brackish water by Reverse osmosis and electro dialysis process. Numericals on calculation of hardness of water, Lime-Soda calculation, Alkalinity of water.

1. Determination of hardness of water by EDTA method. (V. lab)
2. Determination of alkalinity of water. (V. lab)
3. [Determination of Dissolved Oxygen in water.](#) (V. lab)
4. [Determination of Biological Oxygen Demand.](#) (V. lab)
5. [Determination of Chemical Oxygen Demand.](#) (V. lab)

Module-II(2Hrs)

Soil Analysis:

Soil profile, Structure, and properties, Determination of soil properties, Fertility of the soil.

6. Determination of specific gravity of the soil by using pycnometer. (V. lab)
7. Determination of pH and electrical conductivity of soil sample.
8. Determination of moisture content in soil by oven drying method. (V. lab)

Module-III (4Hrs)

Fuel Chemistry-I:

Classification, combustion and chemical principles involved in fuel, calorific value: gross and net calorific values and their determination by bomb calorimeter. Proximate and ultimate analysis of coal and their importance. LPG, Water gas, producer gas, CNG.

9. Determination of calorific value of a fuel sample by using Bomb calorimeter. (V. lab)
10. Analysis of flue gases by Orsat's apparatus.

Module-IV (3Hrs)

Fuel Chemistry-II

Petroleum: its chemical composition and fractional distillation, cracking of heavy oil residues – thermal and catalytic cracking, knocking and chemical structure, octane number, synthesis and applications of bio-fuels, Photovoltaic cell.

11. Synthesis of biodiesel by transesterification process



Module-V(3Hrs)

Corrosion-Mechanisms, Factors affecting Corrosion; Protection from corrosion.

12. Estimation of ferrous ion in the given solution using standard potassium dichromate.

Module-VI (2Hrs)

Electrochemical Phenomenon

Electrochemical cell, Electrode potential, Determination of pH of a solution Using Clomel/ Quinhydrone Electrode.

Module-VII(2Hrs)

Error in Chemical analysis

Types of errors, Accuracy and precision, Absolute and relative uncertainty, mean and standard deviation.

Applied Engineering Material

Code	Course Title	Credit	T-P-PJ
CUTM1009	Applied Engineering Material	3	2-0-1

Objective

- To give an introduction to materials, ceramics, polymers, and electronic materials in the context of a molecular level understanding and their application in various field

Course outcome

- Students will understand the physical/chemical behaviors of materials.
- Students will be able to select materials, based on their properties and behaviors, for a given application.
- Students will understand how molecular interactions to the behavior of material give rise to macroscopic properties.

Course content

Module I: New Materials/Nanomaterials (5hrs)

Nanostructures and Nanomaterials: classification (Dimensionality, Morphology/ shape/structure of nano-entities, New Effect/ Phenomena). Hybrid nanomaterials. Effect of size, structure, mechanism, and property on material performance. Applications of nanomaterials in catalysis, telecommunication and medicine.

Project

Synthesis of TiO₂ and ZnO nanoparticles by Sol Gel ,Sonication and Precipitaion method and study their application .

Module II: Carbon Nanomaterials (5hrs)

Carbon nanomaterials, such as graphene, carbon nanotubes (CNTs), crystalline diamond, and diamond-like carbon , Properties and application of fullerenes,

Project

Synthesis and Fabrication of Graphene and Graphene Oxide by sol-gel techniques

Module III: Polymer (5hrs)

Mechanism of polymerization and synthesis of polymers, Copolymerization, Viscoelasticity. Elastomers-structure, Conducting polymers and applications, Fabrication and moulding of

polymers, Synthesis, properties and uses PMMA, formaldehyde resins, melamine-formaldehyde-urea resins

Project

Preparation of polystyrene by anionic/cationic/emulsion polymerization method

Module IV: Composites (5hrs)

Composites: characteristics, types and applications, Nanocomposites , Polymer/ Metal oxide nanocomposites and its application

Project

Fabrication of Ceramic matrix particulate composite by powder metallurgy route.

Module V: Adhesives Lubricants (4hrs)

Adhesives, adhesive mechanism and applications, Lubricants-physical and chemical properties, types and mechanism of lubrication. Additives of lubricants and freezing points of lubricants

Module VI: Energy Storages material-I (4Hrs)

Fundamental aspects related to energy storage and conversion, lithium ion batteries, Lead acid batteries; Nickel Cadmium batteries; advanced batteries

Module VII: Energy Storages material-II(4Hrs.)

Super capacitors, fuel cells and Photovoltaic, Future of battery technology

Project

Fabrication of Fuel cell and its application

Text Books:

1. A Textbook of Engineering Chemistry, by Shashi Chawla
2. Engineering Chemistry, by P. C Jain and M. Jain
3. Advanced Polymer Chemistry, by M. Chanda

Reference Books:

4. Surfactants and Polymers in Aqueous Solution, by K. Holmberg, B. Jonsson, B. Kronberg and B. Lindman
5. Energy Scenario beyond 2100, by S. Muthukrishna Iyer

Environmental Studies

Code	Course Title	Credit	T-P-PJ
CUTM1010	Environmental Studies	2	0-0-2

Objective

- To introduces the environmental consequences of Industries on the human health and methods for minimizing their impact through technology and legal system to the undergraduate students.

Course outcome

- After learning this course one should be able to control pollution at individual level and also gains an idea about conservation of natural resources and its management.

Course content

Module-I: Fundamentals of Environmental Sciences

Assignment-1: Multidisciplinary nature of Environmental science

Assignment-2: Components of Environment

Assignment-3: scope and importance of environmental science

Module: II Ecology and Ecosystem

Assignment-1: Structure and function of ecosystem

Assignment-2: Types of ecosystem

Assignment-3: Ecological Succession

Module III- Biodiversity and its conservation

Assignment-1: Concepts of Biodiversity

Assignment-2:Biodiversity at local level, global level and National level

Assignment-3: Conservation of Biodiversity

Module IV- Natural resources and its conservation

Assignment-1: Land resources and its conservation



Assignment-2: Forest resources and its conservation

Assignment-3: Water resources and its conservation

Assignment-4: Energy resources and its conservation

Module V Environmental pollutions and its control measure

Assignment-1: Soil pollution

Assignment-2: Water pollution

Assignment-3: Air pollution

Assignment-4: Noise pollution

Module VI Natural Hazards and Disaster management

Assignment-1: Concepts of natural hazards

Assignment-2: Different types of natural hazards: cyclone, earthquake, volcanic eruption etc.

Assignment-3: Process of disaster preparedness and its management

Assignment-4: Solid waste management

Module VII Environmental issues and laws

Assignment-1: Major environmental issues like climate change, global warming, green house effects, Ozone layer depletion, Acid rain

Assignment-2: Water Act, 1974

Assignment-3: Air Act, 1981

Assignment-4: Environmental protection act, 1986

Reference Books:

1. Environmental Studies by U.N. Dash & H. D. Kumar, India Tech Publication, New Delhi
2. Environmental Studies by R. Rajagopalan Oxford University Press
3. Environmental Science and Engineering, 2E, by Aloka Debi, University Press



Centurion University of Technology and Management Odisha

CHOICE BASED CREDIT SYSTEM

COURSE STRUCTURE & SYLLABUS

BASKET - II



Centurion
UNIVERSITY

Shaping Lives...
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School of Engineering & Technology

2020

Course Structure

Basket - II

Course Code	Course Title	Credits	Course Type T+P+PJ
CUTM1011	Optimisation Techniques	2	0-2-0
CUTM1012	Engineering Economics and Costing	3	2-0-1
CUTM1013	Project Management	3	2-0-1
CUTM1014	Gender, Human Rights and Ethics	3	1.5-0-1.5
CUTM1015	Climate Change, Sustainability and Organisation	3	1.5-0-1.5
CUTM1016	Job Readiness	6	0-6-0



Syllabus

Optimization Techniques

Code	Course Title	Credit	T-P-PJ
CUTM1011	Optimization Techniques	2	0-2-0

Course Rationale:

Operations research (OR) have many applications in science, engineering, economics, and industry and thus the ability to solve OR problems are crucial for both researchers and practitioners. Being able to solve the real life problems and obtaining the right solution requires understanding and modelling the problem correctly and applying appropriate optimization tools and skills to solve the mathematical model. The goal of this course is to teach you to formulate, analyse, and solve mathematical models that represent real-world problems. We will also discuss how to use EXCEL for solving optimization problems

Course Objectives:

To learn about the operations research techniques, model formulation and applications used to solve business decisions by using computer software

Course Outcomes: After completion of the course students

LO1. Ability to apply the theory of optimization methods and algorithms to develop and for solving various types of optimization problems

LO2. Ability to go in research by applying optimization techniques in problems of Engineering and Technology

LO3. Ability to solve the mathematical results and numerical techniques of optimization theory to concrete Engineering problems by using computer software

Course contents

Module-I: Linear Programming: Graphical Method, Simplex method, Penalty Method,

Module-II: Transportation Models, Assignment Models, Sequencing



and Scheduling Models by Johnson's Algorithm

References Recommended:

Books

- Harvey M. Wagner, *Principles of Operations Research*, Englewood Cliffs, Prentice-Hall, 1969
- S D Sharma and Himansu Sharma, *Operations Research: Theory, Methods and Applications*, 15 Edition, Kedarnath Ramnath & Co



External Links:

<https://www.informs.org/Resource-Center/INFORMS-Student-Union/Consider-an-Analytics-OR-Career>

<https://www.informs.org/>

https://en.wikipedia.org/wiki/Operations_research

Google and YouTube

Journals:

- International Journal of operations Research
- European Journal of Operations Research
- International Journal of Operations Research and Optimization



Engineering Economics and Costing

Code	Course Title	Credit	T-P-PJ
CUTM1012	Engineering Economics and Costing	3	2-0-1

Course Rationale:

This course aims at providing the student with advanced concepts of engineering economic analysis and its role in engineering decision making.

Course Objectives:

CO1. Facilitate students to understand the basics of Economics and its application in the field of engineering

CO1.Enable students to understand the concepts of the time value of money and techniques for evaluation of engineering project

CO1.Equip students with the skills required to understand cost statements/records of the product and its effect on decision making

Course Outcomes: After completion of the course students

LO1. Apply the microeconomics concepts related to business and its impact on enterprise

LO1.Develop an awareness and understanding time value of money and techniques for evaluation of engineering project

LO1.Apply cost concepts to analyse common business management decisions such as pricing a product and services.

Course contents

Module: I: Engineering Economics – Nature and scope

General concepts on Micro & Macro Economics. The Theory of demand, Demand function, Law of demand and its exceptions, Elasticity of demand, Law of supply and elasticity of supply. Theory of production, Law of variable proportion, Law of returns to scale.

Module-II: Time value of money:

Simple and compound interest, Cash flow diagram, Principle of economic equivalence. Evaluation of engineering projects: Present worth method, Future worth method, Net present value method, internal rate of return method, Cost-benefit analysis in public projects. Depreciation: Meaning Causes, Factors affecting depreciation, Methods of providing depreciation, Straight Line Method & Diminishing Balance Method

Module-III

Cost concepts, Elements of costs, Preparation of cost sheet, Segregation of costs into fixed and variable costs. Break-even analysis (Simple numerical problems to be solved)

Indian Banking System: Banks: Meaning, nature, characteristic of the Indian banking system, functions of commercial banks, functions of Reserve Bank of India, Overview of Indian Financial System.

Books

- Riggs, Bedworth and Randhwa, “Engineering Economics”, McGraw Hill Education India.
- Mithani, D.M., Principles of Economics. Himalaya Publishing House
- Mishra, S. “Engineering Economics & Costing”, PHI
- Sullivan and Wicks, “Engineering Economics”, Pearson
- Paneer Seelvan, R., “Engineering Economics”, PHI
- Gupta, G.S., “Managerial Economics”, TMH
- Lal and Srivastav, “Cost Accounting”, TMH

Links to websites:

- <http://courseware.cutm.ac.in/>

Project Management

Code	Course Title	Credit	T-P-PJ
CUTM1013	Project Management	3	2-0-1

Course Objective:

- The successful development and implementation of all project's procedures.
- Learn project management methodology to initiate and manage projects efficiently and effectively
- Acquire key project management skills and strategies for Productive guidance, efficient communication and supervision of the project's team
- The achievement of the project's main goal within the given constraints

Course outcome:

- Develop a Project Charter document for any project
- Develop Project Management Plan document
- Acquire 10 knowledge area identified by PMI and its application while delivering a projects
- Implement the Project and Prepare a project document that they have undertaken as a learning tool
- Qualify CAPM/PMP certification offered by PMI

Course Content:

Unit: I

Project Management framework; Introduction to Project Management; Project Life Cycle and Organisation, Project vs. Operational work, Stakeholders, Organisational Influences

Project Management Process for a Project, groups, Initiating, planning, executing, monitoring &controlling and closing process groups.

Project management Knowledge area;

Project Integration Management; Develop project charter, develop project management plan, direct and manage project execution, monitor and control project work, perform integrated change control, close project or phase.

Unit: II

Project Scope Management; collect requirements, define scope, create WBS, verify scope, control scope

Project Time Management; Define activities, sequence activities, estimate, develop and schedule

Project Cost Management; Estimate costs, determine budget, control costs

Unit: III

Project Quality Management; Plan quality, perform quality assurance, perform quality control

Project HR Management; Develop HR plan, acquire project team, develop and manage project team

Project Communications Management; Identify stakeholders, plan communication, distribute information, manage expectation of stake holders, report performance

Unit: IV

Project Risk Management; Plan risks; identify risks, perform quality and quantitative risk analysis, plan risk responses, monitor and control risks

Project Procurement Management; Plan procurements, conduct procurements, administer procurements, close procurements

Project Stakeholders Management; Identifying stakeholders, stakeholder analysis, engagement

Note: Students can use any of these software for their project; MS. Excel/ Bitrix 24/Primavera/ Microsoft Projects

Books Recommended:

- 1) Project Management: A Managerial Process, Clifford F Gray & Eric W Larson, Tata McGrawHill
[Text book]
- 2) A Guide to the Project Management Body of Knowledge, 6th Edition, PMI
- 3) Project Management- A system Approach to Planning, Scheduling and Controlling (Harold Kerzner). CBS Publishers and Distributors, New Delhi.
- 4) Projects, Preparation, Appraisal and Implementation (Prasanna Chandra), 3rd Edition, Tata McGraw Hill, New Delhi.
- 5) Project Management (Nagarajan, K), New Age Publishers, New Delhi.
- 6) Project Management. A Managerial Approach (Meredith, R.J and Mantel, S.J), Wiley (India).

Gender, Human Rights and Ethics

Code	Course Title	Credit	T-P-PJ
CUTM1014	Gender, Human Rights and Ethics	3	1.5-0-1.5

Course Objectives

This course is about gender, human rights and ethics in which the student will be sensitized and exposed to related issues in the context of business and organisations in India. The specific objectives are:

- To develop an understanding of gender, human rights and ethics in an unequal society like

India

- Sensitisation of how gender, human rights and ethics are significant in organisations.
- Integrating concerns related to gender, human rights and ethics in organisations.

Course Outcomes

- Understanding the complexity of issues and challenges relating to gender, human rights and ethics
- Be sensitive to gender, human rights and ethics within an organizational context,
- To integrate concerns related to gender, human rights and ethics into the policies, processes and systems in an organization.

Course Syllabus

Module 1

- Difference between sex and gender; social construction of gender and its outcomes in the form of behavior, roles, gender based division of labour, hierarchy; gender relations.
- Gender issues in organisations - significance of relations between structures, practices, context, interactions and power for construction of gender at organisational level
- Gender implications at workplace, management and leadership, Laws and Acts
- Comparing different types of organisations; how to create a gender sensitive organisation.

Module 2

- Introduction to human rights, Meaning and Definition, Types
- Human Rights Law: Protection, violation and the legal framework for their protection - International Human Rights Law, Universal Declaration of Human Rights
- Conflicts of Rights and its Significance to Organisations: Challenges of the past and challenges for the future. Persistence of social discrimination and inequality; efforts in the search for justice for past violations, continued struggle for human rights and accountability in an organisational context.

Module 3

- Introduction to and study of ethics; Indian and Western ethics
- Different ethical systems and perspectives; ethical relativism and its implications, utilitarianism, duty ethics and virtue ethics in organisations
- Critique of various ethical positions and develop their own position in an organizational context.

Session Plan

Session 1

Basic concepts on sex and gender; social construction of gender; constitutional provisions for gender equality.

PPT 1 - Introduction to Gender

1.5 mins video on Gender Equality and Poverty

<https://www.youtube.com/watch?v=4viXOGvvu0Y>

Session 2

Gender issues in different sectors – Health, Education, Governance, Livelihoods

PPT 2 - Gender issues in health

PPT 3 - Gender issues in education

PPT 4 - Gender issues in Governance

1.3 mins video on gender stereotypes and education

<https://www.youtube.com/watch?v=nrZ21nD9I-0>

Session 3

Approaches to address gender inequality – WID, WAD and GAD

PPT 5 - WID WAD GAD



TED talk by Deepa Bhardwaj - True equality is when both women and men have a voice - 13 mins

https://www.youtube.com/watch?v=BSRTZ_q4RX8

Session 4 & 5

Gender and organizational issues

PPT 6 - Gender and Organisations

PPT 7 - Gender Equality in Organisations

PPT 8 - Gender Mainstreaming and Attitude in Workplace

PPT 9 - Gender Sensitisation

3.22 mins on The Future of Gender Equality in Work by ILO

https://www.ilo.org/global/about-the-ilo/multimedia/video/institutional-videos/WCMS_558508/lang--en/index.htm

4.22 mins video on Gender Based Analysis

<https://www.youtube.com/watch?v=p6w-d1mmjFU>

Free Readings

Gender and Development - Concepts and Definitions

Gender and Organisational Change Training

Project

-Gender Responsive Governance in times of COVID 19

<https://in.one.un.org/gender-responsive-governance-in-the-times-of-covid-19/>

- SDG - Gender Equality Goal 5

<https://in.one.un.org/page/sustainable-development-goals/sdg-5/>

- Gender, Sustainability and Environment

Women Environment and Sustainable Development A Ca

- Good Practices of Gender Mainstreaming in India

Good Practices for Gender Mainstreaming

- Gender Equality Case Study

Gender Equality - Kerala Case Study

Session 6

Basic concepts on human rights; history of human rights; current significance

Videos on Basic concepts of human rights

<https://www.youtube.com/watch?v=ew993Wdc0zo>

<https://www.youtube.com/watch?v=JpY9s1Agbsw>

Videos on History of Human Rights

<https://www.youtube.com/watch?v=nDgIVseTkuE>

https://www.youtube.com/watch?v=6XXGF_V8_7M

Session 7

Violation and legal framework for the protection of human rights

Video on the Paris Principles

https://www.youtube.com/watch?v=ZEgD7pdXt_c

Video on Protection of Human Rights Act 1993 (for reference, bilingual)

<https://www.youtube.com/watch?v=qAiiOyL5WAw>

Session 8

Human rights and sustainability framework

Video on Human Rights and Sustainable Development

<https://www.youtube.com/watch?v=mHHy1gDn4x8>

Session 9 & 10

Human rights in the organizational context

Video on Why should your company care about human rights

<https://www.youtube.com/watch?v=mCtNx3hHZ08>

Video on UN Reporting Framework: Salient Human Rights Issues

<https://www.youtube.com/watch?v=LswDupgiZug>

Books:

1. Arihants UGC NET Human Rights and Duties

2. Kapoor, S. K. Central Law Agency's Human Rights under International Law and National Law

Ciapham Andrew, 2015, Human Rights: A Very Short Introduction, Oxford University Press

Smith Rhona, 2015, Textbook on International Human Rights, Oxford University Press

Free Online Sources:

<https://www.humanrightscareers.com/.../10-human-rights-study-books-you-can-download>

<https://www.humanrightscareers.com/courses/>

Session 11

Basic concepts in ethics

PPT - [Introduction to Ethics](#)

Video on Ethics defined

<https://www.youtube.com/watch?v=4vWXpzlL7Mo>

Session 12

Theoretical perspectives – utilitarianism, virtue ethics, duty ethics

PPTs - [Duty Ethics](#)

[Utilitarianism](#)

[Virtue Ethics](#)

Video on Utilitarianism

https://www.youtube.com/watch?v=-FrZl22_79Q

Video on virtue ethics

<https://www.youtube.com/watch?v=NMblKpkKYao>

Video on deontology (duty) ethics

<https://www.youtube.com/watch?v=wWZi-8Wji7M>

Project (self exploration through case studies)

Fraudulent Books_1

Gifts from the Boss's Friend_1

Gifts from the Sales Representative_1

Session 13

Ethical relativism

PPT - Ethical Relativism

Video on Moral relativism

<https://www.youtube.com/watch?v=5RU7M6JSVtk>

Project (self-exploration through case studies)

Mining Data docx_1

Office Affair_2

On-time Delivery

Session 14 & 15

Ethics in organisations

Video on ethics in the workplace

<https://www.youtube.com/watch?v=0mUxMpMTT28>

Project (self-exploration through case studies)

Falsifying Attendance_1

Family Loyalty vs. Meritocracy_1

Rumors_1

The Supervisor's Choice_1

Books

Frankena, WK, 1973, Ethics (2nd Edition), Pearson.

Singer, P. 2011, Practical Ethics (3rd ed), Cambridge University Press.

Smart, JJC and Williams, B. 1973, Utilitarianism: For and Against, Cambridge University Press.

Climate Change, Sustainability and Organisations

Code	Course Title	Credit	T-P-PJ
CUTM1015	Climate Change, Sustainability and Organisations	3	1.5-0-1.5

Course Rationale:

This course is about climate change, sustainability and its implications for organisations. Climate change and sustainability are closely interlinked. Students will be exposed to related issues, challenges and debates on the subjects. They will develop an understanding of how organizational performance gets affected by climate change today. As organisations grow and diversify in India, there is a need to sensitise Management students to the significance of climate change and its impact on humanity and environment; Sustainable Development Goals (SDGs) and integrated reporting framework for sustainability of organisations.

Module 1: Climate Change and Organisations

Course Objectives:

- CO1. To develop an understanding about climate change in general, responses and debates
- CO2. To create awareness about the impact of climate change on organisations in performance, growth and sustainability
- CO3. To facilitate in developing reference points to factor in aspects of climate change in organizational planning and development

Course Outcomes:

- LO1. Students will be exposed to current climate change issues, challenges and debates
- LO2. They will be sensitive to its implications for organisations in different sectors
- LO3. The course will equip the students of Management to develop strategies for perspective planning of organisations

Course Contents:

1. Basics of climate change; impacts on various sectors; responses and mitigation efforts by the state and non-state agencies; debates and critiques
2. Sectoral implications of climate change – Agriculture and Forestry; Transportation; Buildings; Energy; Industry and Manufacturing
3. Climate change – specific impacts (Migration, Disasters and Pandemics)

4. Mitigation and adaptation keeping the sustainability of business organisations

Projects: Case study, videos, small group workshops, book reviews

Session Plan for Module 1 – Climate Change and Organisations (10 one hour sessions)

Session 1: Basic concepts of climate change, impacts, issues and challenges

Session 2: Responses and mitigation efforts by state and non-state agencies

Session 3: Debates and critiques on climate change

Session 4: Climate change and ecosystem

Session 5: Climate change and social sector – health, education and livelihood/food security

Session 6: Climate change and infrastructure and services – buildings, transportation, communication, electricity/energy

Session 7: Mitigation and adaptation of climate change impacts on business organisations

Session 8 and 9: Climate change impacts of migration, disasters and pandemics – societal and organisational implication

Session 10: Develop reference points to factor into perspective planning and development of organisations

Module 2 – Sustainability in Organisations

Course Objectives:

CO1. To develop an understanding of sustainable development, SDGs and their relevance for sustainability of organisations

CO2. To comprehend the application of the Integrated Reporting Framework for Sustainability in business.

Course Outcomes:

- LO1. The student will develop an understanding of perspectives on SDGs, sustainability and development in the context of organisations
- LO2. Argue the business case for sustainability informed by an understanding of the impact of current global and local economic, social and environmental pressures (including pandemics)
- LO3. Develop an Action Plan through a Case Study for integrating sustainability across an organisation's value chain
- LO4. Develop and apply the Integrated Reporting Framework for Sustainability through a case.

Course Contents:

1. Sustainable development, debates, SDGs, challenges and opportunities; The business case and leadership for action
2. Regulatory environment and International policy; Integrated Reporting Framework for Sustainability
3. Production and consumption; Design, technology, and planning for sustainability
4. Communication and marketing; Collaboration and partnerships

Projects: Small group exercises, case analysis, video and book reviews

Session Plan for Module 2 – Sustainability in Organisations (10 one hour sessions)

Session 1: Sustainable development basics and introduction to SDGs (rationale, issues and challenges for India)

Session 2 to 6: Discussion on the 17 SDGs

Session 7: SDGs and its relevance for organisations

Session 8 to 10: Integrated framework for reporting sustainability in organisations; factoring aspects of SD into performance of organisations

The 17 sustainable development goals (SDGs) to transform our world:

GOAL 1: No Poverty

GOAL 2: Zero Hunger

GOAL 3: Good Health and Well-being

GOAL 4: Quality Education

GOAL 5: Gender Equality

GOAL 6: Clean Water and Sanitation

GOAL 7: Affordable and Clean Energy

GOAL 8: Decent Work and Economic Growth

GOAL 9: Industry, Innovation and Infrastructure

GOAL 10: Reduced Inequality

GOAL 11: Sustainable Cities and Communities

GOAL 12: Responsible Consumption and Production

GOAL 13: Climate Action

GOAL 14: Life Below Water

GOAL 15: Life on Land

GOAL 16: Peace and Justice Strong Institutions

GOAL 17: Partnerships to achieve the Goal

Videos – Climate Change

1. CSE Climate Change Analysis - <https://www.youtube.com/watch?v=5fyT3-9kxU4> (7.5 mins)
2. Climate Change is having Massive Impact on Indian Farmers - <https://www.youtube.com/watch?v=A8gcGaIzqIw> (8.5 mins)
3. Climate Change in India: The Risks we face (NDTV) - <https://www.youtube.com/watch?v=AT1yi1tDenM> (20.28 mins)

Videos – Sustainable Development

1. Short Videos (5) on Sustainable Development Goals and one TED Talk <https://developmenteducation.ie/blog/2017/09/5-videos-sustainable-development-goals-worth-view-useful-ted-talk/>



2. Overview of Sustainable Development Goals - <https://www.youtube.com/watch?v=s190sjqYRdg> (7.43 mins)

Projects:

1. Climate change impacts on agriculture and policy responses – what is the current practice and its implications for the sector and people; give your own recommendations based on your understanding of issues, challenges, debates, critiques.
2. Marine fishing – fisherfolk
3. Forest dwellers
4. Business organisations – MSMEs, manufacturing, service industries; application of the integrated framework for sustainability reporting

Job

Readiness

Code	Course Title	Credit	T-P-PJ
CUTM1016	Job Readiness	6	0-6-0

Course Objectives

Develop additional skills (verbal, logical, quantitative and reasoning) required to enhance employability as well as the entrepreneurial ability of the students

Course Outcomes

Achieve the following scores as a minimum:

IELTS 6.5

Verbal: 60% (average of 10 exams)

Quantitative: 60% (average of 10 exams)

Logical Reasoning: 60% (average of 10 exams)



Note: A student will be awarded the credits and grades as outlined in the attached presentation:
<https://drive.google.com/file/d/1Wst-jdAJuHHvtYC4F-p3SKuw1PHWOI1U/view?usp=sharing>

Course Syllabus

Course Division

Course I: IELTS - Reading, Listening, Speaking and Writing

Course II: IELTS Verbal

Course III: Quantitative Aptitude

Course IV: Logical Reasoning

Course I: IELTS - Reading, Listening, Speaking and Writing

Module I: IELTS Reading (18hrs)

- Skimming and Scanning
- Sentence Completion
- Choose the Correct options (A, B, C, D)
- Locating the Specific Information
- Assessment on Reading Skill

Module II: IELTS Listening (6hrs)

- Notes/ Form/Table completion
- Label the Map/Passage, Multiple Choice Questions
- Complete the Sentences, Listening to Find Information
- Assessment on Listening Skills

Module III: IELTS Speaking (18hrs)

- Speaking about yourself, your family, your work and your interests
- Introduction & Interview
- Topic Discussion (e.g, Environment, Covid 19, Job)
- Assessment on Speaking Skills

Module IV: IELTS Writing (6 hrs)

- Summarising the chart, table or graph
- Comparing and contrasting graphs and tables

- Describing maps & diagrams
- Agreeing & disagreeing
- Expressing a personal view & opinion
- Assessment on Writing Skill
- CV Writing (2nd year)
- Letter Writing
- Email Writing(2nd year)
- Getting Started –writing an introduction

Course II: IELTS Verbal

Module I: Grammar (4 Hrs)

- Articles
- Prepositions
- Subject-Verb
- Spotting Errors
- Sentence Correction

Module II: Vocabulary (5 Hrs)

- Synonyms
- Antonyms
- Contextual Vocabulary

Module III: Reading Comprehension (3 Hrs)

- Paragraph/ Sentence Completion
- Jumbled Sentences/ Jumbled Paragraph
- Reading Comprehension

Module IV: Verbal Analogies (3 Hrs)

Course III: Quantitative Aptitude

Module I: Number System & Operation (14 Hrs)

- Speed Math-1 : Multiplication tricks, Square, cube, square root, Cube root tricks

- Speed Math-2 : Speed Calculations
- Number System-01 : Operation on Numbers, Classification of Numbers, Tests of Divisibility, Unit Digit Calculation
- Number System-02 : Arithmetic Progression, Geometric Progression, Factors & Factorials, Trailing Zeroes, Remainder Theorem
- HCF & LCM : Concepts, short tricks, question discussion
- Average : Concepts, short tricks, question discussion
- Assessments

Module II: Basic Arithmetic (16 Hrs)

- Percentage-01 : Basics of Percentage, Effective percentage, shortcuts
- Percentage-02 : Advanced questions and discussions
- Profit & Loss-01 : Basics and advanced questions of Profit & Loss and shortcuts
- Profit & Loss-02 : MRP, Discount, Successive discount
- Ratio & Proportion : Types of ratios, Basics & Advanced Question
- Age : Concepts & Shortcuts
- Partnership : Concepts & Shortcuts
- Mixture & Alligation : Rule of Alligation, Basics & Advanced question, Short tricks
- Assessments

Module III: Time & Analysis (17 Hrs)

- Time, Speed, Distance : Concepts, Problems based on relations, Average speed, Stoppage time
- Trains : Relative Speed & All types of train problems
- Boats & Streams : Basics, Upstream, Downstream & Shortcuts
- Race : All concepts & Shortcuts
- Time & Work : Efficiency, wages, alternative day, chain rule
- Pipes & Cistern : Positive & Negative work
- Simple Interest : Concepts & Shortcuts on Simple Interest & Installments

- Compound Interest : Concepts & Shortcuts on Simple Interest & Installments
- Logarithm : All Formulae, concepts & Shortcuts
- Assessments

Module IV: Advanced Arithmetic (16 Hrs)

- Equation : Linear & Quadratic
- Permutation : All concepts & Shortcuts on factorial, fundamental principles of counting
- Combination : All concepts & Shortcuts on Selection (Groups/teams)
- Probability : Terms related to Probability, Event, Theorems related Probability, Conditional Probability. Shortcuts on coins, dices, balls, cards, etc
- Data Interpretation : (Bar/Pi-Chart /Line) graph
- Mensuration : Area & Volume
- Height & Distance : Lines of Sight, Horizontal line, Angle of Elevation, Angle of Depression
- Assessments

Course IV: Logical Reasoning

Module I: Verbal Reasoning-I (14 Hrs)

- Series-1 : Number series (Missing & Wrong)
- Series-2 : Letter, Alpha numeric, Miscellaneous series
- Coding & Decoding : Letter Coding, Number coding, Message coding, Substitution coding, Conditional coding
- Word Problem : Analogy, Odd man out, word formation, letter pair
- Logical Thinking : Brain Riddles
- Assessments

Module II : Verbal Reasoning-II (14 Hrs)

- Order & Ranking : Ranking & Sequence
- Direction Sense Test : Shortest Distance, Angular movement concept and Dusk & Dawn
- Clock : Concepts of Angle, Reflex angle, Right angle Opposite, Coincide and Incorrect clock
- Calendar : All concepts & Shortcuts
- Blood Relation : Jumbled-up descriptions, coded relations, Relation Puzzles
- Assessments

Module III : Non Verbal Reasoning (14 Hrs)

- Cubes & Dices
- Cubes & Cuboids
- Embedded Figure & Figure series
- Figure Puzzle & Figure grouping
- Figure Counting
- Mirror & Water Image
- Paper Cutting & Paper folding
- Assessments

Module IV: Advanced Reasoning (16 Hrs)

- Sitting Arrangement : Circular, Square, Rectangular, Linear, Triangular
- Puzzle : Box, Floor, Month, Day
- Advanced Puzzle : 3 variable
- Logical Venn Diagram
- Syllogism
- Statement & Conclusion
- Data Sufficiency
- Assessments



Centurion University of Technology and Management Odisha

CHOICE BASED CREDIT SYSTEM

COURSE STRUCTURE & SYLLABUS

BASKET - III



Centurion
UNIVERSITY

Shaping Lives...
Empowering Communities...

School of Engineering & Technology

2020

**Course Structure
Basket - III**

Course Code	Course Title	Credits	Course Type T+P+PJ
CUTM1017	Industrial IOT and Automation	6	3-2-1
CUTM1018	Data Analysis and Visualisation using Python	4	0-1-3
CUTM1019	Machine Learning using Python	4	1-2-1
CUTM1020	Robotic automation with ROS and C++	4	1-2-1
CUTM1021	Basics of Design Thinking	2	0-0-2
CUTM1022	System Integration with DYMOLA	2	0-0-2
CUTM1023	Smart Engineering Project (G2M)	3	0-0-3

Industrial IoT and Automation

Code	Course Title	Credit	T-P-PJ
CUTM1017	Industrial IoT and Automation	6	3-2-1

Objective

- Students will learn the new evolution in hardware, software, and data.
- While the promise of the Industrial Internet of Things (IIoT) brings many new business prospects, it also presents significant challenges ranging from technology architectural choices to security concerns.
- Students acquire upcoming Industrial Internet of Things: Roadmap to the Connected World Course offers important insights on how to overcome these challenges and thrive in this exciting space.

Course outcome

- Discover key IIoT concepts including identification, sensors, localization, wireless protocols, data storage and security
- Explore IoT technologies, architectures, standards, and regulation
- Realize the value created by collecting, communicating, coordinating, and leveraging the data from connected devices
- Examine technological developments that will likely shape the industrial landscape in the future
- Understand how to develop and implement own IoT technologies, solutions, and applications
- At the end of the program, students will be able to understand how to develop and implement their own IoT technologies, solutions, and applications.

Course content

MODULE 1: Introduction & Architecture

Theory

What is IIoT and connected world? The difference between IoT and IIoT, Architecture of IIoT, IOT node.

Challenges of IIOT

Hands-On

1. Introduction to Arduino, ES8266, Introduction to raspberry Pi.

MODULE2: IIOT Components

Theory:

Fundamentals of Control System, introductions, components, closed loop & open loop system.

Introduction to Sensors (Description and Working principle): What is sensor? Types of sensors, working principle of basic

Sensors -Ultrasonic Sensor, IR sensor, MQ2, Temperature and Humidity Sensors (DHT-11).Digital switch, Electro

Mechanical switches.

Practice:

2. Measurement of temperature & pressure values of the process using raspberry pi/node mcu.
3. Modules and Sensors Interfacing (IR sensor, ultrasonic sensors ,Soil moisture sensor) using raspberry pi/node mcu.
4. Modules and Actuators Interfacing (Relay, Motor, Buzzer) using raspberry pi/node mcu.

MODULE 3: Communication Technologies of IIoT

Theory:

Communication Protocols: IEEE 802.15.4, ZigBee, Z Wave, Bluetooth, BLE, NFC, RFID

Industry standards communication technology (LoRAWAN, OPC UA, MQTT), connecting into existing Modbus and Profibus

Technology, wireless network communication.

Practice:

5. Demonstration of MQTT communication
6. Demonstration of LoRa communication.

MODULE 4: Visualization and Data Types of IIoT

Theory:

Front end EDGE devices, enterprise data for IIoT, emerging descriptive data standards for IIoT, cloud data base, cloud

Computing, fog or edge computing,

Connecting an Arduino /raspberry pi to the Web: Introduction, setting up the Arduino/raspberry pi development

Environment, Options for Internet connectivity with Arduino, configuring your Arduino/raspberry pi board for the IoT.

Practice:

7. Visualization of diverse sensor data using dashboard (part of IoT's 'control panel')
8. Sending alert message to the user.

MODULE 5:

Theory

Extraction from Web: Grabbing the content from a web page, Sending data on the web, troubleshooting basic Arduino issues, types of IoT interaction , Machine to Machine interaction (M2M).

Practice

9. Device control using mobile Apps or through Web pages.
10. Machine to Machine communication

MODULE 6: Control & Supervisory Level of Automation

Theory

Programmable logic controller (PLC), real-time control system, Supervisory Control & Data Acquisition (SCADA).

HMI in an automation process, ERP &MES

Practice

11. Digital logic gates programming using ladder diagram
12. Implementation of Boolean expression using ladder diagram
13. Simulation of PLC to understand the process control concept.

Module 7: Application of IIOT

Case study: Health monitoring, Iot smart city, Smart irrigation, Robot surveillance

Text Books:

1. Industrial IoT Challenges, Design Principles, Applications, and Security by Ismail Butun (editor)
2. Internet of Things with Arduino Cookbook, Marco Schwartz, ISBN 978-1-78528-658-2

Reference Books:

1. The Internet of Things in the Industrial Sector, Mahmood, Zaigham (Ed.) (Springer Publication)
2. Industrial Internet of Things: Cybermanufacturing System, Sabina Jeschke, Christian Brecher, Houbing Song, Danda B. Rawat (Springer Publication)
3. Internet of Things- A Hands on Approach, Arshdeep Bahga and Vijay Madiseti , Universities Press , 2015.



Data Analysis and Visualization Using Python

Code	Course Title	Credit	T-P-PJ
CUTM1018	Data Analysis and Visualisation Using Python	4	0-1-3

Objective

- How to tell a story from data
- How to marshal the data for storyline
- The ability to develop visualisation to tell the story
- The focus is on analysis of data using visualisation as a tool

Course outcome

- To create impactful visualization with good story line.

Course content

Module-I

STORY BOARD DEVELOPMENT

The objective and flow of the story to be understood through cases

Module-II

DATA READING USING PYTHON FUNCTIONS

Python libraries: Pandas, NumPy, Plotly, Matplotlib, Seaborn, Dash

Data collection from online data sources, Web scrap, and data formats such as HTML, CSV, MS

Excel, data compilation, arranging and reading data, data munging

Module-III

DATA VISUALISATION USING PYTHON LIBRARIES



Different graphs such as Scatterplot, Line chart, Histogram, Bar chart, Bubble chart, Heatmaps etc.

Dashboard Basics – Layout, Reporting, Infographics, Interactive components, live updating

Projects List

1. COVID 19
2. World Development Indicators
3. ERP dashboarding
4. Details of Social/ Empowerment schemes of Govt. etc.

References:

<https://www.programmer-books.com/wp-content/uploads/2019/04/Python-for-Data-Analysis-2nd-Edition.pdf>

<https://towardsdatascience.com/data-visualization/home>

Reading materials and videos available on internet on how to use ANACONDA, JUPYTER NOTEBOOK and Python Libraries

Machine Learning using Python

Code	Course Title	Credit	T-P-PJ
CUTM1019	Machine Learning using Python	4	1-2-1

Objective

- Understand the meaning, purpose, scope, stages, applications, and effects of ML.
- Explore important packages of python, such as numpy, scipy, OpenCV and scikit-learn.

Course outcome

- Students will able to Create and incorporate ML solutions in their respective fields of study.

Course content

Module 1 – Application and Environmental-setup (12 hrs)

- Applications of Machine Learning In different fields (Medical science, Agriculture, Automobile, mining and many more).
- Supervised vs Unsupervised Learning based on problem Definition.

- Understanding the problem and its possible solutions using IRIS datasets.
- Python libraries suitable for Machine Learning(numpy, scipy, scikit-learn, opencv)
- Environmental setup and Installation of important libraries.

Module 2 - Regression (8 hrs)

- Linear Regression
- Non-linear Regression
- Model Evaluation in Regression
- Evaluation Metrics in Regression Models
- Multiple Linear Regression
- Feature Reduction using PCA
- Implementation of regression model on IRIS datasets.

Module 3 - Classification (24 hrs)

- Defining Classification Problem with IRIS datasets.
- Mathematical formulation of K-Nearest Neighbour Algorithm for binary classification.
- Implementation of K-Nearest Neighbour Algorithm using sci-kit learn.
- Classification using Decision tree.
- Construction of decision trees based on entropy.
- Implementation of Decision Trees for Iris datasets .
- Classification using Support Vector Machines.
- SVM for Binary classification
- Regulating different functional parameters of SVM using sci-kit learn.
- SVM for multi class classification.
- Implementation of SVM using Iris datasets .
- Implementation of Model Evaluation Metrics using sci-kit learn and IRIS datasets.

Module 4 - Unsupervised Learning (12 hrs)

- Defining clustering and its application in ML .
- Mathematical formulation of K-Means Clustering.
- Defining K value and its importance in K-Means Clustering.
- Finding appropriate K value using elbow technique for a particular problem.
- Implementation of K-Means clustering for IRIS datasets

Projects

- To be defined based on respective study area of student.

References:

Text Book:

1. EthemAlpaydin, Introduction to Machine Learning, Second Edition,
<http://mitpress.mit.edu/catalog/item/default.asp?ttype=2&tid=12012>.

Web Resource:

1. <https://towardsdatascience.com/beginners-guide-to-machine-learning-with-python-b9ff35bc9c51>

Robotic automation with ROS and C++

Code	Course Title	Credit	T-P-PJ
CUTM1020	Robotic automation with ROS and C++	4	1-2-1

Course Content:

1. Robotic Automation Introduction
2. Sensors & Controllers
3. Sequential robot control
4. ROS & C++
5. Project

Course Objectives

- To upgrade knowledge levels of robotic application in modern industries
- Project based training

Course Outcomes

- Advanced knowledge on robotic automation
- Understand different types of devices to which robotic modules are connected
- Provide the knowledge about understand various types of robotic applications.
- Industry based project & advanced learning.

Course Syllabus

Module – 1

Robotic Automation Introduction

- 1.1 Basic's of automation
- 1.2 Use of robots in industry.

Module - 2

Sensor's requirement in robots.

- 2.1 Selecting sensors as per the project.
- 2.2 Specification checking of sensors.
- 2.3 Interfacing of sensor to controllers.

Practice

- P2.1 TILT, PROXIMITY, TEMPERATURE, HUMIDITY, SMOKE, FINGERPRINT
- P2.2 BLUETOOTH, ESP8266, GPS, GSM

Module - 3

Controllers and output port handling.

- 3.1 Concept of 8951 controller
- 3.2 Concept of Arduino and concept of Raspberry Pi.

Practice

- P3.1 Port handling of 8951
- P3.2 Port handling of Arduino
- P3.3 Port handling of Raspberry Pi

Module- 4

Sequential robot control

- 4.1 Designing of sequential robot control system.
- 4.2 Writing of programs in different programming languages.
- 4.3 Controlling of input/output devices.

Practice

P4.1 Programming of controllers with different programming languages

P4.2 Designing of sequential control robot.

Module- 5

ROS & C++

5.1 What is Ubuntu & ROS?

5.2 Requirement and application of ROS.

5.3 ROS based simulation of Turtlbot.

5.4 Adding of robot with wheel & sensor. Placing robot inside Gazebo.

Practice:

P5.1 Ubuntu basic command.

P5.2 Installation of Ubuntu, ROS & Gazebo

P5.3 Turtlbot control application

P5.4 Gazebo based robot control and simulation.

P5.5 Python and C++ based programming to control robot.

Virtual LAB : Using ROBOMASTER (AWS)

Projects

1. Mobile controlled robot
2. Autonomous operated robot.
3. Location targeted robot

Basics of Design Thinking

Code	Course Title	Credit	T-P-PJ
CUTM1021	Basics of Design Thinking	2	0-0-2

Course Rationale:

Steve Jobs famously said “Design is just not what it looks or feels like. Design it how it works”. Design Thinking is described as a discipline where designer’s sensibility and methods match with the needs of users. It draws on logic, imagination, intuition and systemic reasoning to explore the possibilities of a solution to a challenge and to create desired outcomes that benefit the end user. So, if you are among the one who is constantly thinking of solving a problem of business or society, it is ideal for you. This course will help you with the basics of design thinking and through an action centric learning approach, lead to creatively explore the challenges and by using the design thinking tool propose innovative solutions.

Course Objectives: The course aims to

- To orient the participants with the basics of the design thinking process
- To familiarize participants with the elements of Design thinking

Course Outcome: After completion of the course the students

- will be able to apply the design thinking process to innovative problem solving

Course contents:

Module: I

Basics of Design Thinking, Why Design Thinking, Design Thinking Mindset (Inspiration, Ideation and Implementation) Design thinking process, (Empathy, Define, Ideate, Prototype, Test). Cases of application of Design thinking approach (Intuit, IDEO, Infosys, IBM, Google, Apple, Jubilant Foods)

Module: II

Executing a Design Thinking Project- Apply Interviewing and empathy building technique, Drawing inferences from the observations, Defining a point of view, Ideation process, developing and testing prototypes and writing a story of a minimum viable solution.



Projects-

- Develop a customer friendly insulin pump design
- Develop a new customer experience for buying a diamond ring online
- Develop a new disease monitoring device for health workers working in remote areas.
- Designing an integrated machinery for end to end farm activities for small and marginal farmers.
- Design a Fund raising campaign

Recommended References:

Books: Tom Kelly & Jonathan Littman (2001). “The Art of Innovation” Broadway Publication.

System Integration with DYMOLA

Code	Course Title	Credit	T-P-PJ
CUTM1022	System Integration with DYMOLA	2	0-0-2

Course Objectives

- To provide powerful multi-disciplinary systems engineering through compatible model libraries for a large number of engineering domains.
- To design high-fidelity modeling of complex integrated systems.
- To design intuitive modeling i.e. advanced, formally defined object-oriented modeling language.
- To enable users to easily build their own components or adapt existing ones to match their unique needs.
- To provide hardware-in-the-loop simulations (HILS) i.e. real-time simulation with AurdinoUno, Python, Matlab, 3D real-time animation, CAD files import capability.
- To increase the ability to integrate with complex 3D geometry for integrated simulation.
- To increase powerful model management, calibration & optimization capabilities.

Course Outcomes

- The use of open standards such as DYMOLA (Modelica and FMI) is a key enabler to better understand the behavior of systems and to work and communicate accurately with partners and suppliers.
- DYMOLA is not only capable to support an ad-hoc modeling level, such as functional behavior or detailed design, but is also able to convert these predictive models into real-time models.
- The user can able to create new elements in an easy and intuitive way, to answer to its own modeling requirements.
- Future Centurions are ready for operating in many industries including automotive, aerospace, architecture, Motorsport, energy, and high tech.

Course Syllabus

Module 1 - Introduction Dymola and Modelica library

Package Browser, Component Browser, Parameter and Variable Editor Simulation Window, Modeling, and Simulation.

The Modeling window is used to compose models and model components.

The Simulation experiment on the model, plot results and animate the behavior.

Creating user-defined models and scripting using Modelica language.

Role Play – Explore the pre-defined libraries and Models, Creating a Package

Practice Project - Preparation of animated projects

<https://www.youtube.com/watch?v=39xyI0k>

<https://www.youtube.com/watch?v=FN8LlnTwzVE&t=314s>

Module 2 – Physical Modeling using DYMOLA

Import of user-defined libraries and packages, interfacing with physical models using ArduinoUno.

The Simulation experiment on the model using multi-domain libraries such as mechanical, electrical, control, thermal, pneumatic, hydraulic, powertrain, thermodynamics, vehicle dynamics, air-conditioning domains

Dymola interface that is stored in the Python package

Role Play – Explore the pre-defined libraries and Models, Creating a Package

Practice Project - Preparation of projects using user-defined packages,

Systems Physics with Modelica/Dymola

<https://www.youtube.com/watch?v=xlpHwX-W3Ns>

Module 3 – Animation and 3D view Using DYMOLA

MultiBody Frame Connector, Building a Mechanical Model, Concept of Furuta

Role Play - Practical session by students for students

Practice Project - Modeling of animated projects using the MultiBody library.

<https://www.youtube.com/watch?v=c9Ar2b4X5rQ>

<https://www.youtube.com/watch?v=k7ILBASaEJg>

Session Plan

Session 1

Project 1

Simulating a model – Modeling of Integrated circuits

Description: Use of Electrical and Electronics components.

Workbench Use: Behavior Modelling, Functional and Logical Design.

Session 2

Project 2

Simulating a model -Creating a model for Electric DC Motor

Description: Design a DC Motor Model, Test, and Simulation, Creating a library for components, Creating a model for motor drive, Scripting.

Workbench Use: Behavior Modelling, Modelica Standard Library.

Session 3

Project 3

Simulating a model -Simple Pendulum with Frictionless joint Using Multi-Body Library

Description: Design the Simple pendulum and the Furuta joint using Dymola and Modelica language. Friction joint for the Mechanical equipment.

Workbench Use: Behavior Modelling.

Session 4

Project 4

Simulating a model – Pick and Place Robot

Description: 5 Axis Pick and Place Robot Design, Validation, and Optimization in the 3DS platform.

Workbench Use: Behavior Modelling, Functional and Logical Design. Part design and Assembly Design.

<https://www.youtube.com/watch?v=9RgdZUvEjPw>

Session 5

Project 5

Simulating a model – 3D Printer Design

Description: Design All System and Sub System of the 3D Printer, Validation and Simulation using 3Ds Platform.

Workbench Use: Behavior Modelling, Functional and Logical Design. Part design and Assembly Design.

Session 6

Project 6

Simulating a model – Bicycle Behavior Modeling

Description: Design Power Train, Driving Cycle, part design, and Simulation.

Workbench Use: Behavior Modelling, Functional and Logical Design. Part design and Assembly Design.

Session 7

Project 7

Simulating a model – Refrigerator Compartment Door Design using Thermal Library

Description: This component model the airflow through the door of a refrigerator or freezer compartment.

Workbench Use: Behavior Modelling, Functional and Logical Design. Part design and Assembly Design.

Session 8

Project 8

Simulating a Model – Engine Analytic Using MultBody Library.

Description: Engine analytic, an engine with 6 cylinders, 6 planar loops, 1 degree of freedom, and analytic handling of kinematic loops.

Workbench Use: Behavior Modeling.

Session 9

Project 9

Simulating a model – Control the real and Digital servo motor ArduinoUno Library

Description: Control the Real and Digital Servo motor with simulation.

Workbench Use: Behavior Modelling, Arduino based System Design, and Functional and logical design.

Session 10

Project 10

Simulating a model – Virtual Universes with Poppy Humanoid Using ArduinoUno Library

Description: Virtual universes with a human assistant robot with simulation.

Workbench Use: Behavior Modelling, Arduino based System Design, Functional, and logical design.

Session 11

Project 11

Simulating a model – Implementation of Model using Python Library

Description: Modeling using python library, validation and optimization in the 3Ds platform.

Workbench Use: Behavior Modelling, Functional and Logical Design. Part design and Assembly Design.

Session 12

Project 12

Simulating a model – Industrial Robot Design

Description: 6 Axis industrial robot design, validation, and optimization in the 3Ds platform.

Workbench Use: Behavior Modelling, Functional and Logical Design. Part design and Assembly Design.

Session 13

Project 13

simulating a model – Temperature Control System Using State Graph

Description: The model contains an electric circuit with a heating resistor and a switch.

Workbench Use: Behavior Modelling.

<https://www.youtube.com/watch?v=zz-crJOG0&t=26s>

<https://www.youtube.com/watch?v=ZI592ARjnpU>

Session 14

Project 14

Simulating a model – Magnetic Ball System using Magnetic Library

Description: The electronic circuit consists of a voltage source, a resistor, and an inductor in the form of a tightly wound coil. An iron ball beneath the inductor experiences a gravitational force as well as an induced magnetic force (from the inductor) that opposes the gravitational force.

Workbench Use: Behavior Modelling.

Session 15

Project 15

Simulating a Model – Design of Water to Steam Converter Using Fluid Library

Description: Create a package under Fluid_Package called Water_To_Steam using temperature sensors.

Workbench Use: Behavior Modelling.

Session 16

Project 16

Simulating a Model – Design of Liquid Valve Control Using Fluid Library

Description: Building a simple circuit with two valves and a volume block.

Workbench Use: Behavior Modelling.

https://www.youtube.com/watch?v=P_YI3RiTI14

Basket IV Core Courses Syllabus

Computer Aided Drafting

Code	Course Title	Credit	T-P-PJ
CUTM1075	Computer Aided Drafting	3	0-2-1

Objective

- How to create simple parts, assemblies and drawings.
- How to use different feature-based tools to build, review and modify a model.
- How to create and analyze assemblies and how to produce a drawing with different views.
- How to dimension the drawing and annotate the views.

Course outcomes

- Students will be able to use CATIA for creation of 3D models, Assembly Designs and Drawings

Course content

Module I: Sketcher - Creating Profiles 2 (hrs)

PLM Objects, Sketch Support, Simple elements, constraining sketches, simple and complex profiles, transforming sketches, saving documents

Practice-1 : Hands on Session on Sketcher Workbench

Module II: Part Design -Creating Basic Features 5 (hrs)

Extruded Features, revolved features, holes, threads, taps, drafts, fillets, chamfers, shelling and stiffeners, relational dimensions,

Practice-2 : Hands on Session on Sketch Based Features & Dress Up Features

Practice-3: Hands on Session on Transformation Features

Module III: Reviewing & Modifying 2 (hrs)

Measuring the model, re using the data, editing features

Practice-4: Hands on Session on Measuring Tools & Editing Features

Module IV: Finalizing Design 5 (hrs)

Adding parameters, reusing features, rendering, weight calculation,



Practice-5: Hands on Session on Parametric Design

Practice-6: Hands on Session on Rendering, Material Addition

Module V: Creating & Managing Products **6 (hrs)**

Positioning Components, constraining Components, Analyzing weight distribution, replacing and revising parts

Practice-7: Hands on Session on Assembly Design

Practice-8 : Hands on Session on Digital Mock Up

Module VI: Creating Drawings **4 (hrs)**

Creating Drawing, Modifying, dimensioning, Annotations, Finalizing & Printing

Practice-9: Hands on Session on Drawing Conventions

Practice-10: Hands on Session on Creating Drawings

Module VII: Master Exercise **(5 hrs)**

Heat Sink , PC Card Slide

Practice-11: Modeling of Heat Sink

Practice-12: Modeling and Assembly of PC card Slide

Text Books:

3. Mechanical Design Fundamentals : Dassault Systemes Companion Learning Space Material

Reference Books:

Note: 1 credit theory=10 hrs lecture, 1 credit practice/project=12.5 hrs lab/workshop/field work in a semester

Product Design & Development

Code	Course Title	Credit	T-P-PJ
CUTM1076	Product Design & Development	2	1-1-0

Objective

- Understand modern product development processes.
- Understand and explain the concept of Industrial design and robust design concepts.
- Understand the concept of Design for manufacture and assembly.
- Understand the legal factors, social issues, engineering ethics related to product design

Course outcomes

- Prepare primary designs taking into consideration all relevant ergonomics and aesthetic aspects of the product.

Course content

Module I: Introduction

2 (hrs)

Introduction to product design, Morphology of design, Modern product development process, Innovative thinking

Module II: Conceptual

3 (hrs)

Generation, Selection and embodiment of concept, Product Architecture

Practice 1: Concept Design using 3D Experience Platform

Module III: Industrial

5 (hrs)

Process and need, Robust design concepts: Taguchi Design and DOE, case studies on various robust design concepts

Practice 2: Failure Analysis through Simulia - Structural Analysis,

Practice 3: Thermal Analysis using Simulia

Module IV:

3 (hrs)

Optimization Optimization using 3D Experience- Function Generative Design

Practice 4: Shape Optimization using 3D Experience

Module V: Design for Manufacturing & Assembly 3 (hrs)

Methods, Design for Maintainability, Designs for Environment, Product costing

Practice 5: Assembly Design Review using 3D Experience

Module VI: Value Engineering & Analysis 3 (hrs)

Definition, Methodology & Case Studies, Economic analysis: Qualitative & Quantitative

Module VII: Ergonomics & Aesthetics 3 (hrs)

Gross human autonomy, Anthropometry, Man-Machine interaction, Concepts of size and texture, color, Comfort criteria, Psychological & Physiological Considerations

Practice 6 : Human Ergonomics using 3D Experience

Text Books:

4. Engineering Design , George E.Dieter, Fourth Edition, McGraw Hill
5. Chitale, A K, Product Design & Manufacturing, 2013, 6th Edition, PHI publication, India

Reference Books:

6. DassaultSystemes Companion Learning Space Material on Product Design
7. DassaultSystemes Companion Learning Space Material on Function Generative Design
8. DassaultSystemes Companion Learning Space Material on Virtual Ergonomics Simulation
Fundamentals- Delmia Ergonomics at Work

Reverse Engineering & Rapid Prototype

Code	Course Title	Credit	T-P-PJ
CUTM1077	Reverse Engineering & Rapid Prototype	4	1-2-1

Objective

- Understand concept of reverse engineering
- Understand principles of imaging, cross-sectional scanning, digital data, computational graphics
- Understand legality of reverse engineering concept

Course outcomes

- Use the Digitized Shape Editor (DSE) workbench
- Import and process the digitized data (scans or clouds of points),
- Quick Surface Reconstruction (QSR) from the digitized data.
- Create a mesh and extract characteristic curves to create surfaces using point cloud data

Course content

Module I: Introduction to Reverse Engineering

2 (hrs)

Historical Background & Industrial Evolution, Reverse Engineering in Modern Industries, Motivation and Challenge, Analysis and Verification, Applications of Reverse Engineering & 3D scanning.

Practice :1 Generate a Model from a Product

Module II: Processing the Point data & Creating Tessellated Mesh

2 (hrs)

Stages in the Process, Introduction to Digitized shape editor, Importing the Point data, editing the cloud, Creating & Correcting the mesh, editing the mesh, creating tessellated mesh

Practice:2 Cloud Point Generation

Practice :3 Mesh Generation from Cloud Point data

Module III: Curve Creation & Processing

2 (hrs)

Stages in the Process, creating and editing scans, creating curves, Additional tools, Introduction to quick surface reconstruction, creating scans by segmentation, processing curves



Practice : 4 Curve Generation

Module IV: Creating Surface

2 (hrs)

Stages in the Process, creating surface, using automatic processes, checking deviations

Practice :5 Surface Generation & Optimization

Module V : Additive Manufacturing

2 (hrs)

Additive Manufacturing Technology in product development-Materials for Additive Manufacturing Technology, Classification – Stereo lithography Apparatus (SLA)- Principle, process, advantages –Fused Deposition Modeling – Principle, process, advantages. Selective Laser Sintering – Principle, Process, advantages, Three Dimensional Printing – Principle, process, advantages - Laser Engineered Net Shaping (LENS)

Module VI : Delmia Additive Part Preparation Essentials

Preparing Infrastructure, Preparing Parts, Managing Rules, Generating the Slicing Path,

Practice : 6 Prepare a part for 3D Printing

Module VII: Master Project

2 (hrs)

Reverse Engineering of the Car Fender and 3D Printing

Text Books:

1. DassaultSystemes Companion Learning Space : Catia Reverse Engineering Essentials

Reference Books:



Product Life Cycle Management

Code	Course Title	Credit	T-P-PJ
CUTM1078	Product Life Cycle Management	2	0-1-1

Objective

- Use ENOVIA Engineering BOM Management
- Create parts and specifications
- Create Change Orders

Course outcomes

- Manage the engineering change process
- Raise Change Requests for the parts and specifications
- Generate various types of reports.

Course content

Module I: Introduction

3 (hrs)

Product Lifecycle Management (PLM), Need for PLM, Product Lifecycle Phases, Opportunities of Globalization, Pre-PLM Environment, PLM Paradigm, Importance & Benefits of PLM, Widespread Impact of PLM, Focus and Application

Module II: ENOVIA

2(hrs)

Getting Started, Working with Parts, Creating & Attaching Specifications

Module III: EBOM

2 (hrs)

Creating Engineering Bill of Materials

Module IV: ECM

2 (hrs)

Releasing parts using Enterprise Change Management, Reports

Module V: Collaborative Life Cycle Management

4 (hrs)

Getting Started, Creating a Product Structure, Managing the Structure

Module VI: 3D Tolerancing & Annotation 3 (hrs)

Dimensions & Tolerances, Assembly Specifications, Validate Annotations, Generate Drawings, Review through 3D Play.



Module VII: Master Project

3(hrs)

Master Project on ENOVIA EBOM Management

Text Books:

1. DassaultSystemes Companion Learning Space- ENOVIA EBOM Management
2. DassaultSystemes Companion Learning Space- Collaborative Lifecycle Management
3. DassaultSystemes Companion Learning Space- 3D Tolerancing& Annotation

Manufacturing Process-Process Planning and Heat Treatment

Code	Course Title	Credit	T-P-PJ
CUTM1079	Manufacturing Process-Process Planning and Heat Treatment	3	2-1-0

Objective

- To Understand the Importance of Materials, Manufacturing Processes, Process Planning & Design in Product Manufacturing

Course outcomes

- Select Engineering Material for a Required Purpose
- Identify Various Manufacturing Processes
- Implement Modern Approaches to Process Planning, Product Design & Development

Course content

Module I: Classification of Materials(5hrs)

Common Engineering Materials; Crystal Geometry (Crystal Types, Crystal Structures, Crystal Defects, Recrystallization, Crystal Growth, Methods of Determining Crystal Structure, Scanning Electron Microscope); **Mechanical Properties, Mechanical Tests and Deformation of Materials** (Mechanism of Strengthening in Metals. Grain Size and its relation to Mechanical Properties, Review and Brief Discussion on Stress Strain Diagram of Steel and the Parameters for Ductility, Percentage of Elongation, Toughness, Strain Hardening, and Tensile Strength, etc., Fracture Toughness and Crack Growth Measurement, Failure Analysis), Fatigue and Creep Testing, Testing for Residual Stresses.

Module II: Tool Materials (4hrs)

Engineering Alloys (Selection and Specification of Carbon and Alloy Steels for General Engineering Purpose, Specification of Materials as per Various Standards- IS, BS, AISI, APS etc.); **Steels** (Case Hardening Steels, Cold Work Tool Steels, Hot Work Tool Steels, High Speed Tool Steels; **Modern Cutting Tool Materials** (Carbide, Coated carbides, Ceramics, CBN, Diamond, SiALON, Impregnated tools); **Introduction to Plastics** (Properties of Plastics, Thermo Plastics-Thermo Setting Plastics, Methods of Processing of Plastics); **Cast Iron** (Grey

Iron Casting IS: 210 SG Cast Iron IS: 865, Malleable Iron Castings IS: 2108 and IS: 2640); **Non-Ferrous Alloys** (Zn & Al Alloys); **Powder Metallurgy** (Methods for Production of Powders, Powder Metallurgy Steps).

Module III: Heat Treatment (4hrs)

Heat Treatment of Steel (Hardenability Concepts and its Role in Steel Specification, Hardening and Annealing of Tool Steels, Case Hardening and Local Hardening, Isothermal Transformation Diagrams, Austempering, Martempering and Isothermal Annealing for Tool Steels,. Major Defects in Metals or Alloys due to Faulty Heat Treatment, ION Nitrating, Vacuum Carburizing, Chemical Vapour Depositing); **Heat Treatment of Non-ferrous Materials** (Classification of Heat Treatment Processes for Aluminium Alloys, Heat Treatment of Wrought & Cast Aluminium Alloys).

Module IV: Manufacturing Processes(7 hrs)

Forming Processes (Cold & Hot Working, Rolling, Forging, Drawing, Bending & Extrusion); **Joining Processes** (Arc Welding, Gas Welding, Resistance Welding, Thermit Welding, TIG & MIG Welding, LBW, EBW, Adhesive Bonding, Soldering & Brazing,); **Casting Process**(Sand Casting, Die Casting, Investment Casting, Centrifugal Casting, Vacuum Casting, Plaster Mould Casting, Lost Foam Method, Continuous Casting); **Machining Processes** (Traditional-Turning, Milling, Drilling, Shaping, Grinding & Finishing, Non-Traditional- EDM. AJM, LBM etc.)

Practice:

1. Pattern & Mold Making in Sand Casting.
2. Butt Joint by using Oxy Acetylene Gas Welding.
3. Joining of Metal Sheets using Spot Welding.
4. Soldering & Brazing Practice.
5. TIG Welding of Stainless Steel
6. MIG Welding Technique and Applications
7. EDM working Principle and Process Parameters

Module V: Process Planning (5 hrs)

Process Planning (Concept, Manufacturing Planning, Process Design, Process Planning Activities, Process Sheet, Process Selection Parameters, Steps in Process Planning, Computer Aided Process Planning)

Practice

8. Process Planning & Simulation in DELMIA

Module VI: Computer Aided Production Management(7 hrs)

Role of Computer in Product Design and Management(Computer in Manufacturing & Design Process, Creation of Manufacturing Data Base, Computer Integrated Manufacturing, Communication Network, Production Flow Analysis, Group Technology); **Process & Product Design** (Degree of Accuracy, Finish and Tolerance, Capability Studies, Basic Product Design Rules for Casting, Forging, Machining, Sheet Metal and Welding.Physical Properties of Engineering Materials and their Importance on Products, Selection of Plastics, Rubber, Composites and Ceramics for Product Design)

9. Casting Design & Analysis using CATIA

10. Forging Design & Analysis using CATIA

Module VII: Industrial Ergonomics (3 hrs)

Man/Machine Considerations, Ease of Maintenance.Ergonomic Considerations in Product Design, Anthropometry, Design of Controls& Displays, Man/Machine Information Exchange, Process Sheet Detail and Their Importance, Advanced Techniques for Higher Productivity, Just-in-Time and Kanban System, **Modern Approaches to Product Design**(Concurrent Design, Quality Function Development, Rapid Prototyping)

Text Books:

1. Balasubramaniam R.,”Callister's Materials Science and Engineering”, 2nd Edition, Wiley.
2. Rao P.N., “Manufacturing Technology”, Volume 1, Mc-Graw Hill.
3. Chitale A.K.,Gupta R.C.”Product Design & Manufacturing”, 6th Edition, PHI Learning.

Reference Books:

1. Campbell F., “Elements of Metallurgy and Engineering Alloys”, ASM International.



2. Kesavan R., Elanchezhian C., Vijaya Ramnath B., “Process Planning & Cost Estimation”, New Age International.

Material in Product Design and Development

Code	Course Title	Credit	T-P-PJ
CUTM1080	Material in Product Design and Development	2	1-1-0

Objective

- Identify and select suitable material for product design.
- Understanding various material selection for manufacturing processes
- Application of smart materials, shape memory metals, Nano materials.
- Understand the concept of bio materials.
- Understand concept of smart and hybrid materials.

Course outcomes

- Understand the concept of elastic and plastic deformation.
- Identify and select suitable material for product design.
- Understand manufacturing characteristics of materials
- Understanding various manufacturing process.
- Understanding Application of smart materials, shape memory metal, Nano material.
- Understood the concept of smart and hybrid materials.

Course content

Module I: Classification of materials

(2 hrs)

Introduction to material classification, Steel, Stainless Steel & Types, HSLA Steels, Dual Phase Steels, Tool and Die Steels. Nonferrous Alloys- Aluminum & Alloys, Copper & Alloys, Zinc & alloys, Nickel & Alloys , Magnesium Alloys, Titanium Alloys, Super Alloys.

Module II : Material behavior

(10 hrs)

Elastic and Plastic deformation- Mechanism of Plastic deformation-yield stress and shear strength-Perfect and Real crystals- Effect of strain rate and temperature on plastic behavior- Super plasticity- Deformation of non crystalline materials

Expt-1 - To study Creep transient for different materials using virtual lab.

Expt-2: To study the effect of obstacle distance on the creep transient behavior of materials using virtual lab.

Expt-3: To evaluate modulus of elasticity of materials using nano indentation using virtual lab.

Expt-4: To find indent depth on materials using nano indentation.

Expt- 5-To find out plastic work done during nano indentation.

Module III: Material Selection for Process modeling and product design (4 hrs)

Material selection- Cost and service requirement- Recycling- Selection of material for mechanical properties- Strength, toughness and fatigue- Material selection for durability and surface wear and Corrosion resistance- Functional relation between materials and processing- Manufacturing characteristics of metals- Material selection using Ashby charts and other aids material selection for aero, auto and nuclear application- Case studies in material selection.

Expt-6- Practice on material selection using Ashby charts

Expt-7- Case study on material selection for bicycle frame using material chart.

Expt-8- Case study on material selection for car brake using material chart.

Expt-9- Case study on material selection for Knee implant.

Module III: Shape memory Alloys and Nano materials (3 hrs)

Introduction to Smart materials and its applications, Shape memory metals and its applications, Introduction to Nano-materials, CNTs Production Process and Uses, Fibers Production and Uses. Introduction to bio materials.

Expt-10- To imagine the cytoskeleton of cells proliferation on bio materials Surface.

Module IV: Polymer Composite materials (3 hrs)

Polymer- Thermosetting, Thermoplastics; Elastomers- Natural & Synthetic Rubber; Composites Material- Classification Based on Matrix and Topology, Particle Reinforced Composites, Fiber Reinforced Composites. Structural Composites, Constituents of Composites, MMC, PMC and FRP. Ceramic Composites, Geo synthetics, Pre-stressed Hollow Concrete Panel, Carbon Composites Fullerenes, Bucky Ball Structures, Grapheme.

Module V: Prefab materials (2 Hrs)

Prefabricated Materials: Types and Applications, Autoclaved Aerated Concrete (AAC), Cellular Lightweight Concrete (CLC).

Module VI: Developments in material processing (3 hrs)

Introduction to Microelectro mechanical Systems (MEMS) and its applications, Micro fabrication technologies- Tool for micro fabrication- Diamond and high speed machining- LIGA micro fabrication process- Multilayer X-ray lithography-



(3)

Module VII: Introduction to smart /intelligent and Hybrid materials hours)

Overview of Smart / Intelligent Materials, Primitive Functions of Intelligent materials, Intelligence Inherent in Materials, Actuator Materials, Sensing Technologies, Micro-sensors, Intelligent Systems, Hybrid Smart Materials, Passive Sensory Smart Structures, Reactive actuators based smart structures, Active Sensing and Reactive Smart Structures, Smart Skins

Practice :

1. Virtual lab by IIT kanpur.

Text Books:

1. Materials Science and Engineering, W D Callister, 2014, 2nd Edition, Wiley India Private Limited, India.

Reference Books:

1. Material Science and Engineering, V Raghavan, 2013, 5th Edition, PHI publication, India.
2. Material Science and Engineering, S Chawla, 2011, 1st Edition, Dhanpat Rai & co Private Ltd., India.

Computer Aided Engineering

Code	Course Title	Credit	T-P-PJ
CUTM1081	Computer Aided Engineering	3	0-2-1

Objective

- This course will help student to use structural scenario, thermal scenario and to do Structural analysis and Thermal analysis of various problems.

Course outcomes

- Create complete finite element models
- Submit and monitor analysis jobs
- View and evaluate simulation results

Course content

Module I: Material and Selection Properties

(6 Hrs)

Property Module, Material Definitions, Linear Elasticity, Large Strain Elasticity, Metal Plasticity, Material Calibration, Material Databases, Section Properties

Practice:

1. Analysis of crack in pressure vessel
2. Cable stayed bridge simulation

Module II: Element Selection Criteria

(6 Hrs)

Solid Element Selection, Structural vs. Continuum Elements, Modeling Bending Using Continuum Elements, Stress Concentrations

Practice:

3. Stress analysis of rail road with wheel.
4. Bike frame structural analysis

Module III: Meshing

(8 Hrs)

Mesh Module, Mesh Elements Mesh Generation Workflow, Local Fine-tuning Quality Checks, Mesh Compatibility, Mesh Convergence, Dependent and Independent Part Instances



Practice:

5. Airplane bracket structural analysis
6. Structural analysis of wind turbine blade

Module IV: Boundary Condition

(6 Hrs)

Step Module, Analysis Steps and Procedures, Output Requests, Output Files

Load Module, Loads and Boundary Conditions, Initial Conditions

Practice:

7. Generative structural analysis applied for design optimization
8. Stress analysis on a backhoe

Module V: Contact

(6 Hrs)

Mechanical Contact Properties, Contact Domain, Contact Formulation and Controls, Handling

Initial Over closures, Contact Output

Practice:

9. Analysis of Economizer.
10. Analysis of Screw Jack

Module VI: Analysis Procedures

(6 Hrs)

Model and Analysis Steps, Analysis Procedures, The static, general analysis procedure, Finding a converged solution, The Static, Linear Perturbation procedure, Buckle procedure, Frequency Procedure, The dynamic, explicit analysis procedure, Stability Limit, Analysis Continuation Techniques

Practice:

11. Steady state analysis of a composite bar.

Module VII: Thermal Analysis

(8 Hrs)

Steady State Heat Transfer, Transient Heat Transfer, Thermal Interfaces, Thermal Stress Analysis

Practice:

12. Temperature distribution in radiators used in automobiles
13. Oven radiation simulation

14. Steady state thermal analysis of tungsten coil with internal heat generation
15. Thermal analysis of disc brake

Projects

1. Thermal Analysis of PV Solar Pannel
2. Structural and thermal analysis of Green House
3. Structural analysis of Quadcopter.
4. Structural analysis of landing gear.
5. Numerical study on different types of fins.
6. Overhead tank failure analysis.
7. Analysis of Rocket Nozzle
8. Analysis of BAJA SAE
9. Structural and Thermal Analysis of Downdraft Gasifier
10. Structural and Thermal Analysis of Stirling Engine
11. Structural Analysis of Hydraulic Press
12. Structural Analysis of Elevating Conveyor

Text Books/ Reference Books/ Reference Material

1. SIMULIA: 3DS Learning Space

Source of reference: 3DS peer learning

Quality Assurance

Code	Course Title	Credit	T-P-PJ
CUTM1082	Quality Assurance	2	1-1-0

Objective

- To introduce the concept of SQC
- To understand Design of Experiments concept and ANOVA test
- To learn about the different plots in quality control

Course outcomes

- Understand quality function deployment principles
- Understand concept of Failure mode affect analysis and apply it in product design process.
- Carry out statistical analysis of experiment, ANOVA ratio test and apply advanced DOE method for product testing.
- Understand statistical process control techniques and reliability concepts.
- Understand SIX SIGMA process and lean production concept.
- Prepare Pareto diagrams, cause and effect diagrams, matrix plots and 3-D plots.

Course content

Module I: Design for Quality (1hr)

Quality Function Deployment, Objectives and functions, Design process, controlling factors in design process.

Module II: Failure Mode Effect Analysis (FMEA) (3hrs)

Basic methods: Refining geometry and layout, general process of product embodiment, embodiment checklists, FMEA method.

Practice 1: Performing a FMEA of a Wooden Chair.

Module III: Design of Experiments (DOE) (4hrs)

Design of Experiments: Basic methods, two factorial experiments, orthogonality, Base design method, higher factorial experiments.



Practice 2: Design of Experiments for comfort conditions in a room using Minitab.

Module IV: Analysis of Variance (ANOVA) (4hrs)

Statistical analysis of experiments, degree of freedom, correlation coefficient, ANOVA test, residual plots.

Practice 3: Performing ANOVA to know the significance of influencing parameters for comfort conditions in a room using Minitab.

Module V: Statistical Process Control (SPC) (2hrs)

Frequency distributions and histograms, Pareto diagrams, Probability distribution, Matrix plots and 3D plots.

Module VI: Reliability (4hrs)

Reliability – Survival and Failure, series and parallel systems, mean time between failure, mean time to repair.

Practice 4: Determining the reliability of series and parallel systems.

Module VII: Design of Six Sigma (4hrs)

Basics of six sigma, project selection for six sigma, six sigma problem solving, six sigma and lean production.

Practice 5: Determining the six sigma limits during machining a cylindrical work piece on CNC lathe.

Text Books:

1. Stastical Quality Control, M. Mahajan, Khanna Publisher.
2. Reliability Engineering, L.S. Srinath, Affiliated East West Press.

Reference Books:

1. Robust Design for Quality Engineering and Six Sigma, Sung H. Park, World Scientific Publisher.

Online Source: (Used in MINI TAB Software)

Course outline Prepared by: Santosh Patro

Date: 5-06-2020

Source of reference: 1. curriculum PG Diploma Tool Design -level-8

Applied Ergonomics

Code	Course Title	Credit	T-P-PJ
CUTM1083	Applied Ergonomics	2	0-1-1

Objective

- Use the Human Ergonomics software to create an accurate simulation of a human entity and its work environment to ensure a natural operation

Course outcomes

- Create, manipulate, and analyze how the manikins interact with a product and its environment

Course content

Module I: Introduction

4(hrs)

Introduction to Human Factors, Anthropometry and Workplace Design, Biomechanics of Work, Work Physiology, Stress and Workload, Introduction to Virtual Ergonomics Solution

Module II: Preparing Work Environment 2 (hrs)

Workbenches & Tool bars, Setting Options, Exploring the 3D Environment

Module III: Creating Manikin & Workspace 2 (hrs)

Creating Workspace, Setting Manikin Properties, Manipulating Manikin, interacting with workspace, setting manikin constraints, creating catalogs, performing clash analysis

Module IV: Human Measurements 2(hrs)

Workbenches & Tool bars, Human measurements editor, summing up using the editor

Module V: Human Activity Analysis 2 (hrs)

Workbenches & Tool bars, Human Activity Analysis, summing up the analysis

Module VI: Human Posture Analysis 2 (hrs)

Workbenches & Tool bars, Human Posture Analysis, summing up the analysis

Module VII: Human Task Simulation 4 (hrs)



Creating Process Activity, Creating a Manikin Activity, Inserting, resources, motion analysis, Human task simulation, Master project on Ergonomics

Text Books:

1. DassaultSystemes Companion Learning Space- Virtual Ergonomics Simulation

Reference Books:

Computer Aided Manufacturing

Code	Course Title	Credit	T-P-PJ
CUTM1084	Computer aided manufacturing	2	0-2-0

Objective

- Create 2-D geometry and 3-D models using various Commands in Master CAM software.
- Create part programs for CNC machining, Contour Concept of cutter compensation using G codes and M codes.
- Create tool path and program for 2-D Lathe operations
- Create tool path and program for 2-D milling, drill tool path, circular milling and facing operation.

Course outcomes

- Create 2-D Geometry and 3-D models using various Command in Master CAM software.
- Identify G-Codes and M-codes for programming
- Create 2-D tool path and program for 2-D facing , turning , drilling in lathe.
- Create 2-D tool path and program for circular milling and facing operations.
- Simulation of CNC programs using Master CAM software.

Course content

Module I: Introduction to CAM and Identification of toolbars in Master CAM software

(2 hrs)

Introduction to Computer Aided manufacturing and Master CAM. Identification of sketch toolbars like profile, operations toolbars and using the toolbars to generate the sketch.

Expt1: Create a 2D sketch using sketch tool bar and operations tool bar

Module II- 3-D models using various Commands in Master CAM software (2 Hrs)

Draw 3-D profiles using various sketch based features like extrude, revolve, Boolean features, rib, slot, groove etc.

Expt-2- Create 3 D model using various commands

Module III : Identification and use of G-code and M code in programming for lathe

(4 hrs)

Functions of G-Code and M-code in lathe machine .Selection and use of G-codes and M codes. Measure tool and work data offset data-X-Z offsets for lathes. Work offsets, length offsets and tool radius for machining center for creating part programming. Cutter compensation.

Expt-3- Create work offset for CNC milling machine using Master CAM.

Expt-4- Create Work off set for CNC lathe using master CAM

Module IV: Create 2D tool path for lathe operations (6hrs)

2D Tool path generation. Concepts of Machining: CNC control basics, & coordinate Systems, Selection of tool, tool parameters, Compensations Program Manager / Creation of 2D tool path for 2D turning , facing ,drilling operations

Expt-5- Create 2D tool path for facing and turning operation in lathe.

Expt-6- Create 2D tool path for a drilling operation in lathe.

Expt-7- Create 2D tool path for a given job in lathe.

Module V: Create 2D tool path for milling operations (6 hrs)

Selection of appropriate tool path for milling operation. Proper machine selection, job setting, tool selection. Selection of appropriate machining tolerance, machining parameters like speed, feed and depth of cut. CNC Programming 2-D milling, circular milling operations.

Expt-8- Create 2D tool path for facing and profile cutting.

Expt-9- Create 2d tool path for circular pocketing.

Expt-10- Create 2D tool path for circular counterboring.

Module VI: Post processing (3 hrs)

Post Processing: Generating NC / NC Files / Editing NC Files / Simulation of tool path.

Expt -11 Create a 2D tool path for a job in CNC milling machine and simulate it.

Expt-12- Create 2D tool path for a job in CNC lathe machine and simulate it.

Module : VII: Transferring Part programming into CNC machine

CNC interface with master CAM ,CNC controls and editing on a machine



Expt-12 : Transfer master CAM program to the CNC machine and perform dry run for a job.

Reference Books:

1. Groover, M.D and simmers ,E.W, CAD/CAM :Computer aided design and Manufacturing ,Person Education India.
2. Manuals of CAD/CAM software package on CAM module and CNC machine.

CNC Programming and CNC Machining

Code	Course Title	Credit	T-P-PJ
CUTM1085	CNC Programming and CNC Machining	2	0-2-0

Objective

- Evaluate manufacturing assignment based on critical thinking and problem solving skills. Become a good communicator and effective team member.
- Practice writing complex “G” code programs for CNC turning centers that meet the part specification
- Interpret and demonstrate complex “G” code programs for CNC milling centers that meet the part specification
- Prepare “G: code programs to perform secondary operations including tapping, countersinking, counter boring, and threading.
- Describe and illustrate common problems with tooling and fixtures in CNC programming and machining.

Course outcomes

- Explain applications and advantages of CNC machines and technology
- Demonstrate and explain various CNC control Calculate technological data for CNC machining
- Understand the importance and use of PPE’s
- Prepare and understand line program for various profiles Identify and set parameters for various simulators
- Prepare programs,demonstrate, simulate and operate CNC lathe machines for various machining operations
- Prepare programs,demonstrate, simulate and operate CNC milling machines for various machining operations
- Define and explain Modern CNC systems and explain its importance in manufacturing

Course content

Module I: introduction to CNC technology & programming(3hrs)

Introduction to CNC technology – CNC machines controls. History & development of CNC

technology. Conventional Vs. non-conventional machine tool. Numerical control on CNC machine tools CNC control and CNC Control and types of CNC control Calculation of technological data for CNC machining. CNC clamping system

Expt1: Identification of different parts of CNC lathe including data input

Expt2: Identification of different parts of CNC mill including data input

Module II: Drawing interpretation(3hrs)

Drawing interpretation practice, identifying feature from sketch and operation from feature

Expt3: Practice on CNC controller using on-screen simulation for generating different profile

Module III: CNC programming (4hrs)

Introduction to CNC programming Introduction and demonstration of line programs CNC programming on lathe & milling machine using iso codes into the CNC simulator. CNC programming for lathe and milling machines using different machining cycles into the CNC simulator. Procedures Associated with part programming, Cutting process parameter selection, Process planning issues and path planning, G & M Codes, Interpolations, Canned Cycles and Subprograms.

Expt4: Writing simple code and test on controller for CNC lathe

Expt5: Writing simple code and test on controller for CNC mill

Expt6: programming canned cycles for simple profile

Module IV: Program generation for CNC milling and turning(3hrs)

Tool compensations Exposure for programming and simulator of FANUC, SINUMERIC Programming exercise.

Expt 7: Machining of programmed exercise on CNC lathe machine.

Expt 8: Machining of programmed exercise on CNC milling machine.

Module V: CNC Turning (4hrs)

Plan and optimize programs for CNC turning operations. Calculate parameters like speed feed etc. and set a references for the various operations. Prepare operation and operation sequence for the

lathe operations like turning, grooving etc. Prepare & set CNC lathe operations and test run programmed Execute program and inspect simple geometrical forms / standard parts Use of various PPE's on CNC lathe machine

Expt 9-11: Programming for complex shape cylindrical objects with parameter selection, machining. (at least 3 exercises)

Module VI: CNC Milling(4hrs)

Plan and optimize programs for CNC Milling operations. Calculate parameters like speed feed, depth of cut etc. and set a references for the various operations. Various methods of work process like edge finding block center etc. Prepare & set CNC Milling operations and test run programmed. Execute program and inspect simple geometrical forms / standard parts. Use of various PPE's on CNC milling machine

Expt 12-14: Programming for complex shape prismatic objects with parameter selection, machining. (at least 3 exercises)

Module VII: Modern CNC systems (4hrs)

Introduction to advanced CNC systems: Computer Aided Part Programming (CAPP), it's application using Solidworks/MasterCAM. comparison of manual part programming and CAPP for a simple component, Automatic Tool Changer, Automatic Pallet Control, Automatic Storage & Retrieval Systems.

Expt 15: comparison of manual part programming and CAPP for a simple component
Text Books:

1. Programming of CNC machines, by Ken Evans
2. CNC Programming Handbook by Peter Smid
3. NC Control by Kundra Rao, Tewari

Reference Books:

3. https://cache.industry.siemens.com/dl/files/554/74475554/att_56792/v1/PGsl_0313_e_n_en-US.pdf
4. G codes, M codes Handbook, by Mazak Corporation, sources:
 - a. available at Mini Tool Room, Parlakhemundi campus, CUTM

b. <https://gist.github.com/anonymous/f14c73a7174bf8a43f0c970817897454>

Source of reference;1. curriculum PG Diploma Tool Design and CAD/CAM-level-8

Quora.com

Note: 1 credit theory=10 hrs lecture, 1 credit practice/project=12.5 hrs lab/workshop/field work in a semester

Design of Tools, Jigs and Fixtures

Code	Course Title	Credit	T-P-PJ
CUTM1086	Design of Tools, Jigs and Fixtures	3	2-1-0

Objective

- To learn basic concepts, functions and design principles of Jigs, Fixtures and Dies
- To know the importance of work piece location & clamping

Course outcomes

- Able to Understand and Analyse customers need
- Able discuss and finalise product needs
- Conceive the tool design parameters
- Design against standard and parameters
- Test against specifications and standards
- Develop prototype / simulation
- Interpret of output and confirming to specifications
- Communicate with manufacturing line
- Take remedial action if required

Course content

Module I: Locating Elements (3hrs)

Introduction, Jigs (Production Devices), Locating Principle, Locating methods and devices

Practice 1: Fabrication of a V – Locator for locating a cylindrical work piece.

Module II: Clamping Devices (3hrs)

Introduction, Pneumatics and hydraulic actuation clamping, Analysis of clamping force

Practice 2: Estimation of clamping force during clamping of a cylindrical work piece with a V-Locator.

Module III: Design of Jigs

(6hrs)

Introduction, drill bushes, elements of jig, construction, material for jig elements, different types of jigs

Practice 3: Designing of a Plate Jig.

Practice 4: Designing of a Swinging Leaf Jig.

Module IV: Drill Jigs

(3hrs)

Automatic drill jig, rack and pinion indexing device, Air operated drilling jig component, group jigs and fixtures, chip control, economic justification for jigs and fixtures

Practice 5: Study of Automated Jigs.

Module V: Design of fixtures

(6hrs)

Introduction, Design principles of fixtures, types of fixture, general principles of boring fixtures, classification of boring fixture, lathe fixture, broaching fixture, Milling fixture, Grinding fixture

Practice 6: Designing a Lathe Fixture.

Practice 7: Designing a Milling Fixture.

Module VI: Design of Dies for Sheet Metal Work

(5hrs)

Introduction, Types of dies, clearance and tolerance of die opening and punch, force, power, energy in shearing, strip layouts, economical stock utilization

Practice 8: Designing a progressive die for making of washer

Module VII: Design of Drawing and Forming Dies

(6hrs)

Theory of drawing, blank development, strain factor, calculation of force, construction of drawing and drawing dies, Modern Metal forming techniques

Practice 9: Designing a Forging die for making a gear blank

Practice 10: Designing a drawing die for making a circular cross-sectional wire.

Text Books:

1. Joshi, P H, Jigs & Fixtures, 2010, 3rd Edition, McGraw Hill.

2. Nagpal, G R, Tool Engineering & Design, 2000, Khanna Publishers.

Reference Books:

1. Venkataraman, K, Design of Jigs, Fixtures & Press Tools, 2015, Wiley & Sons
2. Mehta, N K, Metal Cutting and Design of Cutting Tools, Jigs & Fixtures, 2015, McGraw Hill

Advanced Metrology

Course Code	Course Title	Credit	T-P-PJ
CUTM1087	Advanced Metrology	2	1-1-0

Course Objective

- To Make Students Familiar with the Measuring Systems, and the Standard of Measurements. Learns about Basic Measurement Devices.
- Understanding the Basic Measurement Systems in the Real Time Engineering Applications.
- Enables Students to Work in Quality Control and Quality Assurances Divisions Industries.

Course Outcomes

- Selecting Suitable Measuring Instruments for Basic and Typical Applications in the Industries.
- Analyze Measurement Requirement.
- Can Choose Transducer & Sensors for Products.

Course Outline

Module: I Introduction to Metrology

(2Hours)

Introduction to Metrology; Importance and Need for Measurements and Metrology; Need for Inspection; Precision & Accuracy; Errors in Measurement.

Practice-1: Introduction to Metrology laboratory. Steel Rule, Tape, Right Angle Protractor, Surface Plate

Module: II Standards of Measurement (4 Hours)

Verniers and micrometers least count calculation, Uses of Slide callipers, Height Gauge, Micrometer and 3 point bore micrometer

Practice-2. Vernier Caliper inside, outside, depth measurement and Height Gauge

Practice-3. Micrometers, Outside Inside Micrometer, Depth Micrometer

Practice-4 Three point Bore Micrometer

Module: III Slip Gauges (2 Hours)

Types of Slip Gauge blocks and uses

Practice 5- Calibration of measuring Instruments using slip gauge blocks

Module: IV Limits, Fits and Tolerances (3 Hours)

Limits, Fits, Tolerances: Definitions, Types of Fits (Clearance, Transition and Interference) Allowances, Hole and Shaft basis systems with Numerical

Module: V Angle Measurement (3 Hours)

Spirit Level, Sine Bar and Bevel Protractor. Least count determination and applications

Practice-6. Sine Bar/Spirit Level Measurement of Angles on a Surface plate

Practice 7: Angle measurement by Bevel Protractor

Module: VI Gauge Design (2 Hours)

Design of Go and NO GO gauges, Ring gauge and Plug Gauge applications

Practice-8. Study and use Gauges-Filler, Radius, Thread, Wire, Snap, Go-NoGo gauge

Module: VII Measurement Machines (6 Hours)

Tool makers Microscope: Principle and applications, Measuring Machines: Coordinate Measuring Machine, Talysurf, Profile Projector

Practice-9. Measurement of template using Profile Projector

Practice 10: Measurement of Profile by Tool makers microscope

Practice 11: Measurement of surface roughness using Talysurf

Text books:

1. Gupta, I C, A Text Book of ENGINEERING METROLOGY. 2016. 8th Edition, Reprint, Dhanpat Rai Publication, New Dehi-110002
2. Narayana, K L, Engineering Metrology. 2014. Third Edition, Scitech Publication (India) Private Limited

Reference Books:

1. Mahajan, M, A Text Book of Metrology. 2010. Dhanpat Rai & Co (P) Ltd, ISBN 13 : 978-817700051



Thermodynamics

Code	Course Title	Credit	T-P-PJ
CUTM1088	Thermodynamics	3	2-1-0

Objective

- To know the laws of thermodynamics and conditions for energy transformation
- To get familiar with different thermodynamic properties of pure substances

Course outcomes

- Utilize the concepts of work and energy to evaluate control volumes as well as closed systems
- Students will be able to do energy analysis and determine efficiency of various thermal devices

Course content

Module I: Basic Concepts of Thermodynamics 4(hrs)

System, Surroundings, Universe, State, Thermodynamic Properties, Process, Types of Process, Reversible and Irreversible process, Quasi-static Process, Cycle, Point and path functions, Thermodynamic Equilibrium, Ideal gas, Ideal gas equation

Module II: Zeroth Law of Thermodynamics 4(hrs)

Zeroth Law of Thermodynamics, Temperature, Measurement of Temperature, Temperature Measuring Instruments, Relationship between Temperature Scales

Practice:

Temperature Measurement by using Thermocouple, Thermistors and Resistance Temperature Detector (RTD)

Module III: Work Transfer and Heat Transfer 5(hrs) Work Transfer, Sign Convention of Work, PdV Work for Various Quasistatic Processes, Heat Transfer, Different Modes of Heat Transfer

Practice:

- Simulation of Heat Transfer in Conduction, Convection and Radiation using Finite Element Method in Simulia (Plane Wall, Fin, Metal Rod)
- Thermal Stress Analysis of IC Engine Piston using Simulia
- Thermal Analysis of Intake Manifold of Engine using Simulia

Module IV: First Law of Thermodynamics6(hrs)

First Law of Thermodynamics Applied to Closed System, Energy, PMM1, Enthalpy, Specific Heat at Constant Volume and Constant Pressure, First Law of Thermodynamics Applied to Open System, Control Volume, Mass Balance and Energy Balance, Nozzle, Diffuser, Turbine, Compressor, Throttling Device, Heat Exchanger

Practice:

- Thermal Analysis of Nozzle, Diffuser, Turbine, Compressor, Boiler, Heat exchanger using Simulia

Module V: Second Law of Thermodynamics5(hrs)

Kelvin Planks statement, Clausius Statement, PMM2, Working of Heat Engine, Refrigerator and Heat Pump, Carnot Cycle & Carnot Theorem

Practice:

- Working of Refrigerator and Heat Engine

Module VI: Entropy4(hrs)

Introduction to Entropy, Principle of Increase of Entropy, Clausius Inequality, Change in Entropy in Different Processes

Practice:

- Entropy Change of Metal Bar with Temperature Gradient using Simulia

Module VII: Properties of Pure Substances 5(hrs)

Introduction to Pure Substance, Phase Change Processes of Pure Substances, T-V, P-V, P-T and H-S Diagram for Steam, Dryness Fraction of Steam, Different Types of Steam. Introduction to



Steam Tables: Specific Volume, Pressure, Temperature, Enthalpy and Entropy

Practice:

- Conversion of water to steam
- Determination of properties of steam from Mollier Chart

Text Books:

1. P.K. Nag, "Engineering Thermodynamics", Tata Mcgraw-Hill Publishing Company Limited
2. Y.A Cengel, M. A Boles, "Thermodynamics an Engineering Approach", Tata Mcgraw-Hill Publishing Company Limited

Reference Books:

1. R K Rajput, "A Text Book of Engineering Thermodynamics ", Laxmi Publications
2. Sontag,Borgnakke,VanWylen, " Fundamentals of Thermodynamics", Willey Publisher

Fluid Mechanics with Finite Volume Method

Code	Course Title	(Credit)	T-P-PJ
CUTM1089	Fluid Mechanics with Finite Volume Method	3	2-1-0

Objective

- To learn To learn fundamentals of computational methods like FVM for solving linear and non-linear partial differential equations related to fluid dynamics
- To emphasizes the basic underlying fluid mechanical principles governing energy transfer in a fluid flow systems with their performances in different field of engineering applications

Course outcomes

- After completion of the course, the students will able to evaluate finite difference/volume schemes on model problems of computational fluid dynamics.
- Students will learn to develop steady state mechanical energy balance equation for fluid flow systems, estimate pressure drop in fluid flow systems

Course content

Module I: Introduction to Finite volume Method

(6 hrs)

Fundamentals of Finite volume methods, different types of finite volume grids, approximation of surface and volume integrals; interpolation methods, Review of governing equations, Classification of governing equations , Staggered and co-located formulation

Practice:

1. 2D mapped Mesh for rectangular pipe
2. 2D mapped Meshing for Aerofoil.

Module II: Grid generation

(6 hrs)

Grid generation, creating, updating and managing meshes, Steady diffusion equation on structured meshes, Unsteady diffusion equation on structured meshes, Linear system solvers, finite volume discretization of steady and unsteady diffusion equation, Finite volume discretization of convection-diffusion problem

Practice:

3. 3D structure mesh of Circular Cylinder
4. 3D unstructured mesh with primes layers for Aerofoil
5. 3D coarse/ medium/ fine sweep mesh for pipe

Module III: Incompressible flow field calculation with finite volume method (5 hrs)

Navier-stokes equation, Discretization of the Momentum Equation: Stream Function-Vorticity approach and Primitive variable approach, Staggered grid and Collocated grid solutions of Navier-stokes equation with finite volume method, boundary condition, Reynolds averaged Navier-Stokes equations.

Module IV: Fluid kinematics (2 hrs)

Types of flow, Continuity equation (in one, two & three dimension steady state fluid flow analysis with finite volume method, velocity and acceleration fields, streamline, streak line, path line, velocity potential function and stream function, Rotation and vorticity.

Module V: Fluid Dynamics with Finite volume method (4 hrs)

Lagrangian and Eulerian Approach, Euler's equation of motion along a stream line for ideal flow, Principle of conservation of energy with finite volume method, Integration of Euler's equation along a stream line, Bernoulli's equation

Practice:

6. Fluid Analysis of Bernoulli's equation: Flow in a contracting pipe through CFD simulation

Module VI: Flow through Pipes (5 hrs)

Reynolds's Experiment, Laws of Laminar and Turbulent Friction, Introduction Turbulence modeling through Finite volume method, Hagen Poiseuille Equation for laminar flow through pipe, Darcy-Weisbach Equation for Turbulent flow through pipe.

Practice:

7. Fluid Analysis of Laminar flow in 3D Circular Pipe through CFD simulation
8. CFD Simulation of the Water Flow Passing Through a Converging Pipe.
9. CFD Analysis to determine the frictional losses in the pipe.

Module VII: Flow Measurement (5 hrs)

Flow through small orifice meter, Mouthpiece, Velocity Measurement using Pitot tube, Prandtl



tube, Flow measurement in pipes-Flow, Venturi Meter, Flow rate Measurement in channel- Weir and Notches

Practice:

10. CFD Analysis of Fluid flow through Orifice meter
11. CFD Analysis of Fluid flow through adjustable channel
12. CFD Analysis of Fluid flow simulation through Venturi Meter

Text Books:

1. R.K. Bansal, Fluid Mechanics and Hydraulic Machines, Laxmi Publications, ninth edition

Reference Books:

2. P.N. Modi & S.N. Seth, Hydraulics & Fluid Mechanics, Rajsons Publications Pvt. Ltd, Twentieth Edition

Hydraulic Machinery

Code	Course Title	(Credit)	T-P-PJ
CUTM1090	Hydraulic Machinery	2	1-1-0

Objective

- To emphasize Principle of operation of hydraulic machines and their system design
- To familiarize their huge applications in different industries

Course outcomes

- After completion of the course, the students will have a strong foundation on the pertinent equations to engineering design of the machines for required applications.
- Students will learn to determine performance characteristics of fluid machinery by using various simulation tools

Course content

Module I: Principle of Operation of Hydraulic Machinery (2 hrs)

Introduction to hydraulic machines: Classification and operation principle, Euler equation for turbo machines: net head developed by pump and Turbines

Module II: Radial and Axial flow pumps (8 hrs)

Velocity triangle of pumps, effect of inlet swirl on velocity triangles, Constructional features of Centrifugal Pump, design aspect, working principle and efficiencies, work done by the impeller, priming, specific speed, NPSH, effect of swirl on the cavitations, working principle and design aspect of gear oil pump.

Practice:

1. Flow analysis of fluid of Centrifugal pump through Simulia software
2. Flow analysis of gear oil pump through Simulia software
3. Performance Characteristics of Centrifugal Pump through Virtual lab

Module III: Positive displacement Pumps (3 hrs)

Working principle of Reciprocating Pump, discharge, work done and power requirement, ideal indicator diagram, and slip, characteristic H-Q curve of positive displacement pump

Practice:



4. Performance Characteristics of Double Acting Reciprocating Pump through Virtual lab.

Module IV: Hydraulic Turbine: Impulse Turbine (6 hrs)

Classification, definitions of heads and efficiencies, Pelton Wheel - Construction and working principle, work done and hydraulic efficiency, design aspects.

Practice:

5. Simulation of Pelton Turbine through simulia software

6. Performance Characteristics of Pelton Turbine through Virtual lab.

Module V: Hydraulic Turbine: Reaction Turbine (6 hrs)

Reaction turbine (Francis, Kaplan) -Components, working principle, work done and efficiency, draft tube, specific speed, cavitations

Practice:

7. Performance Characteristics of Francis Turbine Simulia software.

8. Simulation of Kaplan turbine through Virtual lab.

Text Books:

1. R.K. Bansal, Fluid Mechanics and Hydraulic Machines, Laxmi Publications, ninth edition

Reference Books:

1. P.N. Modi & S.N. Seth, Hydraulics & Fluid Mechanics, Rajsons Publications Pvt. Ltd, Twentieth Edition

Source of reference;

1. <https://nptel.ac.in/course.html>
2. www.vlabs.ac.in

Theory of Machines

Code	Course Title	(Credit)	T-P-PJ
CUTM1091	Theory of Machines	3	2-1-0

Objective

- To cover the kinematics and dynamics of planar single degree freedom mechanisms
- To develop skills for designing and analyzing linkages, cams, gears and other mechanisms
- To address the underlying concepts, methods and application of different machines.

Course outcomes

- To understand the implication of computed results in kinematics to improve design of a mechanism.
- To Interpret the simple given dynamic problems and solve them for positions, velocities and accelerations, etc

Course content

Module I: MECHANISMS

(03hrs)

Theory

Planar Mechanisms: Kinematic Link, Pair, Chain and Mechanism, Types of Links and Joints, Degree of Freedom, Grashof's Law for four bar Mechanism; Inversions of four bar Mechanism, Single Slider Crank Mechanism and Double Slider Crank Mechanism;

Practice

(01 hrs)

1. Position Analysis of Grashof and Non-Grashof four bar Mechanism.
2. Position Analysis of Slider Crank Mechanism, Scotch Yoke Mechanism and Elliptical Trammel

Module II: MOTION ANALYSIS(03hrs)

Theory

Instantaneous Centre of Rotation, Number and Types of Instantaneous Centers, Kennedy Theorem, Relative Velocity Method, Velocities and acceleration in Four Bar and Slider Crank Mechanism.

Practice

(02 hrs)

3. Instantaneous Center Method to Find Velocity of Various Mechanisms.

4. Velocity Analysis of Grashof and Non-Grashof Four Bar Mechanism
5. Velocity Analysis of Slider Crank Mechanism .
6. Acceleration Analysis of Slider Crank Mechanism

Module III: POWER TRANSMISSION SYSTEM(03hrs)

Theory

Classification and Basic Terminology, Fundamental Law of Gearing,

Gear trains: Simple, Compound, Reverted and Epi-Cyclic Gear Trains

Flat Belt, V Belt and Rope Drives and chain drives ,Length of open and cross belt drive, Power Transmitted by Belts and Ropes.

Practice

(02 hrs)

7.Experiment to calculate sensitiveness of Governor

8.Length of open and cross belt drive

Module IV: CAMS& GOVERNOR(03hrs)

Theory

Various Types of Cams and Followers; Displacement, Velocity and Acceleration Diagrams for Different Follower Motions; Nomenclature of Cam Profile;

Classification of Governors, Working principle of various type of centrifugal governors, Terminology related to Governor.

Practice

(03 hrs)

9. Construction of cam profile using Solid works software

10. Cam analysis of a Knife edge and roller follower

11.To calculate sensitiveness of Governor

Module V: GYROSCOPE (02hrs)

Theory

Gyroscopic Couple, Gyroscopic Effect on Naval Ships and Aeroplanes, Stability of four wheeler

Practice (01 hrs)

12. Determine Gyroscopic Couple on Motorized Gyroscope

Module VI: BALANCING(03hrs)

Theory

Static and Dynamic Balancing, Balancing of Several Masses Revolving in the Same Plane and Different Planes, Balancing of Reciprocating Mass

Practice (02 hrs)

13. Balancing of Several Masses Revolving in the Same and Different Planes

14. Balancing of Reciprocating masses by Simulation

Module VII: VIBRATION (03hrs)

Theory

Basic Concepts and Types of Vibration, Methods of Vibration Analysis, Free Undamped Longitudinal, Transverse and Torsional Vibrations, Damped Free Vibrations, Logarithmic Decrement, Vibration Isolation and Transmissibility;

Practice (02 hrs)

15. Determination of Critical or Whirling Speed of Shaft

16. Simple and Compound Pendulum

Text Books:

- 1.S. S. Rattan Theory of Machines,. Tata McGraw-Hill Education, 2014
2. Joseph E Shingley Theory of Machines and Machinery oxford publication

Reference Books:

2. Singh. S, Theory of Machines, Khanna publishers.
3. Norton R.L, Design of Machinery, McGraw-Hill.

Heat and Mass Transfer With FDM/FVM

Code	Course Title	Credit	T-P-PJ
CUTM1092	Heat and Mass Transfer With FDM/FVM	3	2-1-0

Objective

- To provide a good exposure for the students to various phenomena associated with fluid flow and different modes of heat & mass transfer

Course outcomes

- Students will be able to analyze and design various Equipment used in industry using principles of Heat Transfer

Course content

Module I: Conduction

(5 Hrs)

Fourier's Law of Conduction, General Heat Conduction Equation in Different Coordinate Systems (No Derivation), One Dimensional Steady State Conduction in Plane Wall, Composite Wall, One Dimensional Steady State Conduction in Composite Cylinders and Composite Spheres with Convective Atmosphere. Electrical Analogy, Conduction with Internal Heat Generation.

Practice

1. To find the thermal conductivity of a material by the two slabs guarded hot plate method.
2. To find heat transfer through composite wall using Simulia

Module II: Fins and Transient Conduction

(6 Hrs)

Overall Heat Transfer Coefficients, Critical Thickness of Insulation, Heat Transfer from Extended Surfaces, Effectiveness and Efficiency, Unsteady State Heat Conduction, Lumped Heat Capacity System and Lumped Capacitance Method.

Practice

3. To find the thermal resistance of the sample.
4. To find the thermal resistance of the sample using Simulia
5. To find the heat transfer in Transient Heat Conduction using Simulia



Module III: Convection

(9 Hrs)

Hydrodynamic and Thermal Boundary Layer, Principles and Governing Equations, Forced Convection: External Flow over a Flat Plate, Cylinder, Sphere and Non-Circular Ducts, Use of Empirical Relations, Internal Flow Through Pipe, Annular Spaces and Non-Circular Conduits, Natural Convection: Vertical, Horizontal, Inclined Surfaces.

Practice

6. To determine the overall heat transfer coefficient at the surface of a given vertical metal cylinder by the natural convection method.
7. To verify Newton's Law of Cooling of different materials and different liquids.
8. To determine heat transfer coefficient using Simulia
9. To find the temperature variation and heat transfer along cylinder in forced convection using Simulia
10. To find the temperature variation and heat transfer along solid cylinder in natural convection using Simulia

Module IV: Heat Transfer With Phase Change

(2 Hrs)

Film Wise and Drop Wise Condensation, Boiling Heat Transfer, Regimes of Boiling.

Module V: Heat Exchangers

(6 Hrs)

Types of Heat Exchangers, Heat Exchanger Analysis Types of Heat Exchangers, Heat Exchanger Analysis, LMTD, Overall Heat Transfer Coefficient, Heat Exchanger Effectiveness, NTU.

Practice

11. Determination of Effectiveness and Efficiency of Parallel Flow and Counter Flow Heat Exchanger.
12. CFD simulation of Heat Exchanger using Simulia

Module VI: Radiation

(8 Hrs)

Electromagnetic Spectrum, Black Body Emission, Emissive Power, Laws of Radiation, Nature of Black and Grey Bodies, Concepts, Radiation Shape Factor, Thermal Resistance and Electrical Analogy, Radiation Heat Transfer Between Two Surfaces, Reradiating Surface, Radiation Shield.

Practice

13. To find the emissivity of different material surface.
14. Verification of Stefan Boltzmann's Law using simulia

Module VII: Mass Transfer

(4 Hrs)



Introduction, Analogy between heat and mass transfer, Mass diffusion, Fick's law of diffusion, boundary conditions, Steady mass diffusion through a wall, Mass convection.

Text Books:

1. Mahesh M. Rathore, Engineering Heat Transfer , Jones & Bartlett Learning, 2011
2. YunusCengel, Heat And Mass Transfer: Fundamentals And Applications, McGraw-Hill Higher Education, 2014

Reference

1. R.C Sachdeva, Fundamentals of Heat and Mass Transfer
2. R.K. Rajput, Heat Transfer, Laxmi Publication

Books:

Course outline Prepared by:-Prof.Mukundjee Pandey, Dr.Ashok Mishra, Dr. Vijay
Date: - 25/05/2020
Source of reference:- NPTEL, Coursera, Udemy, MIT Open Course Ware & Virtual
Amrita Laboratories Universalizing Education

Theories of Failure Using Finite Element Analysis

Code	Course Title	Credit	T-P-PJ
CUTM1062	Theories of Failure Using Finite Element Analysis	4	2-2-0

Objective

- To educate the students on basic theories behind mechanics of solids.
- To educate the students on Finite Element Analysis concept applicable to Practical conditions.
- To educate the students on Failure Criterion which will be useful for designing Practical problems.
- To educate the students on using 3D Experience Tools for analysis of various mechanical structures and load transmitting elements.

Learning outcome

- Students will have knowledge and practical engineering skills in analysis of mechanical strength of structures and load transmission elements and will be able to design them based on input data.
- Students will be able to deploy 3D Experience Platform to develop design solutions.
- Students will be able to apply the Concept of Meshing and Failure Criteria to Practical Problems which will lead Economical and safe in Design Aspect.

Course content

Module I Introduction to Finite Element Analysis (FEA) and 3D Experience Platform - (4(T)+5(P)) (9 Hours)

Introduction to FEA: Need for Studying FEA; Types of Analysis; Discretization of a Structure; Element Shapes, Nodes and Degrees of Freedom; Mesh Refining, Element Aspect Ratio, Use of Symmetry, Principle of Convergence; General Procedure of FEA.

Material failure Behaviour: Stress–Strain Diagrams for Ductile and Brittle Materials.

Equivalent stresses for varying orientations, Principal stresses, maximum shear stress, Mohr's circles.

Practice:

1. Introduction to 3D Experience Platform: About the Apps and their Applications from

Engineering Point of View.

2. Analysis of Steel Bridge – Simulation using 3D Experience Tool.

3. Tensile Test using Simulation 3D Experience Tool.

4. Stress Strain Curve of a Ductile Material (Mild Steel) using Universal Testing Machine

Module II Mesh Generation and Modeling of Truss Structure (1(T)+ 4(P) (5 Hours)

Mesh Generation and Methods of Meshing and Types of Meshing. Procedure for selecting the method of meshing and type of meshing. Importance and application of Stiffness Matrix for different types of elements and the procedure for getting the results.

Practice:

5. 3D Experience Simulia – Modelling and Meshing of Transmission line tower.

Module III Stresses and Deflection Criteria: (5(T)+ 4(P) (9 Hours)

Procedure for Drawing Shear Force and Bending Moment Diagrams, Point of Contra Flexure.

Stresses (No Derivation): Simple or Pure Bending, Flexure Formula, Section Modulus, Neutral Axis, Determination of Bending Stresses, Shear Stress Distribution for Different Sections.

Deflection: Equation of Elastic Curve, Direct Integration Method

Practice:

6. 3D Experience Simulia – Modelling and Finite Element Analysis of Framed Structure subjected Earthquake Loads.

Module IV: Theories of Failure: (2(T)+ 4(P) (6 Hours)

Theories of Failure: Failure Under Biaxial Loading, Rankine's Theory, Guest's or Tresca's Theory, Von Mises Theory, Graphical Representation of Failure, Safety Factors, Prevention of Failure in Design Stage, Diagnosis of Failure In Post-Manufacturing Stage.

Practice:

7. 3D Experience Simulia: Bicycle Frame Structural Analysis

Module V: Torsion: (3(T)+ 4(P) (7 Hours)

Torsion: Torsion Equation, Design of Shafts, Power Transmitted by Shafts, Composite Shafts, Combined Bending and Torsion, Closed-Coiled Helical Springs, Spring Connected in Series and

Parallel.

Dynamic Analysis: Fundamentals of Vibration; Evaluation of Natural Frequencies and Mode Shapes (Eigen values and Eigenvectors); Non-linear Analysis, Fatigue Analysis. Structures Subjected to Blast Loads.

Practice:

8. Simulation: Static and Dynamic Analysis of Shaft

Module VI Pressure Vessels (1(T)+ 2(P)) (3 Hours)

Longitudinal and Hoop Stress in Thin-walled Pressure Vessels Subjected to Internal Pressure.

Practice:

9. Simulation: Crack Analysis of Thin walled Pressure Vessels.

Module VII Fatigue and Fracture: (3(T)+ 4(P)) (7 Hours)

Fatigue: Failure Under Cyclic Loading, Endurance Limit. S-N Curve, Stress Concentration, Goodman and Soderberg Criteria.

Fracture: Types of Failure, Brittle and Ductile Fracture, Basic Modes of Fracture. Griffith's Analysis, Crack Growth and Stress Intensity Factor.

10. Fatigue Analysis of Crankshaft of Two-Wheeler

Text Books:

1. Strength of Materials, S.S. Rattan, Tata Mc-Graw Hill Publication.
2. Advanced Mechanics of Materials, A.P. Boresi and R.J. Schmidt, Willey India

Reference Books:

1. Elements of Fracture mechanics, Prashant Kumar, McGraw Hill Education (India)
2. Engineering Mechanics of Solids, Egor P. Popov, Pearson publication
3. Strength of Materials, R.K.Bansal, Laxmi Publications.

Optimization Techniques

Code	Course Title	Credit	T-P-PJ
CUTM1093	Optimization Techniques	2	0-2-0

Objective

- To Create an Engineering design methodology using a mathematical formulation of a design problem to support selection of the optimal design among alternatives

Learning outcome

- Ability to apply the theory of optimization methods and algorithms to develop and for solving various types of optimization problems
- Ability to go in research by applying optimization techniques in problems of Engineering and Technology
- Ability to solve the mathematical results and numerical techniques of optimization theory to concrete Engineering problems by using computer software

Course content

Module-I: Linear Programming: Graphical Method, Simplex method, Penalty Method

Module-II: Transportation Models, Assignment Models, Sequencing and Scheduling Models by Johnson's Algorithm

References

- Harvey M. Wagner, *Principles of Operations Research*, Englewood Cliffs, Prentice-Hall, 1969
- S D Sharma and Himansu Sharma, *Operations Research: Theory, Methods and Applications*, 15 Edition, KedarnathRamnath & Co

External Links:

<https://www.informs.org/Resource-Center/INFORMS-Student-Union/Consider-an-Analytics-OR-Career>

<https://www.informs.org/>

https://en.wikipedia.org/wiki/Operations_research

Google and YouTube

Database Management Systems

Code	Course Title	Credit	T-P-PJ
CUTM1059	Database Management Systems	3	2-1-0

Objective

- To understand the different issues involved in the design and implementation of a database system.
- To study the physical and logical database designs, database Modeling, relational, hierarchical, and network models
- To understand and use data manipulation language to query, update, and manage a database
- To develop an understanding of essential Properties of DBMS concepts such as: database security, integrity, concurrency
- To design and build a simple database system and demonstrate competence with the fundamental tasks involved with modeling, designing, and implementing a DBMS.

Learning outcome

- Describe the fundamental elements of relational database management systems
- Explain the basic concepts of relational data model, entity-relationship model, relational database design, relational algebra and SQL
- Design ER-models to represent simple database application scenarios
- Convert the ER-model to relational tables, populate relational database and formulate SQL queries on data
- Improve the database design by normalization
- Familiar with basic database storage structures and access techniques: file and page organizations, indexing methods including B tree, and hashing

Course content

Module-1: DBMS Concepts [5 Hrs]

Data Abstraction - Data models and data independence. Instances and Schemas. Components of a DBMS and overall structure of a DBMS- Life Cycle of a DBMS application- Database terminology.

Module-2: Data Modeling [5Hrs]

Basic concepts- Types of data models- Conceptual, physical and logical database models- E-R data model and Object-oriented data model. Components of ER Model- ER Modeling symbols.

Entity and entity sets- Relations and relationship sets- E-R Diagrams- Reducing E-R Diagrams into tables.

Practice

Assume we have the following application that models soccer teams, the games they play, and the

players in each team. In the design, we want to capture the following:

- We have a set of teams, each team has an ID (unique identifier), name, main stadium, and to which city this team belongs.
- Each team has many players, and each player belongs to one team. Each player has a number (unique identifier), name, DoB, start year, and shirt number that he uses.
- Teams play matches, in each match there is a host team and a guest team. The match takes place in the stadium of the host team.
- For each match we need to keep track of the following:
 - The date on which the game is played
 - The final result of the match
 - The players participated in the match. For each player, how many goals he scored, whether or not he took yellow card, and whether or not he took red card.
 - During the match, one player may substitute another player. We want to capture this substitution and the time at which it took place.
 - Each match has exactly three referees. For each referee we have an ID (unique identifier), name, DoB, years of experience. One referee is the main referee and the other two are assistant referee.

Design an ER diagram to capture the above requirements. State any assumptions you have that affects your design (use the back of the page if needed). Make sure cardinalities and primary keys are clear.

Module-3: Relational DBMS Model [5 Hrs]

Basic concepts, Attributes and domains- Intention and extensions of a relation- concept of integrity and referential constraints- Relational Query Languages (Relational algebra and relational calculus (Tuple and domain relational calculus)).

Module-4: Relational Database Design [6 Hrs]

Notion of normalized relations- Normalization using Functional Dependency- First Normal form- Second Normal Form- Third Normal form- BCNF.

Practice

Perform NF on the given table

[CLICK HERE FOR TABLE](#)



Module-5: SQL [6 Hrs]

Structure of a SQL query- DDL and DML, TCL- SQL queries and sub queries- Tables, views and indexes.

Practice

To study DDL-create and DML-insert commands.

(i) Create tables according to the following definition.

```
CREATE TABLE DEPOSIT (ACTNO VARCHAR2(5) ,CNAME VARCHAR2(18) , BNAME
VARCHAR2(18) , AMOUNT NUMBER(8,2) ,ADATE DATE);
CREATE TABLE BRANCH(BNAME VARCHAR2(18),CITY VARCHAR2(18)); CREATE
TABLE CUSTOMERS(CNAME VARCHAR2(19) ,CITY VARCHAR2(18));
CREATE TABLE BORROW(LOANNO VARCHAR2(5), CNAME VARCHAR2(18), BNAME
VARCHAR2(18), AMOUNT NUMBER (8,2));
```

(ii) Insert the data as shown below.

DEPOSIT

[CLICK HERE FOR TABLE](#)

BRANCH

[CLICK HERE FOR TABLE](#)

CUSTOMERS

[CLICK HERE FOR TABLE](#)

BORROW

[CLICK HERE FOR TABLE](#)

- (1) Describe deposit, branch.
- (2) Describe borrow, customers.
- (3) List all data from table DEPOSIT.
- (4) List all data from table BORROW.
- (5) List all data from table CUSTOMERS.
- (6) List all data from table BRANCH.
- (7) Give account no and amount of depositors.
- (8) Give name of depositors having amount greater than 4000.
- (9) Give name of customers who opened account after date '1-12-96'.

Module-6:Aggregate functions [4 Hrs]

Set Operations, predicates and joins, Set Membership- Tuple variables- Set comparison- Database modifications using SQL.

Practice

Create the below given table and insert the data accordingly.

Create Table Job (job_id, job_title, min_sal, max_sal)

COLUMN NAME DATA TYPE

job_id Varchar2(15)

job_title Varchar2(30)

min_sal Number(7,2)

max_sal Number(7,2)

Create table Employee (emp_no, emp_name, emp_sal, emp_comm, dept_no)

COLUMN NAME DATA TYPE

emp_no Number(3)

emp_name Varchar2(30)

emp_sal Number(8,2)

emp_comm Number(6,1)

dept_no Number(3)

Create table deposit(a_no,cname,bname,amount,a_date).

COLUMN NAME DATA TYPE

a_no Varchar2(5)

cname Varchar2(15)

bname Varchar2(10)

amount Number(7,2)

a_date Date

Create table borrow(loanno,cname,bname,amount).

COLUMN NAME DATA TYPE

loanno Varchar2(5)

cname Varchar2(15)

bname Varchar2(10)

amount Varchar2(7,2)

Insert following values in the table Employee.

emp_n emp_name emp_sal emp_comm dept _no

101 Smith 800 20

102 Snehal 1600 300 25

103 Adama 1100 0 20

104 Aman 3000 15

105 Anita 5000 50,000 10

106 Sneha 2450 24,500 10

107 Anamika 2975 30

Insert following values in the table job.

[CLICK HERE FOR TABLE](#)

Insert following values in the table deposit.

[CLICK HERE FOR TABLE](#)

Perform following queries

- (1) Retrieve all data from employee, jobs and deposit.
- (2) Give details of account no. and deposited rupees of customers having account opened between dates 01-01-06 and 25-07-06.
- (3) Display all jobs with minimum salary is greater than 4000.
- (4) Display name and salary of employee whose department no is 20. Give alias name to name of employee.
- (5) Display employee no,name and department details of those employee whose department lies in(10,20)

To study various options of LIKE predicate

- (1) Display all employee whose name start with 'A' and third character is 'a'.
- (2) Display name, number and salary of those employees whose name is 5 characters long and first three characters are 'Ani'.
- (3) Display the non-null values of employees and also employee name second character should be 'n' and string should be 5 character long.
- (4) Display the null values of employee and also employee name's third character should be 'a'.
- (5) What will be output if you are giving LIKE predicate as '%_%' ESCAPE '\'

To Perform various data manipulation commands, aggregate functions and sorting concept on all created tables.

- (1) List total deposit from deposit.
- (2) List total loan from karolbagh branch
- (3) Give maximum loan from branch vrce.
- (4) Count total number of customers
- (5) Count total number of customer's cities.
- (6) Create table supplier from employee with all the columns.
- (7) Create table sup1 from employee with first two columns.
- (8) Create table sup2 from employee with no data
- (9) Insert the data into sup2 from employee whose second character should be 'n' and string should be 5 characters long in employee name field.
- (10) Delete all the rows from sup1.
- (11) Delete the detail of supplier whose sup_no is 103.
- (12) Rename the table sup2.
- (13) Destroy table sup1 with all the data.
- (14) Update the value dept_no to 10 where second character of emp. name is 'm'.
- (15) Update the value of employee name whose employee number is 103.

To study Single-row functions.



- (1) Write a query to display the current date. Label the column Date
- (2) For each employee, display the employee number, job, salary, and salary increased by 15% and expressed as a whole number. Label the column New Salary
- (3) Modify your query no 4.(2) to add a column that subtracts the old salary from the new salary. Label the column Increase
- (4) Write a query that displays the employee's names with the first letter capitalized and all other letters lowercase, and the length of the names, for all employees whose name starts with J, A, or M. Give each column an appropriate label. Sort the results by the employees' last names.
- (5) Write a query that produces the following for each employee:
earns monthly
- (6) Display the name, hire date, number of months employed and day of the week on which the employee has started. Order the results by the day of the week starting with Monday.
- (7) Display the hiredate of emp in a format that appears as Seventh of June 1994 12:00:00 AM.
- (8) Write a query to calculate the annual compensation of all employees (sal+comm.).

Displaying data from Multiple Tables (join)

- (1) Give details of customers ANIL.
- (2) Give name of customer who are borrowers and depositors and having living city nagpur
- (3) Give city as their city name of customers having same living branch.
- (4) Write a query to display the last name, department number, and department name for all employees.
- (5) Create a unique listing of all jobs that are in department 30. Include the location of the department in the output
- (6) Write a query to display the employee name, department number, and department name for all employees who work in NEW YORK.
- (7) Display the employee last name and employee number along with their manager's last name and manager number. Label the columns Employee, Emp#, Manager, and Mgr#, respectively.
- (8) Create a query to display the name and hire date of any employee hired after employee SCOTT.

Module-7: Transaction Management [8 Hrs]

Subqueries, Manipulating Data, Transaction management and Concurrency control

Practice

To apply the concept of Aggregating Data using Group functions.

- (1) List total deposit of customer having account date after 1-jan-96.
- (2) List total deposit of customers living in city Nagpur.
- (3) List maximum deposit of customers living in bombay.
- (4) Display the highest, lowest, sum, and average salary of all employees. Label the columns Maximum, Minimum, Sum, and Average, respectively. Round your results to the nearest whole number.
- (5) Write a query that displays the difference between the highest and lowest salaries. Label the

column DIFFERENCE.

- (6) Create a query that will display the total number of employees and, of that total, the number of employees hired in 1995, 1996, 1997, and 1998
- (7) Find the average salaries for each department without displaying the respective department numbers.
- (8) Write a query to display the total salary being paid to each job title, within each department.
- (9) Find the average salaries > 2000 for each department without displaying the respective department numbers.
- (10) Display the job and total salary for each job with a total salary amount exceeding 3000, in which excludes president and sorts the list by the total salary.
- (11) List the branches having sum of deposit more than 5000 and located in city bombay.

To solve queries using the concept of sub query.

- (1) Write a query to display the last name and hire date of any employee in the same department as SCOTT. Exclude SCOTT
- (2) Give name of customers who are depositors having same branch city of mr. sunil.
- (3) Give deposit details and loan details of customer in same city where pramod is living.
- (4) Create a query to display the employee numbers and last names of all employees who earn more than the average salary. Sort the results in ascending order of salary.
- (5) Give names of depositors having same living city as mr. anil and having deposit amount greater than 2000
- (6) Display the last name and salary of every employee who reports to ford.
- (7) Display the department number, name, and job for every employee in the Accounting department.
- (8) List the name of branch having highest number of depositors.
- (9) Give the name of cities where in which the maximum numbers of branches are located.
- (10) Give name of customers living in same city where maximum depositors are located.

Manipulating Data

- (1) Give 10% interest to all depositors.
- (2) Give 10% interest to all depositors having branch vrce
- (3) Give 10% interest to all depositors living in n agpur and having branch city bombay.
- (4) Write a query which changes the department number of all employees with empno 7788's job to employee 7844's current department number.
- (5) Transfer 10 Rs from account of anil to sunil if both are having same branch.
- (6) Give 100 Rs more to all depositors if they are maximum depositors in their respective branch.
- (7) Delete depositors of branches having number of customers between 1 to 3.
- (8) Delete deposit of vijay.
- (9) Delete borrower of branches having average loan less than 1000.



To apply the concept of security and privileges.

To study Transaction control commands

[VIRTUAL LAB](#)

TEXT BOOKS

Database Management Systems: Raghu Ramakrishnan

ORACLE PL/SQL Programming – Scott Urman BPB Publications.

REFERENCES

Database Systems Concepts – Henry F Korth, Abraham Silberschatz.

Database Management Systems – Alexis Leon, Mathews Leon – Leon, Vikas Publications

Programming in Java(Same as Java Technologies)

Code	Course Title	Credit	T-P-PJ
CUTM1058	Programming in Java(Same as Java Technologies)	3	2-1-0

Objective

- Understand fundamentals of programming such as variables, conditional and iterative execution, methods, etc.
- Understand fundamentals of object-oriented programming in Java, including defining classes, invoking methods, using class libraries, etc.
- Be aware of the important topics and principles of software development
- Have the ability to write a computer program to solve specified problems
- Have the ability to write a computer program to solve specified problems
- Be able to use the Java SDK environment to create, debug and run simple Java programs

Learning outcome

- Use an integrated development environment to write, compile, run, and test simple object-oriented Java programs
- Read and make elementary modifications to Java programs that solve real-world problems
- Identify and fix defects the common safety issues in code
- Document a Java program using Javadoc
- Use a version control system to track source code in a project
- Qualify confidently any interview process where Java is the requirement

Course content

Module I: Introduction to Java (8 hrs)

Features and Installation, Java Programming Basics, Decision Making and Looping, Class and Object, Inheritance

Practice 1 (1 Hr)

Practice 2 (1 Hr)

Module II: Package and Safe Code (5 Hr)

Interfaces, Packages and Access Protection, Exception Handling (Fault Tolerant Programming)

Practice 3 (1 Hr)



Module III: Collection and Threads (5 Hr)

ArrayList, Vector, Set, Map, Multi-threaded Programming, Synchronization

Practice 4 (1 Hr)

Module IV: Language and Utility Packages (5 Hr)

String Handling, Wrappers, Runtime Memory Management, Cloning, Calendar, Date and Time Facilities, Scanner, Internationalization

Practice 5 (1 Hr)

Practice 6 (1 Hr)

Module V: Input/ Output and Applets (5 Hr)

Byte and Character Stream I/O, Persistence, Applet: Architecture, Skeleton, and Implementation

Practice 7 (1 Hr)

Practice 8 (1 Hr)

Module VI: GUI Programming (5 Hr)

AWT: Container, Components, Layout Managers, Event Handling

Practice 9 (1 Hr)

Practice 10 (1 Hr)

Module VII: Networking and Advanced (5 Hr)

Networking Fundamental, Client-Server Communication, Remote Method Invocation (RMI),

Java Virtual Machine (JVM) Tuning, Java Profiler

Practice 11 (1 Hr)

Practice 12 (1 Hr)

Text Book(s):

1. Java The Complete Reference, Fifth Edition, C25 Herbert Schildt, McGraw-Hills

Reference Book(s):



1. Murach's Java Programming, 5th Edition, Joel Murach, Mike Murach & Associates, 2011, ISBN-78-1-943872-07-7
2. Introduction to Java Programming, Comprehensive, 10th ed., Y. Daniel Liang, 2014. ISBN-10: 0133813460, ISBN-13: 9780133813463

<https://nqr.gov.in/qualification-title?nid=3002>
<https://www.cdac.in/index.aspx?id=DAC&courseid=0#>
<https://canvas.harvard.edu/courses/63117/assignments/syllabus>
<https://canvas.harvard.edu/courses/69911/assignments/syllabus>
<https://xid.harvard.edu/xid-apps/submitAccountForm.do>

YouTube Resources:

- freeCodeCamp.org
- Codearchery
- Edureka
- free project
- Jenkov

Online Source(s):

1. <https://docs.oracle.com/javase/tutorial/java/index.html>
2. <https://www.programiz.com/java-programming>
3. <https://marcus-biel.com/>

Software/Tool(s): Java 8, Eclipse IDE

Online Compiler: <https://ideone.com/>

Online Coding Practice: <https://www.hackerrank.com/>

List of Practices:

Practice 1 (Module-I)

Program-1:

Write a program that computes the standard deviation of a set of floating point numbers that the user enters. First the user says how many numbers N are to follow. Then the program asks for and reads in



each floating point number. Finally it writes out the standard deviation. The standard deviation of a set of numbers X_i is:

$$SD = \text{Math.sqrt}(\text{avgSquare} - \text{avg}^2)$$

Here, avg is the average of the N numbers, and avg^2 is its square.

avgSquare is the average of $X_i * X_i$. In other words, this is the average of the squared value of each floating point number.

For example, if $N = 4$, say the numbers were:

$X_i \quad X_i * X_i$

2.0 4.0

3.0 9.0

1.0 1.0

2.0 4.0

sum 8.0 18.0

Now:

$$\text{avg} = 8.0/4 = 2.0$$

$$\text{avg}^2 = 4.0$$

$$\text{avgSquare} = 18.0/4 = 4.5$$

$$SD = \text{Math.sqrt}(4.5 - 4.0) = \text{Math.sqrt}(.5) = 0.7071067812$$

To do this you will need to do several things inside the loop body for each floating point value as it comes in: add it to a sum, square it and add it to a sum of squares. Then after the loop is finished apply the formula.

Program-2 and Program-3:

Two suggested competitive programs to solve on HackerRank

<https://www.hackerrank.com/domains/java>

Practice 2 (Module-I)

Program-1:

Better encapsulation of the Goods class would call making instance variables private and using getter and setter methods to access them. A further refinement would be to make the class abstract and to define additional child classes. Here is a revised Goods class:

```
public abstract class GoodsSGA
{
    private String description;
    private double price;
    private int quantity;
    public GoodsSGA( String des, double pr, int quant )
    {description = des;
    price = pr;
    quantity = quant;}
    double getPrice()
    {return price;}
    void setPrice( double newPrice)
    {price = newPrice;}
    int getQuantity()
    {return quantity;}
    void setQuantity ( int newQuantity )
    {quantity = newQuantity;}
    public String toString()
    {return "item: " + description + " quantity: " + quantity + " price: " + price ;}
```

Revise the source code for the classes Food, Toy, and Book. (Perhaps call the revised classes FoodSG,



ToySG, and BookSG.) create a new class ToiletrySG for things like bubble bath. Create a new testing class, StoreSG to test your revised classes.

Note: the child classes will need to use the getter and setter methods to access the instance variables that are declared as private in GoodsSG.

Program-2 and Program-3:

Two suggested competitive programs to solve on HackerRank

<https://www.hackerrank.com/domains/java>

Practice 3 (Module-II)

Program-1:

User-Friendly Division Practice:

Put in a loop so that the user is repeatedly asked for the numerator and the divisor. For each set of data, the program prints out the result, or an informative error message if there is a problem (division by zero or poor input data).

The program continues looping, even if there is a problem Exit the loop when data entered for the numerator start with characters "q" or "Q". Don't print out an error message in this case.

Don't ask for the divisor if the user just asked to quit.

Here is sample output from one run:

Enter the numerator: 12

Enter the divisor: 4

12 / 4 is 3

Enter the numerator: 12

Enter the divisor : 0

You can't divide 12 by 0

Enter the numerator: glarch

You entered bad data.

Please try again.



Enter the numerator: quit

You will need to use the method `charAt()` from the `String` class.

Program-2 and Program-3:

Two suggested competitive programs to solve on HackerRank

<https://www.hackerrank.com/domains/java>

Practice 4 (Module-III)

Program-1:

In mathematics, several operations are defined on sets. The union of two sets A and B is a set that contains all the elements that are in A together with all the elements that are in B . The intersection of A and B is the set that contains elements that are in both A and B . The difference of A and B is the set that contains all the elements of A except for those elements that are also in B .

Suppose that A and B are variables of type `set` in Java. The mathematical operations on A and B can be computed using methods from the `Set` interface. In particular:

`A.addAll(B)` computes the union of A and B ; `A.retainAll(B)` computes the intersection of A and B ; and `A.removeAll(B)` computes the difference of A and B . (These operations change the contents of the set A , while the mathematical operations create a new set without changing A , but that difference is not relevant to this exercise.)

For this exercise, you should write a program that can be used as a “set calculator” for simple operations on sets of non-negative integers. (Negative integers are not allowed.) A set of such integers will be represented as a list of integers, separated by commas and, optionally, spaces and enclosed in square brackets. For example: `[1,2,3]` or `[17, 42, 9, 53,108]`. The characters `+`, `*`, and `-` will be used for the union, intersection, and difference operations. The user of the program will type in lines of input containing two sets, separated by an operator. The program should perform the operation and print the resulting set.



Here are some examples:

Input Output

[1, 2, 3] + [3, 5, 7] [1, 2, 3, 5, 7]

[10,9,8,7] * [2,4,6,8] [8]

[5, 10, 15, 20] - [0, 10, 20] [5, 15]

To represent sets of non-negative integers, use sets of type `TreeSet<Integer>`. Read the user's input, create two `TreeSets`, and use the appropriate `TreeSet` method to perform the requested operation on the two sets. Your program should be able to read and process any number of lines of input. If a line contains a syntax error, your program should not crash. It should report the error and move on to the next line of input. (Note: To print out a Set, A, of Integers, you can just say `System.out.println(A)`. We've chosen the syntax for sets to be the same as that used by the system for outputting a set.)

Program-2 and Program-3:

Two suggested competitive programs to solve on HackerRank

<https://www.hackerrank.com/domains/java>

Practice 5 (Module-IV)

Program-1:

Password Checker:

Write a program that repeatedly asks the user for a proposed password until the user enters an acceptable password. When the user enters an acceptable password, the program writes a message and exits.

Acceptable passwords:

Are at least 7 characters long.

Contain both upper and lower case alphabetic characters. Contain at least 1 digit. The logic of this program can be quite tricky. Hint: use `toUpperCase()`, `toLowerCase`, and `equals()`. You will also need nested ifs.



Here is a run of the program:

Enter your password:

snowflake

That password is not acceptable.

Enter your password:

SnowFlake

That password is not acceptable.

Enter your password:

snowflake47

That password is not acceptable.

Enter your password:

Snowflake47

Acceptable password.

Program-2 and Program-3:

Two suggested competitive programs to solve on HackerRank

<https://www.hackerrank.com/domains/java>

Practice 6 (Module-IV)

Program-1:

Secret Code:

A text message has been encoded by replacing each character of the message with an integer. Each integer is an index into a key-phrase that contains all the lower case letters of the alphabet as well as the space character. The key-phrase may contain the same character in several locations. The encoded text is series of integers, like this:



35 10 10 33 9 24 3 17 41 8 3 20 51 16 38 44 47 32 33 10 19 38 35 28 49

To decode the message, look up each integer in the key-phrase and output the corresponding character.

For example, say that the key-phrase is this (the index of each character has been written above it):

111111111122222222223333333333444444444455

0123456789012345678901234567890123456789012345678901

six perfect quality black jewels amazed the governor

using each integer from the encoded text as an index into the phrase results in the decoded message:

attack the bridge at dawn

Write a program that decodes a secret message contained in a text file. The first line of the text file contains the key-phrase. Then the file contains a sequence of integers, each of which indexes the key-phrase. Find the character corresponding to each integer and output the secret message. Note if a character character such as 'e' occurs several places in the key-phrase it may be encoded as different integers in different parts of the secret message.

(The recipient of the secret message gets only the file of integers and must put the key-phrase at the top of the file.) For example, here is the contents of a secret message file ready for the program:

six perfect quality black jewels amazed the governor

35 10 10 33 9 24 3 17 41 8 3 20 51 16 38 44 47 32 33 10 19 38 35 28 49

Here is a sample run of the program:

```
C:\> java Decode < secretFile.txt
```

attack the bridge at dawn

You will need the charAt() method of String.

Here is another secret message file, with key-phrase inserted, that you can use to test your program:

six perfect quality black jewels amazed the governor

31 16 2 3 4 42 48 7 27 9 10 43 12 13 35 15 1 40 18 3

20 15 33 23 24 32 26 29 28 27 21 31 25 14 34 14 36

42 38 19 40 41 27 3 44 50 46 42 48 49 50 6



Program-2 and Program-3:

Two suggested competitive programs to solve on HackerRank

<https://www.hackerrank.com/domains/java>

Practice 7 (Module-V)

Program-1:

Stop Word Remover:

Write a program that reads in a file of text, perhaps the text of a novel. The program copies the same text to an output file, except that all the useless words such as "the", "a", and "an" are removed. (Decide on what other words you wish to remove. The list of words removed is called a stop list.) Do this by reading the text file token by token using `hasNext()` and `next()`, but only writing out tokens not on the stop list.

Prompt the user for the names of the input and output files.

Fairly Easy: The output file will have only N tokens per line. Do this by counting tokens as you output them. N will be something like 10 or 12.

Improved Program: Preserve the line structure of the input file. Do this by reading each line using `nextLine()` and then creating a new `Scanner` for that line. (Look at the on-line documentation for `Scanner`.)

With each line's `Scanner`, use `hasNext()` and `next()` to scan through its tokens.

Harder: Write out no more than N characters per line. N will be something like 50. Do this by keeping count of the number of characters written out per line. The `length()` method of `String` will be useful. If X characters has already been written to the current line, and if X plus the length of the current token exceeds N , then start a new line.



Program-2 and Program-3:

Two suggested competitive programs to solve on HackerRank

<https://www.hackerrank.com/domains/java>

Practice 8 (Module-V)

Program-1:

E-Mail Address Extractor:

Write a program that scans a text file for possible e-mail addresses. Addresses look like this:

someone@somewhere.net

Read tokens from the input file one by one using `hasNext()` and `next()`. With the default delimiters of `Scanner`, an entire e-mail address will be returned as one token. Examine each token using the `indexOf()` method of `String`. If a token contains an at sign `@` followed some characters later by a period, regard it as a possible e-mail address and write it to the output file.

Programs such as this scan through web pages looking for e-mail addresses that become the targets of spam. Because of this, many web pages contain disguised e-mail addresses that can't easily be automatically extracted.

Program-2 and Program-3:

Two suggested competitive programs to solve on HackerRank

<https://www.hackerrank.com/domains/java>

Practice 9 (Module-VI)

Program-1:

User-friendly Fat Calculator, with Advice:

Further modify the calories from fat calculator so that it includes another `TextField` that will be set with the text "Too many fat calories" if the percentage of calories from fat is equal or greater than 30 percent, or to "Healthy amount of fat" if the percentage is less than that.

Program-2 and Program-3:

Two suggested competitive programs to solve on HackerRank



<https://www.hackerrank.com/domains/java>

Practice 10 (Module-VI)

Program-1:

Three Button Monte:

Write a program to implement a game:

There are three buttons in the frame. Two of the buttons cause the program to quit using `System.exit(0)`; the remaining button changes the frame to green (a win!) The winning button is different each time the game is played.

The easy way to do this (although it seems unfair to the user) treats each button the same way. The `actionPerformed()` method does not check which button was clicked. When any button is clicked, the method picks a random integer from 0 to 2 and performs the "winning" action if the integer happens to be 0. Otherwise, it performs the "losing" action. To the user, it seems like there is a "winning" button and two "losing" buttons. But, in fact, it does not matter which button was clicked.

This is similar to some electronic gambling devices in casinos, where it appears to the user that there are "winning moves" and "losing moves" but in fact the machine actually ignores what the user has done and just declares a "win" every now and then, according to predetermined odds.

You will need the `Random` class:

```
Random randNum = new Random(); // create a Random number object
```

```
...
```

```
int someInt = randNum.nextInt(3); // someInt gets a number from 0 to 2
```

Program-2 and Program-3:

Two suggested competitive programs to solve on HackerRank

<https://www.hackerrank.com/domains/java>

Practice 11 (Module-VII)

Content Delivery with Networking:



Write a Client-Server program where the client queries with a name of file and the server delivers the content of requested files to the client over the network.

(Improve the program by making the server multi-threaded)

Practice 12 (Module-VII)

Greet the user with Remote Method Invocation:

Write a program using RMI, where the user invokes a method on remote object with username as parameter and receives a greeting message based on time of the day along with username.

Projects

However, not limited to:

1. Chat application
2. Text Editor application
3. GUI based Scientific Calculator
4. Paint application
5. Slam book

(*PROJECT REVIEWS WILL COMMENCE BEYOND CLASS HOURS)

Monitoring:

Credit will be received only on making an honest effort. It is expected that students will finish watching all lecture video and complete all challenge problems by the end of each lecture week.

Borrowing code from other sources is allowed only with proper attribution and credit given to the original author(s).

List of Common Programs to solve using Java:

1. Program to calculate area of a triangle

2. Program to solve quadratic equation

3. Program to swap two variables (with and without using third variable)

4. *Program to generate random numbers in various ways*
5. *Program to convert miles to kilometers and vice-versa*
6. *Program to convert celsius to fahrenheit and vice-versa*
7. *Program to check if a number is odd or even*
8. *Program to check if input year is leap year*
9. *Program to test primality*
10. *Program to print all prime numbers in an interval using "Sieve of Eratosthenes"*
11. *Program to generate factorial of all elements in an array*
12. *Program to display the multiplication table up to 20*
13. *Program to print the fibonacci sequence*
14.
Program to check armstrong number, perfect number, Harshad number
15. *Program to generate armstrong numbers in an Interval*
16. *Program to find the sum of Harshad numbers in an interval*
17. *Program to display powers of two Using lambda*
18. *Program to perform conversions among decimal to binary, octal and hexadecimal*
19. *Program to display ASCII table*
20. *Program to find HCF/GCD and LCM*
21. *Program to find factors of given natural number*
22. *Program to make a simple calculator*

23. *Program to shuffle deck of cards*
24. *Program to generate fibonacci sequence using recursion*
25. *Program to find sum of natural numbers using recursion*
26. *Program to find factorial of number using recursion*
27. *Program to convert decimal to binary using recursion*
28. *Program to add two matrices*
29. *Program to obtain transpose of a matrix*
30. *Program to multiply two matrices*
31. *Program to check if a string is palindrome*
32. *Program to remove punctuations from a string*
33. *Program to sort words lexicographically*
34. *Program to illustrate different set operations*
35. *Program to count frequency of each vowel in a string*
36. *Program to find hash value of a file*

This course on courseware: <http://courseware.cutm.ac.in/courses/java-technologies/>

Database Management Systems

Code	Course Title	Credit	T-P-PJ
CUTM1059	Database Management Systems	3	2-1-0

Objective

- To understand the different issues involved in the design and implementation of a database system.
- To study the physical and logical database designs, database Modeling, relational, hierarchical, and network models
- To understand and use data manipulation language to query, update, and manage a database
- To develop an understanding of essential Properties of DBMS concepts such as: database security, integrity, concurrency
- To design and build a simple database system and demonstrate competence with the fundamental tasks involved with modeling, designing, and implementing a DBMS.

Learning outcome

- Describe the fundamental elements of relational database management systems
- Explain the basic concepts of relational data model, entity-relationship model, relational database design, relational algebra and SQL
- Design ER-models to represent simple database application scenarios
- Convert the ER-model to relational tables, populate relational database and formulate SQL queries on data
- Improve the database design by normalization
- Familiar with basic database storage structures and access techniques: file and page organizations, indexing methods including B tree, and hashing

Course content

Module-1: DBMS Concepts [5 Hrs]

Data Abstraction - Data models and data independence. Instances and Schemas. Components of a DBMS and overall structure of a DBMS- Life Cycle of a DBMS application- Database terminology.

Module-2: Data Modeling [5Hrs]

Basic concepts- Types of data models- Conceptual, physical and logical database models- E-R data model and Object-oriented data model. Components of ER Model- ER Modeling symbols. Entity and entity sets- Relations and relationship sets- E-R Diagrams- Reducing E-R Diagrams into tables.

Practice

Assume we have the following application that models soccer teams, the games they play, and

the

players in each team. In the design, we want to capture the following:

- We have a set of teams, each team has an ID (unique identifier), name, main stadium, and to which city this team belongs.
- Each team has many players, and each player belongs to one team. Each player has a number (unique identifier), name, DoB, start year, and shirt number that he uses.
- Teams play matches, in each match there is a host team and a guest team. The match takes place

place

in the stadium of the host team.

- For each match we need to keep track of the following:
 - The date on which the game is played
 - The final result of the match
 - The players participated in the match. For each player, how many goals he scored, whether or not he took yellow card, and whether or not he took red card.
 - During the match, one player may substitute another player. We want to capture this substitution and the time at which it took place.
 - Each match has exactly three referees. For each referee we have an ID (unique identifier), name, DoB, years of experience. One referee is the main referee and the other two are assistant referee.

Design an ER diagram to capture the above requirements. State any assumptions you have that affects your design (use the back of the page if needed). Make sure cardinalities and primary keys are clear.

Module-3: Relational DBMS Model [5 Hrs]

Basic concepts, Attributes and domains- Intention and extensions of a relation- concept of integrity and referential constraints- Relational Query Languages (Relational algebra and relational calculus (Tuple and domain relational calculus).

Module-4: Relational Database Design [6 Hrs]

Notion of normalized relations- Normalization using Functional Dependency- First Normal form- Second Normal Form- Third Normal form- BCNF.

Practice

Perform NF on the given table

[CLICK HERE FOR TABLE](#)

Module-5: SQL [6 Hrs]

Structure of a SQL query- DDL and DML, TCL- SQL queries and sub queries- Tables, views and indexes.

Practice

To study DDL-create and DML-insert commands.

(i) Create tables according to the following definition.

```
CREATE TABLE DEPOSIT (ACTNO VARCHAR2(5) ,CNAME VARCHAR2(18) , BNAME
VARCHAR2(18) , AMOUNT NUMBER(8,2) ,ADATE DATE);
```

```
CREATE TABLE BRANCH(BNAME VARCHAR2(18),CITY VARCHAR2(18)); CREATE
TABLE CUSTOMERS(CNAME VARCHAR2(19) ,CITY VARCHAR2(18));
```

```
CREATE TABLE BORROW(LOANNO VARCHAR2(5), CNAME VARCHAR2(18), BNAME
```

VARCHAR2(18), AMOUNT NUMBER (8,2));

(ii) Insert the data as shown below.

DEPOSIT

[CLICK HERE FOR TABLE](#)

BRANCH

[CLICK HERE FOR TABLE](#)

CUSTOMERS

[CLICK HERE FOR TABLE](#)

BORROW

[CLICK HERE FOR TABLE](#)

- (1) Describe deposit, branch.
- (2) Describe borrow, customers.
- (3) List all data from table DEPOSIT.
- (4) List all data from table BORROW.
- (5) List all data from table CUSTOMERS.
- (6) List all data from table BRANCH.
- (7) Give account no and amount of depositors.
- (8) Give name of depositors having amount greater than 4000.
- (9) Give name of customers who opened account after date '1-12-96'.

Module-6:Aggregate functions [4 Hrs]

Set Operations, predicates and joins, Set Membership- Tuple variables- Set comparison- Database modifications using SQL.

Practice

Create the below given table and insert the data accordingly.

Create Table Job (job_id, job_title, min_sal, max_sal)

COLUMN NAME DATA TYPE

job_id Varchar2(15)

job_title Varchar2(30)

min_sal Number(7,2)

max_sal Number(7,2)

Create table Employee (emp_no, emp_name, emp_sal, emp_comm, dept_no)

COLUMN NAME DATA TYPE

emp_no Number(3)

emp_name Varchar2(30)

emp_sal Number(8,2)

emp_comm Number(6,1)

dept_no Number(3)

Create table deposit(a_no,cname,bname,amount,a_date).

COLUMN NAME DATA TYPE

a_no Varchar2(5)

cname Varchar2(15)

bname Varchar2(10)

amount Number(7,2)

a_date Date

Create table borrow(loanno,cname,bname,amount).

COLUMN NAME DATA TYPE

loanno Varchar2(5)

cname Varchar2(15)

bname Varchar2(10)

amount Varchar2(7,2)

Insert following values in the table Employee.

emp_n emp_name emp_sal emp_comm dept_no

101 Smith 800 20

102 Snehal 1600 300 25

103 Adama 1100 0 20

104 Aman 3000 15

105 Anita 5000 50,000 10

106 Sneha 2450 24,500 10

107 Anamika 2975 30

Insert following values in the table job.

[CLICK HERE FOR TABLE](#)

Insert following values in the table deposit.

[CLICK HERE FOR TABLE](#)

Perform following queries

(1) Retrieve all data from employee, jobs and deposit.

(2) Give details of account no. and deposited rupees of customers having account opened between dates 01-01-06 and 25-07-06.

(3) Display all jobs with minimum salary is greater than 4000.

(4) Display name and salary of employee whose department no is 20. Give alias name to name of employee.

(5) Display employee no,name and department details of those employee whose department lies in(10,20)

To study various options of LIKE predicate

(1) Display all employee whose name start with 'A' and third character is 'a'.

(2) Display name, number and salary of those employees whose name is 5 characters long and first three characters are 'Ani'.

(3) Display the non-null values of employees and also employee name second character should be 'n' and string should be 5 character long.

(4) Display the null values of employee and also employee name's third character should be 'a'.

(5) What will be output if you are giving LIKE predicate as '%_%' ESCAPE '\'

To Perform various data manipulation commands, aggregate functions and sorting concept on all created tables.

(1) List total deposit from deposit.

(2) List total loan from karolbagh branch

(3) Give maximum loan from branch vrce.

(4) Count total number of customers

(5) Count total number of customer's cities.

(6) Create table supplier from employee with all the columns.

- (7) Create table sup1 from employee with first two columns.
- (8) Create table sup2 from employee with no data
- (9) Insert the data into sup2 from employee whose second character should be 'n' and string should be 5 characters long in employee name field.
- (10) Delete all the rows from sup1.
- (11) Delete the detail of supplier whose sup_no is 103.
- (12) Rename the table sup2.
- (13) Destroy table sup1 with all the data.
- (14) Update the value dept_no to 10 where second character of emp. name is 'm'.
- (15) Update the value of employee name whose employee number is 103.

To study Single-row functions.

- (1) Write a query to display the current date. Label the column Date
- (2) For each employee, display the employee number, job, salary, and salary increased by 15% and expressed as a whole number. Label the column New Salary
- (3) Modify your query no 4.(2) to add a column that subtracts the old salary from the new salary. Label the column Increase
- (4) Write a query that displays the employee's names with the first letter capitalized and all other letters lowercase, and the length of the names, for all employees whose name starts with J, A, or M. Give each column an appropriate label. Sort the results by the employees' last names.
- (5) Write a query that produces the following for each employee:
earns monthly
- (6) Display the name, hire date, number of months employed and day of the week on which the employee has started. Order the results by the day of the week starting with Monday.
- (7) Display the hiredate of emp in a format that appears as Seventh of June 1994 12:00:00 AM.
- (8) Write a query to calculate the annual compensation of all employees (sal+comm.).

Displaying data from Multiple Tables (join)

- (1) Give details of customers ANIL.
- (2) Give name of customer who are borrowers and depositors and having living city nagpur
- (3) Give city as their city name of customers having same living branch.
- (4) Write a query to display the last name, department number, and department name for all employees.
- (5) Create a unique listing of all jobs that are in department 30. Include the location of the department in the output
- (6) Write a query to display the employee name, department number, and department name for all employees who work in NEW YORK.
- (7) Display the employee last name and employee number along with their manager's last name and manager number. Label the columns Employee, Emp#, Manager, and Mgr#, respectively.
- (8) Create a query to display the name and hire date of any employee hired after employee SCOTT.

Module-7: Transaction Management [8 Hrs]

Subqueries, Manipulating Data, Transaction management and Concurrency control

Practice

To apply the concept of Aggregating Data using Group functions.

- (1) List total deposit of customer having account date after 1-jan-96.
 - (2) List total deposit of customers living in city Nagpur.
 - (3) List maximum deposit of customers living in bombay.
 - (4) Display the highest, lowest, sum, and average salary of all employees. Label the columns Maximum, Minimum, Sum, and Average, respectively. Round your results to the nearest whole number.
 - (5) Write a query that displays the difference between the highest and lowest salaries. Label the column DIFFERENCE.
 - (6) Create a query that will display the total number of employees and, of that total, the number of employees hired in 1995, 1996, 1997, and 1998
 - (7) Find the average salaries for each department without displaying the respective department numbers.
 - (8) Write a query to display the total salary being paid to each job title, within each department.
 - (9) Find the average salaries > 2000 for each department without displaying the respective department numbers.
 - (10) Display the job and total salary for each job with a total salary amount exceeding 3000, in which excludes president and sorts the list by the total salary.
 - (11) List the branches having sum of deposit more than 5000 and located in city bombay.
- To solve queries using the concept of sub query.

- (1) Write a query to display the last name and hire date of any employee in the same department as SCOTT. Exclude SCOTT
- (2) Give name of customers who are depositors having same branch city of mr. sunil.
- (3) Give deposit details and loan details of customer in same city where pramod is living.
- (4) Create a query to display the employee numbers and last names of all employees who earn more than the average salary. Sort the results in ascending order of salary.
- (5) Give names of depositors having same living city as mr. anil and having deposit amount greater than 2000
- (6) Display the last name and salary of every employee who reports to ford.
- (7) Display the department number, name, and job for every employee in the Accounting department.
- (8) List the name of branch having highest number of depositors.
- (9) Give the name of cities where in which the maximum numbers of branches are located.
- (10) Give name of customers living in same city where maximum depositors are located.

Manipulating Data

- (1) Give 10% interest to all depositors.
- (2) Give 10% interest to all depositors having branch vnce
- (3) Give 10% interest to all depositors living in n agpur and having branch city bombay.
- (4) Write a query which changes the department number of all employees with empno 7788's job to employee 7844's current department number.
- (5) Transfer 10 Rs from account of anil to sunil if both are having same branch.
- (6) Give 100 Rs more to all depositors if they are maximum depositors in their respective branch.
- (7) Delete depositors of branches having number of customers between 1 to 3.



(8) Delete deposit of vijay.

(9) Delete borrower of branches having average loan less than 1000.

To apply the concept of security and privileges.

To study Transaction control commands

[VIRTUAL LAB](#)

TEXT BOOKS

Database Management Systems: Raghu Ramakrishnan

ORACLE PL/SQL Programming – Scott Urman BPB Publications.

REFERENCES

Database Systems Concepts – Henry F Korth, Abraham Silberschatz.

Database Management Systems – Alexis Leon, Mathews Leon – Leon, Vikas Publications

The following colour represents the syllabus revision, skill, employability and entrepreneurship.

Green : Skill

Pink : Employability

Sky : Entrepreneurship

Centurion University of Technology and Management Odisha

CHOICE BASED CREDIT SYSTEM

COURSE STRUCTURE & SYLLABUS

BASKET - I



Centurion
UNIVERSITY

Shaping Lives...
Empowering Communities...

School of Engineering & Technology

2020

**Course Structure
Basket - I**

Course Code	Course Title	Credits	Course Type T+P+PJ
CUTM1001	Differential Equations and Linear Algebra	3	2+0+1
CUTM1002	Laplace & Fourier Transforms	3	2+0+1
CUTM1003	Complex Analysis & Numerical Methods	3	2+0+1
CUTM1004	Discrete Mathematics	3	2+0+1
CUTM1005	Probability & Statistics	3	2+0+1
CUTM1925	Calculus	3	2+0+1
CUTM1006	Mechanics for Engineers	3	2+1+0
CUTM1007	Optics and Optical Fibres	3	2+1+0
CUTM1008	Applied Analytical Chemistry	3	2+1+0
CUTM1009	Applied Engineering Materials	3	2+0+1
CUTM1010	Environmental Studies	2	0+0+2

Syllabus

Differential Equations and Linear Algebra

Code	Course Title	Credit	T-P-PJ
CUTM1001	Differential Equations and Linear Algebra	3	2-0-1

Objective

- Introduce students to how to solve linear Differential Equations with different methods.
- To solve the system of linear equations appearing in the problems of electrical engineering, mechanical engineering etc.
- To use Eigen values and Eigen vectors in Control theory, vibration analysis, electric circuits, advanced dynamics problems.
- Introduce students how to solve first order and second order differential equations

Course outcome

- Understand the importance of linear functions in mathematics.
- Solve systems of linear equations using Gauss- elimination to reduce to echelon form.
- Learn fundamental concepts of ODE theories and where and how such equations arise in applications to scientific and engineering problems.
- Be competent in solving linear/non-linear 1st & higher order ODEs using analytical methods to obtain their exact solutions

Course content

Module-I

First order linear differential equations and its applications(Kirchhoff's law)

Project-1:Some applications of differential equations in RL electrical circuit problems

Module-II:

Second order linear homogeneous differential equations (Real roots, Real equal roots, Complex conjugate roots) and its applications.

Project-2: RLC Circuit, Pendulum

Module-III:

Second order linear non-homogeneous differential equations, Finding particular integral consisting of exponential, trigonometric functions (Sine, cosine) using inverse operator method

Project-3: Simple mass-spring system, Damped vibration system

Module IV:

Basic concepts of a matrices, solution of linear system of equations by Gauss elimination method, linearly independent and dependent of a vectors, rank of a matrix.

Project-4

Report on finding the traffic flow in the net of one-way streets

Module V:

Determinants and Cramer's Rule, Fundamental theorem of linear system of equations.

Module VI:

Eigenvalues and Eigen vectors of a matrix

Project-5

(i) Find the limit states of the Markov process model.

(ii) Find the growth rate in the Leslie model

Module VII:

Symmetric, Skew-Symmetric, Orthogonal Matrices and Properties

Project-6

To make a report to show that the product of two orthogonal matrices is orthogonal, and so is the inverse of an orthogonal matrix. What does this mean in terms of rotations?

Text Books:

1. Advanced engineering mathematics by Erwin Kreyszig, 8th edition
Chapter-6 (6.1-6.6), Chapter-7 (7.1,7.2)
2. Higher Engineering by B.V. Ramana
Chapter-8(8.1,8.2,8.21), Chapter-9 (9.2,9.3,9.5)

Reference Books:

1. J. Sinha Roy and S. Padhy, A Course of Ordinary and Partial Differential Equations, Kalyani Publishers, New Delhi.
2. G.B. Thomas, M.D. Weir, J.R. Hass, Thomas' Calculus, Pearson Publication.
3. R.G. Bartle, D.R. Sherbert, Introduction to Real Analysis, Wiley Publication

Laplace and Fourier Transform

Code	Course Title	Credit	T-P-PJ
CUTM1002	Laplace and Fourier Transform	3	2-0-1

Objective

- To describe the ideas of Fourier and Laplace Transforms and indicate their applications in the fields such as application of PDE, Digital Signal Processing, Image Processing, Theory of wave equations, Differential Equations and many others.
- To use Fourier series for solving boundary value problems appearing in scientific & engineering problems.

Course outcome

- Solve differential equations with initial conditions using Laplace transform.
- Evaluate the Fourier transform of a continuous function and be familiar with its basic properties.

Course content

Module-I (T-3-Pj-2)

Laplace Transforms, Properties of Laplace transforms, Unit step function.

Project-1

Make a short draft of properties of Laplace transform from memory. Then compare your notes with the text and write a report of 2-3 pages on these operations and their significance in applications.

Module-II (T-2-Pj-2)

Second shifting theorem, Laplace transforms of Derivatives and Integrals

Project-2

Find the Laplace transform of the following functions

Module-III (T-3-Pj-2)

Derivatives and Integrals of Transforms, Inverse Laplace transform.

Project 3:

Application of Unit step function (RC- Circuit to a single square wave).

Module- IV (T-2-Pj-2)

Solution of Differential Equation by using Laplace Transform.

Project 4: Find the solution of differential equation by using Laplace Transform.

Module-V (T-4-Pj-2)

Periodic function, Fourier series, Fourier series expansion of an arbitrary period, Half range expansions.

Project-5

Find the Fourier series expansion of a 2π periodic function.

Module-VI(T-3-Pj-2)

Complex form of Fourier series, Fourier Integrals, Different forms of Fourier Integral.

Project-6

Find the Fourier sine and cosine integral of the following functions.

Module-VII(T-3)

Fourier Transforms, Fourier sine and cosine Transforms.

Text Books:

- E. Kreyszig , Advanced Engineering Mathematics, Johnwiley& Sons Inc-8th Edition.Chapters:5(5.1 to 5.4(without Dirac's delta function)),10(10.1,10.4 and 10.7-10.9(definitions only , no proofs))
- Highjer Engineering Mathematics by B.V.Ramana, Tata McGraw-Hill Education India, Inc-8th Edition.

Reference Books:

- 1) Advanced Engineering Mathematics by P.V.O' Neil Publisher: Thomson
- 2) Mathematical Methods by Potter & Goldberg ; Publisher : PHI

Complex Analysis and Numerical Methods

Code	Course Title	Credit	T-P-PJ
CUTM1003	Complex Analysis and Numerical Methods	3	2-0-1

Objective

- To understand about Complex variables and complex functions.
- To acquire the skill of evaluating contour integrals using Cauchy's integral formula and Cauchy's integral theorem.
- To understand the limitations of analytical methods and the need for numerical methods and the ability to apply these numerical methods to obtain the approximate solutions to engineering and mathematical problems.

Course Outcome

- To get equipped with the understanding of the fundamental concepts of functions of a complex variable along with the concepts of analyticity, Cauchy-Riemann relations and harmonic functions.
- Evaluate complex contour integrals applying the Cauchy integral theorem, Cauchy integral formula.
- Derive a variety of numerical methods for finding out solutions of various mathematical problems arising in roots of linear and non-linear equations, Solving differential equations with initial conditions and Evaluating real definite integrals.

Course Outline

Module I (T-3 hrs-P-0-hrs-P-0 hrs)

Functions of a complex variable, Analytic functions, Cauchy-Riemann equations (Without Proof), Harmonic and Conjugate harmonic functions, Cauchy's Integral Theorem (Without Proof).

Project-1 : Verification of Cauchy-Riemann equations for complex functions in Cartesian form and Polar form

Module II (T-3 hrs-P-0 hrs-P-2 hrs)

Cauchy's Integral Formula (Without Proof), Cauchy's Integral Formula for higher order derivatives (Without Proof), Taylor series.

Project-2 : Evaluation of contour integrals using Cauchy's Integral Formula

Module III (T-4 hrs-P-0 hrs-P-2 hrs)

Laurent series (Without Proof), Pole, Residue, Residue Theorem (Without Proof), Evaluation of Real integral Type-I.

Module – IV (T-2 hrs-P-0 hrs-P-2 hrs)

Interpolation, Lagrange interpolation polynomial.

Project-3 : Finding out the value of a given function at an interior point on an unequal interval using Lagrange interpolation polynomial

Module – V (T-3 hrs-P-0 hrs-P-2 hrs)

Forward and backward difference operators, Newton's forward and backward difference Interpolation formulae.

Project-4 : Finding out the value of a given function at an interior point on an equal interval using Newton's forward and backward difference interpolation formulae

Module – VI (T-2 hrs-P-0 hrs-P 2 hrs)

Numerical Integration, Trapezoidal rule, Simpson's one third rule.

Project-5 : Evaluation of real definite integrals using Trapezoidal rule and Simpson's one third rule

Module – VII (T-3 hrs-P-0 hrs-P-2 hrs)

Runge-Kutta 2nd & 4th order methods.

Project-6 : Finding out Numerical solutions of differential equations using Runge-Kutta 2nd & 4th order methods

Text Book:

1) Advanced Engineering Mathematics by E. Kreyszig Publisher: John Wiley & Sons Inc-8th Edition Chapters : 12 (12.3, 12.4), 13 (13.2 to 13.4), 14.4, 15 (15.1 to 15.4 Only Type-I integral), 17 (17.3, 17.5), 19 (19.1).

Reference Books:

- 1) Advanced Engineering Mathematics by P.V. O'Neil Publisher: Thomson
- 2) Fundamentals of Complex Analysis (with Applications to Engineering and Science) by E.B. Saff & A.D. Snider Publisher: Pearson
- 3) Numerical Methods for Scientific and Engineering Computation by M. K. Jain, S. R. K. Iyengar & R.K. Jain; New Age International Publishers.

4) Introductory Methods of Numerical Analysis by S.S. Sastry; Third Edition, Prentice Hall India.

Discrete Mathematics

Code	Course Title	Credit	T-P-PJ
CUTM1004	Discrete Mathematics	3	2-0-1

Objective

- To understand mathematical reasoning in order to read, comprehend and construct Mathematical arguments as well as to solve problems, occurred in the development of programming languages
- To work with discrete structures such as graphs to study the structure of the world wide web, to model a computer network and to find the shortest path between two places in a transportation network

Course Outcome

- Apply the logical structure of proofs and work symbolically with connectives and quantifiers to produce logically valid, correct and clear arguments.
- Evaluate elementary mathematical arguments and identify fallacious reasoning
- Reformulate statements from common language to formal logic
- Apply truth tables and the rules of propositional and predicate calculus
- Model and solve real world problems using graphs ,both quantitatively and qualitatively

Course Outline

Module -I

(4Hours)

Propositional Logic, Connectives, Truth tables of compound propositions, Propositional Equivalence.

Project 1: Given the truth values of the propositions p and q , find the truth values of the conjunction, disjunction, implication, bi-implication, converse, contrapositive and inverse.

Module -II

(3Hours)

Theory of inference, Predicates and Quantifiers, Rules of Inference.

Project 2: Build valid arguments of a given set of propositional logics and quantified statements using rules of inferences.

Module -III**(3 Hours)**

Relations and its properties, Partial Ordering, POSET, Totally Ordered Set.

Project 3: Define the properties of a relation on a set using the matrix representation of that relation with examples.

Module -IV**(3Hours)**

Hasse Diagram, Maximal & Minimal Elements of a Poset, Greatest & Least Elements of a Poset, Supremum & Infimum of a Poset, Lattice.

Project 4: Find a Topological Sort of a Poset.

Module -V**(3 Hours)**

Introduction to Graph Theory, Graph Terminology and Special types of Graphs, Representation of Graphs.

Project 5: Describe how some special types of graphs such as bipartite, complete bipartite graphs are used in Job Assignment, Model, Local Area Networks and Parallel Processing.

Module -VI**(3 Hours)**

Graph Isomorphism, Connectivity, Euler and Hamiltonian Graphs, Planar Graphs, Graph Coloring.

Project 6(i): Describe the scheduling of semester examination at a University and Frequency Assignments using Graph Colouring with examples. Find also their Chromatic numbers.

Project 6(ii): List out 10 pairs of Non-isomorphic graphs and explain the reason behind it.

Project 6(iii): List out all features of Euler and Hamiltonian Graphs. Justify whether the given set of graphs are Euler and Hamiltonian. Construct a Gray Code where the code words are bit strings of length three.

Module -VII**(4 Hours)**

Trees and their Properties, Spanning Trees, Minimum Spanning Trees, Kruskal's Algorithm.

Project 7: Find a minimum spanning tree in a given weighted graph using Kruskal's Algorithm.

Text Books:

1. Discrete Mathematics and its Applications by K.H.Rosen, Publisher: TMH, Sixth Edition, 2009.

Chapters: 1(1.1, 1.2, 1.3, 1.5); 7(7.1, 7.6); 8(8.1 to 8.5, 8.7, 8.8); 9(9.1, 9.4, 9.5).

Reference Books:

1. Discrete Mathematical Structures with Applications to Computer Science, J. P. Trembkay, R. Manohar, Tata MC Graw – Hill Edition 38th reprint, 2010.
2. Discrete and Combinatorial Mathematics by R.P.Grimaldi Publisher: Pearson, 5th Edition, 2003.
3. Discrete Mathematics and Applications by Thomas Koshy Publisher: Elsevier, 2004.
4. Discrete Mathematical Structures by B. Kolman, R.C. Busby & S. Ross Publisher: PHI, 5th Edition, 2003

Probability and Statistics

Code	Course Title	Credit	T-P-PJ
CUTM1005	Probability and Statistics	3	2-0-1

Objective

- To translate real-world problems into probability models.
- To motivate students in an intrinsic interest in statistical thinking.
- To recognize the role and application of probability theory, descriptive and inferential statistics in many different fields of science and engineering.
- To apply probability and statistics in engineering and science like disease modeling, climate prediction and computer networks etc.

Course outcome

- Define and illustrate the concepts of sample space, events and compute the probability and conditional probability of events.
- Define, illustrate and apply the concepts of discrete and continuous random variables, the discrete and continuous probability distributions.
- Define, illustrate and apply the concept of the expectation to the mean, variance and covariance of random variables.
- Compute probabilities based on practical situations using the Binomial, Poisson and Normal distributions.

Course content

Module I :(3 hrs+2 hrs)

Sample spaces and events; axiomatic definition of probability; Axioms of Probabilities

Project-1

A Report on Application of probability to control the flow of traffic through a highway system, a telephone interchange, or a computer processor

Module II :(3 hrs +2 hrs)

Mutually Exclusive Events, Dependent and Independent Events. Conditional Probability

Project-2

A Report on Dependent and Independent Events with Examples

Module III:(3 hrs +2 hrs)

Discrete random variables and probability distributions, Continuous random variables and probability

distributions , Mean ,Variance and Moment Generating Function of Distributions

Project-3

Application of random variables in Engineering Field

Module IV:(3 hrs +2 hrs)

Uniform Distribution, Binomial Distribution, Poisson Distribution

Project-4

Applications of Poisson distribution

Module V:(3 hrs +2 hrs)

Normal Distribution, Working with Normal Tables, Normal Approximation to the Binomial Distributions

Project-5

Normal Distribution utilized in statistics, business settings, and government entities.

Module VI:(3 hrs)

Statistics: Random Sampling, Population and Sample, Sample Mean and Variances, Point and Interval Estimations, Confidence Intervals

Module VII:(3 hrs +2 hrs)

Regression and Correlation Analysis: Correlation Coefficient, Co-variance independent random variables, linear regression of two variables

Project-6

Uses of Regression and Correlation Analysis in Business

Text Books:

1. Name of Author, Title, Publication, Edition

Advanced Engineering Mathematics by E. Kreyszig Publisher: John Willey & Sons Inc-8th Edition

Reference Books:

1. Statistical Methods by S.P. Gupta (31st Edition); Publisher: Sultan Chand & Sons.

2. Mathematical Statistics by S.C. Gupta & V.K. Kapur (10th Edition); Publisher: Sultan Chand & Sons.

Calculus

Code	Course Title	T-P-PJ	Prerequisite
CUTM1925	Calculus	2-0-1	

Objective

- To apply the concepts of derivative to find curvature and radius of curvature of a curve.
- To apply concepts of Vector Calculus to the problems related to models in work, circulation and flux Problems, hydrodynamics and fluid dynamics etc.

Course Outcome

- Calculate curvature and radius of curvature for a given curve.
- Determine the important quantities associated with scalar and vector fields.
- Find gradient of a scalar point function, divergence and curl of a vector point function.
- Evaluate line integral, double integral and applying these concepts to find out work done by a force, volume of regions in space, center of gravity of a mass etc.
- Transform double integral to line integrals, triple integrals to surface integrals, surface integrals to line integrals and vice versa.

Course Outline

Module-I(3hr+0hr+2hr)

Curvature and Radius of curvature in Cartesian form.

Project 1: To find radius of curvature (Parametric form)

Module-II(2hr+0hr+4hr)

Vector algebra: Algebraic operations, Scalar product, Inner product, Vector product, Scalar and vector triple product.

Project 2: Problems based on inner product, scalar and vector triple products.

Project 3: To find angle between two vectors, area of triangle and parallelogram, volume of parallelepiped and tetrahedron using vector algebra.

Module III(2hr+0hr+4hr)

Gradient of scalar point function, Directional derivatives, Divergence and curl of vector point functions, second order differential operator: the Laplacian operator.

Project 4: To prove the identities with regards to Gradient, Divergence and Curl.

Project 5: To find normal vector to a plane using Gradient of scalar point function.

Module-IV: (3hr+0hr+0hr)

Line Integrals (path dependence and path independence), double integrals.

Module-V: (3hr+0hr+0hr)

Surface Integrals, Triple Integrals

Module-VI: (4hr+0hr+2hr)

Green's and Gauss's Theorems (without proof) and their applications to evaluate the integrals.

Project 6: To find center of gravity and moments of inertia of a mass density

Module-VII: (3hr+0hr+0hr)

Stokes' Theorem (without proof) and its applications to evaluate the integrals.

Text Books:

1. A Text book of Calculus Part – II by Shanti Narayan, Publisher: S. Chand & Company Ltd. Chapters: 8 (Art. 24, 25 (only for Cartesian and parametric curves)).
2. Advanced Engineering Mathematics by E. Kreyszig, Publisher: John Willey & Sons Inc.- 8th Edition
Chapters: 8 (8.1 to 8.3, 8.9 to 8.11), 9 (9.1 to 9.7, 9.9).

Mechanics for Engineers

Code	Course Title	Credit	T-P-PJ
CUTM1006	Mechanics for Engineers	3	2-1-0

Objective

- To provide the students with a clear and thorough understanding on fundamentals of mechanics as applied to solve real-world problems.

Course outcome

- Use scalar and vector analytical techniques for analyzing forces in statically determinate structures.
- Analyze the frictional forces involved in planes, ladder friction and belt friction.
- Determine the centroid and moment of inertia of composite shapes.
- Apply fundamental concepts of kinematics and kinetics of particles to the analysis of simple, practical problems.
- Apply basic knowledge of mathematics and physics to solve real-world problems.

Course content

Module I: Force and Moment (4 Hrs. + 2 Hrs. practices)

Law of Transmissibility of a Force, Composition and Resolution of Forces, Resultant and Equilibrant, Resultant of Two and Several Forces, Moment of a Force and a Couple, Varignon's Principle of Moment

Practice-1: Verification of laws of parallelogram law of forces

Module II: Equilibrium

(3 Hrs. + 2 Hrs. practice)

System Isolation and Free Body Diagram, Particle Equilibrium, Lami's theorem, General Conditions of Equilibrium, Types of Supports and Support Reactions, Rigid Body Equilibrium.

Practice-2: To verify the condition of equilibrium by finding reactions at the support of a beam

Module III: Friction

(2 Hrs. + 2 Hrs. practice)

Basic Terms used in Dry Friction, Laws of Coulomb Friction, Equilibrium of Bodies on a Inclined Plane, Ladder Friction, Belt Friction

Practice-3: Determination of Angle of Repose

Module IV: Centroid**(2 Hrs.)**

Axis of Symmetry, Centroid of Lines, Areas and Volumes, Centroid of Composite Section.

Module V: Moment of Inertia**(3 Hrs. + 2 Hrs. practice)**

Rectangular and Polar Moment of Inertia, Radius of Gyration, Parallel Axis Theorem and Perpendicular Axis Theorem, Moment of Inertia of Composite Section

Practice-4: Determination of Moment of Inertia of a fly wheel.

Module VI: Kinematics of Linear Motion**(3 Hrs.)**

Kinematics of a Particle, Uniform and Variable Acceleration, Motion under Gravity

Module VII: Kinetics of Linear Motion**(3 Hrs. + 4 Hrs. Practice)**

Principles of Dynamics such as Newton's Second Law, Work-Energy Principle, Impulse-Momentum Principle, Law of Conservation Law of Momentum and Energy

Practice-5: Verification of Newton's second law of motion.

Practice-6: Verification of conservation of momentum in collision.

Text Books:

Engineering Mechanics; Statics and Dynamics by A. K. Tayal, Umesh Publications

Reference Books:

Engineering Mechanics by S. Timoshenko, D.H. Young and J.V. Rao, Tata McGraw Hill

Engineering Mechanics by D.S. Kumar, S.K. Kataria and Sons.

Optics and Optical Fibres

Code	Course Title	Credit	T-P-PJ
CUTM1007	Optics and Optical Fibres	3	2-1-0

Objective

- To train the students for the applications of the solar cell, laser and optical fiber in the field of engineering and technology.
- To learn and practice the techniques used by optical phenomenon so that these can be applied to actual field studies.

Course outcome

- Students should understand optical phenomena.
- Students should learn about different light sources and their use
- After completion of the course the students shall be able to understand the basic knowledge of solar cell, laser and optical fiber and instrumentation involved.
- Students should be able to understand optical fiber principle, operations and its applications.

Course outline

Module I: Reflection and Refraction (Derivation is not required) (3hours +2hours)

Reflection at plane surface, reflection at spherical mirrors, Paraxial rays and approximation. Sign convention, Location of the image formation, Spherical mirror equation, Refraction, Total internal reflection, Dispersion by a prism, Refraction through a prism.

Practice: 1

To determine the refractive index of glass slab using travelling microscope.

Module II: Lenses (Derivation is not required) (2hours+2hours)

Definition, Types of Lenses, Terminology associated with the Lens, Sign Convention Location of the image formation by graphical method for Lenses, Lens formula.

Practice: 2

To determine the dispersive power and Cauchy constants of the material of a prism using mercury source.

Module III: Interference (Derivation is not required) (2hours+2hours)

Superposition principle, definition of Interference, Coherence, Young's double slit experiment, Newton's rings theory- Determination of wave length of light.

Practice: 3

Newton's Rings-Refractive index of liquid

Module IV: Diffraction and Polarization (Derivation is not required) (3hours+2hours)

Types of diffraction, Fraunhofer diffraction at a single slit, Diffraction at N-parallel slits (plane diffraction grating) Polarisation, Types of polarized light and their representation, Brewster Law, Malus Law, polarization by double refraction, polarimeter, Applications of polarized light.

Practice: 4

To find grating element of a plan transmission diffraction grating.

Module V: Optical Properties and Laser (3hours+2hours)

Scattering, refraction, reflection, absorption & transmission, Introduction to optoelectronics, Concept of Light Emitting Diode, Stimulated and spontaneous emission, Basic principle of Lasers, Population inversion, Laser Pumping, Different levels of laser system, Ruby Laser, Applications of Lasers (Medicine, Metrology, Defenses, Nuclear energy, in communication, in consumer electronics industry)

Practice: 5

Wave length of LASER source by diffraction grating method

Module VI: Optical Fibers (3hours+1hours)

Introduction to fiber optics, structure of optical fibers, classification of optical fibers on the variation of refractive index, Classification of optical fibers on the variation of mode of transmission/core diameter, Numerical Aperture, Acceptance angle. Principle of optical fibers communication, optical communication (block diagram only),

Practice: 6

To find the numerical aperture of a given optic fiber and hence to find its acceptance angle.

Module VII: Optical Fibers (4hours+1hours)

Attenuation in optical fibers (Qualitative only-Scattering losses, Absorption losses, bending losses) Fiber Materials-Glass fibers, Plastic fibers, Light sources for fiber optics V-number of an optical fiber, optical fiber cables design, optical fiber connection, fiber splices, fiber connectors. Application of optical fibers- Cable TV, Networking, Power companies, Imaging, Sensors, Medical (Dental surgery, Endoscopy, Surgery)

Practice: 7

Measurement of bending loss.

Text Books:

1. A Text Book of Optics by M.N. Avadhanulu, BrijLal, N. Subrahmanyam, S Chand; 23rd Rev. Edn. [Module I&II]
2. Engineering Physics, by D.Thirupathi Naidu, M.Veeranjaneyulu, V.G.S Book links, 2017. [Module-III, IV]
3. Principles of Engineering Physics-2 by Md.Khan, S.Panigrahi, Cambridge University Press 2016. [module-V, VI&VII]

Reference Books:

1. Optics by Ajoy Ghatak, McGraw Hill Education; 6 edition, 2017.
2. Physics-I for engineering degree students by B.B. Swain and P.K. Jena.
3. Concepts in Engineering Physics by I Md. N. Kha, 2016.

Applied Analytical Chemistry

Code	Course Title	Credit	T-P-PJ
CUTM1008	Applied Analytical Chemistry	3	2-1-0

Course Objective

- Explain fundamental principles for environmental analytical methods (titration, electrochemistry, instrumentation and basic parameters of water, soil, fuel, etc)
- Point out suitable analytical techniques for analyzing a specific compound in an environmental matrix

Course Outcome

- Apply quality control on chemical analysis and laboratory work and explain its importance
- Plan and carry out laboratory experiments, including data analysis and conclusions
- Point out suitable techniques for sampling and handling of environmental samples

Module-I(4Hrs)

Water analysis:

Water softening processes: Lime-Soda, Zeolite and Ion exchange methods. Removal of DO and dissolved CO₂ from water by De-aeration method, Desalination of Brackish water by Reverse osmosis and electro dialysis process. Numericals on calculation of hardness of water, Lime-Soda calculation, Alkalinity of water.

1. Determination of hardness of water by EDTA method. (V. lab)
2. Determination of alkalinity of water. (V. lab)
3. [Determination of Dissolved Oxygen in water.](#) (V. lab)
4. [Determination of Biological Oxygen Demand.](#) (V. lab)
5. [Determination of Chemical Oxygen Demand.](#) (V. lab)

Module-II(2Hrs)

Soil Analysis:

Soil profile, Structure, and properties, Determination of soil properties, Fertility of the soil.

6. Determination of specific gravity of the soil by using pycnometer. (V.lab)
7. Determination of pH and electrical conductivity of soil sample.
8. Determination of moisture content in soil by oven drying method. (V. lab)

Module-III (4Hrs)

Fuel Chemistry-I:

Classification, combustion and chemical principles involved in fuel, calorific value: gross and net calorific values and their determination by bomb calorimeter. Proximate and ultimate analysis of coal and their importance. LPG, Water gas, producer gas, CNG.

9. Determination of calorific value of a fuel sample by using Bomb calorimeter. (V. lab)
10. Analysis of flue gases by Orsat's apparatus.

Module-IV (3Hrs)

Fuel Chemistry-II

Petroleum: its chemical composition and fractional distillation, cracking of heavy oil residues – thermal and catalytic cracking, knocking and chemical structure, octane number, synthesis and applications of bio-fuels, Photovoltaic cell.

11. Synthesis of biodiesel by transesterification process

Module-V(3Hrs)

Corrosion-Mechanisms, Factors affecting Corrosion; Protection from corrosion.

12. Estimation of ferrous ion in the given solution using standard potassium dichromate.

Module-VI (2Hrs)

Electrochemical Phenomenon

Electrochemical cell, Electrode potential, Determination of pH of a solution Using Calomel/ Quinhydrone Electrode.

Module-VII(2Hrs)

Error in Chemical analysis

Types of errors, Accuracy and precision, Absolute and relative uncertainty, mean and standard deviation.

Applied Engineering Material

Code	Course Title	Credit	T-P-PJ
CUTM1009	Applied Engineering Material	3	2-0-1

Objective

- To give an introduction to materials, ceramics, polymers, and electronic materials in the context of a molecular level understanding and their application in various field

Course outcome

- Students will understand the physical/chemical behaviors of materials.
- Students will be able to select materials, based on their properties and behaviors, for a given application.
- Students will understand how molecular interactions to the behavior of material give rise to macroscopic properties.

Course content

Module I: New Materials/Nanomaterials (5hrs)

Nanostructures and Nanomaterials: classification (Dimensionality, Morphology/ shape/structure of nano-entities, New Effect/ Phenomena). Hybrid nanomaterials. Effect of size, structure, mechanism, and property on material performance. Applications of nanomaterials in catalysis, telecommunication and medicine.

Project

Synthesis of TiO₂ and ZnO nanoparticles by Sol Gel ,Sonication and Precipitaion method and study their application .

Module II: Carbon Nanomaterials (5hrs)

Carbon nanomaterials, such as graphene, carbon nanotubes (CNTs), crystalline diamond, and diamond-like carbon , Properties and application of fullerenes,

Project

Synthesis and Fabrication of Graphene and Graphene Oxide by sol-gel techniques

Module III: Polymer (5hrs)

Mechanism of polymerization and synthesis of polymers, Copolymerization, Viscoelasticity. Elastomers-structure, Conducting polymers and applications, Fabrication and moulding of polymers, Synthesis, properties and uses PMMA, formaldehyde resins, melamine-formaldehyde-urea resins

Project

Preparation of polystyrene by anionic/cationic/emulsion polymerization method

Module IV: Composites (5hrs)

Composites: characteristics, types and applications, Nanocomposites , Polymer/ Metal oxide nanocomposites and its application

Project

Fabrication of Ceramic matrix particulate composite by powder metallurgy route.

Module V: Adhesives Lubricants (4hrs)

Adhesives, adhesive mechanism and applications, Lubricants-physical and chemical properties, types and mechanism of lubrication. Additives of lubricants and freezing points of lubricants

Module VI: Energy Storages material-I (4Hrs)

Fundamental aspects related to energy storage and conversion, lithium ion batteries, Lead acid batteries; Nickel Cadmium batteries; advanced batteries

Module VII: Energy Storages material-II(4Hrs.)

Super capacitors, fuel cells and Photovoltaic, Future of battery technology

Project

Fabrication of Fuel cell and its application

Text Books:

1. A Textbook of Engineering Chemistry, by Shashi Chawla
2. Engineering Chemistry, by P. C Jain and M. Jain
3. Advanced Polymer Chemistry, by M. Chanda

Reference Books:

4. Surfactants and Polymers in Aqueous Solution, by K. Holmberg, B. Jonsson, B. Kronberg and B. Lindman
5. Energy Scenario beyond 2100, by S. Muthukrishna Iyer

Environmental Studies

Code	Course Title	Credit	T-P-PJ
CUTM1010	Environmental Studies	2	0-0-2

Objective

- To introduces the environmental consequences of Industries on the human health and methods for minimizing their impact through technology and legal system to the undergraduate students.

Course outcome

- After learning this course one should be able to control pollution at individual level and also gains an idea about conservation of natural resources and its management.

Course content

Module-I: Fundamentals of Environmental Sciences

Assignment-1: Multidisciplinary nature of Environmental science

Assignment-2: Components of Environment

Assignment-3: scope and importance of environmental science

Module: II Ecology and Ecosystem

Assignment-1: Structure and function of ecosystem

Assignment-2: Types of ecosystem

Assignment-3: Ecological Succession

Module III- Biodiversity and its conservation

Assignment-1: Concepts of Biodiversity

Assignment-2:Biodiversity at local level, global level and National level

Assignment-3: Conservation of Biodiversity

Module IV- Natural resources and its conservation

Assignment-1: Land resources and its conservation

Assignment-2: Forest resources and its conservation

Assignment-3:Water resources and its conservation

Assignment-4:Energy resources and its conservation

Module V Environmental pollutions and its control measure

Assignment-1: Soil pollution

Assignment-2: Water pollution

Assignment-3: Air pollution

Assignment-4: Noise pollution

Module VI Natural Hazards and Disaster management

Assignment-1: Concepts of natural hazards

Assignment-2: Different types of natural hazards: cyclone, earthquake, volcanic eruption etc.

Assignment-3: Process of disaster preparedness and its management

Assignment-4: Solid waste management

Module VII Environmental issues and laws

Assignment-1: Major environmental issues like climate change, global warming, green house effects, Ozone layer depletion, Acid rain

Assignment-2: Water Act, 1974

Assignment-3: Air Act, 1981

Assignment-4: Environmental protection act, 1986

Reference Books:

1. Environmental Studies by U.N. Dash & H. D. Kumar, India Tech Publication, New Delhi
2. Environmental Studies by R. Rajagopalan Oxford University Press
3. Environmental Science and Engineering, 2E, by Aloka Debi, University Press

Centurion University of Technology and Management Odisha

CHOICE BASED CREDIT SYSTEM

COURSE STRUCTURE & SYLLABUS

BASKET - II



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2020

Course Structure

Basket - II

Course Code	Course Title	Credits	Course Type T+P+PJ
CUTM1011	Optimisation Techniques	2	0-2-0
CUTM1012	Engineering Economics and Costing	3	2-0-1
CUTM1013	Project Management	3	2-0-1
CUTM1014	Gender, Human Rights and Ethics	3	1.5-0-1.5
CUTM1015	Climate Change, Sustainability and Organisation	3	1.5-0-1.5
CUTM1016	Job Readiness	6	0-6-0

Syllabus

Optimization Techniques

Code	Course Title	Credit	T-P-PJ
CUTM1011	Optimization Techniques	2	0-2-0

Course Rationale:

Operations research (OR) have many applications in science, engineering, economics, and industry and thus the ability to solve OR problems are crucial for both researchers and practitioners. Being able to solve the real life problems and obtaining the right solution requires understanding and modelling the problem correctly and applying appropriate optimization tools and skills to solve the mathematical model. The goal of this course is to teach you to formulate, analyse, and solve mathematical models that represent real-world problems. We will also discuss how to use EXCEL for solving optimization problems

Course Objectives:

To learn about the operations research techniques, model formulation and applications used to solve business decisions by using computer software

Course Outcomes: After completion of the course students

LO1. Ability to apply the theory of optimization methods and algorithms to develop and for solving various types of optimization problems

LO2. Ability to go in research by applying optimization techniques in problems of Engineering and Technology

LO3. Ability to solve the mathematical results and numerical techniques of optimization theory to concrete Engineering problems by using computer software

Course contents

Module-I: Linear Programming: Graphical Method, Simplex method, Penalty Method,

Module-II: Transportation Models, Assignment Models, Sequencing and Scheduling Models by Johnson's Algorithm

References Recommended:

Books

- Harvey M. Wagner, *Principles of Operations Research*, Englewood Cliffs, Prentice-Hall, 1969
- S D Sharma and Himansu Sharma, *Operations Research: Theory, Methods and Applications*, 15 Edition, Kedarnath Ramnath & Co

External Links:

<https://www.informs.org/Resource-Center/INFORMS-Student-Union/Consider-an-Analytics-OR-Career>

<https://www.informs.org/>

https://en.wikipedia.org/wiki/Operations_research

Google and YouTube

Journals:

- International Journal of operations Research
- European Journal of Operations Research
- **International Journal of Operations Research and Optimization**

Engineering Economics and Costing

Code	Course Title	Credit	T-P-PJ
CUTM1012	Engineering Economics and Costing	3	2-0-1

Course Rationale:

This course aims at providing the student with advanced concepts of engineering economic analysis and its role in engineering decision making.

Course Objectives:

CO1. Facilitate students to understand the basics of Economics and its application in the field of engineering

CO1.Enable students to understand the concepts of the time value of money and techniques for evaluation of engineering project

CO1.Equip students with the skills required to understand cost statements/records of the product and its effect on decision making

Course Outcomes: After completion of the course students

LO1. Apply the microeconomics concepts related to business and its impact on enterprise

LO1.Develop an awareness and understanding time value of money and techniques for evaluation of engineering project

LO1.Apply cost concepts to analyse common business management decisions such as pricing a product and services.

Course contents

Module: I: Engineering Economics – Nature and scope

General concepts on Micro & Macro Economics. The Theory of demand, Demand function, Law of demand and its exceptions, Elasticity of demand, Law of supply and elasticity of supply. Theory of production, Law of variable proportion, Law of returns to scale.

Module-II: Time value of money:

Simple and compound interest, Cash flow diagram, Principle of economic equivalence. Evaluation of engineering projects: Present worth method, Future worth method, Net present value method, internal rate of return method, Cost-benefit analysis in public projects. Depreciation: Meaning Causes, Factors affecting depreciation, Methods of providing depreciation, Straight Line Method & Diminishing Balance Method

Module-III

Cost concepts, Elements of costs, Preparation of cost sheet, Segregation of costs into fixed and variable costs. Break-even analysis (Simple numerical problems to be solved)

Indian Banking System: Banks: Meaning, nature, characteristic of the Indian banking system, functions of commercial banks, functions of Reserve Bank of India, Overview of Indian Financial System.

Books

- Riggs, Bedworth and Randhwa, “Engineering Economics”, McGraw Hill Education India.
- Mithani, D.M., Principles of Economics. Himalaya Publishing House
- Mishra, S. “Engineering Economics & Costing“, PHI
- Sullivan and Wicks, “ Engineering Economics”, Pearson
- Paneer Seelvan, R., “ Engineering Economics”, PHI
- Gupta, G.S., “ Managerial Economics”, TMH
- Lal and Srivastav, “ Cost Accounting”, TMH

Links to websites:

- <http://courseware.cutm.ac.in/>

Project Management

Code	Course Title	Credit	T-P-PJ
CUTM1013	Project Management	3	2-0-1

Course Objective:

- The successful development and implementation of all project's procedures.
- Learn project management methodology to initiate and manage projects efficiently and effectively
- Acquire key project management skills and strategies for Productive guidance, efficient communication and supervision of the project's team
- The achievement of the project's main goal within the given constraints

Course outcome:

- Develop a Project Charter document for any project
- Develop Project Management Plan document
- Acquire 10 knowledge area identified by PMI and its application while delivering a projects
- Implement the Project and Prepare a project document that they have undertaken as a learning tool
- Qualify CAPM/PMP certification offered by PMI

Course Content:

Unit: I

Project Management framework; Introduction to Project Management; Project Life Cycle and Organisation, Project vs. Operational work, Stakeholders, Organisational Influences

Project Management Process for a Project, groups, Initiating, planning, executing, monitoring &controlling and closing process groups.

Project management Knowledge area;

Project Integration Management; Develop project charter, develop project management plan, direct and manage project execution, monitor and control project work, perform integrated change control, close project or phase.

Unit: II

Project Scope Management; collect requirements, define scope, create WBS, verify scope, control scope

Project Time Management; Define activities, sequence activities, estimate, develop and schedule

Project Cost Management; Estimate costs, determine budget, control costs

Unit: III

Project Quality Management; Plan quality, perform quality assurance, perform quality control

Project HR Management; Develop HR plan, acquire project team, develop and manage project team

Project Communications Management; Identify stakeholders, plan communication, distribute information, manage expectation of stake holders, report performance

Unit: IV

Project Risk Management; Plan risks; identify risks, perform quality and quantitative risk analysis, plan risk responses, monitor and control risks

Project Procurement Management; Plan procurements, conduct procurements, administer procurements, close procurements

Project Stakeholders Management;Identifying stakeholders, stakeholder analysis, engagement

Note: Students can use any of these software for their project; MS. Excel/ Bitrix 24/Primavera/ Microsoft Projects

Books Recommended:

- 1) Project Management: A Managerial Process, Clifford F Gray & Eric W Larson, Tata McGrawHill
[Text book]
- 2) A Guide to the Project Management Body of Knowledge, 6th Edition, PMI
- 3) Project Management- A system Approach to Planning, Scheduling and Controlling (Harold Kerzner). CBS Publishers and Distributers, New Delhi.
- 4) Projects, Preparation, Appraisal and Implementation (Prasanna Chandra), 3rd Edition, Tata McGraw Hill, New Delhi.
- 5) Project Management (Nagarajan, K), New Age Publishers, New Delhi.
- 6) Project Management. A Managerial Approach (Meredith, R.J and Mantel, S.J), Wiley (India).

Gender, Human Rights and Ethics

Code	Course Title	Credit	T-P-PJ
CUTM1014	Gender, Human Rights and Ethics	3	1.5-0-1.5

Course Objectives

This course is about gender, human rights and ethics in which the student will be sensitized and exposed to related issues in the context of business and organisations in India. The specific objectives are:

- To develop an understanding of gender, human rights and ethics in an unequal society like India
- Sensitisation of how gender, human rights and ethics are significant in organisations.
- Integrating concerns related to gender, human rights and ethics in organisations.

Course Outcomes

- Understanding the complexity of issues and challenges relating to gender, human rights and ethics
- Be sensitive to gender, human rights and ethics within an organizational context,

- To integrate concerns related to gender, human rights and ethics into the policies, processes and systems in an organization.

Course Syllabus

Module 1

- Difference between sex and gender; social construction of gender and its outcomes in the form of behavior, roles, gender based division of labour, hierarchy; gender relations.
- Gender issues in organisations - significance of relations between structures, practices, context, interactions and power for construction of gender at organisational level
- Gender implications at workplace, management and leadership, Laws and Acts
- Comparing different types of organisations; how to create a gender sensitive organisation.

Module 2

- Introduction to human rights, Meaning and Definition, Types
- Human Rights Law: Protection, violation and the legal framework for their protection - International Human Rights Law, Universal Declaration of Human Rights
- Conflicts of Rights and its Significance to Organisations: Challenges of the past and challenges for the future. Persistence of social discrimination and inequality; efforts in the search for justice for past violations, continued struggle for human rights and accountability in an organisational context.

Module 3

- Introduction to and study of ethics; Indian and Western ethics
- Different ethical systems and perspectives; ethical relativism and its implications, utilitarianism, duty ethics and virtue ethics in organisations
- Critique of various ethical positions and develop their own position in an organizational context.

Session Plan

Session 1

Basic concepts on sex and gender; social construction of gender; constitutional provisions for gender equality.

PPT 1 - Introduction to Gender

1.5 mins video on Gender Equality and Poverty

<https://www.youtube.com/watch?v=4viXOGvvu0Y>

Session 2

Gender issues in different sectors – Health, Education, Governance, Livelihoods

PPT 2 - Gender issues in health

PPT 3 - Gender issues in education

PPT 4 - Gender issues in Governance

1.3 mins video on gender stereotypes and education

<https://www.youtube.com/watch?v=nrZ21nD9I-0>

Session 3

Approaches to address gender inequality – WID, WAD and GAD

PPT 5 - WID WAD GAD

TED talk by Deepa Bhardwaj - True equality is when both women and men have a voice - 13 mins

https://www.youtube.com/watch?v=BSRTZ_q4RX8

Session 4 & 5

Gender and organizational issues

PPT 6 - Gender and Organisations

PPT 7 - Gender Equality in Organisations

PPT 8 - Gender Mainstreaming and Attitude in Workplace

PPT 9 - Gender Sensitisation

3.22 mins on The Future of Gender Equality in Work by ILO

https://www.ilo.org/global/about-the-ilo/multimedia/video/institutional-videos/WCMS_558508/lang--en/index.htm

4.22 mins video on Gender Based Analysis

<https://www.youtube.com/watch?v=p6w-d1mmjFU>

Free Readings

Gender and Development - Concepts and Definitions

Gender and Organisational Change Training

Project

-Gender Responsive Governance in times of COVID 19

<https://in.one.un.org/gender-responsive-governance-in-the-times-of-covid-19/>

- SDG - Gender Equality Goal 5

<https://in.one.un.org/page/sustainable-development-goals/sdg-5/>

- Gender, Sustainability and Environment

Women Environment and Sustainable Development A Ca

- Good Practices of Gender Mainstreaming in India

Good Practices for Gender Mainstreaming

- Gender Equality Case Study

Gender Equality - Kerala Case Study

Session 6

Basic concepts on human rights; history of human rights; current significance

Videos on Basic concepts of human rights

<https://www.youtube.com/watch?v=ew993Wdc0zo>

<https://www.youtube.com/watch?v=JpY9s1Agbsw>

Videos on History of Human Rights

<https://www.youtube.com/watch?v=nDgIVseTkuE>

https://www.youtube.com/watch?v=6XXGF_V8_7M

Session 7

Violation and legal framework for the protection of human rights

Video on the Paris Principles

https://www.youtube.com/watch?v=ZEgD7pdXt_c

Video on Protection of Human Rights Act 1993 (for reference, bilingual)

<https://www.youtube.com/watch?v=qAiiOyL5WAw>

Session 8

Human rights and sustainability framework

Video on Human Rights and Sustainable Development

<https://www.youtube.com/watch?v=mHHy1gDn4x8>

Session 9 & 10

Human rights in the organizational context

Video on Why should your company care about human rights

<https://www.youtube.com/watch?v=mCtNx3hHZ08>

Video on UN Reporting Framework: Salient Human Rights Issues

<https://www.youtube.com/watch?v=LswDupgiZug>

Books:

1. Arihants UGC NET Human Rights and Duties

2. Kapoor, S. K. Central Law Agency's Human Rights under International Law and National Law

Ciapham Andrew, 2015, Human Rights: A Very Short Introduction, Oxford University Press

Smith Rhona, 2015, Textbook on International Human Rights, Oxford University Press

Free Online Sources:

<https://www.humanrightscareers.com/.../10-human-rights-study-books-you-can-download>

<https://www.humanrightscareers.com/courses/>

Session 11

Basic concepts in ethics

PPT - Introduction to Ethics

Video on Ethics defined

<https://www.youtube.com/watch?v=4vWXpzlL7Mo>

Session 12

Theoretical perspectives – utilitarianism, virtue ethics, duty ethics

PPTs - Duty Ethics

Utilitarianism

Virtue Ethics

Video on Utilitarianism

https://www.youtube.com/watch?v=-FrZl22_79Q

Video on virtue ethics

<https://www.youtube.com/watch?v=NMB1KpkKYao>

Video on deontology (duty) ethics

<https://www.youtube.com/watch?v=wWZi-8Wji7M>

Project (self exploration through case studies)

Fraudulent Books_1

Gifts from the Boss's Friend_1

Gifts from the Sales Representative_1

Session 13

Ethical relativism

PPT - Ethical Relativism

Video on Moral relativism

<https://www.youtube.com/watch?v=5RU7M6JSVtk>

Project (self-exploration through case studies)

Mining Data docx_1

Office Affair_2

On-time Delivery

Session 14 & 15

Ethics in organisations

Video on ethics in the workplace

<https://www.youtube.com/watch?v=0mUxMpMTT28>

Project (self-exploration through case studies)

Falsifying Attendance_1

Family Loyalty vs. Meritocracy 1

Rumors 1

The Supervisor's Choice 1

Books

Frankena, WK, 1973, Ethics (2nd Edition), Pearson.

Singer, P. 2011, Practical Ethics (3rd ed), Cambridge University Press.

Smart, JJC and Williams, B. 1973, Utilitarianism: For and Against, Cambridge University Press.

Climate Change, Sustainability and Organisations

Code	Course Title	Credit	T-P-PJ
CUTM1015	Climate Change, Sustainability and Organisations	3	1.5-0-1.5

Course Rationale:

This course is about climate change, sustainability and its implications for organisations. Climate change and sustainability are closely interlinked. Students will be exposed to related issues, challenges and debates on the subjects. They will develop an understanding of how organizational performance gets affected by climate change today. As organisations grow and diversify in India, there is a need to sensitise Management students to the significance of climate change and its impact on humanity and environment; Sustainable Development Goals (SDGs) and integrated reporting framework for sustainability of organisations.

Module 1: Climate Change and Organisations

Course Objectives:

- CO1. To develop an understanding about climate change in general, responses and debates
- CO2. To create awareness about the impact of climate change on organisations in performance, growth and sustainability
- CO3. To facilitate in developing reference points to factor in aspects of climate change in organizational planning and development

Course Outcomes:

- LO1. Students will be exposed to current climate change issues, challenges and debates
- LO2. They will be sensitive to its implications for organisations in different sectors
- LO3. The course will equip the students of Management to develop strategies for perspective planning of organisations

Course Contents:

1. Basics of climate change; impacts on various sectors; responses and mitigation efforts by the state and non-state agencies; debates and critiques
2. Sectoral implications of climate change – Agriculture and Forestry; Transportation; Buildings; Energy; Industry and Manufacturing
3. Climate change – specific impacts (Migration, Disasters and Pandemics)
4. Mitigation and adaptation keeping the sustainability of business organisations

Projects: Case study, videos, small group workshops, book reviews

Session Plan for Module 1 – Climate Change and Organisations (10 one hour sessions)

Session 1: Basic concepts of climate change, impacts, issues and challenges

Session 2: Responses and mitigation efforts by state and non-state agencies

Session 3: Debates and critiques on climate change

Session 4: Climate change and ecosystem

Session 5: Climate change and social sector – health, education and livelihood/food security

Session 6: Climate change and infrastructure and services – buildings, transportation, communication, electricity/energy

Session 7: Mitigation and adaptation of climate change impacts on business organisations

Session 8 and 9: Climate change impacts of migration, disasters and pandemics – societal and organisational implication

Session 10: Develop reference points to factor into perspective planning and development of organisations

Module 2 – Sustainability in Organisations

Course Objectives:

CO1. To develop an understanding of sustainable development, SDGs and their relevance for sustainability of organisations

CO2. To comprehend the application of the Integrated Reporting Framework for Sustainability in business.

Course Outcomes:

LO1. The student will develop an understanding of perspectives on SDGs, sustainability and development in the context of organisations

- LO2. Argue the business case for sustainability informed by an understanding of the impact of current global and local economic, social and environmental pressures (including pandemics)
- LO3. Develop an Action Plan through a Case Study for integrating sustainability across an organisation's value chain
- LO4. Develop and apply the Integrated Reporting Framework for Sustainability through a case.

Course Contents:

1. Sustainable development, debates, SDGs, challenges and opportunities; The business case and leadership for action
2. Regulatory environment and International policy; Integrated Reporting Framework for Sustainability
3. Production and consumption; Design, technology, and planning for sustainability
4. Communication and marketing; Collaboration and partnerships

Projects: Small group exercises, case analysis, video and book reviews

Session Plan for Module 2 – Sustainability in Organisations (10 one hour sessions)

Session 1: Sustainable development basics and introduction to SDGs (rationale, issues and challenges for India)

Session 2 to 6: Discussion on the 17 SDGs

Session 7: SDGs and its relevance for organisations

Session 8 to 10: Integrated framework for reporting sustainability in organisations; factoring aspects of SD into performance of organisations

The 17 sustainable development goals (SDGs) to transform our world:

GOAL 1: No Poverty

GOAL 2: Zero Hunger

GOAL 3: Good Health and Well-being

GOAL 4: Quality Education

GOAL 5: Gender Equality

GOAL 6: Clean Water and Sanitation

GOAL 7: Affordable and Clean Energy

GOAL 8: Decent Work and Economic Growth
GOAL 9: Industry, Innovation and Infrastructure
GOAL 10: Reduced Inequality
GOAL 11: Sustainable Cities and Communities
GOAL 12: Responsible Consumption and Production
GOAL 13: Climate Action
GOAL 14: Life Below Water
GOAL 15: Life on Land
GOAL 16: Peace and Justice Strong Institutions
GOAL 17: Partnerships to achieve the Goal

Videos – Climate Change

1. CSE Climate Change Analysis - <https://www.youtube.com/watch?v=5fyT3-9kxU4> (7.5 mins)
2. Climate Change is having Massive Impact on Indian Farmers - <https://www.youtube.com/watch?v=A8gcGalzqIw> (8.5 mins)
3. Climate Change in India: The Risks we face (NDTV) - <https://www.youtube.com/watch?v=AT1yi1tDenM> (20.28 mins)

Videos – Sustainable Development

1. Short Videos (5) on Sustainable Development Goals and one TED Talk <https://developmenteducation.ie/blog/2017/09/5-videos-sustainable-development-goals-worth-view-useful-ted-talk/>
2. Overview of Sustainable Development Goals - <https://www.youtube.com/watch?v=s190sjqYRdg> (7.43 mins)

Projects:

1. Climate change impacts on agriculture and policy responses – what is the current practice and its implications for the sector and people; give your own recommendations based on your understanding of issues, challenges, debates, critiques.
2. Marine fishing – fisherfolk
3. Forest dwellers

4. Business organisations – MSMEs, manufacturing, service industries; application of the integrated framework for sustainability reporting

Job Readiness

Code	Course Title	Credit	T-P-PJ
CUTM1016	Job Readiness	6	0-6-0

Course Objectives

Develop additional skills (verbal, logical, quantitative and reasoning) required to enhance employability as well as the entrepreneurial ability of the students

Course Outcomes

Achieve the following scores as a minimum:

IELTS 6.5

Verbal: 60% (average of 10 exams)

Quantitative: 60% (average of 10 exams)

Logical Reasoning: 60% (average of 10 exams)

Note: A student will be awarded the credits and grades as outlined in the attached presentation:
<https://drive.google.com/file/d/1Wst-jdAJuHHVtYC4F-p3SKuw1PHWOI1U/view?usp=sharing>

Course Syllabus

Course Division

Course I: IELTS - Reading, Listening, Speaking and Writing

Course II: IELTS Verbal

Course III: Quantitative Aptitude

Course IV: Logical Reasoning

Course I: IELTS - Reading, Listening, Speaking and Writing

Module I: IELTS Reading (18hrs)

- Skimming and Scanning
- Sentence Completion
- Choose the Correct options (A, B, C, D)
- Locating the Specific Information
- Assessment on Reading Skill

Module II: IELTS Listening (6hrs)

- Notes/ Form/Table completion
- Label the Map/Passage, Multiple Choice Questions
- Complete the Sentences, Listening to Find Information
- Assessment on Listening Skills

Module III: IELTS Speaking (18hrs)

- Speaking about yourself, your family, your work and your interests
- Introduction & Interview
- Topic Discussion (e.g, Environment, Covid 19, Job)
- Assessment on Speaking Skills

Module IV: IELTS Writing (6 hrs)

- Summarising the chart, table or graph
- Comparing and contrasting graphs and tables
- Describing maps & diagrams
- Agreeing & disagreeing
- Expressing a personal view & opinion
- Assessment on Writing Skill
- CV Writing (2nd year)
- Letter Writing
- Email Writing(2nd year)
- Getting Started –writing an introduction

Course II: IELTS Verbal

Module I: Grammar (4 Hrs)

- Articles
- Prepositions

- Subject-Verb
- Spotting Errors
- Sentence Correction

Module II: Vocabulary (5 Hrs)

- Synonyms
- Antonyms
- Contextual Vocabulary

Module III: Reading Comprehension (3 Hrs)

- Paragraph/ Sentence Completion
- Jumbled Sentences/ Jumbled Paragraph
- Reading Comprehension

Module IV: Verbal Analogies (3 Hrs)

Course III: Quantitative Aptitude

Module I: Number System & Operation (14 Hrs)

- Speed Math-1 : Multiplication tricks, Square, cube, square root, Cube root tricks
- Speed Math-2 : Speed Calculations
- Number System-01 : Operation on Numbers, Classification of Numbers, Tests of Divisibility, Unit Digit Calculation
- Number System-02 : Arithmetic Progression, Geometric Progression, Factors & Factorials, Trailing Zeroes, Remainder Theorem
- HCF & LCM : Concepts, short tricks, question discussion
- Average : Concepts, short tricks, question discussion
- Assessments

Module II: Basic Arithmetic (16 Hrs)

- Percentage-01 : Basics of Percentage, Effective percentage, shortcuts
- Percentage-02 : Advanced questions and discussions
- Profit & Loss-01 : Basics and advanced questions of Profit & Loss and shortcuts
- Profit & Loss-02 : MRP, Discount, Successive discount

- Ratio & Proportion : Types of ratios, Basics & Advanced Question
- Age : Concepts & Shortcuts
- Partnership : Concepts & Shortcuts
- Mixture & Alligation : Rule of Alligation, Basics & Advanced question, Short tricks
- Assessments

Module III: Time & Analysis (17 Hrs)

- Time, Speed, Distance : Concepts, Problems based on relations, Average speed, Stoppage time
- Trains : Relative Speed & All types of train problems
- Boats & Streams : Basics, Upstream, Downstream & Shortcuts
- Race : All concepts & Shortcuts
- Time & Work : Efficiency, wages, alternative day, chain rule
- Pipes & Cistern : Positive & Negative work
- Simple Interest : Concepts & Shortcuts on Simple Interest & Installments
- Compound Interest : Concepts & Shortcuts on Simple Interest & Installments
- Logarithm : All Formulae, concepts & Shortcuts
- Assessments

Module IV: Advanced Arithmetic (16 Hrs)

- Equation : Linear & Quadratic
- Permutation : All concepts & Shortcuts on factorial, fundamental principles of counting
- Combination : All concepts & Shortcuts on Selection (Groups/teams)
- Probability : Terms related to Probability, Event, Theorems related Probability, Conditional Probability. Shortcuts on coins, dices, balls, cards, etc
- Data Interpretation : (Bar/Pi-Chart /Line) graph
- Mensuration : Area & Volume
- Height & Distance : Lines of Sight, Horizontal line, Angle of Elevation, Angle of Depression
- Assessments

Course IV: Logical Reasoning

Module I: Verbal Reasoning-I (14 Hrs)

- Series-1 : Number series (Missing & Wrong)
- Series-2 : Letter, Alpha numeric, Miscellaneous series
- Coding & Decoding : Letter Coding, Number coding, Message coding, Substitution coding, Conditional coding
- Word Problem : Analogy, Odd man out, word formation, letter pair
- Logical Thinking : Brain Riddles
- Assessments

Module II : Verbal Reasoning-II (14 Hrs)

- Order & Ranking : Ranking & Sequence
- Direction Sense Test : Shortest Distance, Angular movement concept and Dusk & Dawn
- Clock : Concepts of Angle, Reflex angle, Right angle Opposite, Coincide and Incorrect clock
- Calendar : All concepts & Shortcuts
- Blood Relation : Jumbled-up descriptions, coded relations, Relation Puzzles
- Assessments

Module III : Non Verbal Reasoning (14 Hrs)

- Cubes & Dices
- Cubes & Cuboids
- Embedded Figure & Figure series
- Figure Puzzle & Figure grouping
- Figure Counting
- Mirror & Water Image
- Paper Cutting & Paper folding
- Assessments

Module IV: Advanced Reasoning (16 Hrs)

- Sitting Arrangement : Circular, Square, Rectangular, Linear, Triangular

- Puzzle : Box, Floor, Month, Day
- Advanced Puzzle : 3 variable
- Logical Venn Diagram
- Syllogism
- Statement & Conclusion
- Data Sufficiency
- Assessments

Centurion University of Technology and Management Odisha

CHOICE BASED CREDIT SYSTEM

COURSE STRUCTURE & SYLLABUS

BASKET - III



Centurion
UNIVERSITY
Shaping Lives...
Empowering Communities...

School of Engineering & Technology

2020

**Course Structure
Basket - III**

Course Code	Course Title	Credits	Course Type T+P+PJ
CUTM1017	Industrial IOT and Automation	6	3-2-1
CUTM1018	Data Analysis and Visualisation using Python	4	0-1-3
CUTM1019	Machine Learning using Python	4	1-2-1
CUTM1020	Robotic automation with ROS and C++	4	1-2-1
CUTM1021	Basics of Design Thinking	2	0-0-2
CUTM1022	System Integration with DYMOLA	2	0-0-2
CUTM1023	Smart Engineering Project (G2M)	3	0-0-3

Industrial IoT and Automation

Code	Course Title	Credit	T-P-PJ
CUTM1017	Industrial IoT and Automation	6	3-2-1

Objective

- Students will learn the new evolution in hardware, software, and data.
- While the promise of the Industrial Internet of Things (IIoT) brings many new business prospects, it also presents significant challenges ranging from technology architectural choices to security concerns.
- Students acquire upcoming Industrial Internet of Things: Roadmap to the Connected World Course offers important insights on how to overcome these challenges and thrive in this exciting space.

Course outcome

- Discover key IIoT concepts including identification, sensors, localization, wireless protocols, data storage and security
- Explore IoT technologies, architectures, standards, and regulation
- Realize the value created by collecting, communicating, coordinating, and leveraging the data from connected devices
- Examine technological developments that will likely shape the industrial landscape in the future
- Understand how to develop and implement own IoT technologies, solutions, and applications
- At the end of the program, students will be able to understand how to develop and implement their own IoT technologies, solutions, and applications.

Course content

MODULE 1: Introduction & Architecture

Theory

What is IIoT and connected world? The difference between IoT and IIoT, Architecture of IIoT, IOT node.

Challenges of IIOT

Hands-On

1. Introduction to Arduino, ES8266, Introduction to raspberry Pi.

MODULE2: IIOT Components

Theory:

Fundamentals of Control System, introductions, components, closed loop & open loop system.

Introduction to Sensors (Description and Working principle): What is sensor? Types of sensors, working principle of basic

Sensors -Ultrasonic Sensor, IR sensor, MQ2, Temperature and Humidity Sensors (DHT-11).Digital switch, Electro

Mechanical switches.

Practice:

2. Measurement of temperature & pressure values of the process using raspberry pi/node mcu.
3. Modules and Sensors Interfacing (IR sensor, ultrasonic sensors ,Soil moisture sensor) using raspberry pi/node mcu.
4. Modules and Actuators Interfacing (Relay, Motor, Buzzer) using raspberry pi/node mcu.

MODULE 3: Communication Technologies of IIoT

Theory:

Communication Protocols: IEEE 802.15.4, ZigBee, Z Wave, Bluetooth, BLE, NFC, RFID
Industry standards communication technology (LoRAWAN, OPC UA, MQTT), connecting into existing Modbus and Profibus
Technology, wireless network communication.

Practice:

5. Demonstration of MQTT communication
6. Demonstration of LoRa communication.

MODULE 4: Visualization and Data Types of IIoT

Theory:

Front end EDGE devices, enterprise data for IIoT, emerging descriptive data standards for IIoT, cloud data base, could

Computing, fog or edge computing,

Connecting an Arduino /raspberry pi to the Web: Introduction, setting up the Arduino/raspberry pi development

Environment, Options for Internet connectivity with Arduino, configuring your Arduino/raspberry pi board for the IoT.

Practice:

7. Visualization of diverse sensor data using dashboard (part of IoT's 'control panel')
8. Sending alert message to the user.

MODULE 5:

Theory

Extraction from Web: Grabbing the content from a web page, Sending data on the web, troubleshooting basic Arduino issues, types of IoT interaction , Machine to Machine interaction (M2M).

Practice

9. Device control using mobile Apps or through Web pages.
10. Machine to Machine communication

MODULE 6: Control & Supervisory Level of Automation

Theory

Programmable logic controller (PLC), real-time control system, Supervisory Control & Data Acquisition (SCADA).

HMI in an automation process, ERP &MES

Practice

11. Digital logic gates programming using ladder diagram

12. Implementation of Boolean expression using ladder diagram
13. Simulation of PLC to understand the process control concept.

Module 7: Application of IIOT

Case study: Health monitoring, Iot smart city, Smart irrigation, Robot surveillance

Text Books:

1. Industrial IoT Challenges, Design Principles, Applications, and Security by Ismail Butun (editor)
2. Internet of Things with Arduino Cookbook, Marco Schwartz, ISBN 978-1-78528-658-2 2.

Reference Books:

1. The Internet of Things in the Industrial Sector, Mahmood, Zaigham (Ed.) (Springer Publication)
2. Industrial Internet of Things: Cybermanufacturing System, Sabina Jeschke, Christian Brecher, Houbing Song, Danda B. Rawat (Springer Publication)
3. Internet of Things- A Hands on Approach, Arshdeep Bahga and Vijay Madisetti , Universities Press , 2015.

Data Analysis and Visualization Using Python

Code	Course Title	Credit	T-P-PJ
CUTM1018	Data Analysis and Visualisation Using Python	4	0-1-3

Objective

- How to tell a story from data
- How to marshal the data for storyline
- The ability to develop visualisation to tell the story
- The focus is on analysis of data using visualisation as a tool

Course outcome

- To create impactful visualization with good story line.

Course content

Module-I

STORY BOARD DEVELOPMENT

The objective and flow of the story to be understood through cases

Module-II

DATA READING USING PYTHON FUNCTIONS

Python libraries: Pandas, NumPy, Plotly, Matplotlib, Seaborn, Dash

Data collection from online data sources, Web scrap, and data formats such as HTML, CSV, MS Excel, data compilation, arranging and reading data, data munging

Module-III

DATA VISUALISATION USING PYTHON LIBRARIES

Different graphs such as Scatterplot, Line chart, Histogram, Bar chart, Bubble chart, Heatmaps etc.

Dashboard Basics – Layout, Reporting, Infographics, Interactive components, live updating

Projects List

1. COVID 19
2. World Development Indicators

3. ERP dashboarding

4. Details of Social/ Empowerment schemes of Govt. etc.

References:

<https://www.programmer-books.com/wp-content/uploads/2019/04/Python-for-Data-Analysis-2nd-Edition.pdf>

<https://towardsdatascience.com/data-visualization/home>

Reading materials and videos available on internet on how to use ANACONDA, JUPYTER NOTEBOOK and Python Libraries

Machine Learning using Python

Code	Course Title	Credit	T-P-PJ
CUTM1019	Machine Learning using Python	4	1-2-1

Objective

- Understand the meaning, purpose, scope, stages, applications, and effects of ML.
- Explore important packages of python, such as numpy, scipy, OpenCV and scikit-learn.

Course outcome

- Students will able to Create and incorporate ML solutions in their respective fields of study.

Course content

Module 1 – Application and Environmental-setup (12 hrs)

- Applications of Machine Learning In different fields (Medical science, Agriculture, Automobile, mining and many more).
- Supervised vs Unsupervised Learning based on problem Definition.
- Understanding the problem and its possible solutions using IRIS datasets.
- Python libraries suitable for Machine Learning(numpy, scipy, scikit-learn, opencv)
- Environmental setup and Installation of important libraries.

Module 2 - Regression (8 hrs)

- Linear Regression
- Non-linear Regression
- Model Evaluation in Regression
- Evaluation Metrics in Regression Models
- Multiple Linear Regression
- Feature Reduction using PCA
- Implementation of regression model on IRIS datasets.

Module 3 - Classification (24 hrs)

- Defining Classification Problem with IRIS datasets.
- Mathematical formulation of K-Nearest Neighbour Algorithm for binary classification.
- Implementation of K-Nearest Neighbour Algorithm using sci-kit learn.
- Classification using Decision tree.
- Construction of decision trees based on entropy.
- Implementation of Decision Trees for Iris datasets .
- Classification using Support Vector Machines.
- SVM for Binary classification
- Regulating different functional parameters of SVM using sci-kit learn.
- SVM for multi class classification.
- Implementation of SVM using Iris datasets .

- Implementation of Model Evaluation Metrics using sci-kit learn and IRIS datasets.

Module 4 - Unsupervised Learning (12 hrs)

- Defining clustering and its application in ML .
- Mathematical formulation of K-Means Clustering.
- Defining K value and its importance in K-Means Clustering.
- Finding appropriate K value using elbow technique for a particular problem.
- Implementation of K-Means clustering for IRIS datasets

Projects

- To be defined based on respective study area of student.

References:

Text Book:

1. EthemAlpaydin, Introduction to Machine Learning, Second Edition,
<http://mitpress.mit.edu/catalog/item/default.asp?ttype=2&tid=12012>.

Web Resource:

1. <https://towardsdatascience.com/beginners-guide-to-machine-learning-with-python-b9ff35bc9c51>

Robotic automation with ROS and C++

Code	Course Title	Credit	T-P-PJ
CUTM1020	Robotic automation with ROS and C++	4	1-2-1

Course Content:

1. Robotic Automation Introduction
2. Sensors & Controllers
3. Sequential robot control
4. ROS & C++
5. Project

Course Objectives

- To upgrade knowledge levels of robotic application in modern industries
- Project based training

Course Outcomes

- Advanced knowledge on robotic automation
- Understand different types of devices to which robotic modules are connected
- Provide the knowledge about understand various types of robotic applications.
- Industry based project & advanced learning.

Course Syllabus

Module – 1

Robotic Automation Introduction

- 1.1 Basic's of automation
- 1.2 Use of robots in industry.

Module - 2

Sensor's requirement in robots.

- 2.1 Selecting sensors as per the project.
- 2.2 Specification checking of sensors.
- 2.3 Interfacing of sensor to controllers.

Practice

P2.1 TILT, PROXIMITY, TEMPERATURE, HUMIDITY, SMOKE, FINGERPRINT

P2.2 BLUETOOTH, ESP8266, GPS, GSM

Module - 3

Controllers and output port handling.

- 3.1 Concept of 8951 controller
- 3.2 Concept of Arduino and concept of Raspberry Pi.

Practice

P3.1 Port handling of 8951

P3.2 Port handling of Arduino

P3.3 Port handling of Raspberry Pi

Module- 4

Sequential robot control

4.1 Designing of sequential robot control system.

4.2 Writing of programs in different programming languages.

4.3 Controlling of input/output devices.

Practice

P4.1 Programming of controllers with different programming languages

P4.2 Designing of sequential control robot.

Module- 5

ROS & C++

5.1 What is Ubuntu & ROS?

5.2 Requirement and application of ROS.

5.3 ROS based simulation of Turtlbot.

5.4 Adding of robot with wheel & sensor. Placing robot inside Gazebo.

Practice:

P5.1 Ubuntu basic command.

P5.2 Installation of Ubuntu, ROS & Gazebo

P5.3 Turtlbot control application

P5.4 Gazebo based robot control and simulation.

P5.5 Python and C++ based programming to control robot.

Virtual LAB : Using ROBOMASTER (AWS)

Projects

1. Mobile controlled robot
2. Autonomous operated robot.
3. 3. Location targeted robot

Basics of Design Thinking

Code	Course Title	Credit	T-P-PJ
CUTM1021	Basics of Design Thinking	2	0-0-2

Course Rationale:

Steve Jobs famously said “Design is just not what it looks or feels like. Design it how it works”. Design Thinking is described as a discipline where designer’s sensibility and methods match with the needs of users. It draws on logic, imagination, intuition and systemic reasoning to explore the possibilities of a solution to a challenge and to create desired outcomes that benefit the end user. So, if you are among the one who is constantly thinking of solving a problem of business or society, it is ideal for you. This course will help you with the basics of design thinking and through an action centric learning approach, lead to creatively explore the challenges and by using the design thinking tool propose innovative solutions.

Course Objectives: The course aims to

- To orient the participants with the basics of the design thinking process
- To familiarize participants with the elements of Design thinking

Course Outcome: After completion of the course the students

- will be able to apply the design thinking process to innovative problem solving

Course contents:

Module: I

Basics of Design Thinking, Why Design Thinking, Design Thinking Mindset (Inspiration, Ideation and Implementation) Design thinking process, (Empathy, Define, Ideate, Prototype, Test). Cases of application of Design thinking approach (Intuit, IDEO, Infosys, IBM, Google, Apple, Jubilant Foods)

Module: II

Executing a Design Thinking Project- Apply Interviewing and empathy building technique, Drawing inferences from the observations, Defining a point of view, Ideation process, developing and testing prototypes and writing a story of a minimum viable solution.

Projects-

- Develop a customer friendly insulin pump design
- Develop a new customer experience for buying a diamond ring online
- Develop a new disease monitoring device for health workers working in remote areas.
- Designing an integrated machinery for end to end farm activities for small and marginal farmers.

- Design a Fund raising campaign

Recommended References:

Books: Tom Kelly & Jonathan Littman (2001). “The Art of Innovation” Broadway Publication.

System Integration with DYMOLA

Code	Course Title	Credit	T-P-PJ
CUTM1022	System Integration with DYMOLA	2	0-0-2

Course Objectives

- To provide powerful multi-disciplinary systems engineering through compatible model libraries for a large number of engineering domains.
- To design high-fidelity modeling of complex integrated systems.
- To design intuitive modeling i.e. advanced, formally defined object-oriented modeling language.
- To enable users to easily build their own components or adapt existing ones to match their unique needs.
- To provide hardware-in-the-loop simulations (HILS) i.e. real-time simulation with AurdinoUno, Python, Matlab, 3D real-time animation, CAD files import capability.
- To increase the ability to integrate with complex 3D geometry for integrated simulation.
- To increase powerful model management, calibration & optimization capabilities.

Course Outcomes

- The use of open standards such as DYMOLA (Modelica and FMI) is a key enabler to better understand the behavior of systems and to work and communicate accurately with partners and suppliers.
- DYMOLA is not only capable to support an ad-hoc modeling level, such as functional behavior or detailed design, but is also able to convert these predictive models into real-time models.
- The user can able to create new elements in an easy and intuitive way, to answer to its own modeling requirements.
- Future Centurions are ready for operating in many industries including automotive, aerospace, architecture, Motorsport, energy, and high tech.

Course Syllabus

Module 1 - Introduction Dymola and Modelica library

Package Browser, Component Browser, Parameter and Variable Editor Simulation Window, Modeling, and Simulation.

The Modeling window is used to compose models and model components.

The Simulation experiment on the model, plot results and animate the behavior.

Creating user-defined models and scripting using Modelica language.

Role Play – Explore the pre-defined libraries and Models, Creating a Package

Practice Project - Preparation of animated projects

<https://www.youtube.com/watch?v=39xyI0k>

<https://www.youtube.com/watch?v=FN8LlnTwzVE&t=314s>

Module 2 – Physical Modeling using DYMOLA

Import of user-defined libraries and packages, interfacing with physical models using ArduinoUno.

The Simulation experiment on the model using multi-domain libraries such as mechanical, electrical, control, thermal, pneumatic, hydraulic, powertrain, thermodynamics, vehicle dynamics, air-conditioning domains

Dymola interface that is stored in the Python package

Role Play – Explore the pre-defined libraries and Models, Creating a Package

Practice Project - Preparation of projects using user-defined packages,

Systems Physics with Modelica/Dymola

<https://www.youtube.com/watch?v=xlpHwX-W3Ns>

Module 3 – Animation and 3D view Using DYMOLA

MultiBody Frame Connector, Building a Mechanical Model, Concept of Furuta

Role Play - Practical session by students for students

Practice Project - Modeling of animated projects using the MultiBody library.

<https://www.youtube.com/watch?v=c9Ar2b4X5rQ>

<https://www.youtube.com/watch?v=k7ILBASaEJg>

Session Plan

Session 1

Project 1

Simulating a model – Modeling of Integrated circuits

Description: Use of Electrical and Electronics components.

Workbench Use: Behavior Modelling, Functional and Logical Design.

Session 2

Project 2

Simulating a model -Creating a model for Electric DC Motor

Description: Design a DC Motor Model, Test, and Simulation, Creating a library for components, Creating a model for motor drive, Scripting.

Workbench Use: Behavior Modelling, Modelica Standard Library.

Session 3

Project 3

Simulating a model -Simple Pendulum with Frictionless joint Using Multi-Body Library

Description: Design the Simple pendulum and the Furuta joint using Dymola and Modelica language. Friction joint for the Mechanical equipment.

Workbench Use: Behavior Modelling.

Session 4

Project 4

Simulating a model – Pick and Place Robot

Description: 5 Axis Pick and Place Robot Design, Validation, and Optimization in the 3DS platform.

Workbench Use: Behavior Modelling, Functional and Logical Design. Part design and Assembly Design.

<https://www.youtube.com/watch?v=9RgdZUvEjPw>

Session 5

Project 5

Simulating a model – 3D Printer Design

Description: Design All System and Sub System of the 3D Printer, Validation and Simulation using 3Ds Platform.

Workbench Use: Behavior Modelling, Functional and Logical Design. Part design and Assembly Design.

Session 6

Project 6

Simulating a model – Bicycle Behavior Modeling

Description: Design Power Train, Driving Cycle, part design, and Simulation.

Workbench Use: Behavior Modelling, Functional and Logical Design. Part design and Assembly Design.

Session 7

Project 7

Simulating a model – Refrigerator Compartment Door Design using Thermal Library

Description: This component model the airflow through the door of a refrigerator or freezer compartment.

Workbench Use: Behavior Modelling, Functional and Logical Design. Part design and Assembly Design.

Session 8

Project 8

Simulating a Model – Engine Analytic Using MultBody Library.

Description: Engine analytic, an engine with 6 cylinders, 6 planar loops, 1 degree of freedom, and analytic handling of kinematic loops.

Workbench Use: Behavior Modeling.

Session 9

Project 9

Simulating a model – Control the real and Digital servo motor ArduinoUno Library

Description: Control the Real and Digital Servo motor with simulation.

Workbench Use: Behavior Modelling, Arduino based System Design, and Functional and logical design.

Session 10

Project 10

Simulating a model – Virtual Universes with Poppy Humanoid Using ArduinoUno Library

Description: Virtual universes with a human assistant robot with simulation.

Workbench Use: Behavior Modelling, Arduino based System Design, Functional, and logical design.

Session 11

Project 11

Simulating a model – Implementation of Model using Python Library

Description: Modeling using python library, validation and optimization in the 3Ds platform.

Workbench Use: Behavior Modelling, Functional and Logical Design. Part design and Assembly Design.

Session 12

Project 12

Simulating a model – Industrial Robot Design

Description: 6 Axis industrial robot design, validation, and optimization in the 3Ds platform.

Workbench Use: Behavior Modelling, Functional and Logical Design. Part design and Assembly Design.

Session 13

Project 13

simulating a model – Temperature Control System Using State Graph

Description: The model contains an electric circuit with a heating resistor and a switch.

Workbench Use: Behavior Modelling.

<https://www.youtube.com/watch?v=zz-crJOG0&t=26s>

<https://www.youtube.com/watch?v=Zl592ARjnpU>

Session 14

Project 14

Simulating a model – Magnetic Ball System using Magnetic Library

Description: The electronic circuit consists of a voltage source, a resistor, and an inductor in the form of a tightly wound coil. An iron ball beneath the inductor experiences a gravitational force as well as an induced magnetic force (from the inductor) that opposes the gravitational force.

Workbench Use: Behavior Modelling.

Session 15

Project 15

Simulating a Model – Design of Water to Steam Converter Using Fluid Library

Description: Create a package under Fluid_Package called Water_To_Steam using temperature sensors.

Workbench Use: Behavior Modelling.

Session 16

Project 16

Simulating a Model – Design of Liquid Valve Control Using Fluid Library

Description: Building a simple circuit with two valves and a volume block.

Workbench Use: Behavior Modelling.

https://www.youtube.com/watch?v=P_YI3RiTl14

Centurion University of Technology and Management Odisha

Choice Based Credit System

Course Structure & Syllabus

Electrical and Electronics Engineering



School of Engineering & Technology

2020

CBCS Structure

Basket	Basket Category	Minimum Credits to be acquired by Regular students	Minimum Credits to be acquired by Lateral Entry students
I	Foundation Courses in Sciences	17	06
II	Foundation Courses in Humanities & Management [A: 6 credit (choice), B: 6 credit (Compulsory)]	12	6(Job readiness) + 3
III	Smart Stack	25	25
IV	Foundation and Core Engineering Courses	58*	48
V	Domain/Skill/Internship/Minor Project/MOOC	48	32
	Total Credits	160	120

Course Structure

Basket I	Foundation Courses in Sciences		
Course Code	Course Title	Credit	Type (Theory+Practice+Project)
CUTM1001	Differential Equations and Linear Algebra	3	2+0+1
CUTM1002	Laplace & Fourier Transforms	3	2+0+1
CUTM1003	Complex Analysis & Numerical Methods	3	2+0+1
CUTM1004	Discrete Mathematics	3	2+0+1
CUTM1005	Probability & Statistics	3	2+0+1
CUTM1925	Calculus	3	2+0+1
CUTM1006	Mechanics for Engineers	3	2+1+0
CUTM1007	Optics and Optical Fibres	3	2+1+0
CUTM1008	Applied Analytical Chemistry	3	2+1+0
CUTM1009	Applied Engineering Materials	3	2+0+1
CUTM1010	Environmental Studies	2	0+0+2

Basket II	Foundation Courses in Humanities & Management [A: 6 credit (choice), B: 6 credit (Compulsory)]		
Course Code	Course Title	Credit	Type (Theory+Practice+Project)
CUTM1011	Optimisation Techniques	2	0-2-0
CUTM1012	Engineering Economics and Costing	3	2-0-1
CUTM1013	Project Management	3	2-0-1
CUTM1014	Gender, Human Rights and Ethics	3	1.5-0-1.5
CUTM1015	Climate Change, Sustainability and Organisation	3	1.5-0-1.5
CUTM1016	Job Readiness	6	0-6-0

Basket III	Smart Stack		
Course Code	Course Title	Credit	Type (Theory+Practice+Project)
CUTM1017	Industrial IOT and Automation	6	3-2-1
CUTM1018	Data Analysis and Visualisation using Python	4	0-1-
CUTM1019	Machine Learning using Python	4	1-2-1
CUTM1020	Robotic automation with ROS and C++	4	1-2-1
CUTM1021	Basics of Design Thinking	2	0-0-2
CUTM1022	System Integration with DYMOLA	2	0-0-2
CUTM1023	Smart Engineering Project (G2M)	3	0-0-3

Basket IV	Core Course_ Electrical and Electronics Engineering		
Course Code	Course Title	Credit	Type (Theory+Practice+Proje

			ct
CUTM1028	OOPs with C ++ Programming	4	1-2-1
CUTM1029	Data Structures using C++	4	1-2-1
CUTM1030	Advanced Web Programming	4	1-2-1
CUTM1031	Java Technologies	4	2-1-1
CUTM1039	Embedded System Design Using ARM Cortex	6	3-2-1
CUTM1040	VLSI Design	6	3-2-1
CUTM1042	Electromagnetic Field Theory and Transmission Line	3	2-1-0
CUTM1043	Network Analysis	3	2-1-0
CUTM1051	Energy Production & Transmission	3	2-1-0
CUTM1052	Substation Switch gear & Protection	4	2-1-1
CUTM1053	System Modeling and Control	4	3-1-0
CUTM1054	Electrical Machines Operation and Control	4	2-2-0
CUTM1055	Industrial Power Electronics	4	2-1-1
CUTM1056	Digital Measurement and Instrumentation	3	2-1-0
CUTM1057	Basic Electrical Engineering	2	1-1-0
	Total Credits	58	

Basket V: Domain/Skill/MOOC/Minor Project/Internship/Applied Courses

Domain:

- Industrial Automation
- Operation and Maintenance of Electrical Grid System & Transformers
- Embedded System Design
- Renewable Energy Applications
- GO-TO MARKET (Digital Manufacturing)

Basket IV: Core Courses Syllabus

OOPs with C++ Programming

Code	Course Title	Credit	T-P-PJ
CUTM1028	OOPs with C++ Programming	4	1-2-1

Objective

- To understand how C++ improves C with object-oriented features
- To learn how to design C++ classes for code reuse
- To learn how inheritance and virtual functions implement dynamic binding with polymorphism
- To learn how to use exception handling in C++ programs

Course Outcome

- Apply the object-oriented programming approach in connection with C++
- Illustrate the process of data file manipulations using C++
- Apply virtual and pure virtual function & complex programming situations
- Write an error free program of minimum 200 lines of code

Course content

Module I: Revision of C programming

(8 hrs)

Revision of C Programming, Pointers, Functions (Call by value and reference), Recursion, Arrays using Pointers, Structures, Union, Enumeration and Typedef, File handling.

Programs:

1. Write a Program to perform Parameter passing.
2. Write a program to create a scientific calculator.
3. Write a program to convert a decimal to binary number using recursion.
4. Write a program to Read 'n' employee details and display the top 10 employees as per the salary.
5. Write a program to evaluate MCQ questions of an examination and generate the results using files.

Module II: Basics of Object oriented concepts

(8 hrs)

Object oriented concepts Classes and Objects, Encapsulation, Abstraction, Overloading, Inheritance, Polymorphism.

Beginning with C++, Tokens, Static Members, Constant Members, Expressions, Control Structure, Functions: parameter passing, inline function, function overloading.

Programs:

1. Write a program to read a number and check whether the number is Prime number , Palindrome number , Magic number , Armstrong number , Strong number or not.
2. Write definitions for two versions of an overloaded function. This function's 1st version sum() takes an argument, int array, and returns the sum of all the elements of the passed array. The 2nd version of sum() takes two arguments, an int array and a character ('E' or 'O'). If the passed character is 'E', it returns the sum of even elements of the passed array and if the passed character is 'O', it returns the sum of odd elements. In case of any other character, it returns 0 (zero).

Module III: Class-Object-Constructor**(10 hrs)**

Classes: data members, member function, array of objects, static data members, constant members function, and friend function.

Constructors, Encapsulating into an object, Destructors.

Programs:

1. Define a class to represent a book in a library. Include the following members:

Data Members

Book Number, Book Name, Author, Publisher, Price, No. of copies issued, No. of copies

Member Functions

- (i) To assign initial values
- (ii) To issue a book after checking for its availability
- (iii) To return a book
- (iv) To display book information.

2. A bank maintains two kinds of accounts for customers, one called as savings and the other as current account. The savings account provides compound interest and withdrawal facilities but no cheque book facility. The current account provides cheque book facility but no interest. Current account holders should also maintain a minimum balance and if the balance falls below this level a service charge is imposed.

Define a class to represent a bank account. Include the following members: Data members: 1. Name of the depositor. 2. Account number. 3. Type of account. 4. Balance amount in the account. Member functions: 1. To assign initial values. 2. To deposit an amount. 3. To withdraw an amount after checking the balance. 4. To display the name and balance. Write a main program to test the program

3. Declare a class to represent fixed-deposit account of 10 customers with the following data members:

Name of the depositor, Account Number, Time Period (1 or 3 or 5 years), Amount.

The class also contains following member functions:

- (a) To initialize data members.
- (b) For withdrawal of money (after half of the time period has passed).
- (c) To display the data members.

4. Create two classes DM and DB which store the value of distances. DM stores distances in meters and centimeters and DB in feet and inches. Write a program that can read values for the class objects and add one object of DM with another object of DB. Use a friend function to carry out the addition operation. The object that stores the results may be a DM object or DB object, depending on the units in which the results are required. The display should be in the format of feet and inches or meters and centimeters depending on the object on display.

Module IV: Inheritance

(8 hrs)

Associations, Inner Classes, Memory Management and pointers

Inheritance: Derived classes, member accessibility, forms of inheritance, virtual base classes.

Programs:

1. Write a Program to describe about all types of inheritance.
2. Create a base class called shape. Use this class to store two double type values that could be used to compute the area of figures. Derive two specific classes called triangle and rectangle from the base shape. Add to the base class, a member function `get_data()` to initialize base class data members and another member function `display_area()` to compute and display the area of figures. Make `display_area()` as a virtual function and redefine this function in the derived classes to suit their requirements. Using these three classes, design a program that will accept dimensions of a triangle or a rectangle interactively, and display the area.
3. An educational institution wishes to maintain a database of its employees. The database is divided into a number of classes whose hierarchical relationships are shown in following figure. The figure also shows the minimum information required for each class. Specify all classes and define functions to create the database and retrieve individual information as and when required.

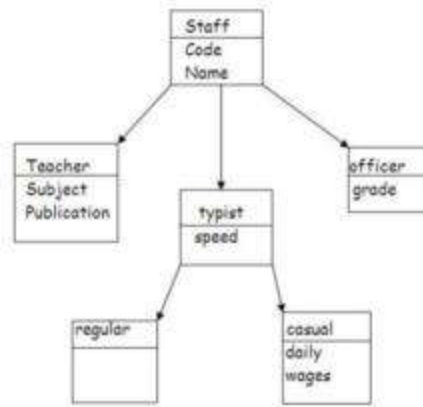


fig: class relationships (for exercise 8.3)

Module V: Polymorphism (8 hrs)

Polymorphism (Compile time Polymorphism, Run time Polymorphism), Virtual Functions, Abstract class, virtual destructors, Interfaces.

Programs:

1. Write a Program to overload ++ operator.
2. Write a program to overload + operator by concatenating strings.
3. Write a program to describe about virtual function.

Module VI: Exception Handling

(8 hrs)

Exception Handling, Managing Console I/O Operations, Streams & Files: streams, hierarchy of stream classes, working with files

Programs:

1. Write a Program to describe about exception handling mechanism.
2. Write a Program to describe multi catch statement.
3. Write a program to read a list containing item name, item code, and cost interactively and produce a three column output as shown below.

Name	Code	Cost
Turbo C++	1001	250.95
C primer	905	95.70
.....
.....

Note that the name and code are left-justified and the cost is right justified with a precision of two digits. Trailing zeros are shown.

4. Write a program that reads a text file and creates another file that is identical except that every sequence of consecutive blank spaces is replaced by a single space.

5. Write a program that reads character from the keyboard one by one. All lower case characters get store inside the file LOWER, all upper case characters get stored inside the file UPPER and all other characters get stored inside OTHERS.

Module VII: Templates

(8 hrs)

Advance Topics in C++ Object Design and Templates STL (Standard Type Libraries)RTTI (Run Time Type Identification) Advanced Typecasting ,new data types, new operators, class implementation, namespace scope , operator keywords, new headers , C++ Containers

Programs:

1. Write a function template for finding the minimum value contained in an array.

2. Imagine a publishing company that markets both books and audio-cassette versions of its works. Create a class called Publication that stores the title (a string) and price of a publication. From this class derive two classes: Book, which adds a page count (type int); and Tape, which adds a playing time in minutes (type float). Each of the three class should have a getdata() function to get its data from the user at the keyboard, and a putdata() function to display the data. Write a main() program that creates an array of pointers to Publication. In a loop, ask the user for data about a particular book or Tape, and use new to create a object of type Book or Tape to hold the data. Put the pointer to the object in the data for all books and tapes, display the resulting data for all the books and taps entered, using a for loop and a single statement such as `pubarr[i]->putdata();`to display the data from each object in the array.

Text Books:

3. E Balagurusamy, “Object Oriented Programming with C++”, Tata McGraw Hill, Sixth Edition.
4. Herbert Schlitz, “The Compete Reference C++”, Tata McGraw Hill, Fourth Edition.

Reference Books:

6. Ashok Kamthane, “Object Oriented Programming with ANSI and Turbo C++”, Pearson.
7. Behrouz A. Forouzan & Richard F. Gilberg “A Structured approach using C++” Cengage Learning Indian Edition.

Data Structures using C++

Code	Course Title	Credit	T-P-PJ
CUTM1029	Data Structures using C++	3	1-2-1

Objective

- Be familiar with techniques of algorithm analysis and Recursive method
- Be familiar with implementation of linked data structures such as linked lists and binary trees
- Be familiar with several sub-quadratic sorting algorithms including quick sort, merge sort and heap sort
- Be familiar with some graph algorithms such as shortest path and minimum spanning tree

Course Outcome

- Evaluate algorithms and data structures in terms of time and memory complexity of basic operations
- Define basic static and dynamic data structures and relevant standard algorithms for them: stack, queue, dynamically linked lists, trees, graphs, heap, priority queue, hash tables, sorting algorithms, min-max algorithm
- Determine and demonstrate bugs in program, recognize needed basic operations with data structures
- Formulate new solutions for programming problems or improve existing code using learned algorithms and data structures

Course content

Module I: Problem Solving Analysis

(6 hrs)

Define the problem, Identify the problem, Introduction to Problem Solving, Problem solving basics, Defining creativity v/s innovation

Find Creative Solutions using creativity tools

Effective problem solving approaches , Critical thinking and information analysis , Brainstorming, Reverse Brainstorming, Imagineering, Mind Mapping, Six Thinking Hats: A Tool to Strengthen Critical Thinking, Collaboration, Communication, and Creativity Skills , Analyzing the situation, Gathering information, Identifying solution criteria , Decision Making Methods , Charts and Diagrams , Applying outcome-based thinking

Evaluate and Select solution

Pro's and Con's, Force field analysis, Feasibility/Capability Analysis, Decision analysis, evaluating problems , Choosing among alternatives , Qualitative analysis, discussing qualitative

analysis techniques , Establishing objectives , Assigning weight to objectives in order to make the best decision , Creating a satisfaction scale to choose between alternatives

Implementing Decisions

Create an action plan, Break solution into action steps, Prioritize actions and assign roles (setting priorities for taking action) ,Follow-up at milestones

Programs:

1. Problem solving (Control structures, Arrays) using Raptor Tool.

Module II: Array & Stack

(9 hrs)

Analysis of different Algorithms, Asymptotic analysis, Algorithm analysis, Complexity Analysis, Application of Data structures

Basic Data Structures, Arrays, Stacks and its applications (Recursion, Infix to Postfix Conversion and Postfix Evolution

Programs:

1. Write a program to perform the following menu driven program on the input array.

- a. Insertion
- b. Deletion
- c. Searching
- d. Sorting
- e. Merging
- f. Display
- g. Exit

2. Write a program to perform the following menu driven program on the STACK.

- a. Push
- b. Pop
- c. Display
- d. Exit

Module III: Queue & Linked List

(9 hrs)

Queues, Priority Queues, Dequeues.

Linked lists: Single Linked List and Operations on Single Linked List (Creation Insertion , Deletion , Sorting and Reverse).

Programs:

1. Write a program to perform the following menu driven program on the Queue.

- a. Insertion

- b. Deletion
- c. Display
- d. Exit

2. Write a program to create a single linked list performs the following menu driven program.

- a. Insertion at front
- b. Insertion at end
- c. Insertion at particular position
- d. Deletion at front
- e. Deletion at end
- f. Deletion at particular position
- g. Display

Module IV: Stack & Queue Using Linked List

(8 hrs)

Circular linked list and Double linked list, Stack implementation using Linked List and Queue implementation using Linked List

Programs:

1. Write a program to create a Double linked list performs the following menu driven program.

- a. Insertion at front
- b. Insertion at end
- c. Insertion at particular position
- d. Deletion at front
- e. Deletion at end
- f. Deletion at particular position
- g. Display

2. Write a program to create a circular linked list and display it.

3. Write a program to implement Stack Using Linked List.

4. Write a program to implement Queue Using Linked List.

Module V: Trees

(10 hrs)

Trees and hierarchical orders ,Introduction to trees , Abstract trees , Tree traversals , Forests , Ordered trees , Binary trees , Perfect binary trees , Complete binary trees , Search trees , Binary search trees , AVL trees

Programs:

1. Write a program to create Binary tree and display it.

2. Write a program to create a BST and display it.
3. Write a program to print all pairs from two BSTs whose sum is greater than the given value.
4. Write a program to remove duplicate entries from the BST.
5. Write a program to create a AVL tree and display it.

Module VI: Searching & Sorting

(8 hrs)

Searching & Sorting algorithms , Objectives of Searching , The Sequential Search , Analysis of Sequential Search , The Binary Search , Analysis of Binary Search , Introduction to sorting , Insertion sort , Bubble sort , Heap sort ,Merge sort ,Quick sort

Programs:

1. Write a program to perform linear and binary search.
2. Write a program to perform selection sort, Bubble sort and Insertion sort.
3. Write a program to perform merge and quick sort.
4. Write a program to perform Heap sort.

Module VII: Hashing

(8 hrs)

Hash functions and hash tables ,Hashing & Introduction to hash tables ,Hash functions , Mapping down to $0 \dots M - 1$, Chained hash tables , Scatter tables , Open addressing , Linear probing , Quadratic probing , Double hashing, Poisson distribution , Collision Resolution Graph Terminology and Traversals.

Programs:

1. Write a program to perform Linear Probing.
2. Write a program to perform Double Hashing

Text Books:

1. Data Structures, Algorithms and Applications in C++, Sartaj Sahani, 2nd Edition.
2. Data Structures and Algorithms in C++, Michael T.Goodrich, R, Tamassia and D.Mount, wiley Student Edition, 7th edition, John Wiley and Sons.

Reference Books:

1. Data Structures and Algorithms Analysis in C++ by Mark Allen Weiss.
2. Data Structures and Algorithms in C++, 3rd edition, Adam Drozdek, Cengage Learning.

Source of reference;<http://courseware.cutm.ac.in/courses/data-structures-using-c/>

Advanced Web Programming

Code	Course Title	Credit	T-P-PJ
CUTM1030	Advanced Web Programming	4	1-2-1

Objective

- Understand client server architecture and able to use the skills for web project development.
- Create job opportunities as a web developer

Course Outcome

- Develop a static, interactive and well-formed webpage using JavaScript, CSS3 and HTML5.
- Use PHP7 to improve accessibility of a web document.
- Gain necessary skills for designing and developing web applications.

Course content

Module I: Web Programming Concepts(7hrs)

Architecture of the Web (1)

HTTP Protocols(1)

Difference HTTP1.0 and HTTP 1.1, Stateless nature of the protocol, Methods (GET, POST, HEAD, PUT, DELETE), HTTP session, Statuscodes, Persistent connections, HTTPS

HTML(1)

Document Object Model (DOM), Elements, Events

HTML 5(2)

Elements, Objects, Events, Canvas, Audio & Video Support, Geo-location Support

CSS(2)

Styling HTML with CSS, Inline Styling (Inline CSS), External Styling (External CSS), CSS Fonts, The CSS Box Model, The id Attribute, The class Attribute, HTML Style Tags

Practice

1. Write an HTML code to display your CV on a web page.
2. Write an HTML code to create a Home page having three links: About Us, Our Services and Contact Us. Create separate web pages for the three links.
3. Write an HTML code to create a Registration Form. On submitting the form, the user should be asked to login with this new credentials.
4. Write an HTML code to create your Institute website, Department Website and Tutorial website for specific subject.
5. Write an HTML code to create a frameset having header, navigation and content sections.

6. Write an HTML code to demonstrate the usage of inline CSS.
7. Write an HTML code to demonstrate the usage of internal CSS.
8. Write an HTML code to demonstrate the usage of external CSS.
- 9: Design your own website using HTML CSS
- 10: Design form using HTML and apply CCS

Module II: JavaScript & jQuery(14 hrs)

JavaScript (10)

Introduction to JavaScript: Variable, statements, Operators, Comments, constructs, Functions, expressions, Javascript console, Scope, Events, Strings, String Methods, Numbers, Number Methods, Dates, Date Formats, Date, Methods, Arrays, Array Methods, Booleans, Comparisons
Control Structures: Conditions, Switch, Loop For, Loop While, Break

Functions: Function Definitions, Function Parameters, Function Invocation, Function Closures

Objects: Object Definitions, Object Properties, Object Methods, Object Prototypes

Object Oriented Programming:

Method, Constructor, Inheritance, Encapsulation, Abstraction, Polymorphism, Javascript Validations, Document Object Model, Document and Events (DOM Manipulation)

HTML DOM: DOM Intro, DOM Methods, DOM Document, DOM Elements, DOM HTML, DOM CSS, DOM Animations, DOM Events, DOM EventListener, DOM Navigation, DOM Nodes, DOM Nodelist, Debugging, Type Conversion, Regular expressions, Errors, Debugging

Forms: Forms Validation, Forms API, JS Browser BOM, Window, Screen, Location, History, Navigator, Popup Alert, Timing, Cookies, Javascript Windows, Pushing code quality via JSLint tool, Security in Java Script

jQuery(4)

Basics of jQuery, jQuery selection and events, jQuery Effects, jquery traversal and manipulation, Data attributes and templates, jQuery Plugins, JQuery / Google Web Toolkit

Practice:

1. Write a Java script to prompt for users name and display it on the screen.
2. Design HTML form for keeping student record and validate it using Java script.
3. Write programs using Java script for Web Page to display browsers information.

4: Validate form page using JavaScript

5: use JQuery effect in page

6. Write a jQuery Code to Find the data passed with the on() method for each element.

7. Find the position of the mouse pointer relative to the left and top edges of the document.

8. Count the number of milliseconds between the two click events on a paragraph

9. Find all the text nodes inside a paragraph and wrap them with an italic tag

Module III: AJAX& JSON(8 hrs)

AJAX(3)

Design Introduction to Ajax, Web services and Ajax, Ajax using HTML, CSS, JavaScript, Ajax Framework and DOM, XMLHttpRequest, Ajax Architecture

Working with JSON (5)

JSON – Introduction, Need of JSON, JSON Syntax Rules, JSON Data - a Name and a Value, JSON Objects, JSON Arrays, JSON Uses JavaScript Syntax, JSON Files, JSON & Security

Concerns, Cross Site Request Forgery (CSRF), Injection

Attacks, XMLHttpRequest functions, JavaScript XMLHttpRequest & Web APIs, JSON & Client Side Frameworks, JSON & Server Side Frameworks, Replacing XML with JSON, JSON

parsing, AJAX using JSON and jQuery

Practice:

1. Create a simple application using AJAX to show the table of numbers given by user at runtime.

2. Access web service using Ajax and handle using JSON

Module IV: Responsive Web Design (5 hrs)

Introduction

The Best Experience for All Users

- Desktop
- Tablet
- Mobile

Bootstrap

Overview of Bootstrap

Need to use Bootstrap

Bootstrap Grid System, Grid Classes, Basic Structure of a Bootstrap Grid

Typography

Tables, Images, Jumbotron, Wells, Alerts, Buttons, Button Groups, Badges/Labels, Progress

Bars, Pagination, List Groups, Panels, Dropdowns, Collapse, Tabs/Pills, Navbar, Forms, Inputs

Bootstrap Grids, Grid System, Stacked/Horizontal

Bootstrap Themes, Templates

Practice:

1. Create a responsive website using bootstrap

Module V: PHP(10 hrs)

PHP(10):

Introduction to PHP, Working with arrays, Functions, Forms, Handling date and Times, Working with Files, Session and state management, Database operations from PHP

Practice:

1. Develop student registration web application using PHP
2. Write a PHP database application that collects comments from users and makes it possible for users to view all the comments that have been submitted. You will need three files: an HTML page with a form where the user can enter a comment; a PHP program to process the input from this form by adding the comment to the database; and a PHP program that displays all the comments.

Module VI: Introduction to Drupal(5 hrs)

Drupal Basics, Content Management System, Content Management Framework, Web Application, Framework, Drupal Workflow, Bootstrap, hooks, callbacks, output, Modules (Core and Contributed), Nodes, Blocks, Regions, The Admin Interface (Overview), Content Management, Site Building, Site Configuration, User Management, Reports, Help, Content Translation, User Contributed Modules, Layouts in Drupal, File Systems

Practice:

1. Setup Drupal server and develop a site on it

Module VII: XML & Web Security (6 hrs)

XML (2)

Introduction to XML,XML Validation,Reason for XML,XML Tree Structure, XML DOM,XML DTD,XML Schema

XML style language(2)

XML and XSLT, XML Parsing,XML parsers (DOM & SAX),XML WSDL,RSS Feed

Web Security(2)

SQL Injection,Cross-Site Scripting (XSS),Security standards (OWASP)

Practice:

1. Creating XML Document
- 2.DTD creation
- 3.Test SQL Injection for student resgistration application

Text/Reference Books

- 1.Web Technologies: HTML, JAVASCRIPT, PHP, JAVA, JSP, XML and AJAX, Black Book Kindle Edition,byKogent Learning Solutions Inc.
- 2.HTML 5 Black Book, Covers CSS 3, JavaScript, XML, XHTML, AJAX, PHP and jQuery, 2ed Kindle Edition,by DT Editorial Services
- 3.Programming PHP: Creating Dynamic Web Pages, Third Edition, by Kevin Tatroe, O'REILLY
- 4.Introduction to JavaScript Object Notation: A To-the-Point Guide to JSON kindle Edition by Lindsay Bassett,O'REILLY
- 5.Bootstrap: Responsive Web Development by Jake Spurlock, Paperback

Project Work

- 1.Online Quiz System
- 2.Online Student feedback System
- 3.. Online Tutorial System
- 4.Restaurant Billing System
- 5.Online MCQ Database Bank System

Source of reference:<https://nqr.gov.in/qualification-title?nid=3002>

Courseware Link: <http://courseware.cutm.ac.in/courses/advanced-web-programming/Course>

Java Technologies

ode	Course Title	Credit	T-P-PJ
CUTM1031	Java Technologies	4	2-1-1

Objective

- Understand fundamentals of programming such as variables, conditional and iterative execution, methods, etc.
- Understand fundamentals of object-oriented programming in Java, including defining classes, invoking methods, using class libraries, etc.
- Be aware of the important topics and principles of software development
- Have the ability to write a computer program to solve specified problems
- Have the ability to write a computer program to solve specified problems
- Be able to use the Java SDK environment to create, debug and run simple Java programs

Course Outcome

- Use an integrated development environment to write, compile, run, and test simple object-oriented Java programs
- Read and make elementary modifications to Java programs that solve real-world problems
- Identify and fix defects the common safety issues in code
- Document a Java program using Javadoc
- Use a version control system to track source code in a project
- Qualify confidently any interview process where Java is the requirement

Course content

Module I: Introduction to Java (8 hrs)

Features and Installation, Java Programming Basics, Decision Making and Looping, Class and Object, Inheritance

Practice 1 (1 Hr)

Practice 2 (1 Hr)

Module II: Package and Safe Code (5 Hr)

Interfaces, Packages and Access Protection, Exception Handling (Fault Tolerant Programming)

Practice 3 (1 Hr)

Module III: Collection and Threads (5 Hr)

ArrayList, Vector, Set, Map, Multi-threaded Programming, Synchronization

Practice 4 (1 Hr)

Module IV: Language and Utility Packages (5 Hr)

String Handling, Wrappers, Runtime Memory Management, Cloning, Calendar, Date and Time Facilities, Scanner, Internationalization

Practice 5 (1 Hr)

Practice 6 (1 Hr)

Module V: Input/ Output and Applets (5 Hr)

Byte and Character Stream I/O, Persistence, Applet: Architecture, Skeleton, and Implementation

Practice 7 (1 Hr)

Practice 8 (1 Hr)

Module VI: GUI Programming (5 Hr)

AWT: Container, Components, Layout Managers, Event Handling

Practice 9 (1 Hr)

Practice 10 (1 Hr)

Module VII: Networking and Advanced (5 Hr)

Networking Fundamental, Client-Server Communication, Remote Method Invocation (RMI), Java Virtual Machine (JVM) Tuning, Java Profiler

Practice 11 (1 Hr)

Practice 12 (1 Hr)

Text Book(s):

1. Java The Complete Reference, Fifth Edition, C25 Herbert Schildt, McGraw-Hills

Reference Book(s):

1. Murach's Java Programming, 5th Edition, Joel Murach, Mike Murach & Associates, 2011, ISBN-78-1-943872-07-7
2. Introduction to Java Programming, Comprehensive, 10th ed., Y. Daniel Liang, 2014. ISBN-10: 0133813460, ISBN-13: 9780133813463

Source of reference;

<https://nqr.gov.in/qualification-title?nid=3002>

<https://www.cdac.in/index.aspx?id=DAC&courseid=0#>

<https://canvas.harvard.edu/courses/63117/assignments/syllabus>

<https://canvas.harvard.edu/courses/69911/assignments/syllabus>

<https://xid.harvard.edu/xid-apps/submitAccountForm.do>

YouTube Resources: freeCodeCamp.org
 Codearchery
 Edureka
 free project
 Jenkov

Online Source(s):

1. <https://docs.oracle.com/javase/tutorial/java/index.html>

2. <https://www.programiz.com/java-programming>

3. <https://marcus-biel.com/>

Software/Tool(s): Java 8, Eclipse IDE

Online Compiler: <https://ideone.com/>

Online Coding Practice: <https://www.hackerrank.com/>

List of Practices:

Practice 1 (Module-I)

Program-1:

Write a program that computes the standard deviation of a set of floating point numbers that the user enters. First the user says how many numbers N are to follow. Then the program asks for and reads in each floating point number. Finally it writes out the standard deviation. The standard deviation of a set of numbers X_i is:

$$SD = \text{Math.sqrt}(\text{avgSquare} - \text{avg}^2)$$

Here, avg is the average of the N numbers, and avg² is its square.

avgSquare is the average of $X_i * X_i$. In other words, this is the average of the squared value of each floating point number.

For example, if N = 4, say the numbers were:

$X_i \quad X_i * X_i$

2.0 4.0

3.0 9.0

1.0 1.0

2.0 4.0

sum 8.0 18.0

Now:

$$\text{avg} = 8.0/4 = 2.0$$

$$\text{avg}^2 = 4.0$$

$$\text{avgSquare} = 18.0/4 = 4.5$$

$$SD = \text{Math.sqrt}(4.5 - 4.0) = \text{Math.sqrt}(.5) = 0.7071067812$$

To do this you will need to do several things inside the loop body for each floating point value as

it comes in: add it to a sum, square it and add it to a sum of squares. Then after the loop is finished apply the formula.

Program-2 and Program-3:

Two suggested competitive programs to solve on HackerRank

<https://www.hackerrank.com/domains/java>

Practice 2 (Module-I)

Program-1:

Better encapsulation of the Goods class would call making instance variables private and using getter and setter methods to access them. A further refinement would be to make the class abstract and to define additional child classes. Here is a revised Goods class:

```
public abstract class GoodsSGA
{private String description;
private double price;
private int quantity;
public GoodsSGA( String des, double pr, int quant )
{description = des;price = pr;
quantity = quant;}
double getPrice()
{return price;}
void setPrice( double newPrice)
{price = newPrice;}
int getQuantity()
{return quantity;}
void setQuantity ( int newQuantity )
{quantity = newQuantity;}
public String toString()
{return "item: " + description + " quantity: " + quantity + " price: " + price ;}}
```

Revise the source code for the classes Food, Toy, and Book. (Perhaps call the revised classes

FoodSG, ToySG, and BookSG.) create a new class ToiletrySG for things like bubble bath. Create a new testing class, StoreSG to test your revised classes.

Note: the child classes will need to use the getter and setter methods to access the instance variables that are declared as private in GoodsSG.

Program-2 and Program-3:

Two suggested competitive programs to solve on HackerRank

<https://www.hackerrank.com/domains/java>

Practice 3 (Module-II)

Program-1:

User-Friendly Division Practice:

Put in a loop so that the user is repeatedly asked for the numerator and the divisor. For each set of data, the program prints out the result, or an informative error message if there is a problem (division by zero or poor input data).

The program continues looping, even if there is a problem Exit the loop when data entered for the numerator start with characters "q" or "Q". Don't print out an error message in this case.

Don't ask for the divisor if the user just asked to quit.

Here is sample output from one run:

Enter the numerator: 12

Enter the divisor: 4

12 / 4 is 3

Enter the numerator: 12

Enter the divisor : 0

You can't divide 12 by 0

Enter the numerator: glarch

You entered bad data.

Please try again.

Enter the numerator: quit

You will need to use the method charAt() from the String class.

Program-2 and Program-3:

Two suggested competitive programs to solve on HackerRank

<https://www.hackerrank.com/domains/java>

Practice 4 (Module-III)

Program-1:

In mathematics, several operations are defined on sets. The union of two sets A and B is a set that contains all the elements that are in A together with all the elements that are in B. The intersection of A and B is the set that contains elements that are in both A and B. The difference of A and B is the set that contains all the elements of A except for those elements that are also in B.

Suppose that A and B are variables of type set in Java. The mathematical operations on A and B can be computed using methods from the Set interface. In particular:

A.addAll(B) computes the union of A and B; A.retainAll(B) computes the intersection of A and B; and A.removeAll(B) computes the difference of A and B. (These operations change the contents of the set A, while the mathematical operations create a new set without changing A, but that difference is not relevant to this exercise.)

For this exercise, you should write a program that can be used as a “set calculator” for simple operations on sets of non-negative integers. (Negative integers are not allowed.) A set of such integers will be represented as a list of integers, separated by commas and, optionally, spaces and enclosed in square brackets. For example: [1,2,3] or [17, 42, 9, 53,108]. The characters +, *, and - will be used for the union, intersection, and difference operations. The user of the program will type in lines of input containing two sets, separated by an operator. The program should perform the operation and print the resulting set.

Here are some examples:

Input Output

[1, 2, 3] + [3, 5, 7] [1, 2, 3, 5, 7]

[10,9,8,7] * [2,4,6,8] [8]

[5, 10, 15, 20] - [0, 10, 20] [5, 15]

To represent sets of non-negative integers, use sets of type `TreeSet<Integer>`. Read the user's input, create two `TreeSets`, and use the appropriate `TreeSet` method to perform the requested operation on the two sets. Your program should be able to read and process any number of lines of input. If a line contains a syntax error, your program should not crash. It should report the error and move on to the next line of input. (Note: To print out a Set, A, of Integers, you can just say `System.out.println(A)`. We've chosen the syntax for sets to be the same as that used by the system for outputting a set.)

Program-2 and Program-3:

Two suggested competitive programs to solve on HackerRank

<https://www.hackerrank.com/domains/java>

Practice 5 (Module-IV)

Program-1:

Password Checker:

Write a program that repeatedly asks the user for a proposed password until the user enters an acceptable password. When the user enters an acceptable password, the program writes a message and exits.

Acceptable passwords:

Are at least 7 characters long.

Contain both upper and lower case alphabetic characters. Contain at least 1 digit. The logic of this program can be quite tricky. Hint: use `toUpperCase()`, `toLowerCase`, and `equals()`. You will also need nested ifs.

Here is a run of the program:

Enter your password:

snowflake

That password is not acceptable.

Enter your password:

SnowFlake

That password is not acceptable.

Enter your password:

snowflake47

That password is not acceptable.

Enter your password:

Snowflake47

Acceptable password.

Program-2 and Program-3:

Two suggested competitive programs to solve on HackerRank

<https://www.hackerrank.com/domains/java>

Practice 6 (Module-IV)

Program-1:

Secret Code:

A text message has been encoded by replacing each character of the message with an integer.

Each integer is an index into a key-phrase that contains all the lower case letters of the alphabet

as well as the space character. The key-phrase may contain the same character in several

locations. The encoded text is series of integers, like this:

35 10 10 33 9 24 3 17 41 8 3 20 51 16 38 44 47 32 33 10 19 38 35 28 49

To decode the message, look up each integer in the key-phrase and output the corresponding

character. For example, say that the key-phrase is this (the index of each character has been

written above it):

111111111122222222223333333333444444444455

0123456789012345678901234567890123456789012345678901

six perfect quality black jewels amazed the governor

using each integer from the encoded text as an index into the phrase results in the decoded

message:

attack the bridge at dawn

Write a program that decodes a secret message contained in a text file. The first line of the text file contains the key-phrase. Then the file contains a sequence of integers, each of which indexes the key-phrase. Find the character corresponding to each integer and output the secret message. Note if a character character such as 'e' occurs several places in the key-phrase it may be encoded as different integers in different parts of the secret message.

(The recipient of the secret message gets only the file of integers and must put the key-phrase at the top of the file.) For example, here is the contents of a secret message file ready for the program:

```
six perfect quality black jewels amazed the governor  
35 10 10 33 9 24 3 17 41 8 3 20 51 16 38 44 47 32 33 10 19 38 35 28 49
```

Here is a sample run of the program:

```
C:\> java Decode < secretFile.txt  
attack the bridge at dawn
```

You will need the charAt() method of String.

Here is another secret message file, with key-phrase inserted, that you can use to test your program:

```
six perfect quality black jewels amazed the governor  
31 16 2 3 4 42 48 7 27 9 10 43 12 13 35 15 1 40 18 3  
20 15 33 23 24 32 26 29 28 27 21 31 25 14 34 14 36  
42 38 19 40 41 27 3 44 50 46 42 48 49 50 6
```

Program-2 and Program-3:

Two suggested competitive programs to solve on HackerRank

<https://www.hackerrank.com/domains/java>

Practice 7 (Module-V)

Program-1:

Stop Word Remover:

Write a program that reads in a file of text, perhaps the text of a novel. The program copies the same text to an output file, except that all the useless words such as "the", "a", and "an" are removed. (Decide on what other words you wish to remove. The list of words removed is called a stop list.) Do this by reading the text file token by token using `hasNext()` and `next()`, but only writing out tokens not on the stop list.

Prompt the user for the names of the input and output files.

Fairly Easy: The output file will have only N tokens per line. Do this by counting tokens as you output them. N will be something like 10 or 12.

Improved Program: Preserve the line structure of the input file. Do this by reading each line using `nextLine()` and then creating a new `Scanner` for that line. (Look at the on-line documentation for `Scanner`.) With each line's `Scanner`, use `hasNext()` and `next()` to scan through its tokens.

Harder: Write out no more than N characters per line. N will be something like 50. Do this by keeping count of the number of characters written out per line. The `length()` method of `String` will be useful. If X characters has already been written to the current line, and if X plus the length of the current token exceeds N, then start a new line.

Program-2 and Program-3:

Two suggested competitive programs to solve on HackerRank

<https://www.hackerrank.com/domains/java>

Practice 8 (Module-V)

Program-1:

E-Mail Address Extractor:

Write a program that scans a text file for possible e-mail addresses. Addresses look like this:
someone@somewhere.net

Read tokens from the input file one by one using `hasNext()` and `next()`. With the default delimiters of `Scanner`, an entire e-mail address will be returned as one token. Examine each token using the `indexOf()` method of `String`. If a token contains an at sign @ followed some characters later by a period, regard it as a possible e-mail address and write it to the output file.

Programs such as this scan through web pages looking for e-mail addresses that become the targets of spam. Because of this, many web pages contain disguised e-mail addresses that can't easily be automatically extracted.

Program-2 and Program-3:

Two suggested competitive programs to solve on HackerRank

<https://www.hackerrank.com/domains/java>

Practice 9 (Module-VI)

Program-1:

User-friendly Fat Calculator, with Advice:

Further modify the calories from fat calculator so that it includes another TextField that will be set with the text "Too many fat calories" if the percentage of calories from fat is equal or greater than 30 percent, or to "Healthy amount of fat" if the percentage is less than that.

Program-2 and Program-3:

Two suggested competitive programs to solve on HackerRank

<https://www.hackerrank.com/domains/java>

Practice 10 (Module-VI)

Program-1:

Three Button Monte:

Write a program to implement a game:

There are three buttons in the frame. Two of the buttons cause the program to quit using `System.exit(0)`; the remaining button changes the frame to green (a win!) The winning button is different each time the game is played.

The easy way to do this (although it seems unfair to the user) treats each button the same way. The `actionPerformed()` method does not check which button was clicked. When any button is clicked, the method picks a random integer from 0 to 2 and performs the "winning" action if the integer happens to be 0. Otherwise, it performs the "losing" action. To the user, it seems like there is a "winning" button and two "losing" buttons. But, in fact, it does not matter which button was clicked.

This is similar to some electronic gambling devices in casinos, where it appears to the user that there are "winning moves" and "losing moves" but in fact the machine actually ignores what the user has done and just declares a "win" every now and then, according to predetermined odds.

You will need the Random class:

```
Random randNum = new Random(); // create a Random number object  
int someInt = randNum.nextInt(3); // someInt gets a number from 0 to 2
```

Program-2 and Program-3:

Two suggested competitive programs to solve on HackerRank

<https://www.hackerrank.com/domains/java>

Practice 11 (Module-VII)

Content Delivery with Networking:

Write a Client-Server program where the client queries with a name of file and the server delivers the content of requested files to the client over the network.

(Improve the program by making the server multi-threaded)

Practice 12 (Module-VII)

Greet the user with Remote Method Invocation:

Write a program using RMI, where the user invokes a method on remote object with username as parameter and receives a greeting message based on time of the day along with username.

Projects

However, not limited to:

1. Chat application
2. Text Editor application
3. GUI based Scientific Calculator
4. Paint application
5. Slam book

(*PROJECT REVIEWS WILL COMMENCE BEYOND CLASS HOURS)

Monitoring:

Credit will be received only on making an honest effort. It

is expected that students will finish watching all lecture video and complete all challenge problems by the end of each lecture week.

Borrowing code from other sources is allowed only with proper attribution and credit given to the original author(s).

List of Common Programs to solve using Java:

1. Program to calculate area of a triangle

3. Program to solve quadratic equation

3. Program to swap two variables (with and without using third variable)

4. Program to generate random numbers in various ways

5. Program to convert miles to kilometers and vice-versa

6. Program to convert celsius to fahrenheit and vice-versa

7. Program to check if a number is odd or even

8. Program to check if input year is leap year

9. Program to test primality

10. Program to print all prime numbers in an interval using "Sieve of Eratosthenes"

11. Program to generate factorial of all elements in an array

12. Program to display the multiplication table up to 20

13. Program to print the fibonacci sequence

14. Program to check armstrong number, perfect number, Harshad number

15. Program to generate armstrong numbers in an Interval

16. Program to find the sum of Harshad numbers in an interval

17. Program to display powers of two Using lambda

18. Program to perform conversions among decimal to binary, octal and hexadecimal

19. Program to display ASCII table

20. Program to find HCF/GCD and LCM

21. Program to find factors of given natural number
22. Program to make a simple calculator
23. Program to shuffle deck of cards
24. Program to generate fibonacci sequence using recursion
25. Program to find sum of natural numbers using recursion
26. Program to find factorial of number using recursion
27. Program to convert decimal to binary using recursion
28. Program to add two matrices
29. Program to obtain transpose of a matrix
30. Program to multiply two matrices
31. Program to check if a string is palindrome
32. Program to remove punctuations from a string
33. Program to sort words lexicographically
34. Program to illustrate different set operations
35. Program to count frequency of each vowel in a string
36. Program to find hash value of a file

This course on courseware: <http://courseware.cutm.ac.in/courses/java-technologies/>

Embedded System Programming with ARM-Cortex

Code	Course Title	Credit	T-P-PJ
CUTM1039	Embedded System Programming with ARM-Cortex	6	3-2-1

Objective

- To allow students in Embedded System sectors to learn programming / Interfacing peripherals to ARM Cortex based Microcontroller

Course Outcome

- Describe the architectural features and instructions of 32 bit ARM Cortex M3 microcontroller.
- Understand the basic hardware components and their selection method based on the

characteristics and attributes of an Embedded System.

- Understand various Sensors, Actuators & Interfacing Modules.

Course content

Module I: EMBEDDED C

(4 Hrs)

Embedded System, Programming Embedded system, Factor for selecting the Programming language, Embedded C programming Language, Embedded C vs C.

Practice:

1. Familiarization with tools (STM32CubeMX, KeilVision IDE, Flash Magic & Proteus Simulator).
2. Programming STM32 using KeilVision& STM32CubeMX.

Module II: ARM-32 bit MICROCONTROLLER

(6 Hrs)

ARM Design Philosophy & RISC Architecture, Programmer's Model. ARM Cortex M, Cortex M Architecture, ARM Cortex-M Internals & Debugging.

Practice:

1. Familiarization with Different Processors and Controllers Boards (8, 16, 32, 64 bits)

Module III: STM32 GPIO MANAGEMENT

(14 Hrs)

GPIO Configuration, Driving De-initialization, Interfacing IO devices and its type – LEDs, Switches, Buzzer, Seven Segment Display, LCD (4 bit, 8 bit Mode), Keypad (4*4), DC Motor, Stepper Motor, Servo motor, Relay.

Practice:

1. Write an Embedded C program to interface LEDs with STM32.
2. Write an Embedded C program to interface Switch with STM32.
3. Write an Embedded C Program to design up counter & down counter using Seven Segment Display. (1 digit, 2 digit)
4. Write an Embedded C program to interface buzzer to control with the help of Switch.
5. Write an Embedded C program to display characters on Alphanumeric LCD.
6. Write an Embedded C program to interface Keypad and LCD with STM32.
7. Write an Embedded C program to interface DC Motors, Stepper Motor, and Servo Motor rotate clockwise, anticlockwise and in angle (45°, 90°, 180°).
8. Write an Embedded C program to interface relay to control the AC Appliances.

Module IV: STM32 INTERRUPT MANAGEMENT & UART

(14 Hrs)

NVIC Controller, Enabling Interrupt, Interrupt Priority Levels, UART Initialization, UART communication in polling Mode & in Interrupt Mode. Wireless Technologies- Bluetooth, Wi-Fi, RF.

Practice:

1. Write an embedded C program to generate an Interrupt process using STM32.
2. Write an Embedded C program to interface STM32 to Bluetooth Module to send & receive Data.
3. Write an Embedded C program to interface STM32 to GPS module to get a Location Coordinate.
4. Write an Embedded C program to interface STM32 to GSM module to Send & Receive SMS.
5. Write an Embedded C program RF module with STM32 to send and receive the data wirelessly.
6. Write and Embedded C program to design a system to read the RFID cards using STM32.
7. Write and Embedded C program to connect ESP8266 with STM32 to create a Webserver.

Module V: STM32 TIMERS , ADC, & DAC

(10 Hrs)

Timers Basics, General Purpose Timer, SysTick Timer, ADC & DAC Basics, Initialization, DAC Peripherals & Modules. Analog Sensors and its Types(Ultrasonic Sensor, Temperature, Humidity, Soil Moisture Sensor, PIR sensor)

Practice:

1. Write an Embedded C Programs to generate Delay using Timer.
2. Write an Embedded C program to display output for given analog input using internal ADC. (Use of Analog Sensors like Ultrasonic Sensor, Temperature, Humidity, Soil Moisture Sensor, PIR sensor)
3. Write an embedded C program to generate Triangular and Square waves using DAC.

Module VI: STM32 I2C & SPI

(10 Hrs)

I2C specification, Protocol configuration, I2C Peripherals. SPI Specification, Protocol configuration, it's Peripheral and Modules.

Practice:

1. Write an Embedded C program to build I2C communication between STM32 and Arduino
2. Write an Embedded C program to build SPI communication STM32 to the Arduino board.

Module VII: PWM & CAN (8 Hrs)

RTC feature and its Module, CAN Protocols Overview, Application, Architecture, Data Transmission & Data Frames.

Practice:

1. Write an Embedded C program to implement a Real-Time Clock.
2. Write an Embedded C program to Speed Control of DC motor using PWM.
3. Write an Embedded C program to change the intensity of Light using PWM.

Text Books:

1. Shibu K V, —Introduction to Embedded Systems, Tata McGraw Hill Education Private Limited, 2nd Edition
2. Noviello, Carmine. "Mastering STM32." Obtenido de <http://www2.keil.com/mdk5/uvision>,2017.
3. Norris, Donald. Programming with STM32: Getting Started with the Nucleo Board and C/C++. McGraw Hill Professional, 2018.

Reference Books:

1. STM32F10xx User Manual
2. <https://www.udemy.com/course/stm32cubemx-complete-training/learn/lecture/9606338#overview>

1. <https://www.udemy.com/course/embedded-c-programming-for-embedded-systems/>

VLSI Design

Code	Course Title	Credit	T-P-PJ
CUTM1040	VLSI Design	6	3-2-1

Objective

- The objective of the course is to provide understanding of the entire logic design process with the analysis from combinational and sequential digital circuit design.
- Provide understanding of the techniques essential to the Verilog programming for Verification and Testing.
- To learn the architecture of most prominent vendor in the FPGA market, Xilinx FPGAs and Altera FPGAs.

Course Outcome

- Analyze combinational and sequential circuit design concepts.
- Develop FSMs & ASMs for the given problems.
- Write Verilog code, compile, simulate and execute on any VLSI design platform.
- Apply Verilog HDL for FPGA Programming.
- Implement Digital Circuits on Xilinx FPGAs and Altera FPGAs using Verilog HDL.

Course content

Module I: Introduction to VERILOG

(10 hrs)

Introduction to Verilog HDL & Hierarchical Modeling Concepts, Lexical Conventions & Data Types, System Tasks & Compiler Directives, Modules, Ports and Module Instantiation Methods, Modeling methods, Design Verification using Test benches

Practice

1. Introduction to Xilinx EDA Tool.
2. Introduction to XST Tool and ISIM Tool
3. Xilinx Tool Flow: Simulation and Synthesis
4. Module and Ports in Verilog
5. Data Types in Verilog Programming.

Module II: Boolean Algebra and Logic Minimization

(8hrs)

Binary Arithmetic and 1's and 2's Complementation, Basic Theorems and Properties, Canonical and Standard Form, Algebraic Simplification of Digital Logic Gates, The Karnaugh Map Method, Prime and Essential Implications, Don't Care Map Entries.

Practice

1. Gate level Modelling in Verilog.
2. Data flow Modelling in Verilog.
3. Behavioral Modelling in Verilog.

Module III: Combinational Circuit Design

(12hrs)

Arithmetic Circuits: Adder/Subtractor Circuits, Ripple Carry Adder, Universal Ripple carry Adder, BCD Adder, MultipliersComparators, Multiplexer, Demultiplexer, Decoder, Encoder and Priority Encoder, Code Converters: Binary to Gray, Binary to BCD.

1. Design of Arithmetic Circuits using Verilog.
2. Design of Encoder and Decoder using Verilog.
3. Design of Data selector and Data Distributor using Verilog.
4. Design of comparator and Code converters using Verilog.

Module IV: Sequential Circuit Design

(14hrs)

Latch, Flip-Flop: S-R,D,J-K,T, Flip-Flop Conversion and Excitations Counter: Asynchronous and Synchronous counter Design, Register: SISO, SIPO,PISO and PIPO, Universal Shift Register, Johnson counter and Ring Counter.

Practice

1. Design SR and D-Flip Flop Using Continuous and Procedural Assignments.
2. Design JK-Flip Flop And T-Flip Flop Using Verilog.
3. Design Shift Registers (SISO, SIPO, PISO, PIPO) using Verilog.
4. Design Ripple Counter and Up/Down Synchronous Binary Counter Using Verilog.

Module V: State Machines

(10 hrs)

Basic Finite state machines (FSM) structures, Mealy and Moore type FSM,Design of controller and Data path units,Controller Design using FSMs & ASMs

Practice

1. Design of Sequence Detectors allowing overlapping as well as non-overlapping.
2. Design of Mealy and Moore type FSM using Verilog.
3. Design of data controller using ASM.

Module VI: FPGA Architecture and Prototyping

(5 hrs)

Introduction to Programmable Logic and FPGAs, Popular CPLD & FPGA Families, Architecture of Xilinx and Altera FPGAs

Practice

1. Proto-typing of a design using FPGA Design Kit

Module VII: Synthesis and Timing

(6hrs)

FPGA Design Flow, Implementation Details Advanced FPGA Design tips, Logic Synthesis for FPGA, Static Timing Analysis

Practice

1. Design mapping and optimization
2. Analyze and resolve design problems
3. Report generation
4. Verilog gate-level netlist generation and post-synthesis timing data (SDF) extraction
5. Design constraints generation for placement and routing

Text Books:

1. M.Morris Mano., “Digital Design”, Pearson Education, 4th Edition.
2. Palnitkar, S. (2003). Verilog HDL: a guide to digital design and synthesis (Vol. 1). Prentice Hall Professional.

Reference Books:

1. Kohavi, Z., & Jha, N. K. (2009). Switching and finite automata theory. Cambridge University Press.
2. Jain, R. P. (2003). Modern digital electronics. Tata McGraw-Hill Education.

Electromagnetic Field Theory & Transmission Lines

Code	Course Title	Credit	T-P-PJ
CUTM1042	Electromagnetic Field Theory & Transmission Lines	3	2-1-0

Objective

- To introduce the fundamental theory and concepts of electromagnetic waves and transmission lines
- To impart knowledge on the concepts of electrostatics, electric potential, energy density and their applications.
- To impart knowledge on the concepts of magnetostatics, magnetic flux density, scalar and vector potential and its applications.
- To impart knowledge on the concepts of Faraday's law, induced emf and Maxwell's equations.
- Model and design the transmission lines at high frequencies.
- To apply Smith chart use for solution of transmission line problems and impedance matching.

Course Outcome

- Apply the principles of electrostatics to the solutions of problems relating to electric field and electric potential.
- Apply the principles of electrostatics to the solutions of problems relating to boundary conditions and electric energy density.
- Apply the principles of magnetostatics to the solutions of problems relating to magnetic field and magnetic potential,
- Apply the principles of magnetostatics to the solutions of problems relating to boundary conditions and magnetic energy density.
- Understand the concepts related to Faraday's law, induced emf and Maxwell's equations.
- Apply Maxwell's equations to solutions of problems relating to transmission lines and uniform plane wave propagation.

Course content

Module I: Electrostatics

(3hrs Theory + 2hrs Practice)

Introduction to Electrostatic Fields, Gauss's Law and Applications, Electric Potential, Maxwell's Two Equations for Electrostatic Fields, Electric Current and Current Density, Continuity Equation, Relaxation Time, Laplace's and Poisson's Equations.

Practice:

1. To Calculate the Electric field of a dipole using Coulomb's law in Matlab
2. Simulation of Electric Potential and Electric Field in Matlab

Module II: Magnetostatics**(3hrs Theory + 2hrs Practice)**

Biot-Savart Law: Current Flow – which path does it take, Ampere's Circuital Law, Magnetic Flux Density: Closed Loop Circuits, Magnetic Scalar and Vector Potentials, Forces due to Magnetic Fields, Inductances and Magnetic Energy.

Practice:

1. Magnetic field by an infinitely long line current using matlab
2. Magnetic field of a Circular current loop using Biot Savart's Law

Module III: Maxwell's Equations**(3hrs Theory + 1hr Practice)**

Maxwell's Equations and Boundary Conditions.

Practice:

1. Maxwell's Equation using matlab

Module IV: Electromagnetic Waves (3hrs Theory + 4hrs Practice)

Wave Equations for Conducting and Perfect Dielectric Media, Uniform Plane Waves, Wave Propagation in Lossless and Conducting Media, Polarization, Reflection and Refraction of Plane Waves – Normal and Oblique Incidences for both Perfect Conductor and Perfect Dielectrics, Brewster Angle, Critical Angle and Total Internal Reflection, Surface Impedance. Poynting Vector and Poynting Theorem.

Practice:

1. Linear and Circular Polarization of waves using matlab
2. 1-D standing wave using matlab
3. 2-D standing wave (TE) using matlab
4. 2-D standing wave (TM) using matlab
5. Design of Wireless Power Transfer using matlab

Module V: Introduction to Transmission Line Modelling (3hrs Theory + 3hrs Practice)

Introduction to Transmission line equations, Primary & Secondary constants Expressions for Characteristic Impedance, Propagation Constant, Phase and Group Velocities, Losslessness/Low Loss Characterization, Distortion, Loading, Transmission Line Effects, SC and OC Lines,

Reflection Coefficient, VSWR, $\lambda/8$, $\lambda/4$, $\lambda/2$ line impedance Transformations, Smith Chart – Configuration and Applications, Impedance Control.

Practice:

1. Reflection and transmission of a plane wave (S-wave)
2. Reflection and transmission of a plane wave (P-wave)
3. Radiation by an infinitesimal dipole

Module VI: Waveguides

(3hrs Theory)

Introduction, Rectangular Waveguides, electric and magnetic field patterns in TE₁₀ and TE₁₁ mode configuration, modes of TE wave in rectangular waveguide, field equations, impossibility of TEM wave propagation in waveguides, cutoff frequency of rectangular waveguide, propagation constant, wave impedance, phase velocity, group velocity, dominant mode and degenerate modes, related problems.

Module VII: Electromagnetic Computational Techniques

(3hrs Theory)

Introduction, Finite Difference Method (FDM), Finite Element Method (FEM) and Method of moments (MOM) technique.

Text Books:

1. Matthew N.O. Sadiku, “Elements of Electromagnetics”, Oxford Univ. Press.
2. G.S.N.Raju, “Electromagnetic Field Theory and Transmission Lines”, Pearson Education (Singapore) Pvt., Ltd.

Reference:

- 1.E.C. Jordan and K.G. Balmain, “Electromagnetic Waves and Radiating Systems”, PHI.
- 2.Seungbum Hong, "Electrodynamics: An Introduction", Coursera.
- 3.Seungbum Hong, "Electrodynamics: Electric and Magnetic Field", Coursera.
- 4.Seungbum Hong, "Electrodynamics: In-depth Solutions for Maxwell's Equations", Coursera.
- 5.Husain Habib, "Electromagnetic Tutorials part 1 with MATLAB & GeoGebra", Udemy.

Network Analysis

Code	Course Title	Credit	T-P-PJ
CUTM1043	Network Analysis	3	2-1-0

Objective

- To learn techniques of solving circuits involving different active and passive elements.
- To deliver problem solving skills on circuits through the application of simulation & programming techniques and principles to common circuit problems.
- To analyze the behavior of the circuit's response in time domain.

Course Outcome

- Apply the knowledge of basic circuit law and simplify the network using different techniques.
- Analyze the circuit using graphical method and network theorems.
- Infer and evaluate transient response, Steady state response
- Obtain the maximum power transfer to the load, and Analyze the series resonant and parallel resonant circuit.
- Evaluate two-port network parameters.

Course Content

Module I

(4 hrs)

Network Topology

Graph of a network, Concept of tree, Incidence matrix, Tie-set matrix, Cut-set matrix, Formulation and solution of network equilibrium equations on loop and node basis

Practice

- Incidence Matrix Formulation
- Tie-set Matrix Formulation
- Cut-set Matrix Formulation

Module II

(5 hrs)

Network Theorems

Substitution theorem, Reciprocity theorem, Maximum power transfer theorem, Tellegen's theorem, Millman's theorem, Compensation theorem

Practice

- Verification of Reciprocity theorem
- Verification of Tellegen's theorem
- Verification of Millman's theorem
- Verification of Maximum power transfer theorem
- Verification of Compensation theorem

Module III
Coupled Circuits

(5 hrs)

Theory

Coupled Circuits, Dot Convention for representing coupled circuits, Coefficient of coupling, Series and parallel resonant circuits: Band Width and Q-factor

Practice

1. Self-inductance, mutual inductance and coefficient of coupling to be determined for a 1- \emptyset transformer representing coupled circuit.
2. Frequency response of a series and parallel resonant circuit by laboratory set up.

Module IV
Network Laplace Transform

(5 hrs)

Application of Laplace transform: Circuit Analysis (Steady State and Transient)

Practice:

- Analysis of transient characteristics using Matlab
- AC and DC transient response analysis for RL,RC and RLC circuits

Module V
Two Port Network

(5 hrs)

Z, Y, ABCD and h-parameters, Reciprocity and Symmetry, Interrelation of two-port parameters, Interconnection of two-port networks

Practice:

- Determination of Z parameters
- Determination of Y parameters
- Determination of h parameters
- Determination of ABCD parameters

Module VI
Filters

(4 hrs)

Brief idea about network filters (Low pass, High pass, Band pass and Band elimination) and their frequency response

Practice:

- Design and frequency response analysis of Low Pass filter
- Design and frequency response analysis of High Pass filter
- Design and frequency response analysis of Band Pass filter
- Design and frequency response analysis of Band elimination filter

Module VII
Fourier Series

(5 hrs)

Theory

Fourier series, Fourier analysis and evaluation of coefficients, Steady state response of network to periodic signals, Fourier transform and convergence, Fourier transform of some functions

Practice:

- Fourier series expansion of Square wave
- Fourier series expansion of Sine wave

Text Books:

1. M. E. VAN VALKENBURG- *Network Analysis, PHI Publications*
2. A K Chakraborty, “*Network Theory,*” DhanpatRai Publication
3. MAHMOOD NAHVI – *Electric Circuits, SCHAUM’S Outlines Fifth Edition*

Reference Books:

1. Smarajit Ghosh- *Network Theory Analysis & Synthesis, MC Graw Hill Publishers*
2. Dr. B.R.GUPTA-*Network Analysis & Synthesis, S.Chand*

Energy Production & Transmission

Code	Course Title	Credit	T-P-PJ
CUTM1051	Energy Production & Transmission	3	2-1-0

Course Objective

- | |
|---|
| <ul style="list-style-type: none"> • To understand power generation and economics • To design the transmission line parameters • To understand the mechanical design of transmission lines |
|---|

Course Outcome

- | |
|--|
| <ul style="list-style-type: none"> • Able to understand the different functions of major equipment of the power plants and layout designing of the plants |
|--|

- Able to understand the economic aspects of power system generation
- Able to design transmission line cables

Course content

Module I: Thermal & Nuclear Power Plants

(6Hours)

Introduction: Statistics of generation of electric power from Conventional and non conventional sources of energy, Thermal & Nuclear power station: Schematic arrangement, Types of prime movers, types of reactors, speed control & auxiliaries, Environmental aspects for selecting the sites and locations, Hazards.

Practice:

1. Schematic Layout design Thermal Plant using AutoCad
2. Schematic Layout design Nuclear Plant using AutoCad

Module II: Hydro & Wind power plants

(4Hours)

Hydro power station: Schematic arrangement, Hydro turbines, Environmental aspects for selecting the sites and locations of hydro power stations, small hydro for irrigation, Wind power generation.

Practice:

3. Schematic Layout design of Hydro Plant using AutoCad

Module III: Power Generation Tariffs

(5Hours)

Tariff and Economic aspects in power Generation: Terms commonly used in system operation, various factors affecting cost of generation: Load curves, load duration curves, Connected load, maximum load, Peak load, base load and peak load power plants, load factor, Plant capacity factor, Plant use factor, Demand factor, diversity factor, Cost of power plant.

Practice: MATLAB

4. Preparation of Load calculator using MATLAB

Module IV: Transmission systems

(4 Hours)

Supply System: Different kinds of supply system and their comparison, choice of transmission voltage. Transmission Lines: Configurations, types of conductors, resistance of line, skin effect, Kelvin's law, Proximity effect,

Module V: Transmission line Parameters

(5 Hours)

Calculation of inductance and capacitance of single phase, three phase, single circuit and double circuit transmission lines, Representation and performance of short, medium and long transmission lines, T & Pi networks, ABCD parameters, Ferranti effect, Surge impedance loading.

Practice:

5. Designing of transmission line parameters using MATLAB

Module VI: Transmission line operation & Insulators**(5Hours)**

Phenomenon of corona, corona formation, calculation of potential gradient, corona loss, factors affecting corona, methods of reducing corona and interference Electrostatic and electromagnetic interference with communication lines.

Overhead line Insulators:

Type of insulators and their applications, potential distribution over a string of insulators, methods of equalizing the potential, string efficiency.

Practice:**6. Designing of Insulators and calculation of voltages using MATLAB****Module VII: Design of cables****(4 Hours)**

Calculation of sag & tension, effects of wind and ice loading, sag template, vibration dampers. Under Ground Insulated cables: Type of cables and their construction, dielectric stress, grading of cables, insulation resistance, capacitance of single phase and three phase cables, dielectric loss, heating of cables, Transmission line tower designs

Practice:**7. Designing of Cables****Text Books:**

1. Electrical power Generation, Transmission and Distribution S.N. Singh PHI 2nd Edition, 2009

Reference Books:

1. A Text Book on Power System Engineering A.Chakrabarti, Dhanpath Rai 2nd Edition

Substation Switch Gear & Protection

Code	Course Title	(Credit)	T-P-PJ
CUTM1052	Substation Switch Gear & Protection	4	2-1-1

Objective

- To understand the different components of substation.
- To understand the protection of different equipment in power system.

Course Outcome

- Able to understand the performance of different protection methods of different equipments.

- Able to understand the different components of substation and their operation.
- Able to design the power system switchgear.

Course content

Module I: Substation Systems

(6 Hours)

Introduction to Substation System: Definition of substation, necessity of substation, essential features, types of substation, single line diagram of substation, List and functions of each component of substation. Auxiliary systems, Over head earthing screen, Sub-station earthing system.

Practice:

1. Layout Design of 220KV substation using MATLAB
2. Layout Design of 400KV & 750KV substation using MATLAB as per IEEE standards

Module II: Operation & Maintenance of Substations

(10 Hours)

Testing and maintenance of Bus Bars, and Isolators: Types and ratings – Bus bar configuration, Tests on Bus bars. Types of isolators and ratings, Load Break switches, Maintenance of isolators, testing and maintenance of Power Transformers, Current and Voltage Transformers and Insulators: Preliminary tests, Final tests, Impulse test, Partial discharge test, Transformer maintenance. Current Transformer tests, Potential Transformer tests. CT and PT maintenance, Tests and maintenance of insulator

Practice:

3. Maintenance tests of CT & PT of substation as per manufacturers Hand book
4. Maintenance tests of Lightning Arrestor & Circuit Breaker of substation as per manufacturers Hand book
5. Maintenance tests of transformer as per manufacturers Hand book

Module III: Protection & System components

(5 Hours)

Need for protective schemes, Nature and Cause of Faults, Types of Fault, Effects of Faults, Zones of Protection, Primary and Backup Protection, Essential Qualities of Protection, Classification of Protective Relays, Automatic Reclosing, Current Transformers for protection, Voltage Transformers for Protection.

Module IV: Relays

(4 Hours)

Introduction, -Electromechanical Relays, Static Relays – Merits and Demerits of Static Relays, Numerical Relays, Comparison between Electromechanical Relays and Numerical Relays.

Practice:

6. Designing of a Digital Relay

Module V: Relay Operations

(7 Hours)

Introduction, Time – current Characteristics, Current Setting, Time Setting, Overcurrent Protective Schemes, Reverse Power or Directional Relay, Protection of Parallel Feeders, Protection of Ring Mains, Earth Fault and Phase Fault Protection, Combined Earth Fault and Phase Fault Protective Scheme, Phase Fault Protective Scheme, Directional Earth Fault Relay, Static Overcurrent Relays, Numerical Overcurrent Relays.

Module VI: Protection control systems

(5Hours)

Pilot Relaying Schemes: Introduction, Wire Pilot Protection, Carrier Current Protection
Numerical Differential Relays: Simple Differential Protection, Percentage or Biased Differential Relay, Differential Protection of 3 Phase Circuits, Balanced (Opposed) Voltage Differential Protection.

Rotating Machines Protection: Introduction, Protection of Generators

Transformer and Buszone Protection: Introduction, Transformer Protection, Buszone Protection, Frame Leakage Protection

Practice:

7. Design of Protection Scheme using MATLAB

Module VII: Circuit Breakers

(8 Hours)

Introduction, Fault Clearing Time of a Circuit Breaker, Arc Voltage, Arc Interruption, Restriking Voltage and Recovery Voltage, Current Chopping, Interruption of Capacitive Current, Classification of Circuit Breakers, Air – Break Circuit Breakers, Oil Circuit Breakers, Air – Blast Circuit Breakers, SF6 Circuit Breakers, Vacuum Circuit Breakers, High Voltage Direct Current Circuit Breakers, Rating of Circuit Breakers, Testing of Circuit Breakers.

Practice:

8. Design & simulation of Circuit breaker using 3DS Tools

Project:

1. Analysis of critically operating power system using MATLAB/DYMOLA

Text Books:

1. Fundamentals of Power System Protection Y.G.Paithankar S.R. Bhide PHI 1 st Edition, 2009

Reference Books:

1. Power System Protection and Switchgear, BhuvaneshOza et al McGraw Hill 1 st Edition, 2010

System Modeling & Control

Code	Course Title	(Credit)	T-P-PJ
CUTM1053	System Modeling and Control	4	3-1-0

Objective

- To teach how to convert a physical systems consist of mechanical and electrical system into a mathematical model.
- Analysis of a live system in time domain and frequency domain and application of controllers to get the desired response.

Course Outcome

- Students will understand the basics of a system.
- Student gain knowledge on stability of a system.
- Student will analyze the system and controller.
- Students will develop skill of designing automatic control system and controller for a particular application.

Course content

Module I: Introduction

(6 Hours)

Theory

Introduction to Control Systems: Basic Concepts of Control Systems, Open loop and closed loop systems; Servomechanisms, Laplace transform, Transfer functions, Concept of Pole and Zero.

Practice: Hardware/MATLAB

1. Study of Temperature control system
2. Using MATLAB, find the poles, zeros, gain and draw the pole-zero plot of the transfer function.

Module II: System Dynamics

(10 Hours)

Theory

Mathematical Models of Physical Systems: Differential Equations of Physical Systems, Mechanical Translational Systems, Rotational systems, Electrical Systems, Analogy between Mechanical and electrical quantities, Derivation of Transfer functions, Block Diagram Algebra, Signal Flow Graphs and Mason's Gain Formula.

Practice: MATLAB

3. Using MATLAB, find the transfer function from given block diagram.

Module III: Time Response Analysis

(8Hours)

Theory

Time Response Analysis: Type Test Signals, Time response of first order systems to unit step and unit ramp inputs, Time Response of Second order systems to unit step input, Time Response specifications, Steady State Errors and Static Error Constants of different types of systems.

Practice: MATLAB/DYMOLA

4. Standard Test Signals
5. Time response of first order systems to unit step and unit ramp inputs
6. Time Response of Second order systems to unit step input
7. Using MATLAB, determine the steady state error of the given system.

Module IV: Stability in Time Domain

(4 Hours)

Theory

Stability in Time Domain: Stability and Algebraic Criteria, concept of stability, Necessary conditions of stability, Hurwitz stability criterion, Routh stability criterion and Application of the Routh stability criterion to linear feedback system

Module V: Root Locus Technique

(5 Hours)

Theory

Root Locus Technique: Root locus concepts, Rules of Construction of Root locus and Determination of Roots from Root locus for a specified open loop gain.

Practice: MATLAB

8. Construct the root locus for 2nd & 3rd order system and analyze its stability (Gain)

Module VI: Frequency Response Analysis

(6Hours)

Theory

Frequency Response Analysis: Frequency domain specifications, correlation between Time and Frequency Response with respect to second order system, Bode plot, Determination of Gain Margin and Phase Margin from Bode plot.

Practice: MATLAB

9. Construct the bode plot for 2nd and 3rd order system and analyze its stability (PM & GM)

Module VII: Controllers

(4 Hours)

Theory

Controllers: Concept of Proportional, Derivative and Integral Control actions, P, PD, PI and PID controllers.

Practice: MATLAB/DYMOLA

10. Design of P, PD, PI and PID Controller for 2nd or 3rd order system

Text Books:

1. Saeed S. Hasan, "Automatic Control Systems," Kataria Publication, 9th Edition-2017.

Reference Books:

2. Nagrath J. and Gopal M., "Control Systems Engineering," New Age International Publishers, 6th Edition-2017.

Electrical Machines Operation and Control

Code	Course Title	T-P-PJ	Prerequisite
CUTM1054	Electrical Machines Operation and Control	3-1-0	Basic Electrical Engineering

Objective

- To introduce the students about principles of electromagnetism applied to alternating machines.
- To familiarize the students about the fundamental laws that governs the operation of machines and to extend its application to synchronous generator and motors.
- To introduce the students about the constraints associated with starting of Induction motors.
- Develop selection skill to identify the type of generators or motors required for particular application.
- Highlight the importance of transformers in transmission and distribution of electric power.

Course Outcome

- Distinguish the constructional similarity and dissimilarity between various machines.
- Perform different tests on various machines.
- Understand electromagnetic and electromagnetic induction
- Understand DC Machines
- Understand single and three phase A.C circuits, and Understand AC machines

Course content

Module-I: D.C. Machines (5 Hrs)

Theory

Construction, Classification and Principle of operation of DC machines.

Theory & testing:-EMF equation of DC generator, DC Motor Characteristics, Speed Equation of DC Motor. Characteristic for Speed Armature Current, Torque Armature Current and Speed Torque of (i) Separately Excited DC Motor, (ii) DC Shunt Motor, (iii) DC Series Motor, and (iv) DC Compound Motor, Comparison between Different types of DC Motors

Application- DC Generator, DC Motor-Types

Practice:

- 1) Determination of OCC (Open Circuit Characteristics) of D.C Shunt Generator.
- 2) Starting & Speed Control of D.C Shunt motor by (i) Field flux control method & (ii) armature voltage control method.
- 3) Starting & Speed Control of D.C Series motor by (i) Field flux control method & (ii) armature voltage control method.

MODULE II: Stepper Motors (Precision Machines) (6 Hrs)

Theory

Stepper motor drive, basic principles involved in stepper motor control, stepper motor specification, operation and commercial driver chips and packages, Brushless DC Motors, Reluctance Motor, Hysteresis Motor
Application in Medical, Automobile, Civil, Electrical etc

Practice:

- 4) Motor Voltage and Current Measurement.
- 5) ON-Load Tap changer

Module-III: Induction Motors (8 Hrs)

Theory

Principles of operation of induction motors, both single and 3-phase types. Torque-speed curves, Different types of single phase motors

Three Phase Induction Motor

Equivalent Circuit and Phasor Diagram, No-Load and Blocked Rotor tests, Determination of Parameters, Slip-Torque Characteristics Losses and Efficiency, Effect of rotor resistance, Starting and speed control methods, Cogging, Crawling and Electrical Braking of Induction Motors.

Applications of three & single phase motors which will assist in picking the right one for an application.

Practice:

- 5) Determination of parameter of a single phase induction motor and study of (a) Capacitor start induction motor (b) Capacitor start and capacitor run induction motor
- 6) Determination of Efficiency, Plotting of Torque-Slip Characteristics of Three Phase Induction motor by Brake Test.
- 7) Load test of a 3 phase slip ring induction motor.

Module-IV: Three Phase Synchronous Generators (7 Hrs)

Theory

Construction, Principle, Coil Pitch, Distributed Windings in A.C. Machines, The Equivalent Circuit of a Synchronous Generator (Armature Reaction Reactance, Synchronous Reactance and Impedance). The Phasor Diagram of a Synchronous Generator, Power and Torque in Synchronous Generators (Power Angle Equation and Power Angle Characteristic)

Practice:

- 8) Plotting the open circuit and short circuit characteristics of alternator.
- 9) Calculating the voltage regulation by synchronous impedance method.
- 10) Calculating the voltage regulation by zero power factor method.

Module-V: Parallel Operation Of Three Phase AC Synchronous Generators (4 Hrs)

Theory

Synchronous condenser, Hunting, Paralleling-Conditions, Procedure, Operation of Generators in Parallel with Infinite bus bar, Effect of excitation, effect of unequal voltage and steam power supply.

Practice:

- 11) Connection & verifying the conditions of parallel operation of alternators.
- 12) Verification of direct axis reactance, quadrature axis reactance
- 13) Load Sharing during parallel operation using Dymola.

Module-VI: Three Phase Synchronous Motors (6 Hrs)

Theory

Basic Principles of Motor operation, Construction, Starting Synchronous Motors, Synchronous Motor Ratings, Equivalent circuit & phasor diagram, Effect of excitation on varying load, power developed in a synchronous motor.

Applications of synchronous motors

Practice:

14) Study of universal motor and shaded pole motor.

15) Use of synchronous motor as a synchronous condenser for p.f improvement.

Module-VII: Single-Phase Transformers (9 Hrs):

Theory

Construction and principle of operation, EMF Equation, Transformation ratio, Practical and Ideal transformers

Three Phase Transformers: Three-phase transformer connections- Star-star, Two Single-Phase Transformers connected in Open Delta (V-Connection) and their rating, Delta-star, Zig-zag connections. Scott connection, Open delta connection. Auto Transformers, Welding Transformer.

Application of Single & Three Phase transformer

Practice:

16) Prescribed tests of single phase and three phase Transformer.

17) Load balancing in a three phase distribution Transformer.

18) Simulation of open delta condition of Transformer.

TEXT BOOK:

1. Electrical Machines – D P Kothari and I J Nagrath, Fourth Edition – Tata McGraw Hill.

REFERENCE BOOKS:

1. Electrical Machinery – P S Bimbhra – Khanna Publishers.
2. Electrical Machines - P. K. Mukherjee, S. Chakravarti, Dhanpat Rai & Sons

Industrial Power Electronics

Code	Course Title	Credit	T-P-PJ
CUTM1055	Industrial Power Electronics	4	2-1-1

Course Objective

- They must meet industrial requirement for power electronic engineers.
- They must be gaining adequate practical knowledge on power semiconductor devices, converters and their control techniques.
- They should know the typical applications to motor drives.

Course Outcome

- They will apply their knowledge of the electrical characteristics of power semiconductor devices.
- They will know how to select power semiconductor devices for a range of applications.
- They will understand the basic topology of converters, inverters and power supplies and design calculations for drive
- They will learn the power converter applications, and understand the approximations used.

Course content

Module I (6hrs.)

Power Semiconductor Devices

Introduction to power electronics, uncontrolled switches, semi-controlled switches, fully controlled switches, constructional features, operating principle, characteristics and specification of power semiconductor devices, hard and soft switching of power semiconductor switches.

Practice

1. Simulation of V-I characteristics of power diode & power transistor.
2. Simulation of V-I characteristics of MOSFET & IGBT.
3. Simulation of V-I characteristics of silicon-controlled rectifier.

Module II (3 hrs.)

Triggering Circuits

R- Triggering, R-C triggering, UJT triggering, design of UJT triggering circuit.

Practice

4. Simulation of R and RC triggering.
5. Simulation of UJT triggering

Module III (8 hrs)

AC to DC Converter

Overview of rectifiers, half wave uncontrolled rectifier with R load and R-L load, use of freewheeling diode, half wave rectifier R-L load with FWD, full wave bridge uncontrolled rectifier, half wave controlled rectifier with R load, R-L load and R-L load with free-wheeling diode, half controlled bridge rectifier, fully controlled bridge rectifier, effect of source inductance on the performance of ac to dc converters, power factor improvement, harmonic reduction, filter design.

Practice

6. Simulation of single phase half-wave and full-wave diode rectifier using R & L load.

7. Simulation of single phase fully controlled converter using R & L load.

8. Simulation of single phase semi converter using R-L load.

9. Simulation of 3-phase semi converter with R, R-L and dc motor load with/without freewheeling diode.

10. Simulation of 3-phase bridge converter with R, R-L and dc motor load with/without freewheeling diode.

Module IV: (10 hrs.)

DC to DC Converter

Introduction to chopper (Type A, B, C, D, E), switching techniques, step down dc chopper with R load, R-L-E load, step up dc chopper with R, R-L, R-L-E load, buck regulator, boost regulator, Buck-boost regulator, CUK and SEPIC converter, commutation of thyristor based circuits part-I, commutation of thyristor based circuits part-II, introduction to SMPS circuits, fly back type SMPS, forward type SMPS, design of transformer for SMPS circuits.

Practice

11. Simulation of buck converter.

12. Simulation of boost converter.

13. Simulation of buck boost converter.

Module V (6 hrs.)

DC to AC Converter

Introduction to inverters, importance and application of inverters, single phase half bridge inverter with R and R-L load, single phase bridge inverter with R and R-L load, three phase inverters, control techniques of inverter, single/multiple pulse width modulation, sinusoidal pulse width modulation and its realization, CSI, load-commutated CSI, industrial inverter.

Practice

14. Simulation of single-phase inverter & three phase inverter.

Module VI (3 hrs.)

AC to AC Converter

AC voltage controller: Single phase bi-directional controllers with R and R-L load, single phase cyclo-converters.

Practice

15. Simulation of single phase AC voltage controller&cyclo-converter.

Module VII

(9 hrs)

Application of Power Electronics Converters

Analysis of converter fed dc drives, analysis of chopper fed dc drives, analysis of VSI, CSI fed induction motor drives, automotive & traction system, industries as rolling mills, pumps, elevators, utility systems as FACTs, smart grid, and renewable energy as wind turbine.

Practice

16. Simulation of converter fed dc drives (Wind Turbines).

17. Simulation of chopper fed dc drives (PV Systems).

18. Simulation of induction motor drives (e-Vehicle).

19. Simulation of railway electrification system using Dymola

Project

1. 500 VA Sine wave Inverter

2. Industrial Battery Charger using SCR

3. Precision Illumination control of Lamp

4. Dual Converter using Thyristors

Text Books:

1. M. H. Rashid, "Power Electronics: Circuits, Devices and Applications," 4th Edition, Pearson, 2017
2. M. D. Singh & K. B. Khanchandani, "Power electronics", 2nd Edition, Tata McGraw-Hill, 2008

Reference Books:

1. J. Vithayathil, "Power Electronics: Principles and Applications", 2nd Edition TMH Edition, 1995
2. Mohan, Undeland and Robbins, "Power Electronics: Converters, Applications and Design" 3rd Edition Edition, 2007

Digital Measurement and Instrumentation

Code	Course Title	Credit	T-P-PJ
CUTM1056	Digital Measurement and Instrumentation	3	2-1-0

Objective

- The main objective of this course is to explain the operation, performance and application of Digital Measuring Instruments to the students.

Course Outcome

- Understand the construction, principle and characteristics of different types of digital measuring instruments
- Apply the knowledge about different instruments and can identify the best suitable instrument for a required typical measurement

Course Content

Module I (6 hrs)

Philosophy of digital measurements

Time Measurement Techniques: Error analysis in digital measurement, Measurement of time interval between two events, Error in time interval measurement, Vernier technique for small time measurement, Measurement of time interval with constraints, Measurement of periodic time, phase, Quality factor of ringing circuit, Decibel meter, Software controlled measurement.

Practice

- Error analysis of digital measurement using Matlab
- Simulation of Quality Factor of ringing circuit

Module II (5 hrs)

Digital frequency measurement techniques

Measurement of frequency, Ratio of two frequencies, Product of two frequencies, High frequency, average Frequency difference, Deviation of power frequency, Peak frequency. Fast low-frequency measurement, Digital Tachometer.

Practice

- Addition and product of different frequencies using Matlab
- Simulation of digital tachometer using Matlab

Module III (5 hrs)

Digitally Programmable Circuits

Single mode switching, Group mode switching, Resistors, Potentiometers, Amplifiers, Schmitt trigger, Dual polarity gain amplifiers. Programmable gain amplifier with dual output, Two stage programming, Programmable Biquads.

Practice:

- Analysis of switching using Matlab
- Simulation of programmable biquads using Matlab

Module IV (4 hrs)

Digital to Analog Converters

Output Input relation, DACs derived from programmable gain amplifiers, Weighted-resistor DAC, Weighted current DAC, Weighted reference voltage DAC, Ladder DAC, Switches.

Practice:

- Simulation of programmable gain amplifier using Matlab
- Simulation of DAC using Matlab

Module V (5 hrs)

Digital Voltage Measurement Techniques

Sampling theorem, Time-division multiplexing, Quantization, Indirect type A/D converters, Direct type A/D converters, Input circuitry of a digital voltmeter.

Practice:

- Simulation of Digital voltmeter using Matlab
- Analysis and simulation of digital multi-meter.

Module VI (4 hrs)

Digital Instrument

Need for digital instruments, Advantages of digital instruments, Essentials of digital instrument, Performance characteristics of digital instrument.

Digital Recording Systems

Input Conditioning Equipment, Digitizer, Multiplexer, Programme Pinboard, Linearizer, Digital Clock, Limit Detectors, Output Devices

Practice:

- Data fetching using controllers
- Simulation of digital clock using Matlab

Module VII: (4 hrs)

Signal Generator, Analyzers and Oscilloscopes:

Function Generator, Pulse Generator, RF Signal Generator, Harmonic Distortion Analyzer, Spectrum Analyzer, Digital Storage CROs

Practice:

- To study block wise Construction of a Function Generator
- Measure Voltage, Frequency, Phase and Modulation Index (Trapezoidal Method) using CRO
- Demonstrate features of Digital Storage Oscilloscope
- Measure unknown Frequency using Lissajous Patterns

Text Books:

1. T. S. Rathore- Digital Measurement Techniques, Alpha Science International Ltd
2. David A. Bell - Electronic Instrumentation and Measurements, Oxford Univ. Press, 1997
3. A. K. Sawhney – A Course in Electrical and Electronic Measurements and Instrumentation, Dhanpat Rai & Co

Reference Books:

1. PrithwirajPurkait- Electrical and Electronics Measurement and Instrumentation, MC Graw Hill Publishers
2. H.S. Kalsi-Electronic Instrumentation, Tata McGraw-Hill, New Delhi, 2010
3. R. K. Rajput- Electrical & Electronic measurement and Instrumentation, S. Chand Publication
4. K. Lal Kishore- Electronic Measurements and Instrumentation, Pearson Education 2010

Basic Electrical Engineering

Code	Course Title	(Credit)	T-P-PJ
CUTM1057	Basic Electrical Engineering	2	1-1-0

Objective

- In this course, student will come to know about the Basics of Electrical Engineering, Currents and Voltages across various Electrical elements.
- Their behavior in both Alternating Current and Direct Current circuits.
- Analysis of 1-phase and 3-phase AC wave forms.

Course Outcome

- Student will be exposed to the breadth of electrical engineering, able to gain knowledge in Electrical Circuits (AC and DC).
- Acquire knowledge on various parameters of electrical engineering and their properties with hands-on-practice of basic electrical experiments.

Course content

Module I: Basic Concepts and Basic Laws

(4hrs)

Theory

Essence of Electricity, Electric Field; Electric Current, Potential and Potential Difference, E.M.F., Electric Power, Ohm's Law, Basic Circuit Components, Ideal and Practical Sources, Source Conversion.

Practice:

1. Design and Analysis of Basic electrical circuits using Dymola. Plotting the V-I Characteristics of Incandescent lamp using Dymola.

Module II: Methods of Analysis (4hrs)

Theory

Network Analysis using Series and Parallel Equivalent, Voltage and Current Divider Circuits, Nodal Analysis, Mesh Analysis, Delta-Star & Star-Delta conversion.

Practice :

2. Verification of KCL and KVL in series and parallel circuits using Dymola.

Module III: DC Network Theorems (3hrs)

Theory

Analysis of Superposition, Thevenin's and Norton's theorem.

Practice:

3. Verification of Superposition, Thevenin's and Norton's theorem using Dymola.

Module IV: Introduction to Electromagnetism (4hrs)

Theory

Magnetic Circuits, B-H curve, Permeability, Reluctance, Solution of simple magnetic circuits, Hysteresis and Eddy current loss. Methods of preventing such losses. Solenoids and field coils. Application of solenoids in different circuits in Automobiles and in electrical circuit.

Practice (Hardware):

4. Observation of generation of magnetic flux for different input current in a coil and plotting B-H Curve.

Module V: Single-Phase Transformer (2hrs)

Practice (Hardware):

5. Study of Transformers, Linear Transformer Model, Ideal Transformer Model, No-load Loss and Load-loss Calculation.

Module VI: AC Circuit Analysis (3hrs)

Theory

Single-phase EMF Generation, Waveform and Phasor Representation, Average and Effective value of sinusoids, Peak factor & Form factor, Complex Impedance and Power using j-operator, Power factor.

Practice:

6. Calculation of current, voltage, power & power factor of series RLC circuit excited by 1- \emptyset A.C Supply using Dymola.

Module VII: Phasor Analysis (3hrs)

Theory

Three-Phase AC Circuits: Comparison between single-phase and three-phase systems, Three-phase EMF Generation, Line and Phase quantities in star and delta networks, Power and its measurement in three-phase balanced circuits.

Practice

7. Measurement of power and power factor in a 3- \emptyset AC circuit by (one, two and three) wattmeter using Dymola.

Recommended Books:

1. P. K. Sathpathy, "Basic Electrical Engineering," 3rd Edition, Oxford.
2. B. L. Thereja, "Electrical Technology", Volume-I, 2005 Edition (24th Revised Edition)
3. Hughes, "Electrical & Electronic Technology", Ninth Edition (Revised by J Hiley, K Brown, and I Smith), Pearson Education

Industrial Automation

Code	Course Title	(Credit)	T-P-PJ
IACU2100	Industrial Automation	24	5-9-10

Course Code	Course Title	Credits	Type T-P-PJ
CUIA2100	Introduction to Industrial Automation	1	1-0-0
CUIA2101	Advanced Programming & Control Blocks of PLC	3	1-2-0
CUIA2102	Control & Signal Wiring of PLC	2	0-2-0
CUIA2103	SCADA based advanced features	2	1-1-0
CUIA2104	SCADA & PLC based sequential control	1	0-1-0
CUIA2105	Human Machine Interface	3	1-2-0
CUIA2106	OPC server base data fetching & control	2	1-1-0
CUIA2107	Project	6	0-0-6
CUIA2108	Internship	4	0-0-4
	Total Credits	24	

Domain Track Objectives

- To upgrade knowledge levels needed for modern industries.
- Process & sequential control logic of industry.
- Project based training.

Domain Track Course Outcomes

- Gain knowledge on advanced industrial automation.
- Understand different types of Devices to which PLC input and output modules are connected.
- Provide the knowledge about understand various types of mobile applications.
- Industry based project & advanced learning.
- Students will develop skill of designing automatic control system and controller for a particular application.

Domain Syllabus

Course – 1: INTRODUCTION TO INDUSTRIAL AUTOMATION

- 1.1 Automation Uses
- 1.2 Automation - PLC Basics
- 1.3 Mechanical relays versus PLC
- 1.4 Functions of various blocks and working principle of advanced blocks.

Course – 2: ADVANCED PROGRAMMING & CONTROL BLOCKS OF PLC

- 2.1 CPT, ADD, SUB, MUL, DIV, SQR, NEG, TOD, FRD
- 2.2 MOV, MVM, AND, OR, XOR, NOT. CLR.
- 2.3 BSL, BSR, SQC, SQL, SQO, FFL, FFU, LFL, LFU
- 2.4 JMP, LBL, JSR, MCR
- 2.5 Connecting PLC software with SCADA software

Practice:

- P2.1 - Comparison of industry based analog signals.
- P2,2 - Detecting different product output of an industry
- P2.3 - Sequential control of an industry by using advanced blocks.
- P2.4 - Emergency control system of an industry
- P2.5 - Connecting PLC software with SCADA software

Course – 3: CONTROL & SIGNAL WIRING OF PLC

- 3.1 Control wiring of PLC.
- 3.2 PLC, Sensor and field instruments signal flow wiring.
- 3.3 Device connectivity

Practice:

- P3.1 PLC input/output wiring concept.

P3.2 Connecting relay, contactor, sensors and other field instruments.

P3.3 Controlling an industry motor using STAR-DELTA connection

Course – 4: SCADA BASED ADVANCED FEATURES

4.1 Alarms

4.2 Trends, Data base connectivity & Report generation

4.3 Recipe management

4.4 Security

Practice:

P4.1 - Data fetching and representing on graph and excel

P4.2 - Advanced controlling of industry by using SCADA

Course – 5: SCADA & PLC BASED SEQUENTIAL CONTROL

5.1 Script

5.2 Networking

5.3 Device connectivity.

Practice:

P5.1 Script

P5.2 Networking

P5.3 Device connectivity

Course – 6: HUMAN MACHINE INTERFACE

6.1 What is HMI. Use of HMI

6.2 Concept of different operational features

6.3 Connectivity of HMI and PLC.

Practice:

- P6.1 Alarms
- P6.2 Security
- P6.3 Recipe manager

Course – 7: OPC SERVER BASE DATA FETCHING & CONTROL

- 7.1 Study of Open Platform Communications
- 7.2 OPC to control PLC, SCADA.
- 7.3 OPC based different protocol concept.
- 7.4 Data handling using OPC.

Practice:

- P7.1 Installation of OPC
- P7.2 OPC protocols
- P7.3 Connectivity of PLC, SCADA & ARDUINO to OPC.

Operation and Maintenance of Electrical Grid System & Transformers

Domain Name	Code	Type of course	T-P-P	Pre-requisite
Operation and Maintenance of Electrical Grid System & Transformers	EGCU2090	Theory + Practice + Project	6-14-4	Nil

1. Track Total Credits:

Theory + Practice + Project: [6+14+4] (24)

2. Course objectives :

A] To create technically trained manpower readily available for recruitment to the power/energy Companies & Transformer Manufacturing firms in Electrical Sector.

B] Develop digital prototypes of the products and validate them and innovate for design efficiency

3. Course Outcomes :

A] Product: Manufacturing of commercially used distribution transformer

B] Project Report: Report on different Operation and maintenance procedures carried out on transmission and distribution system including Transformer Manufacturing & Testing Process

4. **Domain Structure** : The Domain will consist of following components and these components will be reflected in the grade sheet.

- a. CUEG 2090: Introduction, Power Scenario, Power Quality & Faulty clearance, [1-1-0]
- b. CUEG 2091: Switchyard & substation Networks, [1-2-0]
- c. CUEG 2092: Protection scheme & Switchgear, [1-2-0]
- d. CUEG 2093: Cable system & Testing, [1-2-0]
- e. CUEG 2094: Power Markets, [1-0-0]
- f. CUEG 2095: Grid Safety, [0-2-0]
- g. CUEG 2096: Transformer Manufacturing, [1-5-0]
- h. CUEG 2097: Project, [0-0-4]

The Domain will be delivered through case studies, assignments and product development

Product Development Stack :

1. Distribution Transformer (Full product)
2. Smart Energy Meter (Modular Platform design and electric power train design , BIW)

5. Session Plan for the Entire Domain:

Course 1: **Generation, Transmission & Distribution scenario in India**

[Interactive + Modelling], [1-1-0], [20 Hrs]

- 1.1 Types of generation: Conventional and Non-conventional,
- 1.2 Thermal Power Plant, Hydro Power Plant,
- 1.3 Gas Power Plant, Nuclear Power Plant,
- 1.4 Co-generation Various sources Non-conventional Energy Sources.
- 1.5 Role of computers in distribution system planning-Load modelling
- 1.6 characteristics: definition of basic terms and loss factor
- 1.7 Classification of loads and their characteristics.
- 1.8 Distribution Feeders and Substations: Design consideration of Distribution feeders: Radial and loop types of primary feeders, voltage levels, and feeder-loading.

Video Links

- 1.2.1 https://www.youtube.com/watch?v=lh5_7sHyLU4
- 1.2.2 Hydro Power
- 1.3.1 Gas Power Plant
- 1.3.2 Nuclear Power Plant
- 1.3.3 1.4.1 Co-Generation

Practice

- 1. Load Modeling
- 2. Substation Modeling

Course 2: Switchyard/Substation Types

[Lab Practice in Own Distribution Network, Modelling], [1-2-0], [20 Hrs]

- 2.1 Single line diagram/equipments [Equipments-transformer, CB, fuse etc.]
- 2.2 Relays, Relaying schemes and auxiliaries Wiring Diagram
- 2.3 Layout of Sub-Station(33/11KV S/S, 220/33KV S/S)
- 2.4 Indoor and outdoor busbars — bus-bar mountings and their clearances.
- 2.5 Designing Electrical Transmission Tower Types and Design

Video Links

- 2.3.1 Substation layout
- 2.5.1 Transmission Tower Design

Practice

- 1. Design 33/11 KV substation
- 2. Single Line layout of substation

Course 3: System Protection & Auxiliaries

[Field Visit+ Lab Practice in Own Distribution Network] [1-2-0] [20 Hrs]

- 3.1 CT & PTs, Local & Back-up Protection. Protection Schemes,
- 3.2 New Generation Relays, Different types of indoor and outdoor CB, Breaker Maintenance,
- 3.3 Lightning Arrestors/Surge Arrestors, Isolators And Insulators,
- 3.4 Grounding system, Auxiliary System in Switchyard/Substation

Video Links

- 3.1.1 CT, PT, Relay
- 3.2.1 Distance Protection
- 3.4.1 Grounding/Earthing

Practice

1. Design Over current Protection for sub-station Feeder.
2. Measuring Earth Insulation Resistance

Course 4: Cables in Electrical System

[Visit to Standard Testing Lab, Workshop Practice], [1-2-0], [20 Hrs]

- 4.1 Modern trends in Underground Cabling Basic Concepts,
- 4.2 Materials Used in Cables, Conductors,
- 4.3 Testing and Commissioning of cables,

Video Links

- 4.1.1 Under Ground Cable
- 4.3.1 [Cable Laying](#)

Practice

1. IR Test of Cable
2. Cable Jointing

Course 5: Power System Market, Markets For Electrical Energy, Energy Conservation

[Interactive], [1-0-0] [3 Hrs]

- 5.1 Electricity Business
- 5.2 Electricity Market Models
- 5.3 Power Transfer, Inter & Intra State
- 5.4 Energy Efficiency in Grid

5.5 Energy conservation measures

Video Links

5.1 Power Market Fundamental

5.2 Power Exchange

5.5 Energy Conservation

Practice

1. Developing Market Model for electricity trading

Course 6: GRID Safety Norms, Electrical Accidents and prevention, Electricity Costing & Audit,

[Field Survey], [0-2-0], [5 Hrs]

6.1 Safety Requirement, Hazards, Electrical Accidents and prevention, First Aid

6.2 Safety : Safety Philosophy, Safety Procedures, GRID Safety Norms, Procedures for issuing L.C.P. and cancellation, Maintenance of Safety records.

6.3 First Aid : Places of Potential Hazards, Electric Shock Treatment, Artificial Respiration, Handling Emergency Conditions, Treatment of Wounds, Injuries & Burns.

6.4 Fire Fighting: Causes of Fire, Fire Extinction, Classification of Fires, Fire Fighting, Equipment: their operation – maintenance & refilling, Fire prevention.

6.5 Energy Audit.

Video Link

6.1.1 General Grid Safety

6.2.2 Industrial Safety

6.3.1 Electrical Shock First Aid

6.4.1 Fire Extinguisher

Practice

Hazard Analysis & Mitigation

Course 7: Principles of transformer

[DS Tools, Workshop Practice], [1-5-0], [20 Hrs]

7.1 Inner & Outer Part of Transformer,

7.2 Manufacturing of Transformer,

7.3 Transformer Test,

7.4 Conditions leading to faults in Transformer,

7.5 Maintenance of transformer

Practice

1. Transformer Manufacturing

2. Transformer Testing

3. Fault Finding & Corrective action

6. List of Projects/products to be done in domain: [200 Hrs]

1. Substation layout & Placement of equipment.
2. Protection System of 33/11/0.4 KV substation.
3. O & M of distribution substation.
4. Energy Audit
5. Safety Practice.
6. Transformer Manufacturing & Testing.

EVALUATION: As per Central QA system policy



School of Forensic Sciences

B.Sc. Forensic Science (2020)

Programme Objectives:

POs: Forensic Science Graduates will be able to:

POs Outcomes	POs Outcomes
PO1	Forensic knowledge: Apply knowledge of mathematics, various disciplines of science and basic principles of forensic in investigation.
PO2.	Perform experiments as well as to carry out problem analysis and data interpretation of instrumental analysis
PO3	The crime and society: Apply reasoning informed by the contextual knowledge to assess civil and criminal laws,society,health and cultural issues and the consequent responsibilities relevant to forensics
PO4	Individual and team work: Function affectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings in the field of forensic Science.
PO5	Conduct investigations: Visit crime scene and help the police officials in proper collection, preservation and handling of scientific evidences which will aid in maintaining the integrity of evidences
PO6	Understanding of professional and ethical responsibility of forensic scientist
PO7	Communication: Communicate effectively on various activities of forensics with proper understanding of scientific and legal terminologies
PO8	Understand psychology of criminal mind
PO9	Life- long learning: Recognize the need for lifelong learning in the broadest contest of challenges and recent advances in the field of forensic science.
PO10	Project Management: Demonstrate knowledge & understanding of the forensic science and apply these to one's own work, as a member and leader in a team, to manage projects in forensic science.
PO11	Use of modern techniques, skills, and instruments necessary for forensic expert or any person working in such field.

PO12	Make a robust report on the basis of scientific analysis.
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PSO (Program Specific Outcomes)

Sl No.	Program Specific Outcomes
PSO1	Graduate will be able to develop skill which can be applied in the jobs of Forensic Science
PSO2	Graduate will be able to pursue higher studies and research
PSO3	Graduate will be able to use software and technologies that can be effectively used to solve various problems encountered during investigations.

Course Outcome (CO)

CUTM1659: Basics of Forensic Science

Course Objective : To teach in depth knowledge of forensic science, it's disciplines and importance and working of FSL.

Course Outcome : On completion of this course, the successful students should be able to:

CO	Statements
CO-1	know the significance of forensic science to human society.
CO-2	understand fundamental principles and functions of forensic science.
CO-3	get idea about working of the forensic establishments in India and abroad.

CUTM1660: Crime and Society

Course Objective : To obtain knowledge about criminology i.e. crime and its causes, its impact on society and basic elements of justice delivery system.

Course Outcome : On completion of this course, the successful students should be able to:

CO	Statements
CO-1	Student will know about importance of criminology.
CO-2	Understand the causes of criminal behaviour.
CO-3	Understand the significance of criminal profiling to mitigate crime.
CO-4	Understand the elements of criminal justice system.

CUTM1661: Criminal Law

Course Objective : To obtain knowledge about basic law which governs our society

Course Outcome : On completion of this course, the successful students should be able to :

CO	Statements
CO-1	Know about Elements of Criminal Procedure Code related to forensic science.
CO-2	Understand the acts and provisions of the Constitution of India related to forensic science.
CO-3	Understand the acts governing socio-economic crimes.
CO-4	Understand acts governing environmental crimes

CUTM1662: Forensic Psychology

Course Objective : To obtain knowledge about forensic psychology and various psychological investigative tools.

Course Outcome : On completion of this course, the successful students should be able to :

CO	Statements
CO-1	Know about importance of psychological assessment in gauging criminal behaviour.

CO-2	Understand the legal aspects of forensic psychology.
CO-3	Understand the significance of criminal profiling.
CO-4	Do critical assessment of advanced forensic techniques like polygraph, Narco analysis and brain electrical oscillation signatures.

CUTM1663 : Forensic Dermatoglyphics

Course Objective : To study fingerprints and its fundamental principles, its role in linking a person to the crime scene, techniques to develop prints

Course Outcome : On completion of this course, the successful students should be able to :

CO	Statements
CO-1	Know about physical and chemical techniques of developing fingerprints on crime science evidence.
CO-2	Understand the significance of foot, palm, ear and lip prints.
CO-3	Understand pattern types and matching

CUTM1664 : Technological Methods in Forensic Science

Course Objective: To gain knowledge about various instruments and techniques used in analysis and examination of evidences

Course Outcome : On completion of this course, the successful students should be able to :

CO	Statements
CO-1	Understand the importance of chromatographic and spectroscopic techniques in processing crime scene evidence.
CO-2	Understand the significance of microscopy in visualizing trace evidence and comparing it with control samples.
CO-3	Understand usefulness of photography and videography for recording the crime scenes.

CUTM1665: Criminalistics

Course Objective: To gain knowledge about crime scene and its processing including securing, searching and documentation as well as collection and packaging of evidences.

Course Outcome: On completion of this course, the successful students should be able to :

CO	Statements
CO-1	Understand the methods of securing, searching and documenting crime scenes.
CO-2	Understand the tools and techniques for analysis of different types of crime scene evidence.
CO-3	Understand about legal importance of chain of custody.

CUTM1666: Forensic Chemistry

Course Objective : The study enhances ability of investigating officer in arson cases. Scientific study to analyse the explosives and Petroleum product and investigation in cases of IED.

Course Outcome : On completion of this course, the successful students should be able to :

CO	Statements
CO-1	Understand the methods of analysing trace amounts of petroleum products in crime scene evidence.
CO-2	Understand the classification of explosives, including the synthesis and characterization of representative analogues.
CO-3	Understand significance of bomb scene management.

CUTM1667 : Questioned Documents

Course Objective : helps in understanding nature of paper and some other characteristics of written as well printed document with respect to class and individual characteristics and helps to examine fraud cases.

Course Outcome : On completion of this course, the successful students should be able to :

CO	Statements
CO-1	Understand the importance of examining questioned documents in crime cases.
CO-2	Understand the tools required for examination of questioned documents.
CO-3	Understand significance of comparing hand writing samples.
CO-4	Know about the importance of detecting frauds and forgeries by analysing questioned Documents.

CUTM1668: Forensic Biology

Course Objective: To teach about biological fluid which helps to determine source of origin among the individuals. Hair evidence distinguishes between human and animal. Study of wild life forensic science enhances skill and knowledge of investigator in investigation smuggling cases.

Course Outcome: On completion of this course, the successful students should be able to:

CO	Statements
CO-1	Know about the significance of biological and serological evidence.
CO-2	Understand importance of biological fluids – blood, urine, semen, saliva, sweat and milk – in crime investigations.
CO-3	Know about how wildlife forensics aid in conserving natural resources.
CO-4	Know about how forensic entomology assists in death investigations

CUTM1669: Forensic Ballistics

Course Objective: It helps to identify class and individual characteristics of firearm and ammunition. Enhance the skill and knowledge of investigating officer.

Course Outcome: On completion of this course, the successful students should be able to:

CO	Statements
CO-1	Know about classification of firearms and their firing mechanisms..

CO-2	Understand importance of firearm evidence
CO-3	Know about methods of identifying firearms.
CO-4	Know about methods for characterization of gunshot residue.

CUTM1670: Forensic Toxicology

Course Objective : To study qualitative and quantitative analysis of poison in body fluids. It also helps understanding mode of administration of poison and their absorption.

Course Outcome: On completion of this course, the successful students should be able to:

CO	Statements
CO-1	Know about the significance of toxicological studies in forensic science.
CO-2	Classify poisons and their modes of actions.
CO-3	Understand classification and characteristics of the narcotics, drugs and psychotropic substances.
CO-4	Know about menace of designer drugs.

CUTM1671: Forensic Anthropology

Course Objective : Study focuses on skeletal parts and their significance in determining identification of person, characteristics that helps in identifying missing person as well facial reconstruction through sketching of individual characteristics.

Course Outcome: On completion of this course, the successful students should be able to:

CO	Statements
CO-1	Know about the importance of forensic anthropology in identification of persons.
CO-2	Classify poisons and their modes of actions.
CO-3	Understand different techniques of facial reconstruction and their forensic importance.
CO-4	Know about significance of somatoscopy and somatometry

CUTM1672: Forensic Medicine

Course Objective Study helps to distinguish between postmortem and anti-mortem characteristics of corpus delicti. Age and sex can also be determined by forensic odontology.

Course Outcome: On completion of this course, the successful students should be able to:

CO	Statements
CO-1	Know about the importance of forensic odontology
CO-2	Understand the importance of autopsy
CO-3	Understand the importance of bloodstain patterns in reconstructing the crime scene.
CO-4	importance of bloodstain patterns in reconstructing the crime scene.

Ability Enhancement Elective Course

CUTM1673: English

Course Objective: To expose the students to a variety of self-instructional, learner-friendly modes of language learning and to enable them to learn better pronunciation through stress on word accent, intonation, and rhythm.

Course Outcome: On completion of this course, the successful students should be able to:

CO	Statements
CO-1	Communicate fluently in different business situation
CO-2	Use appropriate words with correct pronunciation
CO-3	Do effective oral and written communication

CUTM1674: Environmental Science

Course Objective : To understand the concept of multi-disciplinary nature of Environmental Science where different aspects are dealt with a holistic approach.

Course Outcome: On completion of this course, the successful students should be able to:

CO	Statements
CO-1	develop a sense of community responsibility by becoming aware of environmental issues in the larger social context.
CO-2	Characterize and analyze human impacts on the environment
CO-3	Design and evaluate strategies, technologies and methods for sustainable management of environmental systems and for the remediation or restoration of degraded environments.
CO-4	Integrate facts, concepts, and methods from multiple disciplines and apply to environmental problems.

Ability Enhancement Elective (Skill Based) course

CUTM1675: Introduction to Biometry

Course Objective : To understand the concept of biometry and its role in identification and various kinds of biometrics.

Course Outcome: On completion of this course, the successful students should be able to:

CO	Statements
CO-1	Understand the basis of biometry.
CO-2	Know about the classification of biometric processes
CO-3	Know about the importance of behavioural biometry

CUTM1676 : Handwriting Identification and Recognition

Course Objective : To understand the important features of handwriting identification and perform detection of document forgery or alteration.

Course Outcome: On completion of this course, the successful students should be able to:

CO	Statements
CO-1	Understand important features in handwriting identification.
CO-2	Learn about basis of handwriting characteristics.
CO-3	Know about significance of forensic documentation.

Discipline Specific Elective

CUFS2410 : Digital Forensics

Course Objective : To understand the basic concepts of digital forensics and types of digital forensics, malwares and investigation methods applied in such cases.

Course Outcome: On completion of this course, the successful students should be able to:

CO	Statements
CO-1	Understand the basics of digital forensics.
CO-2	Analyse the cases which fall under the purview of digital crimes.
CO-3	Understand the types of digital crimes.
CO-4	Understand the elements involved in investigation of digital crimes.

CUFS2411 : Economic Offences

Course Objective: To introduce to terminologies related to economic offences, some common economic offences and its impact on society.

Course Outcome: On completion of this course, the successful students should be able to:

CO	Statements
CO-1	Understand basic economic and financial terminology.
CO-2	Understand steps involved in mitigating economic crimes.
CO-3	Know about types of common economic offences and their consequences.

CUFS2412: Forensic Serology

Course Objective: To gain knowledge about serological evidences and their importance in crucial cases and methods of their detection.

Course Outcome: On completion of this course, the successful students should be able to:

CO	Statements
CO-1	Understand the significance of serological evidence.
CO-2	The importance of biological fluids – blood, urine, semen, saliva, sweat and milk – in crime investigations.
CO-3	Know about the usefulness of genetic markers in forensic investigations.

CUFS2413 : Accident Investigations

Course Objective: To study methods of investigation in accidental cases, types of injuries in accidents, documentation, collection and preservation of evidences and their analysis.

Course Outcome: On completion of this course, the successful students should be able to:

CO	Statements
CO-1	Understand the significance of tiremark evidence.
CO-2	Understand the importance of air bags and photography of accident cases
CO-3	Know about the usefulness of trace evidences in forensic investigations.

CUFS2414 : DNA Forensics

Course Objective: Understanding basic concepts of DNA Analysis, DNA Typing, STR markers.

Course Outcome: On completion of this course, the successful students should be able to:

CO	Statements
CO-1	Understand the basic principle of DNA analysis and its significance
CO-2	Understand the importance of short tandem repeats and restriction fragment length polymorphism in DNA technique.
CO-3	Know about role of DNA typing in parentage testing

CUFS2415 : Audio Recognition and Video Analysis

Course Objective: To Understand the role of voice in forensic investigations, understanding speaker recognition and identification and their analysis.

Course Outcome: On completion of this course, the successful students should be able to:

CO	Statements
CO-1	Understand the basic principle of voice production and forensic significance speaker identification and recognition.
CO-2	Know about the importance of audio recording evidences.
CO-3	Use various software in audio recognition and video analysis.

CUFS2416 : Explosives Analysis & Post Blast Investigation

Course Objective: To study the protocols followed for analysis of explosives and get in depth knowledge about post blast investigations.

Course Outcome: On completion of this course, the successful students should be able to:

CO	Statements
CO-1	Know about History and development of explosives.
CO-2	Understand processing of crime scene.
CO-3	Know about clandestine Laboratories.

CUTM2328 : Quality Control and Quality Assurance

Course Objective : To study the various aspects of quality control and assurance aspects and understand important parameters such as cGMP, QC tests, documentation, Quality certifications, GLP and regulatory affairs.

Course Outcome: On completion of this course, the successful students should be able to:

CO	Statements
CO-1	Understand the cGMP aspects in a pharmaceutical industry.
CO-2	Know about the importance of documentation.
CO-3	Understand the Scope of quality certifications applicable to Pharmaceutical industries and responsibilities of QA and QC department.

School of Forensic Sciences

M.Sc. Cyber Security and Digital Forensics

Programme Outcomes (PO) :

POs	Outcomes
PO1	Cyber forensic knowledge: Apply knowledge of mathematics, tools, techniques various disciplines of science and basic principles of digital forensic in investigation.
PO2	Perform live hands on as well as to carry out problem analysis and data interpretation of tools analysis.
PO3	The cybercrime and digital society: Apply cognitive informed by the circumstantial knowledge to assess corporate and digital criminal laws, society, health and educational issues and the consequent responsibilities relevant to the cyber forensics
PO4	Discrete and team work: Functions affectively as an individual, and as a member or leader in assorted teams, and in multidisciplinary settings in the field of digital forensics.
PO5	Conduct digital investigations: Tracing cyber victims and help the cyber police officials in proper collection, preservation and handling of digital evidences which will aid in maintaining the integrity of digital evidences.
PO6	Understanding of professional and ethical responsibility of cyber security professionals.
PO7	Communication: Communicate effectively on various activities of digital forensics with proper understanding of scientific tools and legal terminologies.
PO8	Understand thinking of felonious mind and finding digital signatures.
PO9	Life- long learning: Recognize the need for lifelong learning in the broadest contest of challenges and recent advances in the field of cyber forensic science.
PO10	Project Management: Demonstrate knowledge & understanding of the digital forensic science and apply these to one's own work, as a member and leader in a team, to manage projects in cyber forensic science.
PO11	Use of modern techniques, tools, skills, and digital devices necessary for forensic expert or any person working in such field.
PO12	Make a robust documentation on the basis of scientific tools analysis.

Programme Specific Outcomes (PSO):

PSO1: Masters will be able to develop skill which can be applied in the jobs of Cyber Forensic Science in private and public sector.

PSO2: Masters will be able to pursue higher studies and research.

PSO3: Masters will be able to use software and technologies that can be effectively used to solve various problems encountered during digital investigations.

CUTM1618 : PRINCIPLES OF INFORMATION SECURITY

Course Objective: The objective of this course is to focus on the models, tools, and techniques for enforcement of security. Student will also learn security from multiple perspectives.

Course Outcomes : On completion of this course, the successful students should be able to:

CO	Statements
CO-1	Will gain familiarity with computer network, defences against them, and forensics to investigate the aftermath.
CO-2	Develop a basic understanding of Risk assessment
CO-3	Develop an understanding of security policies as well as protocols to implement such policies.

CUTM1619: DIGITAL FORENSICS

Course Objective : This course focuses on two aspects of Cyber Security: analysis and assessment of risk plus how to minimize it, and, how to extract and use digital information from a wide range of systems and devices.

Course Outcomes : On completion of this course, the successful students should be able to:

CO	Statements
CO-1	Explain the origins of forensic science.
CO-2	Explain the difference between scientific conclusions and legal decision-making
CO-3	Explain the role of digital forensics and the relationship of digital forensics to traditional forensic science, traditional science and the appropriate use of scientific methods
CO-4	Outline a range of situations where digital forensics may be applicable
CO-5	Identify and explain at least three current issues in the practice of digital forensic investigations.

CUTM1620 : COMPUTER NETWORKS

Course Objective: The course objectives include learning about computer network organization and implementation, obtaining a theoretical understanding of data communication and computer networks, and gaining practical experience in installation, monitoring, and troubleshooting of current LAN systems.

Course Outcomes : On completion of this course, the successful students should be able to:

CO	Statements
CO-1	explain the concepts of confidentiality, availability, and integrity (CIA) in context of Information Assurance; articulate the threats to CIA and be able to analyse a given architecture, discern vulnerabilities, and recommend physical, logical, or administrative controls to mitigate the threat; (Cybersecurity Fundamentals—Theory)
CO-2	demonstrate expertise in configuring host and network level technical security controls, to include host firewalls, user access controls, host logging, network

	filtering, intrusion detection, and prevention and encryption at all levels; (Managing Security—Applied)
CO-3	describe the hardware, software, and services that comprise an enterprise network, and be able to articulate how these components integrate to form a network solution; (Network Integration—Theory)
CO-4	Explain key networking protocols, and their hierarchical relationship in the context of a conceptual model, such as the OSI and TCP/IP framework; be able to articulate the low-level data communications and subsequent abstractions that allow networked hosts and applications to communicate across the internet; (Networking Protocols—Theory)
CO-5	Build multiple host and network architectures, given business requirements and constraints; student will configure operating systems, network specific services, routing, switching, and remote access solutions; (Networking—Applied)

CUTM1621: CYBER CRIME & INVESTIGATIONS

Course Objective: This course focusses on two aspects of Cyber Security: analysis and assessment of risk plus how to minimize it, and, how to extract and use digital information from a wide range of systems and devices. The course is structured so that all students cover the same introductory material, but then choose to specialize in either Cyber Security or Digital Forensics. Any aforesaid science graduate who requires keen interest & knowledge of IT programming languages with basic knowledge of math beyond calculus.

Course Outcomes : On completion of this course, the successful students should be able to:

CO	Statements
CO-1	Discuss data and identify data sources
CO-2	Describe and discuss digital evidence
CO-3	Compare and contrast the differences between digital evidence and traditional evidence
CO-4	Describe and critique digital forensics process models
CO-5	Describe and critique digital forensics process models
CO-6	Critically evaluate standards and good practices for digital evidence and digital forensics

CUTM1622 : INTELLECTUAL PROPERTY RIGHTS

Course Objective : The main objective of the IPR is to make the students aware of their rights for the protection of their invention done in their project work. The students will get a basic idea about registration in India and abroad of their invention, designs, thesis written/developed by them during their project work and for this they must have knowledge of patents, copy right, trademarks, designs.

Course Outcomes : On completion of this course, the successful students should be able to:

CO	Statements
CO-1	Once the students complete their syllabus and assessment, they will develop the basic knowledge and awareness of acquiring the patent and copyright for their innovative works.
CO-2	They will also get an idea about plagiarism while writing any article, blog, research or review paper and learn how to avoid it.

CUTM1623 : NUMBER THEORY & CRYPTOGRAPHY

Course Objective : Covers fundamental algorithms for integer arithmetic, greatest common divisor calculation, modular arithmetic, and other number theoretic computations. Algorithms are derived, implemented and analysed for primality testing and integer factorization. Applications to cryptography are explored including symmetric and public-key cryptosystems. A cryptosystem will be implemented and methods of attack investigated. To be able to implement and analyse algorithms for integer factorization and primality testing. To be able to use a system like Maple to explore concepts and theorems from number theory. To understand fundamental algorithms from symmetric key and public key cryptography.

Course Outcomes : On completion of this course, the successful students should be able to:

CO	Statements
CO-1	To understand fundamental number theoretic algorithms such as the Euclidean algorithm, the Chinese Remainder algorithm, binary powering, and algorithms for integer arithmetic.
CO-2	To understand fundamental algorithms for symmetric key and public key cryptography.
CO-3	To understand the number theoretic foundations of modern cryptography and the principles behind their security.
CO-4	To implement and analyze cryptographic and number theoretic algorithms.
CO-5	To be able to use Maple to explore mathematical concepts and theorems.

CUTM1624: ADVANCED INFORMATION SECURITY

Course Objective: The objective of this course is to focus on the models, tools, and techniques for enforcement of security. Students will learn security from multiple Perspectives.

Course Outcomes:

CO	Statements
CO-1	Will gain familiarity with computer network, defences against them, and forensics to investigate.
CO-2	Develop a basic understanding of Risk assessment
CO-3	Develop an understanding of security policies as well as protocols to implement such policies

CUTM1625: CYBER FORENSICS

Course Objective: The aim of this course is to equip you with the knowledge and techniques to computer forensics practices and evidence analysis. It prepares you to use various forensic investigation approaches and tools necessary to start a computer forensics investigation. It also aims at increasing the knowledge and understanding in cyber security and ethical hacking.

Course Outcomes:

CO	Statements
CO-1	Define computer forensics.
CO-2	Identify the process in taking digital evidence.
CO-3	Describe how to conduct an investigation using methods of memory, operating system, network and email forensics.
CO-4	Assess the different forensics tools.
CO-5	Differentiate among different types of security attacks.
CO-6	Describe the concept of ethical hacking.

CUTM1626: SYSTEM & NETWORK SECURITY

Course Objective: The course objectives include learning about computer network organization and implementation, obtaining a theoretical understanding of data communication and computer networks, and gaining practical experience in installation, monitoring, and troubleshooting of current LAN systems.

Course Outcomes : On completion of this course, the successful students should be able to:

CO	Statements
CO-1	Able to understand the concepts of confidentiality, availability, and integrity (CIA) in context of Information Assurance.
CO-2	Articulate the threats to CIA and be able to analyze a given architecture.
CO-3	Discern vulnerabilities.
CO-4	Recommend physical, logical, or administrative controls to mitigate the threat; (Cybersecurity Fundamentals—Theory)

CUTM1627: CYBER LAW

Course Objective: The Objectives of This Course Is to Enable Learner to Understand, Explore, And Acquire A Critical Understanding Cyber Law. Develop Competencies for Dealing with Frauds and Deceptions (Confidence Tricks, Scams) And Other Cyber Crimes for Example, Child Pornography Etc. That Are Taking Place Via the Internet.

Course Outcomes : On completion of this course, the successful students should be able to:

CO	Statements
CO-1	Make Learner Conversant with The Social and Intellectual Property Issues Emerging From 'Cyberspace.
CO-2	Give Learners in Depth Knowledge of Information Technology Act and Legal Frame Work Of Right to Privacy, Data Security and Data Protection.
CO-3	Make Study on Various Case Studies on Real Time Crimes.

3RD SEMESTER

CUTM1628: MOBILE SECURITY ANALYSIS

Course Objective: This course focuses on two aspects of Cyber Security: analysis and assessment of risk plus how to minimize it, and, how to extract and use digital information from a wide range of systems and devices. The course is structured so that all students cover the same introductory material, but then choose to specialize in either Cyber Security or Digital Forensics. Any aforesaid science graduate who requires keen interest & knowledge of IT programming languages with basic knowledge of math beyond calculus.

Course Outcomes : On completion of this course, the successful students should be able to:

CO	Statements
CO-1	Students learn cryptography basics (concepts, algorithms, techniques,

	implementation, and evaluation) for mobile apps.
CO-2	Students learn basic cryptography implementation for Android mobile security.
CO-3	Understand how to outsource application and data to a cloud in mobile computing which will leverage services provided by cloud providers.
CO-4	Deal with the various aspects arising in architecting secure complex systems, such as analysing and identifying system threats and vulnerabilities, and investigating operating systems security.

CUTM1629: IT GOVERNANCE, RISK& COMPLIANCE

Course Objective: This course focusses on two aspects of Cyber Security: analysis and assessment of risk plus how to minimize it, and, how to extract and use digital information from a wide range of systems and devices. The course is structured so that all students cover the same introductory material, but then choose to specialize in either Cyber Security or Digital Forensics. Any aforesaid science graduate who requires keen interest & knowledge of IT programming languages with basic knowledge of math beyond calculus.

Course Outcomes : On completion of this course, the successful students should be able to:

CO	Statements
CO-1	Understand the concepts of governance, risk management and compliance (GRC) and regulatory environment.
CO-2	Identify high-risk areas and compliance in your organization and apply Risk-based Approach
CO-3	Develop and implement a governance, risk management and compliance strategic plan
CO-4	Understand, define, and enhance organizational culture as it relates to performance, risk, and compliance
CO-5	Implement governance, risk management and compliance processes that are effective and efficient
CO-6	Using a risk-based audit approach

CUTM1630: BUSINESS CONTINUITY PLANNING & DISASTER RECOVERY

Course Objective: This course focuses on two aspects of Cyber Security: analysis and assessment of risk plus how to minimize it, and, how to extract and use digital information from a wide range of systems and devices. The course is structured so that all students cover the same introductory material, but then choose to specialize in either Cyber Security or Digital

Forensics. Any aforesaid science graduate who requires keen interest & knowledge of IT programming languages with basic knowledge of math beyond calculus.

Course Outcomes : On completion of this course, the successful students should be able to:

CO	Statements
CO-1	Understand the concept of business continuity
CO-2	Learn the importance of a BCP (business continuity planning)
CO-3	See how load balancing maintains business continuity
CO-4	Discover how a DCP (Disaster recovery plan) is a second line of defence
CO-5	Learn how to choose the right failure over solution

CUTM1631: PENETRATION TESTING & VULNERABILITY ASSESSMENT

Course Objective: In the end, the goal is to identify security weaknesses in a network, machine, or piece of software. Once they're caught, the people maintaining the systems or software can eliminate or reduce the weaknesses before hostile parties discover them. "Security" isn't limited to how well the machines and software stand up against penetration attempts.

Course Outcomes :

CO	Statements
CO-1	Explain the basic principles and techniques of how attackers can enter computer systems.
CO-2	Put acquired knowledge into practice by performing ethical penetration tests and hide the intrusion.
CO-3	Perform analyses of data breaches and audits of information technology security.
CO-4	Evaluate the strengths and weaknesses of various information technology solutions in terms of data security.
CO-5	Independently present and perform demonstrations of pen-tests for educational purposes.
CO-6	Evaluate the societal role of hacking from a social, ethical and economic standpoint

CUTM1632 : DIGITAL FRAUDS

Course Objective: To provide students with a comprehensive overview of collecting, investigating, preserving, and presenting evidence of cybercrime left in digital storage devices. To introduce topics of forensic data examination of computers and digital storage media.

Investigation of computers used for wrong-doing. Understand file system basics and where hidden files may lie on the disk, as well as how to extract the data and preserve it for analysis. Understand some of the tools of e-discovery. Legal aspects must form a constant background for these types of investigations.

Course Outcomes :

CO	Statements
CO-1	Understand the importance of a systematic procedure for investigation of data found on digital storage media that might provide evidence of wrong-doing.
CO-2	Understand the file system storage mechanisms of two common desktop operating systems (i.e., versions of Microsoft Windows and LINUX)
CO-3	Use tools for faithful preservation of data on disks for analysis. Find data that may be clear or hidden on a computer disk.

4TH SEMESTER

CUTM1633 : PROJECT/ DISSERTATION

Course Objective: To help in training of students with hands on experience of instruments while working on any research topic.

Course Outcomes : On completion of this course, the successful students should be able to:

CO	Statements
CO-1	Have understanding of research methodology and lab work/field work.



School of Forensic Sciences

M.Sc. Forensic Science

Programme Outcome:

POs: Forensic Science postgraduate will be able to:

POs	Outcomes
PO1	Forensic knowledge: Apply knowledge of mathematics, various disciplines of science and basic principles of forensic in investigation.
PO2	Knowledge of psychology and law related to forensic science. Understanding of psychology of criminal mind and modus operandi of crime and statistical analysis in forensic science.
PO3	Knowledge and understanding of crime scene and their management, Visit crime scene and help the police officials in proper collection, preservation and handling of scientific evidences which will aid in maintaining the integrity of evidences.
PO4	Individual and team work: Function affectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings in the field of forensic Science.
PO5	Identification of individuals by knowledge and understanding of Fingerprints. Identify and analyse the questioned documents to aid the police officials and court of law.
PO6	Understanding of different instruments used for forensic analysis and perform experiments as well as to carry out problem analysis and data interpretation of instrumental analysis
PO7	Understanding of professional and ethical responsibility of forensic scientist.
PO8	Communication: Communicate and convey effectively on various activities of forensics with proper understanding of scientific and legal terminologies.
PO9	Understanding of drugs analysis, explosive materials, adulteration analysis as well as poison detection and analysis in forensic science.
PO10	Knowledge and understanding of biological aspects, serological analysis and DNA profiling as well as medico legal aspects in forensic science.

PO11	Understanding and knowledge of ballistics for the analysis of fire arms and projectiles in forensic science.
PO12	Life- long learning: Recognize the need for lifelong learning in the broadest contest of challenges and recent advances in the field of forensic science.
PO13	Project Management: Demonstrate knowledge & understanding of the forensic science and apply these to one's own work, as a member and leader in a team, to manage projects in forensic science.
PO14	Use of modern techniques, skills, and instruments necessary for forensic expert or any person working in such field.
PO15	Make a robust report on the basis of scientific analysis to administer the court of law.

PSO (Program Specific Outcomes)

Sl No.	Program Specific Outcomes
PSO1	Post-graduate will be able to develop skill and knowledge which can be applied in the jobs of Forensic Science
PSO2	Post-graduate will be able to pursue higher studies and research
PSO3	Post-graduate will be able to use software and technologies that can be effectively used to solve various problems encountered during investigations.

Course Outcome (CO)

1st Semester

CUTM1634 Introduction to Forensics, Psychology, Law and Statistics

Course Objective: To understand the Basic knowledge of Psychology, Law and Statistics in Forensic science.

Course Outcomes: On completion of this course, the successful students should be able to:

CO	Statements
CO-1	Understand criminal mind, their Modus Operandi.
CO-2	Understand the Law used in Forensic science.
CO-3	Get idea about statistical analysis and can use in forensic science.

CUTM1635 Instrumental Techniques

Course Objective: To familiarize the students about the different instruments and their techniques used for analysis in Forensic Science.

Course Outcomes: On completion of this course, the successful students should be able to:

CO	Statements
CO-1	Understand the instrumentation and basic concept of the instruments.
CO-2	Understand the process for analysis of different evidences.
CO-3	Get knowledge on using different instruments, understanding the concept of the instruments.
CO-4	To know the different instruments required for respective evidences and prepare the results to administer the court of law.

CUTM1636 Crime Scene Management and Forensic Physics

Course Objective: To understand the management of crime scene, formulation of hypothesis and processing of evidence to FSL.

Course Outcomes: On completion of this course, the successful students should be able to:

CO	Statements
CO-1	Visit the crime scene, conduct the investigation, processed the evidence and sent to FSL.
CO-2	Understanding of different type of evidence, formulation of hypothesis, reconstruction of the crime scene.
CO-3	Skills to investigate the crime scene, find out the evidence and forward the evidence to FSL for analysis.
CO-4	Formulate the hypothesis of the crime and reconstruction of the crime scene.

CUTM1637 Fingerprints and Questioned Documents

Course Objective: To impart knowledge of fingerprint and questioned document and to understand the role of individual characteristics and identification of Friction Ridges.

To equip the students with skills to analyse the fingerprints and questioned documents.

Course Outcomes: On completion of this course, the successful students should be able to:

CO	Statements
CO-1	Know about the important of fingerprint, pattern and their characteristics. Knowledge of analysis of fingerprints and identification of individuals on the basis of fingerprint pattern.
CO-2	Knowledge of documents evidences and their examination process and techniques.
CO-3	Get knowledge on different techniques and recent technologies developed used in fingerprint and questioned documents.
CO-4	Skills to analyse the fingerprint. Compare the fingerprint to match and identify the individuals.
CO-5	Skills to analyse the different documents and find out the contents and characteristics of the documents. Analyse the authenticity of the documents. Detect the forgery in the documents.

FCHU1203 Business Communication

Course Objective: To impart knowledge on language to communicate in Forensic science.

Course Outcomes: On completion of this course, the successful students should be able to:

CO	Statements
CO-1	Know the basic terminologies.
CO-2	Will be able to communicate with different officers and convey the important information of forensic aspects.

2ND SEMESTER

CUTM1639 Quality Management, Narcotic Drugs, Explosives, and Forensic Chemistry

Course Objective: To understand the quality management and assurance. Knowledge of drugs, explosives materials and their analysis.

To identify the quality of the product. Analysis of drugs and explosive materials.

Course Outcomes: On completion of this course, the successful students should be able to:

CO	Statements
CO-1	Impart the concept of quality management and quality assurance.
CO-2	Knowledge of drugs, analysis of drugs and their forensic aspects.
CO-3	Knowledge of explosive and the material used as explosive. Analysis of residue material and parts of the explosives. Detection of the cause of the explosion.
CO-4	Skill to identify the quality of the different product. Examination of different product as per BIS standards.
CO-5	Identification of NDPS drugs and detection of different drugs by different techniques.

CO-6	Identification of explosives materials and detection of explosives by different techniques.
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CUTM1640 Forensic Biology and Forensic Medicine

Course Objective: Impart the knowledge of biological concept and materials used in forensic science, medico legal aspect.

Course Outcomes: On completion of this course, the successful students should be able to:

CO	Statements
CO-1	Know the biological material used in forensic science. Understand the wild life forensic, entomology and odontology.
CO-2	Understand the autopsy used in forensic science. Determine the cause of death and time of death and understanding the medico legal aspects.
CO-3	Skill to analyse the biological material and detection of age, sex, race, height and species origin.
CO-4	Identification of injuries and various types of death by post-mortem examination.

CUTM1641 Forensic Serology and DNA Profiling

Course Objective: To acquaint the students about different body fluids and their analysis. Impart the knowledge of DNA profiling and individualisation.

Course Outcomes: On completion of this course, the successful students should be able to:

CO	Statements
CO-1	Know the body fluids analysis and serological techniques.
CO-2	Impart the knowledge of DNA and DNA analysis. Understand the basic concept of individualization and uniqueness of DNA in identification of individuals.
CO-3	Skill to analyse the body fluids and different serological techniques for serological analysis.
CO-4	Identification of individuals by DNA profiling.

CUTM1642 Forensic Toxicology and Pharmacology

Course Objective: To educate students about basic concepts of poison and their analysis.

Course Outcomes: On completion of this course, the successful students should be able to:

CO	Statements
CO-1	Impart the knowledge of poison and their analysis. Detection of poison in the body or body fluids.

CO-2	Understanding of drug interaction with body and drug toxicity.
CO-3	Skill to analyse the type of poison and detection of different type of poison in body.
CO-4	Analyse the drug interaction and bioavailability of the drug in the body and their metabolites.

CUTM1643 Forensic Ballistics and Computer Forensics

Course Objective: To impart the knowledge of firearms and projectile and basic understanding of digital platform and cyber laws.

Course Outcomes: On completion of this course, the successful students should be able to:

CO	Statements
CO-1	Impart the knowledge of different firearms and projectile. Understanding of bullet and cartridge cases and gunpowder.
CO-2	To understand the computer parts, digital platform, cyber-crime and cyber laws.
CO-3	Skill to analyse the different firearms and projectiles. Identification and detection of gunshot residue, gunshot powder, range, marks and characters of projectiles.
CO-4	Analysis of storage media, deleted files and information from digital platform and tracking.

3RD SEMESTER

Specialisation in Forensic Chemistry and Toxicology

CUTM1647 Pharmacology and Pharmaceutical Drug Analysis

Course Objective: To teach the concepts Drug, analysis of drug. Understanding of drug therapy, abuses and interaction of drug with body.

Course Outcomes: On completion of this course, the successful students should be able to:

CO	Statements
CO-1	Understand about the drug, factors, bioavailability, and responses of drugs.
CO-2	Understanding the different agents of drugs, designer drugs and NDPS substances.
CO-3	Analysis of drugs and agents.
CO-4	Qualitative and quantitative analysis of various chemicals.
CO-5	Instrumental analysis of various chemicals.

CUTM1648 Concepts of Toxicology

Course Objective: Concepts of poison and toxic materials. Understanding of toxic agents and their risk assessments.

Course Outcomes: On completion of this course, the successful students should be able to:

CO	Statements
CO-1	Get knowledge on different toxic substances and their identification and detection.
CO-2	Understanding of analytical methods of toxicology and application of toxicology.
CO-3	Ability to detect the drugs by various analytical techniques.
CO-4	Ability to detect the poison by various analytical techniques from biological and non-biological matrices.

CUTM1649 Modern and Applied Analytical Forensic Chemistry

Course Objective: Understanding of nuclear forensics, detection and measurement of radioactive substances.

Understanding of drugs chemistry, NDPS laws and analytical method. Understanding and identification of fire crime scene and explosion crime scene.

Course Outcomes: On completion of this course, the successful students should be able to:

CO	Statements
CO-1	Acquainted with proper knowledge chemistry of drugs and different laws related to drugs. Understanding the process of analysis involved to identify the drugs.
CO-2	Ability to detect the different drug component. Identify and detect the cause of fire and explosion and analyse the residue materials.
CO-3	Skill to detect the food adulteration in food and identify the adulterated material in food.

Specialisation in Forensic Biology

CUTM1644 Molecular Biology and Genetics

Course Objective: To understand the concept of serological analysis and uses of enzymes and proteins in criminal investigation. Understanding of methodologies in forensic DNA analysis.

Course Outcomes: On completion of this course, the successful students should be able to:

CO	Statements
CO-1	Understand about the serological methods, enzymes and proteins for criminal investigation. Understanding of parameter and factors in forensic DNA typing.
CO-2	Understanding the different methods and techniques used for DNA analysis and development in technologies and methods for DNA analysis.

CO-3	Understanding of Bioinformatics, population structure and DNA databases.
CO-4	Extraction and estimation of DNA from different sources. Genotyping of the DNA with different markers and interpretation of the result to aid the police officials and court of law.
CO-5	Extraction and estimation of proteins from different sources. Analysis of protein structure using RASMOL software.

CUTM1645 Biotechnology in Pharmaceutical Sciences

Course Objective: Concepts of recombinant DNA technology, bioprocessing, animal and plant biotechnology and industrial microbiology.

Course Outcomes: On completion of this course, the successful students should be able to:

CO	Statements
CO-1	Get knowledge on recombinant DNA technology and genetically modified organism. Understanding of Blotting techniques and molecular therapy.
CO-2	Understanding of quality control and assurances, regulatory affairs and intellectual property rights.
CO-3	Skills to isolate DNA from different sources and GMO detection.
CO-4	Ability to handle blotting techniques and identification and detection of production of industrial products.

CUTM1646 Environmental Biotechnology

Course Objective: Understanding the component of environment, waste analysis and detection of illegal waste.

Course Outcomes: On completion of this course, the successful students should be able to:

CO	Statements
CO-1	Acquainted with proper knowledge of environmental forensic, analysis of the component of pollutants and materials.
CO-2	Acquainted with the knowledge of waste management and detection of waste material in the environments.
CO-3	Ability to detect the pollutants material in the environment and analysis of the pollutants.
CO-4	Skill to identify the adulterated material in food and examine the food quality.

Specialisation in Forensic Physics

CUTM1650 Advances in Physical Techniques

Course Objective: Skill to identify and examine various analyses of techniques used in Forensic Physics

Course Outcomes: On completion of this course, the successful students should be able to:

CO	Statements
CO-1	Ability to detect the various techniques Such as Microscopes, etc.
CO-2	Skill to identify the examination of nanotechnology and Forensic Engineering

CUTM1651 Concepts of Conventional and Modern Ballistics

Course Objective: Concepts of Ballistics, GSR and various Standards of V50, STANNG 4500, NIG .06

Course Outcomes: On completion of this course, the successful students should be able to:

CO	Statements
CO-1	Identifications and Examination of Ammunitions Range of Fire.
CO-2	Analysis and Examination of GSR Material with various Standards

CUTM1652 Audio Recognition and Video Analysis

Course Objective: Understanding the anatomy of Voice production, Audio and video Analysis

Course Outcomes: On completion of this course, the successful students should be able to:

CO	Statements
CO-1	Identification and Examination of Voice samples using Gold wave Software, Automatic Speaker recognition.
CO-2	Examination of Audio and Video analysis using AMphed Five.

Specialisation in Fingerprints and Questioned Documents

CUTM1653 Modern Trends in Fingerprint Sciences

Course Objective: Understanding of morphology and anatomy of fingerprints and their method for fingerprints detection.

Course Outcomes: On completion of this course, the successful students should be able to:

CO	Statements
CO-1	Fundamental and principle of fingerprints and their detection methods.
CO-2	Understanding of development and detection of fingerprints from various methods.
CO-3	Skill to analyse the fingerprint with microscopic techniques and comparison of male and female fingerprint with specific reference and with AFIS method..

CO-4	Development of fingerprint with various chemical and physical methods.
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CUTM1654 Questioned Document and Forensic Accounting

Course Objective: Concepts of documents and their examination. Understanding of forgery and their detection. Identification of fraud and writings and examination of financial documents.

Course Outcomes: On completion of this course, the successful students should be able to:

CO	Statements
CO-1	Understanding of writing forgery and documents forgery. Examination of questioned documents and writings.
CO-2	Understanding of frauds, money laundering and financial reports.
CO-3	Skill to examination of ink, paper age, currency notes and detection of forgery of the documents.
CO-4	Examination of passports, stamps, stamps impression.

CUTM1655 Forensic Photography and Biometric Traits

Course Objective: Understanding the knowledge of photography and different biometric techniques.

Course Outcomes: On completion of this course, the successful students should be able to:

CO	Statements
CO-1	Skill to analyse the fingerprint with microscopic techniques and comparison of male and female fingerprint with specific reference and with AFIS method..
CO-2	Development of fingerprint with various chemical and physical methods.
CO-3	Do crime scene photography, evidences photography and videography. Development of photographic prints.
CO-4	Do photography with various light sources and with various filters. Analysis of various biometrics.

CUTM1656 : ASSIGNMENT

Course Objective: To familiar and skilled to write the content with order and right pattern.

Course Outcomes: On completion of this course, the successful students should be able to:

CO	Statements
CO-1	Understanding of writing the proper content with professional language and with proper explanation.

CUTM1657 : SEMINAR

Course Objective: to make student familiar and skilled to deliver in seminar

Course Outcomes: On completion of this course, the successful students should be able to:

CO	Statements
CO-1	Get familiar and skilled to deliver in seminar

CUTM1658 : Dissertation/project

Course Objective: To help in training of students with hands on experience of instruments while working on any research topic.

Course Outcome :On completion of this course, the successful students should be able to:

CO	Statements
CO-1	Have understanding of research methodology and lab work/field work.

**CENTURION UNIVERSITY OF TECHNOLOGY AND
MANAGEMENT, ODISHA**

SCHOOL OF PARAMEDICS & ALLIED HEALTH SCIENCES



Centurion
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Shaping Lives...
Empowering Communities...

BACHELORE OF SCIENCE IN CLINICAL MICROBIOLOGY

2020

SYLLABUS

Preface: Clinical Microbiology helps to diagnose and prevent disease through clinical laboratory tests. It is complementary to medical science. It involves analysis of body matter such as Collection of samples like body fluid, tissue, and blood and diagnoses them. It also covers micro-organism screening, sterilization of laboratorial environment and equipments, Antibiotic sensitivity tests.

Clinical Microbiologists are an integral part of the medical profession. These professionals get involved in practical and technical work to aid correct diagnosis and effective functioning of Microbiological Laboratory.

With adequate knowledge and experience, Clinical Microbiologist having +2 Sc with biology qualification can work in supervisory or management positions in laboratories and hospitals. They can also work as Laboratory Manager/Consultant/supervisor, health care Administrator, Hospital Outreach coordination, laboratory information system Analyst/Consultant, educational consultant/coordinator etc. Additional opportunities are available in molecular diagnostics, molecular biotechnology companies and in vitro fertilization laboratories as well as in research labs.

Programme: B. Sc. in Clinical Microbiology.

Duration: Three years (Six semesters) full-time programme with 6 months internship in the last semester.

Eligibility: +2 Science with Physics, Chemistry & Biology or equivalent degree

Examination: Examination rules will be as per guideline of CUTM Examination hand book.

Mini Project: A candidate will have to carry out a mini project work as mentioned in the course structure. After completion of the mini project, the student has to submit the dissertation of the mini project. Internal evaluation of the same (consisting of presentation and viva-voce) will be conducted by the respective School.

Internship: A candidate will have to undergo internship for a period of six calendar months in a hospital/Diagnostics Centre/ government or private organization, equipped with modern microbiology laboratory facility or in a fully equipped pathology laboratory, which fulfills the norms decided by the University.

Dissertation will be compulsory to all students. Students will carry out dissertation work individually or in the group of not more than three students. The format for dissertation/Internship report will be similar to the research thesis style; incorporating chapters on: Introduction, Materials and Methods, Results and Discussion and References / Bibliography. The dissertation will be submitted in a typewritten and bound form.

Degree: The degree of B. Sc. in Clinical Microbiology course of the University shall be conferred on the candidates who have pursued the prescribed course of study for not less than three academic years and have passed examinations as prescribed under the relevant scheme and completed 6 months of compulsory internship in the last semester.

On successful completion of three years programme, with a minimum course credit load of **140 credits**, the candidate will be awarded with “**Bachelor of Science in Clinical Microbiology (B. Sc. CMB)**” from Centurion University.

BACHELOR OF SCIENCE IN CLINICAL MICROBIOLOGY

Programme structure

BASKET 1	BASKET 2	BASKET 3	BASKET 4	TOTAL CREDITS
School Core Courses	Discipline Core Courses	Ability Enhancement Compulsory Course (AECC) To be selected from University Basket	Skill Courses (To be selected from University Basket)	
SC-1 SC-2 SC-3 SC-4 SC-5 SC-6 SC-7	DC-1 DC-2 DC-3 DC-4 DC-5 DC-6 DC-7 DC-8 DC-9 DC-10 DC-11 DC-12 DC-13 DC-14 DC-15 DC-16 DC-17 DC-18 DC-19	AECC-I AECC-II	SFS-1 SFS-2 SFS-3 SFS-4 SFS-5	
28 Credits	86 Credits	6 Credits	20 Credits	140 Credits (Minimum Credits required)

BASKET I
School Core Courses

Sl. No.	CODE	SUBJECT	SUBJECT TYPE (T+P+Pj)	CREDITS
SC-1	CUTM1708	Human Anatomy and Physiology	2+1+0	3
SC-2	CUTM1729	Cell Biology	3+0+1	4
SC-3	CUTM1730	Medical Instrumentation and Technique	2+2+0	4
SC-4	CUTM1732	Biochemistry	3+1+0	4
SC-5	CUTM1715	Clinical Pathology	3+1+0	4
SC-6	CUTM1736	Immunology	3+2+0	5
SC-7	CUTM1737	Molecular Biology	3+0+1	4

BASKET II
Discipline Core Courses

Sl. No.	CODE	SUBJECT	SUBJECT TYPE (T+P+Pj)	CREDITS
DC-1	CUTM1731	Haematology	3+2+0	5
DC-2	CUTM1733	Microbiology	3+2+0	5
DC-3	CUTM1734	Medical Law and Ethics	2+0+1	3
DC-4	CUTM1713	Systemic Bacteriology	3+1+0	4
DC-5	CUTM1735	Systemic Virology & Mycology	3+2+0	5
DC-6	CUTM1721	Research Methodology	2+0+1	3
DC-7	CUTM1738	Analytical Biochemistry	3+2+0	5
DC-8	CUTM1740	Public Health Microbiology	3+1+0	4
DC-9	CUTM1739	Pharmaceutical Microbiology	3+1+0	4
DC-10	CUTM1741	Industrial Microbiology	3+0+1	4
DC-11	CUTM1742	Basic Computer and Information Science	0+2+0	2
DC-12	CUTM1746	Epidemiology	2+0+1	3
DC-13	CUTM1747	Diagnostic Bacteriology	3+2+0	5
DC-14	CUTM1745	Diagnostic Mycology	3+1+0	4
DC-15	CUTM1743	Diagnostic Virology	3+0+1	4
DC-16	CUTM1744	Diagnostic Parasitology	3+1+0	4
DC-17	CUTM1754	Mini Project	0+0+2	2
DC-18	CUTM1755	Internship		12

DC-19	CUTM1756	Project		12
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NOTE: Along with the School core and Discipline core subjects, the students need to opt for AECC Courses, Skill/ Domain/ Elective courses and value- added courses from the University Basket, as per the requirement by the University.

BASKET I

School Core Courses

SC1- CUTM1708- Human Anatomy and Physiology

Subject Name	Code	Type of course	T-P-Pj	Prerequisite
Human Anatomy and Physiology	CUTM1708	Theory+ Practice	2-1-0	Fundamental Science

Course Objective

To identify different types of cells and describe their functions.

To identify the organelles of a typical cell and describe their functions.

To identify the major components of the integumentary system and describe their functions.

To identify the major structures of the skin and describe their functions

To identify the major components of the skeletal system and describe their functions.

To identify the major components of the circulatory, endocrine, nervous system etc and describe their functions.

Course Outcome

Use anatomical terminology to identify and describe locations of major organs of each system covered.

Explain interrelationships among molecular, cellular, tissue, and organ functions in each system.

Describe the interdependency and interactions of the systems.

Explain contributions of organs and systems to the maintenance of homeostasis.

Identify causes and effects of homeostatic imbalances.

Describe modern technology and tools used to study anatomy and physiology.

Course Outline

Module-I (10 Hours)

Scope of Anatomy and physiology. Terms and terminology used in Anatomy. Structure of cell, function of its components with special reference to mitochondria and microsomes.

Elementary tissues: Anatomy of epithelial tissue, muscular tissue, connective tissue and nervous tissue.

Skeletal System: Skeleton system with classification, types of bone, features of long bone, ossification, blood supply, Joints – classification with examples, structure of typical synovial joints, Joint disorders.

Practice: Demonstration of individual bone from skeleton.

Identification of different organs and system from chart.

Module-II (13 Hours)

Cardiovascular System: Composition and functions of blood. Blood groups – ABO system and Rh factor and coagulation of blood. Brief information regarding disorders of blood. lymph – origin, circulation, functions of lymph and lymph nodes. Structure and functions of various parts of the heart. Blood pressure and its recording. Brief information about cardiovascular disorders.

Respiratory system: Introduction and functional anatomy of respiratory tract, physiology of respiration.

Practice: Demonstration the morphology of different blood cells

Measurement of Blood pressure, impulses, Heart beats, respiration rate etc.

Module-III (15 Hours)

Urinary System: Various parts of urinary system and their functions, structure and functions of kidney. Physiology of urine formation. Patho-physiology of renal diseases and edema.

Digestive System: Anatomy of digestive system and their functions. Structure and functions of liver, physiology of digestion and absorption.

Endocrine System: Endocrine glands and Hormones. Reproductive system. Structure and function of sense organs.

Practice: Demonstration of various parts of body, tissues of body, parts of digestive

system, parts of respiratory system, parts of excretory system. Identification of different organs and system from chart

Suggested Readings:

1. Text book Anatomy & Physiology for nurses by Evelyn Pearce, Publisher Faber&Faber.
2. Text book Anatomy and Physiology for nurses by Sears, Publisher EdwardArnold.

3. Anatomy & Physiology- by Ross and Wilson, PublisherElsevier.
4. Anatomy& Physiology: Understanding the human body by Clark, Publisher Jones & Bartlett.
5. Anatomy and Physiology for nurses by Pearson, Publisher Marieb&Hoehn.
6. Anatomy and Physiology by N Murgesh, PublisherSatya

SC2-CUTM1729- Cell Biology

Subject Name	Code	Type of course	T-P-Pj	Prerequisite
Cell Biology	CUTM1729	Theory+ Project	3-0-1	Fundamental Science

Course Objective

<p>.Determine the parts of the cell membrane and the cell wall</p> <p>Distinguish the types and mechanism of mutation</p> <p>Compare and contrast the events of cell cycle and its regulation</p> <p>Understand the dynamic character of cellular organelles</p>
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Course Outcome

<p>Describe the fundamental principals cellular biology</p> <p>Develop a deeper understanding of cell structure and how it relates to cell functions.</p> <p>Understand how cells grow, divide, and die and how these important processes are regulated.</p> <p>Understand cell signaling and how it regulates cellular functions. Also how its dis- regulation leads to cancer and other diseases.</p>

Course Outline

Module –I (12 Hr)

An Overview of Cells: History, Cell theory, Structure and Function of Cell and its Organelles: Biological membranes - Nucleus - Nuclear envelope, Nucleolus, Mitochondria, Chloroplasts, Lysosomes, Gloxysomes and Peroxisomes, endoplasmic reticulum, ribosomes, Golgi complex (Structural organization, function, marker enzymes of the above organelles), Cell types: prokaryotes vs. eukaryotes; from single cell to multi-cellular organism; Different molecules of cell- water, salt and

mineral ions etc.

Module- II (14 Hr)

Cell cycle and its regulation, Cellular communication and cell mobility: Cell cycle: G₀/G₁, S, G₂ and M phases (Cell Division: Mitosis, meiosis and cytokinesis); regulation of cell cycle; cell adhesion and roles of different adhesion molecules, gap junctions, Extra- Cellular Matrix (ECM), Cell-cell interaction and cell- ECM interaction, The cytoskeleton, Microtubule- based movement and microfilament -based movement.

Module-III (14 Hr)

Cell signaling, Programmed Cell Death (Apoptosis) and Cancer: Hormones and their receptors, cell surface receptor, signaling through G-protein coupled receptors (G-PCR), Tyrosine Kinase, signal transduction pathways, second messengers, regulation of signaling pathways, bacterial and plant two-component systems, bacterial chemotaxis, Intrinsic and Extrinsic apoptotic pathway, Caspase enzyme, Biology and elementary knowledge of development and causes of cancer; Tumor viruses, Oncogenes and tumor suppressor genes.

Suggested Readings:

1. The Cell a Molecular Approach (4th Edition) by Cooper & Hausman
<https://www.thebiomics.com/books/cell-biology/cell-molecular-approach-cooper-and-hausmn-4th-ed.html>
2. Molecular Biology by Friefelder David, Publisher Narosa www.alibris.com/Molecular-Biology-David..
3. Introduction to Cell biology by John K Young, World Scientific publishing company www.overdrive.com/.../introduction-to-cell-biology
4. Introduction to biology, 3rd tropic edition by D G Maackean www.amazon.com/Introduction-Biology-D-G-Mackean/.

SC3-CUTM1730-Basic Medical Instrumentation and Techniques

Subject Name	Code	Type of course	T-P-Pj	Prerequisite
Basic Medical Instrumentation and Techniques	CUTM1730	Theor+Practice	2-2-0	Fundamental Science

Course Objective

To learn the principle, instrumentation & application of Microscopy

Principle, instrumentation & application of Centrifugation

Principle of Spectroscopy

Course Outcome

After completion of the course the student will be efficient in handling the microscopy equipment's.

They will also be able to have idea about handling instruments like centrifuge, spectrophotometer, chromatography, flow cytometer, Automated and semi- automated Biochemistry analyzer.

The conceptual understanding of the subject provides opportunities for skill enhancement and scopes for higher education.

Course Outline

Module -I (12 hrs)

Microscopic techniques: Principle, Instrumentation, Specimen preparation and Application: Phase–contrast microscopy, fluorescence microscopy, polarization microscopy, electron microscopy (Scanning and Transmission); Bacterial Colony Counter (Principle and working). Laminar Air Flow (Principle and working technique).

Practice: Demonstration of different Microscopes with their operation and maintain technique.

Module- II (14 hrs)

Colorimeter: Principle and Instrumentation; **Spectrophotometry:** Ultraviolet, Mass spectrophotometry; Flame photometry. **Centrifugation:** Principle; Preparative, Analytical, Density gradient centrifugation. **Cytometry:** Types, Flow cytometry and its applications.

Practice: Operation, Demonstration and Quality control of Centrifuge, UV-Vis spectrometer, Colorimeter.

Module- III (14 hrs)

Microtomy: Sectioning, Staining. Application, Principle and Application of: Fully Automated Biochemistry Analyser, Semi- automated Biochemistry Analyser, Coagulometer. Principle, working and uses of: Incubator, Hot air oven, Autoclave.

Practice: Demonstration of Auto/ Semi auto Analyzer; Working procedure of microtome, Incubator, Hot air oven, autoclave and others

Suggested Readings:

1. Wilson K and Walker J. (2010). Principles and Techniques of Biochemistry and Molecular Biology. 7th Ed., Cambridge University Press.
(e-Book link: <https://www.pdfdrive.com/principles-and-techniques-of-biochemistry-and-molecular-biology-e174866056.html>)
2. Nelson DL and Cox MM. (2008). Lehninger Principles of Biochemistry, 5th Ed., W.H. Freeman and Company.
(e-Book link: <https://www.pdfdrive.com/lehninger-principles-of-biochemistry-5th-edition-d164892141.html>)
3. Willey MJ, Sherwood LM & Woolverton C J. (2013). Prescott, Harley and Klein's Microbiology. 7thEd., McGraw Hill.
(e-Book link: <https://www.pdfdrive.com/prescott-harley-and-kleins-microbiology-7th-ed-e188166539.html>)
4. Labs for Life
(e-source link: <http://labsforlife.in/InstructionalVideo.aspx>)

(e-Book link- <https://books.google.co.in/books?id=z9SzvsSCHv4C&printsec=frontcover&dq=instrumentation&hl=en&sa=X&ved=2ahUKEwjipqrO347qAhUjwzGHRomCNUQ6wEwAHoECAIQAAQ#v=onepage&q=instrumentation&f=false>)

SC4-CUTM1732- Biochemistry

Subject Name	Code	Type of course	T-P-Pj	Prerequisite
Biochemistry	CUTM1732	Theory+ Practice	3-1-0	Fundamental Science

Course Objective

<p>To understand the concept of metabolism of carbohydrates</p> <p>To understand the significance of amino acids, proteins</p> <p>Use of enzymes in enhancing metabolic reactions</p> <p>Role of lipids</p>

Course Outcome

After completion of the course the student will be developed a very good understanding of various biomolecules which are required for development and functioning of cells.

Would have understood the significance of carbohydrates in energy generation and as storage food molecules for cells.

They would have understood the significance of proteins and enzymes in accelerating various metabolic activities.

The conceptual understanding of the subject provides opportunities for skill enhancement and scopes for higher education.

Course Outline

Module- I

Structure of enzyme: Apoenzyme and cofactors, prosthetic group-TPP, coenzyme NAD, metal cofactors, Classification of enzymes.

Mechanism of action of enzymes: active site, transition state complex and activation energy. Lock and key hypothesis, and Induced Fit hypothesis.

Enzyme inhibition, enzyme kinetics.

Diagnostic value of serum enzymes: Creatinine kinase, Alkaline phosphatase, Acid phosphatase, LDH, SGOT, SGPT, Amylase, Lipase, Carbonic anhydrase etc.

Practice: Study of effect of temperature on enzyme activity
Study of effect of pH on enzyme activity

Module- II

Carbohydrates: Biomedical importance & properties of Carbohydrates, Classification,

Families of monosaccharides: aldoses and ketoses, trioses, tetroses, pentoses, and hexoses. Stereo isomerism of monosaccharides, epimers, Haworth projection formulae for glucose; chair and boat forms of glucose.

Metabolism: Glycogenesis & glycogenolysis, Glycolysis, citric acid cycle & its significance, Components of respiratory chain, energy relationships during cell respiration, types of respiration. HMP shunt & Gluconeogenesis, regulation of blood glucose level.

Practice: Estimation of Glucose in urine
Estimation of Glucose in blood

Module- III

Amino acids: Classification, essential & non-essential amino acids. Chemistry of Proteins & their related metabolism, Classification, biomedical importance.

Metabolism: Ammonia formation & transport, Transamination, Decarboxylation, Urea cycle, metabolic disorders in urea cycle, catabolism of amino acids.

Practice: Estimation of Protein in urine
Estimation of Protein in blood

Module- IV

Chemistry of Lipids & their related metabolism: Classification, biomedical importance, essential fatty acids. Brief out line of metabolism: Beta oxidation of fatty acids, fatty liver, Ketogenesis, Cholesterol & its clinical significance, Lipoproteins in the blood composition & their functions in brief, Atherosclerosis.

Diabetes mellitus: its types, features, gestation diabetes mellitus, glucose tolerance test, glycosuria, Hypoglycaemia & its causes.

Practice: Estimation of Bile pigment in urine
Estimation of Bile salts in urine

Suggested Readings:

1. Victor W. Rodwell, David A. Bender, Kathleen M. Botham, Peter J. Kennelly, P. Anthony Weil (2018) Harper's Illustrated Biochemistry. Mc Graw Hill.
(e-Book link: <https://www.pdfdrive.com/harpers-illustrated-biochemistry-d176838999.html>)
2. Nelson DL and Cox MM. (2008). Lehninger Principles of Biochemistry, 5th Ed., W.H. Freeman and Company.
(e-Book link: <https://www.pdfdrive.com/lehninger-principles-of-biochemistry-5th-edition-d164892141.html>)
3. Donald Voet, Judith G. Voet (2011) Biochemistry 4th Edition. Wiley Publishers.
(e-Book link: <https://www.pdfdrive.com/biochemistry-4th-edition-e165192126.html>)
4. Jeremy M. Berg, John L. Tymoczko, Lubert Stryer. Biochemistry 7th Edition. W.H. Freeman and Company, New York.
(e-Book link: <https://www.pdfdrive.com/biochemistry-seventh-edition-e167675390.html>)

Simulation links for labs:

1. Lecturio
(e-source link: <https://app.lecturio.com/#/course/s/8014>)
2. Labs for Life
(e-source link: <http://labsforlife.in/InstructionalVideo.aspx>)

SC5-CUTM1715 -Clinical Pathology

Subject Name	Code	Type of course	T-P-Pj	Prerequisite
Clinical pathology	CUTM1715	Theory+ Practice	3-1-0	Fundamental Science

Course Objective

Analyze body fluid for diagnosis of disease
Analyze waste product for diagnosis of disease
Understanding DOT Policy
Understand Physiological disorder and infectious disease
Analysis of pregnancy

Course Outcome

Able to collect pathological specimen
Able to detect diabetes, ketosis, nephritis, jaundice and other physiological disorder
Able to detect infectious disease (UTI, Hematuria, Filaria, Dysentery, Ulcer, TB, etc.)
Preservation and processing of pathological sample.
Identification of Parasites
Analysis of Infertility disorder

Course Outline

Module-I (16

Hrs)

Introduction of clinical pathology, Composition, collection and preservation of urine, Physical examination of Urine, Chemical Examination of Urine - Sugar and Ketone bodies, Diabetes and Ketosis, Nephritis and UTI, Albumin, Phosphate, BJP, Bile Salt and Bile pigment, Chemical Examination of Urine - Multistix reagent strip, Jaundice, Microscopical Examination of Urine, Operation of Urine Analyzer, Pregnancy test, Report writing and report analysis of Urine

Practice: Operation of Urine analyzer, Benedict Test, Heat and Acid Test, Rothera's Test, Benzidine Test, Fouchet's Test

Lab:-Urine Analysis: Collection and Physical Examination, Specific Gravity, Benedict's Qualitative test, Acetone Rothera's Test, Protein and BJP Test, Hay's Test and Fouchet's test, Benzidine test, Microscopical Examination, Pregnancy Test, Auto-mentation by Urine analyzer

Module-II (14 Hrs)

Respiratory Tract Infection: Gram Staining and ZN Staining, Basic of DOT Centre, Report writing and report analysis of sputum, Sputum for the diagnosis of Mycobacterium tuberculosis, Clinical significance and Report writing of Stool, Difference between Amoebic, Dysentery and Bacillary Dysentery, Microscopical Examination of Stool, Physical and Chemical examination of Stool, Composition, collection and preservation of stool

Practice: Microscopic finding of stool, Morphology of stool parasite

Lab:- Stool Analysis: Collection and physical examination, Chemical Examination, Occult test and reducing sugar, Microscopical Examination: Protozoa, Microscopical Examination: Helminthes

Sputum Analysis: Collection and physical examination, Tuberculosis (ZN Stain), Respiratory infection (Gram Stain)

Module-III (15 Hrs)

Routine laboratory investigation of Pleural Fluid, Routine laboratory investigation of Pericardial Fluid, Routine laboratory investigation of Synovial Fluid, Synovial fluid: Collection and preservation, Examination of CSF related to Meningitis, Brain Tumour and other disorder, CSF: Composition, Collection, Preservation and physical examination, Report analysis and report writing of Semen, Semen examination for male infertility disorder, Semen: Composition, function, collection and physical examination

Practice: Gram stain, ZN Stain, General consideration on specimen collection

Lab:- Semen Analysis: Collection and physical examination, Chemical Examination, Microscopical examination

CSF Analysis: Collection and Routine Examination

Synovial Fluid: Collection and Routine examination

Pleural Fluid: Collection and routine examination

Pericardial Fluid: Collection and routine examination

Bacteriological Examination of throat swab

Suggested Readings:

1. Textbook of Clinical laboratory methods and diagnosis by Gradwohls, Publisher Mosby
2. Medical laboratory technology Vol.1 by K. L. Mukherjee, 2007, Publisher Tata McGrawHill
3. Textbook of medical laboratory technology by Praful B Godkar, Publisher Bhalan

4. Medical laboratory science theory and practice by J Ochei and Kolhatkar, 2002, Tata McGraw-Hill, Publisher TBS

SC-6 - CUTM1736- Immunology

Subject Name	Code	Type of course	T-P-Pj	Prerequisite
Immunology	CUTM1736	Theory + Practice	3-2-0	Fundamental Science

Course Objective

Understanding the concept of Innate & adaptive immune system; complement system; Hypersensitivity.

Clinically relevant serological analysis for deeper understanding of antigen- antibody interaction.

Course Outcome

Application of Immunology in disease diagnosis.

The conceptual understanding of the subject provides opportunities for employability and scopes for higher education.

Course Outline

Module-I

Immunity: Classification, Measurement of immunity, Local immunity, Herd immunity. **Antigens:**

Types of antigen, Epitope. Biological Classes of antigens, Superantigens.

Immunoglobulins: Antibody structure, Immunoglobulin classes.

Practice: Collection of blood sample by vein puncture
Separation and preservation of serum

Module-II

Complement System: Principal pathways of Complement activation, Quantitation of Complement (C) and its Components. Biosynthesis of complement, Complement Deficiencies.

Antigen-Antibody Reactions, Antigen-Antibody measurement, Parameters of serological tests.

Serological Reactions.

Practice: Performing Serological tests: Widal test, VDRL test, ASO test, C-Reactive Protein test,
Rheumatoid factor (RF) test
Precipitation in agarose gel
Performing Ouchterlony Double diffusion test
Demonstration of SDS-PAGE
Demonstration of ELISA
Demonstration of Western blotting

Module-III

Immune Response: Types of Immune response, Humoral immunity, Cell-mediated Immune Responses, Cytokines, Immunological tolerance.

Hypersensitivity Reactions: Classification of hypersensitivity reactions, Type I Hypersensitivity (IgE Dependent). Type II Hypersensitivity: Cytolytic and Cytotoxic. Type III Hypersensitivity-Immune Complex-mediated, Type IV Hypersensitivity-Delayed Hypersensitivity.

Suggested Readings:

1. Kuby's Immunology (7th Ed) - by J. Owen, J. Punt, S. Strandford. Macmillan Higher Education, England.
(e-book link: <https://www.pdfdrive.com/kuby-immunology-7th-edition-2013-e44842271.html>)
2. Roitt's Essential Immunology (13th Ed)- by Seamus J. Martin, Dennis R. Burton, Ivan M. Roitt. Wiley Blackwell.
(e-book link: [http://dl.mehrsys.ir/pdf-books/Roitt_s%20Essential%20Immunology%20Thirteenth%20Edition\(www.myuptodate.com\).pdf](http://dl.mehrsys.ir/pdf-books/Roitt_s%20Essential%20Immunology%20Thirteenth%20Edition(www.myuptodate.com).pdf))
3. Prescott, Harley, and Klein's Microbiology (Seventh Edition)- by Joanne M. Willey, Linda M. Sherwood, Christopher J. Woolverton. McGrawHill.
4. Microbiology An Introduction (10th Edition)- by Gerard J. Tortora, Berdell R. Funke, Christine L. Case. Pearson.
5. Text book of Microbiology (7th Edition)- by Ananthanereyan & Paniker, Publisher Universities press.
(e-book link: <https://www.pdfdrive.com/textbook-of-microbiology-e177143667.html>)
6. Practical Immunology (4th Edition)- by Frank C. Hay, Olwyn M.R. Westwood. Blackwell Science.
(e-Book link: <https://www.pdfdrive.com/practical-immunology-d34330313.html>)

Online Tutorial links:

1. Fundamentals of Immunology: Innate Immunity and B-Cell Function

(Coursera link: <https://www.coursera.org/learn/immunologyfundamentalsimmunitybcells>)

2. Fundamentals of Immunology: T Cells and Signaling
(Coursera link: <https://www.coursera.org/learn/immunologyfundamentalstcellssignaling>)
3. Fundamentals of Immunology: Death by Friendly Fire
(Coursera link: <https://www.coursera.org/learn/immunology-friendlyfire>)
4. The Immune System: New Developments in Research
(edX link: <https://www.edx.org/course/the-immune-system-new-developments-in-research-par>)

SC-7- CUTM1737- Molecular Biology

Subject Name	Code	Type of course	T-P-Pj	Prerequisite
Molecular Biology	CUTM1737	Theory + Project	3-0-1	Fundamental Science

Course Objective

To provide depth knowledge of biological or medicinal processes through the investigation of the underlying molecular mechanisms.

Understanding of chemical and molecular processes that occur in and between cells. Understanding will become such that , can be able to describe and explain processes and their meaning for the characteristics of living organisms.

Course Outcome

Conduct independent work in a laboratory.
 Read scientific articles and gain a critical understanding of their contents.
 Give a spoken and written presentation of scientific topics and research results.
 Present hypotheses and select, adapt and conduct molecular and cell-based experiments to either confirm or reject the hypotheses.

Course outline

Module I

Introduction: a. Introduction to molecular biology, b. Molecular biology of cell. Evolution and Molecular structure of cell and its organelles. Types of cells. Including different kinds of Prokaryotic and eukaryotic cells, Cell growth, Cell adhesion, cell junctions and extra cellular matrix organelles,

Cell cycle, Cell membrane and its structure (fluid-mosaic model). Factors influencing on membrane fluidity, asymmetry of membrane and membrane transport (active and passive)

Project Topic: Causes, types and molecular mechanism of human cancer.

Module II

Molecular Nature of the Genetic Material in Prokaryotic and Eukaryotic Cells: Molecular biology of Genes, DNA: Molecular structure, types: Primary, secondary and tertiary, Double helix, types, Transferring information from DNA to RNA, Synthesis of RNA, Translation RNA: Molecular structure, types. Evolution of DNA and RNA, Gene and genetic codes.

Project Topic: Tumor suppressor gene and oncogene.

Module III

General Concept on: a. Regulation of the Gene Expression b. Regulating the Metabolism: The Lac-Operon system, Catabolic repression, Trp Operon system: regulating the biosynthesis of the tryptophan, Gene expression in Eukaryotic cells, Plasmids: types, maintenance and functions.

Project Topic: Human Genome Project.

Module IV

DNA Replication and Gene Expression: DNA Replication: Semi conservative Nature of DNA Replication, DNA Replication in prokaryotic Cells, DNA Replication in Eukaryotic cell, Enzymes involved in DNA Replication: DNA polymerases, Proofreading, post-replication Modification of DNA. Transferring information from DNA to RNA, Synthesis of RNA (Transcription), RNA polymerase, Initiation and Termination of Transcription, Post and co- transcription modification of the RNA. Protein Biosynthesis: Translation of the genetic code, Translation of m RNA, Role of r-RNA in protein synthesis, Forming the polypeptides- elongation, Termination of the protein biosynthesis.

Project Topic: Molecular basis, types, causes and a case study of the effects of DNA mutation.

Suggested Readings:

1. Molecular Biology of the gene (7th Ed) by James D. Watson.
E-book link-<https://www.pdfdrive.com/molecular-biology-of-the-gene-e158278674.html>
2. Genes XII by Lewin's.

E-book link- <https://www.pdfdrive.com/lewins-genes-xii-e168024578.html>

3. Molecular cell biology (5th Ed) by Lodish H.

E-book link- <https://www.pdfdrive.com/molecular-cell-biology-lodish-5th-ed-e15674865.html>

BASKET II

Discipline Core Courses

DC-1-CUTM1731-Haematology

Subject Name	Code	Type of course	T-P-Pj	Prerequisite
Hematology	CUTM1731	Theory+Practice	3-2-0	Basic Medical science

Course Objective

The overall aims are that the student should obtain advanced knowledge of the most common hematologic diseases & understanding the concept of Blood cells and other blood components.

Be able to handle an investigation of hemorrhagic disorder and laboratory abnormalities such as anaemia, polycythemia, leukopenia, leukocytosis, thrombocytopenia, thrombocytosis, elevated ESR etc within hematology.

Clinically relevant hematological analysis for deeper understanding of Evaluate normal and abnormal cell morphology with associated diseases and other blood components .

Course Outcome

Differentiate various laboratory test findings with their associated clinical conditions.

Identify the various skills necessary to perform blood counts, evaluate blood elements, and report results within the stated limits of accuracy.

Describe the various components of blood ,their functions, and roles in various disease states.

To be able to demonstrate good skills in the relevant Hematology laboratory methodology.

Collection of blood for the investigations.

Be able to distinguish the developmental stages of blood cells. It will also cover Bone marrow examination.

To learn about tests carried out for hematological investigations.

To be able to carry out blood sampling.

Course Outline

Module- I (8 Hrs)

Scope & importance of Hematology, important equipment and chemicals, various test performed in Hematology laboratory, Focusing different blood cells through microscope.

Practice: Demonstration of instruments used in hematology- Microscope, Blood Cell

counter

, Sahali's Apparatus.

Module- II (12 Hrs)

Identify and/or confirm the composition & function of various red blood cell inclusions. Function of normal cellular components. Formation of blood, Synthesis of blood in Bone marrow- Erythropoiesis, leucopoiesis, thrombopoiesis. Anticoagulants: definition, Uses, Different types of Anticoagulants., mode of action, their merits and demerits. Morphology of normal blood cells, abnormal morphology & diseases.

Practice: Demonstration of different blood cell, their synthesis from slide presentation or chart.

Demonstration the normal and abnormal morphology of different blood cells.

Module- III (10

Hrs) Hematological

Disorders

1. Classification of Anemia: Morphological & etiological.
2. Iron Deficiency Anemia: Distribution of body Iron, Iron Absorption, causes of iron deficiency, lab findings.
3. Megaloblastic Anemia: Causes, Lab findings.
4. Hemolytic Anemia: Definition, causes, classification & lab findings.

Bone Marrow: Cell composition of normal adult Bone marrow, Aspiration, Indication, Preparation & Staining, Special Stain for Bone Marrow -Periodic Acid Schiff, Sudan Black

Leukemia: Classification, Blood Picture, Differentiation of Blast Cells.

Practice: Collection of blood by different methods

Different normal and abnormal morphology of RBCs, WBCs, Platelet.

Module- IV (10 Hrs)

Collection of blood, Methods & Preparation of Stains and Smears

Practice:

Cleaning and drying of glass and plastic ware, Collection of venous and capillary blood, cleaning of glass-syringes and its sterilization. Preparation of buffers, Preparation of the stains and other reagents,

Preparation of peripheral blood film (PBF), To stain a peripheral blood Film by Leishman- stain, Haemoglobin estimation (Sahali's method and cyanmethaemoglobin method).

Module- V (10 Hrs)

Routine Hematological Tests:

Complete blood cell count, ESR, Differential Leukocyte count, Total leukocyte count, Bleeding time and Clotting time, Blood Grouping and Rh Typing.

Practice:

Complete Blood Counts, Determination of Haemoglobin, TRBC Count by Haemocytometers, TLC by Haemocytometer, Differential Leukocyte count, Determination of Platelet Count. Determination of ESR by wintrobes, Determination of ESR by Westergeren's method, Determination of PCV by Wintrobes, Erythrocyte Indices- MCV, MCH, MCHC. Reticulocyte Count, Absolute Eosinophil Count, Bleeding time and Clotting time, Blood Grouping and Rh Typing

Suggested Readings:

1. Textbook of Medical Laboratory Technology P.B Gotkar Mumbai, Bhalani Publishing House
2. Text book of Medical Laboratory Technology by Paraful B. Godkar, Publisher Bhalani
3. Text book of Medical Laboratory Technology (2nd edition) by V.H Talib, Publisher CBS
4. Atlas of hematology (5th edition) by G.A. McDonald, Publisher Churchill Livingstone
5. Medical Laboratory Technology By K.L Mukharjee, Publisher McGraw Hill education pvtlimited
6. Text book of Medical Laboratory Technology (6th edition) by Ramnik Sood, Jaypee Publication.
7. Ebook link-<https://www.pdfdrive.com/hematology-basic-principles-and-practice-e176384006.html>
8. Ebook link-<https://www.pdfdrive.com/hematology-basic-principles-and-practice-expert-consult-online-and-print-expert-consult-title-online-print-5th-edition-e186195241.html>
9. Ebook link-
<https://books.google.co.in/books?id=6sfacydDNsUC&printsec=frontcover&dq=hematology&hl=en&sa=X&ved=2ahUKEwja9-ve3I7qAhUwzTgGHSMUDekQ6wEwAHoECAQQAQ#v=onepage&q=hematology&f=false>
10. Ebook link-
<https://books.google.co.in/books?id=QQcYAAAAAYAAJ&printsec=frontcover&dq=hematology&hl=en&sa=X&ved=2ahUKEwja9-ve3I7qAhUwzTgGHSMUDekQ6wEwAnoECAIQQAQ#v=onepage&q=hematology&f=false>

DC-2- CUTM1733- Microbiology

Subject Name	Code	Type of course	T-P-Pj	Prerequisite
Microbiology	CUTM1733	Theory+ Practice	3-2-0	Fundamental Science

Course Objective

To know various Culture media and their applications and also understand various physical and chemical means of sterilization

To know General bacteriology and microbial techniques for isolation of pure cultures of bacteria, fungi and virus

To master aseptic techniques and be able to perform routine culture handling tasks safely and effectively

Course Outcome

This study demonstrates the theory and practical skills in microscopy and their handling techniques and staining procedures.

Understanding the details of microbial cell organelles.

Provides knowledge on growth of microorganism.

Provides knowledge Culturing microorganism.

Course Outline

Module –I (14 Hours)

Microbiology: Definition, history, host- microbe relationship, and safety measures in a microbiology laboratory. Morphology of bacterial cell wall, Bacterial anatomy (Bacterial cell structure: including spores, flagella, pili and capsules). Sporulation. Classification of bacteria according to cell wall and shape (arrangement), Classification of micro-organisms. Growth and Nutrition of Microbes: General nutritional requirements of bacteria, Bacterial growth curve

Practice:

1. Handling of Microscope
2. To learn techniques for Inoculation of bacteria on culture media.
3. To isolate specific bacteria from a mixture of organisms.

Module-II (11 Hours)

Sterilization: Definition, sterilization by dry heat, moist heat (below, at & above 100° C), Autoclave, Hot air oven, Radiation and Filtration, preventive measures, controls and sterilization indicators. Use of laminar flow in sterilization.

Antiseptics and Disinfectants: Definition, types, properties, mode of action and use of disinfectants and antiseptics, efficiency testing of disinfectants.

Practice:

1. To demonstrate simple staining (Methylene blue)
2. Bacterial identification: To demonstrate reagent preparation and procedure for Gram stain, Z-N staining, Capsule staining, Demonstration of flagella by staining methods, Spore staining, To demonstrate spirochetes by Fontana staining procedure

Module-III (15 Hours)

Staining techniques: Methods of smear preparation, Gram stain, AFB stain, Albert's stain and special staining for spore, capsule and flagella, Culture Media, Liquid and solid media, defined and synthetic media, routine laboratory media (basal, enriched, selective, enrichment, indicator, and transport media). Different Culture, media their preparation and uses in microbial growth.

Practice:

1. Biochemical tests for identification of bacteria
2. Preservation of stock cultures of bacteria
3. Antibiotic susceptibility test

Suggested Reading:

1. Medical Laboratory Technology by Kanai Lal Mukherjee; Tata McGraw Hill, New Delhi
2. Microbiology by Prescott
3. An Introduction to Medical Laboratory Technology by FJ Baker; Butterworth – Heinemann; Oxford
4. Practical Book of Medical Microbiology by Satish Gupta; JP Brothers, New Delhi
5. Medical Laboratory Manual for Tropical Countries Vol. I and II by Monica Cheesbrough; Cambridge University Press; UK
6. Textbook of Medical Laboratory Technology by Praful B Godkar; Bhalani Publishing House, Mumbai
7. Text book of Medical Microbiology by Gruckshiank

DC-3- CUTM1734 - Medical Law and Ethics

Subject Name	Code	Type of course	T-P-Pj	Prerequisite
Medical Law and Ethics	CUTM1734	Theory+ Project	2-0-1	Fundamental Science

Course Objective

The course provides an introduction to ethics generally and more specifically to medical ethics, examining in particular the principle of autonomy, which informs much of medical law. The course then considers the general part of medical law governing the legal relationship between medical practitioners and their patients. It considers the legal implications of the provision of medical advice, diagnosis and treatment. Selected medico-legal issues over a human life are also examined. These may include reproductive technologies, foetal rights, research on human subjects, organ donation, the rights of the dying and the legal definition of death.

Course Outcome

- The ethical underpinnings of the law as it relates to medicine.
- The law of negligence in the context of the provision of healthcare,
- Legal and ethical issues surrounding end and beginning of life
- decisions,

Course Outline

Module-1

1. The Indian medical council act, 2. Medical council of India (functions),3. Functions of state medical councils, 4. The declaration of Geneva

Module-2

1. Duties of medical practioners 2. Regarding red cross emblem 3. Professional secrecy 4. Privileged communication.

Module-3

1. Professional negligence 2. Medical mal occurrence 3. Contributory negligence 4. Criminal negligence

Module-4

1. Corporate negligence 2. Ethical negligence 3. Precautions against negligence 4. difference between professional negligence and infamous conduct.

Module-5

1. Malpractice litigation involving various specialities 2. Prevention of medical negligence 3. supreme court of India guidelines on medical negligence 3. The therapeutic misadventure 4. Vicarious liability

Module-6

1. Products liability 2. medical indemnity insurance 3. Medical records 4. Consent in medical practice

Module-7

1. Euthenasia 2. Deaths due to medical care 3. Malingering

Text books

1. Medical Law and Ethics by Shaun D Pattinson, 5 th edition, 2017.

DC-4 - CUTM1713- Systemic Bacteriology

Subject Name	Code	Type of course	T-P-Pj	Prerequisite
Systemic Bacteriology	CUTM1713	Theory+ Practice	3-1-0	Fundamental Science

Course Objective

To learn opportunities in the basic principles of medical microbiology and infectious disease.

To study mechanisms of infectious disease transmission, principles of aseptic practice, and the role of the human body's normal microflora.

To understand the importance of pathogenic bacteria in human disease with respect to infections of the respiratory tract, gastrointestinal tract, urinary tract, skin and soft tissue.

Course Outcome

The course provides the conceptual basis for understanding pathogenic microorganisms and the mechanisms by which they cause disease in the human body.

Recall the relationship of this infection to symptoms, relapse and the accompanying pathology.

Explain the methods of microorganism's control, e.g. chemotherapy & vaccines.

Course Outline

Module –I (9

Hrs)

Morphology, cultural characteristics, biochemical reaction, pathogenesis/disease caused & lab diagnosis, Prevention and Control of: Cocci (Gram Positive): Aerobic: Micrococcus spp., Staphylococcus spp., Streptococcus spp. Anaerobic: Peptococcus spp., Peptostreptococcus spp., Villanelle spp., Acidaminococcus spp, and others. Cocci (Gram Negative): Aerobic: Neisseria spp., Anaerobic Gram-negative bacteria.

Practice: Culture techniques
Culture media
Identification of *Staphylococcus* sp.

Module -II (12 Hrs)

Morphology, cultural characteristics, biochemical reaction, pathogenesis/disease caused & lab diagnosis, Prevention and Control of : Aerobic non-spore forming gram positive bacilli: Bacillus spp., Corynebacterium spp., Actinomyces, Nocardia spp., Mycobacterium spp.-pathogenic, Tubercle bacilli and MOTT bacilli (Atypical mycobacterium) and Hansen's bacilli and others. Anaerobic: Bifidobacterium spp., Eubacterium spp., Actinomyces spp., Propionebacterium, Clostridium spp., and others.

Practice: Preparation of media
Media used for biochemical identification & their uses
Identification of *Mycobacterium* sp.

Module -III (18 Hrs)

Morphology, cultural characteristics, biochemical reaction, pathogenesis/disease caused & lab diagnosis, Prevention and Control of Gram- Negative Bacilli Aerobic: Enterobacteriaceae, Citrobacter spp , Edwardsiella spp ,Enterobacter spp , Escherichia coli, Ewingella , Hafnia spp., Klebsiella spp.,

Morganella spp., Proteus spp., Porvidencia spp., Salmonella spp., Serratia spp., Shigella spp., Yersinia

spp., *Vibrio* spp., *Pseudomonas* spp., *Chlamydia* and *Chlamydozoa*, *Brucella* spp., *Bordetella* spp., *Haemophilus* spp., *Mycoplasma* spp.

Practice: Culture methods & identification of common bacteria on media.
 Antibiotic sensitivity testing.
 Identification of *Escherichia*, *Klebsiella*, *Proteus* sp.

Suggested Readings:

1. Textbook of Microbiology- Ananthanarayan & Paniker (10th Ed)
2. Microbiology (7th Ed)- by Prescott
3. Medical Microbiology- by David Greenwood et al (Elsevier)
4. Essential Medical Microbiology- by Rajesh Bhatia (4th Ed)
5. Medical Microbiology- by Kayser et al
6. The short text book of medical microbiology- by Satis Gupte (10th Ed)

DC-5- CUTM1735- Systemic Virology & Mycology

Subject Name	Code	Type of course	T-P-Pj	Prerequisite
Systemic Virology & Mycology	CUTM1735	Theory+ Practice	3-2-0	Fundamental Science

Course Objective

To learn opportunities in the basic principles of medical microbiology and infectious disease.

To study mechanisms of infectious disease transmission, principles of aseptic practice, and the role of the human body's normal microflora.

To understand the importance of pathogenic Virus and fungus in human disease with respect to infections of the respiratory tract, gastrointestinal tract, urinary tract, skin and soft tissue.

Course Outcome

The course provides the conceptual basis for understanding pathogenic microorganisms and the mechanisms by which they cause disease in the human body.

Recall the relationship of this infection to symptoms, relapse and the accompanying pathology.

Explain the methods of microorganism's control, e.g. chemotherapy & vaccines.

Solve problems in the context of this understanding.

Course Outline

Module-1 (18 Hours)

Structure, cultivation and properties of Viruses. Classification of Medically Important Viruses. Genetic material, Organ system involved, Transmission.

Replication of Viruses, Virus Host Interaction, Bacteriophage. Epidemiology, Pathogenesis, Treatment, Prevention and Control of Viral Diseases (DNA Viruses) *Adenoviridae*, *Poxviridae*, *Herpes viridae*, Epidemiology, Pathogenesis, Treatment, Prevention & Control of Viral Diseases (RNA Viruses) *Orthomyxoviridae*, *Paramyxoviridae*, *Picornaviridae*, *Corona viridae*, *Rhabdoviridae*, *Retrovirida*.

Practice:

1. Demonstration of virus isolation techniques.
2. Demonstration of cell and tissue culture techniques used for virus isolation
3. Serological techniques used in diagnostic virology

Module-2 (7 Hours)

Mycology, Classification, Scope and medical importance of fungi. General Structure of Fungus and Yeast. Laboratory Methods of Fungal Isolation and Identification. Superficial and Cutaneous Mycoses. Subcutaneous Mycoses. Systemic Mycosis caused by Endemic Dimorphic Fungal Pathogens, Opportunistic Mycoses

Practice:

4. Organization of laboratory – Mycology
5. Preparation of different media, chemical and stain for fungus study
6. Microscopic examination of saprophytic molds / Collection of agar plates for exposure

Module-3 (15 Hours)

Pathogenic Group of Fungi: Opportunistic pathogens, True pathogens: *Blastomyces dermatitidis*, *Cooccidioides immitis*, *Paracoccidioides brasiliensis*, *Histoplasma capsulatum*. A. Dermatophytes: *Mycrosporum* (Hair, skin), *Tricophyton* (Skin, hair, nail), *Epidermophyton* (Skin, nail), *Aspergillus spp.* Dermatomycosis (*Candida albicans*, *Cryptococcus neoformans*)

Practice:

7. Slide culture technique for Superficial infections
8. Culture and identification of yeasts
9. Processing of specimens in Mycology lab

Suggested Reading:

1. Textbook of Microbiology- Ananthanarayan & Paniker (10th Ed)
2. Medical Microbiology-by Fritz H. Kayser et al
3. Fundamental medical mycology / Errol Reiss, H. Jean Shadomy, and G. Marshall Lyon III
4. Essential Medical Microbiology- by Rajesh Bhatia (4th Ed)
5. Clinical Microbiology Procedures Handbook- by Amy L. Leber (4th Ed)
6. The short text book of medical microbiology- by Satis Gupte (10th Ed)

DC-6- CUTM1721- Research Methodology

Subject Name	Code	Type of course	T-P-Pj	Prerequisite
Research Methodology	CUTM1721	Theory+ Project	2-0-1	Fundamental Science

Course Objective

To equip students with a basic understanding of the underlying principles of quantitative and qualitative research methods.

Provide students with in-depth training on the conduct and management of research from inception to completion using a wide range of techniques.

Course Outcome

Students can understand the ethical and philosophical issues associated with research in education

This study provides knowledge on various modes of presenting and disseminating research findings.

Enable students to acquire expertise in the use and application of the methods of data collection and analysis.

Provide learning opportunities to critically evaluate research methodology and findings.

Enable students to be reflexive about their role and others' roles as researchers.

Course Outline

Module- I (9

Hrs)

Introduction to Research: Definition, Scope, Limitations, and Types. Objectives of Research. Research Process: Proposal Development: Basic steps involved in the health research proposal development process Literature Review: Importance and Sources, Strategies for gaining access to information, Library search, Computer search.

Research Designs: Research Title and Objectives Criteria for selecting a research title, Formulation of research Objectives, Types of research Objectives, Qualities of research Objective

Module- II (8 Hrs)

Data Collection: Secondary Data, Primary Data, and Methods of Collection. Scaling Techniques: Concept, Types, Rating scales & Ranking Scales, Scale Construction Techniques and Multi-Dimensional Scaling. Sampling Designs: Concepts, Types and Techniques and Sample size Decision.

Module- III (14 Hrs)

Research Hypothesis: Definition, Qualities of research hypothesis Importance and types of research hypothesis. Theory of Estimation and Testing of Hypothesis Small & Large Sample Tests, Tests of Significance based on t, F, Z test and Chi-Square Test. Designing Questionnaire. Interviewing. Tabulation, Coding, Editing. Interpretation and Report Writing.

Project: Writing a review on Nosocomial urinary tract infection.

Writing a research article on antibiotic resistance patterns in wound infections.

Writing a review on Virus culture

Literature survey on Covid-19

Suggested Readings:

1. Research Methodology by C.R. Kothari (3rd Ed)
2. Research Methodology In the Medical & Biological Sciences by Petter Laake et al.
3. Essentials of Research Design and Methodology by Geoffrey Marczyk et al.
4. WHO, Health Research Methodology: A guide for training in research Methods, 2nd Edition, WHO- WIPRO
5. A Student's Guide to Methodology by Clough P and Nutbrown C. Sage Publication.
6. National Ethical Guidelines for Health Research in Nepal, Available at Nepal Health Research

Council.

7. Field Trials of Health Interventions in Developing Countries by Smith PG, Morrow.

DC-7 - CUTM1738- Analytical Biochemistry

Subject Name	Code	Type of course	T-P-Pj	Prerequisite
Analytical Biochemistry	CUTM1738	Theory+ Practice	3-2-0	Fundamental Science

Course Objective

Understanding the concept of Biochemical analyzing instruments both automated and semi automated.

To learn about how to Care & Maintenance of Equipment & Chemicals.

To learn normal ranges of biochemical components in our body.

Clinically relevant biochemical analysis for deeper understanding of all biochemical components i.e., Proteins, Electrolytes, Hormones etc.

Course Outcome

Understanding of instrumentation technique & principle of spectrophotometry, colometry, photometry and electrolyte analyzer.

To learn about Various tests carried out for biochemical analysis & Hormone investigations.

To learn about safety precautions and handling the equipment in biochemical laboratory.

Course Outline

Module- I (12 Hrs)

Chromatography: Paper, Thin layer, Column, Ion exchange, Affinity chromatography, Gel filtration, Gas Chromatography, HPLC, FPLC

Practice: Handling the Equipments and chemicals used in biochemical laboratory.

Module-III (12 Hrs)

Electrophoresis: Moving boundary, Zone (Paper Gel) electrophoresis, Immuno electrophoresis, Isoelectric focusing, 2-D electrophoresis. Principle, Instrumentation, Specimen preparation and Application of: X-ray diffraction, NMR, ESR

Practice: Estimate Erythrocyte sedimentation rate

Module- III (26 Hrs)

Principle and Application of: Fully Automated Biochemistry Analyser, Semi- automated Biochemistry Analyser, Coagulometer. Method of estimation and assessment for: a. Glucose tolerance test. Clearance test for renal function. Gastric analysis, LFT, KFT, Lipid profile, Qualitative test for Urobilinogens, Renal calculi, Barbiturates, T3, T4 and TSH, 17 Ketosteroids. Principles, clinical significance and procedures for estimation, of Acid phosphatase, Alkaline phosphatase, Lactate dehydrogenase, Aspartate transaminase, Alanine, transaminase and Creatine phosphokinase.

Practice: Glucose Tolerance Test, Clearance Test, Gastric juice collection, Gastric Analysis, Kidney Function Test, Liver Function Test, Lipid Profile, Renal calculi, Hormone Test

Suggested readings:

1. Handbook of Christen Medical Association, India (CMAI) Medical Laboratory Technology- Robert H. Carman. 2nd Edn. CMAI, New Delhi.
2. Text book of Medical Laboratory Technology, P.B. Godkar 2nd Edn. Bhalani Publication.
3. Handbook of Biochemistry by M. A. Siddique 8th Edn. Vijay Bhagat Scientific Book
4. Principle of Biochemistry by Lehninger
5. Biochemistry by Voet & Voet
6. Biochemistry by Stryer
7. Biochemistry of Metabolic process by Asim Kumar Roy, Kalyani Publication
8. Ebook link-
https://www.cartercenter.org/resources/pdfs/health/ephti/library/lecture_notes/health_science_students/medicalbiochemistry.pdf
9. Ebook link-
https://books.google.co.in/books?id=Je_pJfb2r0cC&printsec=frontcover&source=gbs_ge_summary_r&cad=0#v=onepage&q&f=false
10. Ebook link-
https://books.google.co.in/books?id=csPcDAAAQBAJ&printsec=frontcover&source=gbs_ge_summary_r&cad=0#v=onepage&q&f=false
11. Ebook link-
https://books.google.co.in/books?id=2FkXAwAAQBAJ&printsec=frontcover&source=gbs_ge_summary_r&cad=0#v=onepage&q&f=false

DC-8- CUTM1740- Public Health Microbiology

Subject Name	Code	Type of course	T-P-Pj	Prerequisite
Public Health Microbiology	CUTM1740	Theory+ Practice	3-1-0	Fundamental Science

Course Objective

To learn the occurrence, abundance and distribution of microorganism in the community and their role in the associated with Public health and also learn different methods for their detection and characterization.

To understand the basic principles of environment microbiology and be able to apply these principles to understanding and solving environmental problems – Water pollution and waterborne diseases, Air pollution and airborne infections.

Course Outcome

Understanding the role of microbiologist in public health

Study of Air borne & water borne infection

Course Outline

Module- 1 (7 Hours)

Introduction to Public Health: Definition, scope, concept and importance of public health microbiology, Roles of microbiologist in public health, Concept of health and disease, Indicators of health, Microbial association of water, air and soil, Basic concept on pollution (air, water, noise, radiation and waste pollution) and public health hazard in the community.

Practice:

1. Isolation and identification of microorganism from different food products: meat, canned juice, milk, cheese and ice cream.
2. Isolation and Identification of microorganisms (hospital acquired infection)

Module- 2(14 Hours)

Air Borne Infections:

1. Introduction: Air and its composition, Microbial air pollution, Sources of air pollution &

control, Indicator of air pollution – WHO guide line (microbial pollution).

2. Air borne diseases: Transmission of pathogens, Respiratory infection (Viral, bacterial, fungal), Sources of infection, characters of organisms and controls of: Bacterial pneumonia, Diphtheria, Tuberculosis, Influenza, Measles.

3. Method of measuring microorganisms in air.

Practice:

3. Selection, collection, preservation and transportation of samples from the community to the laboratory.

Module- 3 (19 Hours)

Water Borne Infections:

1. Introduction: Definition of wholesome and safe water, Nature, cycle, sources, importance and quality (WHO guide line) of water. Water pollution and sanitation,

2. Microorganisms in water: Transmission of pathogens, Water borne diseases (Viral, bacterial, protozoal), Sources of infection, characters of organisms and control of: Hepatitis, Cholera, Typhoid, Amoebiasis, Giardiasis, Poliomyelitis. Water Pollution Control.

3. Method of Measuring Microorganisms in Water. Water Treatment, Control of Water Borne Diseases.

Practice:

4. Isolation and Identification of microorganisms from air.
5. Isolation and Identification of microorganisms from water and evaluation of water quality

Suggested Readings:

2. A Text Book of Microbiology, by Ghimire P. & Parajuli K. Vidhyarthi Pustak Bhandar Publication, Kathmandu.
3. Text Book of Social and Preventive Medicine by Park JE and Park K
4. Evidence Based Public Health by Brownson, RC., Baker, EA., Leet. TL., Follespie. KN, Oxford University Press
5. The Quest for Health, Educational Enterprises, Kathmandu, by Dixit H.
6. Epidemiology for Public Health Practice, by Friis, RH., and Sellers, TA, 2nd Edition, Gaithersburg, MD: Aspen Publication,
7. Modern Food Microbiology, by Jay, J, H 3rd Edition CBS Publication and Distributors Delhi 1987.
8. Introduction to Soil Microbiology, Martin Alexander, by Academic press, 1961.

Subject Name	Code	Type of course	T-P-Pj	Prerequisite
Pharmaceutical Microbiology	CUTM1739	Theory+ Practice	3-1-0	Fundamental Science

Course Objective

Understanding of types & synthesis of antimicrobial agents

Manufacture of antibiotics

To understand the mechanism of action of antibiotics

To study how microorganisms are known to develop resistance to antibiotics

Course Outcome

With the completion of the course, the students will acquire detailed knowledge of antimicrobial agents, their mechanism of action and basis of resistance of microbes to these antimicrobials, formulations.

They will develop an understanding of different types of disinfectants/antiseptics and their uses, evaluation of their bactericidal and bacteriostatic action.

The conceptual understanding of the subject provides opportunities for employability and scopes for higher education.

Course Outline

Module- I

Pharmaceutical Microbiology: Chemical disinfectants, Antiseptic, Antibiotics, static and cidal activity.

Types of Antibiotics. Synthetic Antimicrobial Agents, Antifungal drug, Antiviral drug.

Practice: Sterilization methods used in Microbiology Lab

Isolation of human pathogens in sterile condition

Module-II

Manufacture of Antibiotics: Production of penicillin, Production of Streptomycin. Assessment of New

Antibiotics: Parameters for determination of the usefulness of antibiotics (in vitro and in vivo).

Pharmacokinetics and Pharmacodynamics of Antimicrobial agents. Antibiotic Assay: Microbiological

methods: Disc diffusion technique, Dilution technique. Microbial Spoilage and Preservation of Pharmaceutical Products.

Practice: Test for Bacteriostatic and Bactericidal activity:

Disc test

Dilution test

Module- III

Mechanisms of Action of Antibiotics: Cell wall synthesis inhibitors, Inhibitors of protein biosynthesis, Inhibitors of tetrahydrofolate, Disorganize the cytoplasm membrane. Mode of action of Antibiotics (Cell wall synthesis inhibitors, Inhibitors of protein biosynthesis, Inhibitors of tetrahydrofolate, Disorganize the cytoplasm membrane). Bacterial Resistance to Antibiotics. Biochemical mechanisms of resistance, Genetic basis of antibiotic resistance. Problems in antibiotic therapy due to resistance.

Practice: Screening of herbal plants for Antibiotic activity

Sterility testing of pharmaceuticals

Bacteriological analysis of water

Suggested Readings:

1. W B Hugo and A D Russel, Pharmaceutical Microbiology, 2nd Edition
(e-Book link: <https://www.pdfdrive.com/hugo-and-russells-pharmaceutical-microbiology-e34745384.html>)
2. T H Sandal Pharmaceutical Microbiology: Essentials for quality assurance and quality control. Woodhead Publishing Series.
(e-Book link: <https://www.pdfdrive.com/pharmaceutical-microbiology-essentials-for-quality-assurance-and-quality-control-e157918748.html>)
3. Willey MJ, Sherwood LM & Woolverton C J. (2013). Prescott, Harley and Klein's Microbiology. 7thEd., McGraw Hill.
(e-Book link: <https://www.pdfdrive.com/prescott-harley-and-kleins-microbiology-7th-ed-e188166539.html>)

Online tutorial links:

1. Lecturio link
(<https://app.lecturio.com/#/course/s/6956>)

DC-10 - CUTM1741- Industrial Microbiology

Subject Name	Code	Type of course	T-P-Pj	Prerequisite
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Industrial Microbiology	CUTM1741	Theory +Project	3-0-1	General Microbiology
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Course Objective

Describe the use of microorganism in different industries to produce valuable products like drugs, beverages and different food products etc.

To developed skills for growing microorganisms in the laboratory for the production of different products by different microorganisms.

Course Outcome

Students has acquired a fairly good knowledge of how microbes are used in the fermentative production of organic acids, alcohols, enzymes, antibiotics and various foods in the industry.

Enhances analytic ability of various physical parameters which affect production of industrial products by the microorganisms and the safety aspects of the production and use of these products.

The conceptual understanding of the subject provides opportunities for employability and scopes for higher education.

Developes laboratory skills in producing alcohol and enzymes by fermentative process using bacteria/yeast.

Course Outline:

Module 1

Introduction to Industrial Microbiology: Introduction, History, Definition and scope. Industrial Equipment and Uses. Fermentation Process: Primary and secondary screening, Detection and assay of fermentation products- Physical and chemical assays, Biological assay Stock culture, Fermentation media, Inoculums preparation, Increasing products.

Project Topic: 1. Design a protocol for the treatment of community sewage in your locality.

Module II

Typical Fermentation Process: Antibiotic drug fermentation - Penicillin, Streptomycin, Bacterial insecticide, Other antibiotics. Acetone, Lactic acid, Brewing. Biological Waste Treatment / Bioremediation: Anaerobic fermentation. Production of: Vitamin, Vaccines, Milk & Milk Products, Food, Baker's yeast, Food and feed yeasts, Mushrooms, Vinegar (Acetic acid) Enzymes: Amylase, Proteolytic enzyme, Pectinases, Invertase Other enzymes.

Project Topic:

2. Detail fermentation process of a food product and the advantages of fermented food.
3. Fermenter Designing

Module III

Industrial sewage and its treatment: Introduction, Industrial pollution, Types of sewage. Microbiology of Domestic sewage and industrial sewage. Methods for the treatment of industrial effluent and sewage-Primary treatment, secondary treatment and tertiary treatment.

Project Topic:

4. Impacts of industrial pollution on Society and Environment and its prevention and control.

Suggested Readings:

1. Industrial Microbiology (2nd Ed.) by A. H. Patel.
2. Modern industrial Microbiology and Biotechnology.
(E-book link- <https://www.pdfdrive.com/modern-industrial-microbiology-and-biotechnology-e33452862.html>)
3. L. E. Casida, JR., *Industrial Microbiology*, 1991, Wiley Eastern Limited, New Delhi,

DC-11- CUTM1742- Basic Computer and Information Science

Subject Name	Code	Type of course	T-P-Pj	Prerequisite
Basic Computer and Information Science	CUTM1742	Practice	0-2-0	Fundamentals of Computer

Course Objective

Identify the function of computer hardware components.

Identify the factors that go into an individual or organizational decision on how to purchase computer equipment.

Identify how to maintain computer equipment and solve common problems relating to computer hardware.

Identify how software and hardware work together to perform computing tasks and how software is developed and upgraded

Identify different types of software, general concepts relating to software categories, and the tasks to which each type of software is most suited or not suited.

Course Outcome

Understand the fundamental hardware components that make up a computer's hardware and the role of each of these components.

Understand the difference between an operating system and an application program, and what each is used for in a computer.

Describe some examples of computers and state the effect that the use of computer technology has had on some common products

Course Outline

Module- I

Introduction to computer: introduction, characteristics of computer, block diagram of computer, generations of computer. Types of Input output devices. Processor and memory: The Central Processing Unit (CPU), main memory. Storage Devices.

Module- II

Introduction to MS-Word: introduction, components of a word window, creating, opening and inserting files, editing a document file, page setting and formatting the text, saving the document, spell checking, printing the document file, creating and editing of table, mail merge. Introduction to Excel:

introduction, about worksheet, entering information, saving workbooks and formatting, printing the worksheet, creating graphs. Introduction to power-point: introduction, creating and manipulating presentation, views, formatting and enhancing text, slide with graphs.

Module- III

Introduction to MS-DOS: History of DOS, features of MS-DOS, MS-DOS Commands (internal and external). Introduction of windows: History, features, desktop, taskbar, icons on the desktop, operation with folder, creating shortcuts, operation with windows (opening, closing, moving, resizing, minimizing and maximizing, etc.). Computer networks: introduction, types of network (LAN, MAN, WAN, Internet, Intranet), network topologies (star, ring, bus, mesh, tree, hybrid). Internet and its Applications: definition, brief history, basic services (E-Mail, File Transfer Protocol, telnet, the World Wide Web (WWW)), www browsers, use of the internet.

Suggested readings:

1. Objective Computer Awareness
2. Computer Networking (Global Edition)

DC-12 - CUTM1746- Epidemiology

Subject Name	Code	Type of course	T-P-Pj	Prerequisite
Epidemiology	CUTM1746	Theory+Project	2-0-1	Fundamental Science

Course Objective

<p>Understand the basic epidemiological methods and study designs.</p> <p>Understand and discuss population based perspective to examine disease and health – related events.</p> <p>Discuss the ethical issues in epidemiological research.</p> <p>Explain the importance of epidemiology for informing scientific, ethical, economic and political discussion of health issues.</p> <p>Describe a public health problem in terms of person, place, and time.</p> <p>Evaluate the strengths and limitations of epidemiologic reports</p>

Apply concepts, methods, and tools of public health data collection, analysis and interpretation, and the evidence-based reasoning and informatics approaches that are essential to public health practice.

Course Outcome

Distinguish between definitions of epidemiology and clinical epidemiology and public health research.

Apply the terminology of the Epidemiologic Triad to an infectious disease.

Describe the important historic events in the field of epidemiology.

Course Outline

Module-I (8

Hrs).

Introduction to Principles of Epidemiology: History, Definition, and scope of epidemiology, Achievements in epidemiology, Terms & Terminologies used in epidemiology. Measuring Health and Disease: Definitions of health and disease, Measures of disease frequency Use of available information, Comparing disease occurrence

Module-II (6 Hrs)

Concept of Epidemiological Study: Basic concepts of epidemiology Descriptive / Analytical, Applied/Experimental, Field Epidemiology. Concept of Prevention and Control of Diseases: Causation in epidemiology: The concept of cause, Establishing the cause of a disease Epidemiological markers, Phenotypic and genetic markers including molecular epidemiology. Disease surveillance: Clinical, Laboratory

Module-III (6 Hrs)

Communicable disease epidemiology, Clinical epidemiology, Environmental & occupational epidemiology, Nutritional epidemiology, Reproductive epidemiology, Social epidemiology, Food epidemiology. Epidemiology, Health services and health Policy: Health care planning, Monitoring & evaluation, The planning cycle, Epidemiology, public policy and health policy, Healthy public policy in

practice

Suggested Readings:

1. Basic Epidemiology. By Beaglehole R., Bonita R., Kjellstrom , World Health Organization, Geneva, https://books.google.com/books/about/Basic_Epidemiology.html?id=AAZGobMNTXgC
2. Field Epidemiology, By B Gregg, 2nd Edition, Oxford University Press, 2002
academic.oup.com/aje/article/156/8/783/78217
3. Gordis L. *Epidemiology*, 2nd Edition, WB Saunders Company Aharcourt Health Sciences Company, Philadelphia. [www.bookdepository.com/Epidemiology-Leon-Gordis/..](http://www.bookdepository.com/Epidemiology-Leon-Gordis/)
4. Epidemiology in Medicine, by LippincottEilliams and Wilkins, and Walters Kluwer Company wkauthorservices.editage.com/.../medicine.html
5. Epidemiology, Principle and Method, McMahon B, Trichopoulos D, by 2nd Edition, Boston, Little, Brown.

DC-13- CUTM1747 - Diagnostic Bacteriology

Subject Name	Code	Type of course	T-P-Pj	Prerequisite
Diagnostic Bacteriology	CUTM1747	Theory+ Practice	3-2-0	Fundamental Science

Course Objective

To confirm the suspicion of infectious bacterial disease.

To identify the etiologic agent by isolating the causative bacterial pathogen.

Course Outcome

Study of Lab diagnosis for Enteric infection, Respiratory tract Infection, Oral & Stomach infection, Urinary tract infections.

Study of control measures for nosocomial infection.

Student can safeguard himself & society and can work diagnostics and hospitals

Course Outline

Module -I (10 Hours)

Aerobic Culture: Scope and importance of aerobic culture, Factors affecting aerobic culture, Various media and techniques of aerobic culture. Laboratory Diagnosis of Enteric Infections: (Terminology, mechanism of infection, etiology, conventional and rapid diagnostic methods) Enteric fever / Typhoid fever, Bacterial endocarditis, Bacteraemia, Septicemia, Pyrexia of unknown origin (PUO).

Practice:

1. Isolation & identification of different groups of bacteria in laboratory
2. Antibiotic susceptibility test
3. Preparation and use of different stains in bacteriology laboratory Grams stain, ZN stain, Albert stain, Spore stain, Capsule stain, Flagella stain, Motility test

Module -II (7 Hours)

Laboratory Diagnosis of Respiratory Tract Infection (RTI): (Terminology, mechanism of infection, etiology, conventional and rapid diagnostic methods) Lower RTI, Upper RTI. Laboratory Diagnosis of Urinary Tract Infection: (Terminology, mechanism of infection, etiology, conventional and rapid diagnostic methods)

Practice:

4. Anaerobic Culture
5. Laboratory Diagnosis of Pus
6. Laboratory Diagnosis of GI Tract

Module -III (10 Hours)

Laboratory Diagnosis of Oral, Throat and Stomach Infection: (Terminology, mechanism of infection, etiology, conventional and rapid diagnostic methods) Gingivitis and anaerobic infection of oral cavity. Peptic ulcer (with emphasis in mechanism of peptic ulcer caused by *Helicobacter pylori*), Laboratory Diagnosis of Eye Infection: (Terminology, mechanism of infection, etiology, conventional and rapid diagnostic methods) Corneal ulcer, Conjunctivitis.

Practice:

7. Laboratory Diagnosis of Mycobacterium Infection
8. Laboratory Diagnosis of Venereal Diseases
9. Performance of different Tests Rapid Diagnostic Tests Molecular Tests 8 hours Interpretation of Test Results 5 hours Test reporting

Suggested Readings:

1. Textbook of Microbiology- Ananthanarayan & Paniker (10th Ed)
2. Medical Microbiology-by Fritz H. Kayser et al
3. Bailey and Scott's Diagnostic Microbiology(12th) Ed
4. Essential Medical Microbiology- by Rajesh Bhatia (4th Ed)
5. Clinical Microbiology Procedures Handbook- by Amy L. Leber (4th Ed)
6. The short text book of medical microbiology- by Satis Gupte (10th Ed)

DC-14 - CUTM1745 - Diagnostic Mycology

Subject Name	Code	Type of course	T-P-Pj	Prerequisite
Diagnostic Mycology	CUTM1745	Theory+ Practice	3-1-0	Fundamental Science

Course Objective

To confirm the suspicion of fungal disease.

To identify the etiologic agent by isolating the causative fungal pathogen.

Course Outcome

This course provides learning opportunities in the basic principles of medical microbiology and infectious fungal diseases.

The course provides the conceptual basis for understanding pathogenic fungi and the mechanisms by which they cause disease in the human body.

Student can safeguard himself & society and can work diagnostics and hospitals

Course Outline

Module-I (11

Hours)

Diagnostic Mycology: Medically important fungi, Opportunistic Fungi

Fungal Diseases: Mycoses

1. Superficial mycoses
2. Subcutaneous mycoses
3. Cutaneous mycoses: Trichophytosis, Microsporiosis, Epidermophytosis.
4. Systemic mycoses: Histoplasmosis, Blastomycosis, Cryptococcosis, Coccidioidosis, Paracoccidioidosis .

Practice:

1. Antifungal Sensitivity Test: Antibiotics.
2. Preparation of stock solution of drug

Module- II (12 Hours)

Pathogenesis and Laboratory Diagnosis of Mycotic Infections: *Aspergillus* spp, *Candida albicans*, *Fusarium* spp, *Cryptococcus neoformans*, *Histoplasma capsulatum*, *Sporothrix* spp, *Philophora* spp., *Trichophyton microsporum*, *Epidermophyton* spp. *Blastomyces dermatitidis*, *Coccidioides immitis*.

Practice:

3. Dilution technique
4. Determination of Minimal inhibitory concentration (MIC)

Module-III (17 Hours)

Isolation and Identification of Fungi (Laboratory Diagnosis): A. Selection, collection and transportation of specimens 5 hours Skin, Hair, Nail, Mucous membranes, Ear, eye, Corneal ulcer, Pus, Blood, Biopsy, Sputum, Urine, Vaginal and Cervical swab, Stool samples, Plural and peritoneal fluid, Superficial, subcutaneous and cutaneous samples. B. Smear Preparation: 2 hours KOH Preparation, 20% KOH with 20% Glycerol, KOH – DMSO (Dimethyl Sulphoxide) 100% Lactophenol Cotton Blue, India ink preparation.

Practice:

5. Preparation of different media, chemical and stain for fungus study
6. Isolation and identification of different fungi of medical importance

Suggested Readings:

1. Textbook of Microbiology- Ananthanarayan & Paniker (10th Ed)
2. Medical Microbiology-by Fritz H. Kayser et al
3. Fundamental medical mycology / Errol Reiss, H. Jean Shadomy, and G. Marshall Lyon III
4. Essential Medical Microbiology- by Rajesh Bhatia (4th Ed)
5. Clinical Microbiology Procedures Handbook- by Amy L. Leber (4th Ed)
6. The short text book of medical microbiology- by Satis Gupte (10th Ed)

DC-15- CUTM1743- Diagnostic Virology

Subject Name	Code	Type of course	T-P-Pj	Prerequisite
Diagnostic virology	CUTM1743	Theory +Project	3-0-1	Basic virology

Course Objective

Understanding laboratory diagnosis of virus by both conventional and molecular approach.

To produce a cadre of specialized medical virologists who would help establish clinical diagnostic services in various hospitals/centres.

Course Outcome

Organise sample collection, transportation, processing and storage in an appropriate manner.

Plan, write and implement research projects in virology, analyze their results and publish these in peer-reviewed journals.

Coordinate with concerned agencies regarding viral diseases and their outbreaks.

Plan and execute epidemiological studies and provide advice in relation to viral diseases.

Course Outline

Module I

Laboratory Organization: Guidelines on Establishment of Virology Laboratory by WHO – key elements of a virology laboratory- Room (space), Electricity, Water supply, Sterility etc.

Specimen management- Selection of specimen, specimen collection, optimal times for collection of specimen, specimen transport and storage , Biosafety- Personal protective equipment , Minimizing equipment and technique-related hazards, Management of laboratory waste, Labelling of wastes etc. Quality systems – Documentation and Standard Operating Procedure (SOP).

Module II

Clinical Virology-

Viral infections of the skin - including pediatric exanthems and enanthems, Viral respiratory infections- pharyngitis, croup, bronchiolitis, pneumonia etc , Viral CNS infections - encephalitis, meningitis, acute

flaccid paralysis, etc. Viral gastroenteritis - viruses causing diarrhea. Viral hepatitis – due to HAV, HBV, HCV, HDV, HEV etc. Viral infections in the immunocompromised persons—in transplant recipients. Congenital viral infections – Human Cytomegalovirus (HCMV), rubella virus, Varicella Zoster Virus (VZV), etc. Sexually transmitted viral infections .Oncogenic viral infections .HIV/AIDS.

Project Topic: Middle East respiratory syndrome (MERS) respiratory infection in human.

Project Topic: Severe acute respiratory syndrome (SARS) respiratory infection in human.

Module III

Virological techniques for cultivation and identification of virus- Isolation of viruses- Cell (tissue) culture; - Embryonated hen’s egg inoculation (various routes) - Animal inoculation method. Identification of virus- Direct examination of specimen: Electron microscopy (TEM and SEM), Staining and microscopy for viral inclusion bodies, Molecular techniques for direct identification of viral genomes- Nucleic acid amplification techniques (PCR, real-time PCR, etc). Indirect Examination of specimen: Cytopathic effect, Neutralization assay, Haemadsorption etc and serological assay (Immunofluorescence, Haemagglutination inhibition assay (HAI), Complement fixation tests (CFT) and ELISA. Antiviral drugs, Laboratory diagnosis of important DNA and RNA viruses.

Project topic: Molecular methods for laboratory diagnosis of corona virus (CoV).

Project topic: Comparative study of serological and molecular methods for lab diagnosis of coron a virus (CoV).

Suggested Readings:

1. Bailey & Scott’s Diagnostic Microbiology.
(e-book-<https://www.pdfdrive.com/bailey-scotts-diagnostic-microbiology-e187863782.html>)
2. Basic virology by Edward K. Wagner.
(e-book -<https://www.pdfdrive.com/basic-virology-e18900518.html>)
3. Essential in clinical microbiology by C A Kauffman and J D Sobel, 2nd Ed.
(Ebook-link- <https://www.pdfdrive.com/essentials-of-clinical-mycology-second-edition-e39564930.html>)

DC-16- CUTM1744- Diagnostic Parasitology

Subject Name	Code	Type of course	T-P-Pj	Prerequisite
Diagnostic Parasitology	CUTM1744	Theory+ Practice	3-1-0	Basic Parasitology

Course Objective

To explain the mechanisms of pathogenesis from a gross, microscopic and molecular perspective.

Recognize the diagnostic stage of the infection under the microscope and to manage the infected patient.

To examine parasites and parasitism, emphasizing the influence of parasites on the ecology and evolution of free-living species, and the role of parasites in global public health.

Course Outcome

Organise sample collection, transportation, processing and storage in an appropriate manner.

Plan, write and implement research projects in parasitology, analyze their results and publish these in peer-reviewed journals.

Coordinate with concerned agencies regarding protozoan and helminth diseases and their outbreaks.

Plan and execute epidemiological studies and provide advice in relation to protozoan diseases.

Course Outline:

Module I

Laboratory Organization (Parasitology Lab). Selection, Collection, Preservation and Transportation of Samples.

Practice: Safety measures in Parasitology lab and laboratory organization.

Module II

Laboratory Diagnosis, of the Intestinal and Vaginal Parasites:

(Terminology, mechanism of infection, etiology, conventional and rapid diagnostic methods) **Protozoa:** Entamoeba histolytica, Giardia lamblia, Trichomonas spp, Cryptosporidium, Cyclospora cayantensis, Isospora

Helminthes: Ascaries lumbricoides, Hook worm: Anacylostoma and Necator, Enterobius vermicularis, Trichuris trichuira, Strongloides spp., Taenia spp., Echinococcus spp., Hymonolepis nana. Tissue and Blood Parasites: Malaria spp, Leishmania spp (Kalaazar), Wacheria spp. Brugia, Loa loa, Oncoerca, Dracuhculus, Paragonimus westermani/hertmani.

Practice: Examination of stool for parasite identification. Examination of clinical sample for parasite identification.

Module III

Laboratory Diagnosis of Various Parasites: Direct method, Indirect method, Rapid methods, Molecular Technique -Parasite Culture. Different Stains used in Diagnostic Parasitology.

Practice: Demonstration of different rapid methods for parasite identification.

Suggested Readings:

1. Textbook of medical Parasitology.
(e-book link- <https://www.pdfdrive.com/textbook-of-medical-parasitology-textbook-of-medical-parasitology-e128716897.html>)
2. Parasitology book by K.D. Chatterjee.
(e-book link- <https://sites.google.com/site/bkthrtzapg/atahrgiwu>.
<https://www.goodreads.com/book/show/24366965-parasitology-protozoology-and-helminthology-with-two-hundred-fourteen>.)
3. Stool Examination
<https://www.youtube.com/watch?v=ePqcdDKCe0>
<https://www.youtube.com/watch?v=MRzUXg8kFi>
<https://www.youtube.com/watch?v=-iI2PxmHxuo>
4. Malaria thick smear preparation.
<https://www.youtube.com/watch?v=WPP7AjmStBg>
5. Malaria thin smear preparation.
<https://www.youtube.com/watch?v=acoALifVvb8>

DC-17- CUTM1754- Mini Project

Subject Name	Code	Type of course	T-P-Pj	Prerequisite
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Mini Project	CUTM1754	Project	0-0-2	Basic Medical science
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The student is supposed to carry out project work in assistance with a mentor. The project should be relevant to the syllabus and should be qualitatively initiated towards fetching a research publication/ case study/ clinical study/ community service/ survey on successful completion within the stipulated time.

Outcome: Research paper publication/ new idea generation/ case study/ clinical study/ community service/ survey.

DC-19- CUTM1756 - Project

Subject Name	Code	Type of course	T-P-Pj	Prerequisite
Project	CUTM1756	Project	0-0-12	Basic Medical science

Project work:

Suggested Project title

1. Antibacterial activity of sweet orange (citrus sinensis) on Staphylococcus aureus and Escherchia coli isolated from wound infected.
2. The incidence of Salmonella and Escherchia coli in livestock (Poultry) feeds
3. Microbial evaluation of milk from a dairy farm.
4. Gastroenteritis in primary school children (6-12yr) of specific locality.
5. Comparative analysis of microbial load of the main water production and water available to CUTM campus

DC-18- CUTM1755 - Internship

Subject Name	Code	Type of course	T-P-Pj	Prerequisite
Internship	CUTM1755	Project	0-0-12	Basic Medical science

Internship Thesis Guideline

This Guideline is designed to provide students the knowledge and practice of public health research activity, to enable them to carry out researches and solve research related problems and to help them in writing thesis and defend their work. Upon successful completion of the course, the students shall be able to:

1. Search relevant scientific literature
2. Develop a research proposal
3. Employ appropriate data collection techniques and tools
4. Manage collected data
5. Analyze data with appropriate statistical techniques
6. Write thesis
7. Defend the findings

Proposal Development:

At the ending of third year (Sixth Semester), students individually consultation with designated faculties and extensive literature survey will develop research proposal during the initial 6 months period.

Data Collection/ Thesis Writing:

Students will carry out data collection, data management, data analysis, and thesis writing during the remaining period (Six Semester).

The Dissertation should have following format:

1. Title
2. Introduction
3. Materials and Methods
4. Results
5. Discussion
6. Conclusion
7. Recommendation
8. References
9. Appendix

Internship

1. Case record
2. Lab management and ethics
3. Evaluation -Guide(internal)
 - a. -Industries guide(external)
 - b. -University-project report/ Viva

**CENTURION UNIVERSITY OF TECHNOLOGY AND MANAGEMENT,
ODISHA**

SCHOOL OF PARAMEDICS & ALLIED HEALTH SCIENCES



**Centurion
UNIVERSITY**

*Shaping Lives...
Empowering Communities...*

**BACHELORE OF SCIENCE IN MEDICAL LABORATORY
TECHNOLOGY**

2020

SYLLABUS

Preface: Medical Laboratory Technology helps to diagnose and prevent disease through clinical laboratory tests. It is complementary to medical science. It involves analysis of body matter such as fluid, tissue, and blood. It also covers micro-organism screening, chemical analyses, and cell count.

Medical Technologists are an integral part of the medical profession. These professionals get involved in practical and technical work to aid correct diagnosis and effective functioning of Biochemical Laboratories.

With adequate knowledge and experience, Medical Laboratory Technologists having B.Sc. MLT qualification can work in supervisory or management positions in laboratories and hospitals. They can also work as Laboratory Manager/Consultant/supervisor, health care Administrator, Hospital Outreach coordination, laboratory information system Analyst/Consultant, educational consultant/coordinator etc. Additional opportunities are available in molecular diagnostics, molecular biotechnology companies and in vitro fertilization laboratories as well as in research labs.

Programme: B. Sc. in Medical Laboratory Technology

Duration: Three years (Six semesters) full-time programme with 6 months internship in the last semester.

Eligibility: +2 Science with Physics, Chemistry & Biology or equivalent degree

Examination: Examination rules will be as per guideline of CUTM Examination hand book.

Mini Project: A candidate will have to carry out a mini project work as mentioned in the course structure. After completion of the mini project, the student has to submit the dissertation of the mini project. Internal evaluation of the same (consisting of presentation and viva-voce) will be conducted by the respective School.

Internship: A candidate will have to undergo internship for a period of six calendar months in a hospital/Diagnostics Centre equipped with modern pathology laboratory facility or in a fully equipped pathology laboratory, which fulfills the norms decided by the University.

Dissertation will be compulsory to all students. Students will carry out dissertation work individually or in the group of not more than three students. The format for dissertation/Internship report will be similar to the research thesis style; incorporating chapters on: Introduction, Materials and Methods, Results and Discussion and References / Bibliography. The dissertation will be submitted in a

typewritten and bound form.

Degree: The degree of B. Sc. in Medical Laboratory Technology course of the University shall be conferred on the candidates who have pursued the prescribed course of study for not less than three academic years and have passed examinations as prescribed under the relevant scheme and completed 6 months of compulsory internship in the last semester.

On successful completion of three years programme, with a minimum course credit of **140 credits**, the candidate will be awarded with “**Bachelor of Science in Medical Laboratory Technology (B.Sc. MLT)**” from Centurion University.

BACHELOR OF SCIENCE IN MEDICAL LABORATORY TECHNOLOGY
Programme structure

BASKET 1	BASKET 2	BASKET 3	BASKET 4	
School Core Courses	Discipline Core Courses	Ability Enhancement Compulsory Course (AECC) To be selected from University Basket	Skill Courses (To be selected from University Basket)	
SC-1	DC-1	AECC-I	SFS-1	TOTAL CREDITS
SC-2	DC-2	AECC-II	SFS-2	
SC-3	DC-3		SFS-3	
SC-4	DC-4		SFS-4	
SC-5	DC-5		SFS-5	
SC-6	DC-6			
SC-7	DC-7			
	DC-8			
	DC-9			
	DC-10			
	DC-11			
	DC-12			
	DC-13			
	DC-14			
	DC-15			
	DC-16			
	DC-17			
	DC-18			
28 Credits	86 Credits	6 Credits	20 Credits	140 Credits (Minimum Credits required)

BASKET I
School Core Courses

Sl. No.	CODE	SUBJECT	SUBJECT TYPE (T+P+Pj)	CREDITS
SC-1	CUTM1708	Human Anatomy and Physiology	2+1+0	3
SC-2	CUTM1729	Cell Biology	3+0+1	4
SC-3	CUTM1730	Medical Instrumentation and Technique	2+2+0	4
SC-4	CUTM1732	Biochemistry	3+1+0	4
SC-5	CUTM1715	Clinical Pathology	3+1+0	4
SC-6	CUTM1736	Immunology	3+2+0	5
SC-7	CUTM1737	Molecular Biology	3+0+1	4

BASKET II
Discipline Core Courses

Sl. No.	CODE	SUBJECT	SUBJECT TYPE (T+P+Pj)	CREDITS
DC-1	CUTM1731	Haematology	3+2+0	5
DC-2	CUTM1733	Microbiology	3+2+0	5
DC-3	CUTM1734	Medical Law and Ethics	2+0+1	3
DC-4	CUTM1720	Histology	3+1+0	4
DC-5	CUTM1727	Advanced Hematology	3+1+0	4
DC-6	CUTM1721	Research Methodology	2+0+1	3
DC-7	CUTM1738	Analytical Biochemistry	3+2+0	5
DC-8	CUTM1749	Applied Haematology	3+2+0	5
DC-9	CUTM1750	Immunopathology	3+0+1	4
DC-10	CUTM1748	Parasitology	3+2+0	5
DC-11	CUTM1742	Basic Computer and Information Science	0+2+0	2
DC-12	CUTM1725	Blood Banking	3+0+1	4
DC-13	CUTM1751	Medical Laboratory Management	3+0+2	5
DC-14	CUTM1753	Introduction to Quality and Patient Safety	3+0+2	5
DC-15	CUTM1752	Mycology & Virology	3+2+0	5
DC-16	CUTM1754	Mini Project	0+0+2	2
DC-17	CUTM1755	Internship	-	12
DC-18	CUTM1755	Project	-	12

NOTE: Along with the School core and Discipline core subjects, the students need to opt for AECC Courses, Skill/ Domain/ Elective courses and value- added courses from the University Basket, as per the requirement by the University.

BASKET I

School Core Courses

SC1- CUTM1708- Human Anatomy and Physiology

Subject Name	Code	Type of course	T-P-Pj	Prerequisite
Human Anatomy and Physiology	CUTM1708	Theory+ Practice	2-1-0	Fundamental Science

Objective

- To identify different types of cells and describe their functions.
- To identify the organelles of a typical cell and describe their functions.
- To identify the major components of the integumentary system and describe their functions.
- To identify the major structures of the skin and describe their functions
- To identify the major components of the skeletal system and describe their functions.
- To identify the major components of the circulatory, endocrine, nervous system etc and describe their functions.

Course Outcome

- Use anatomical terminology to identify and describe locations of major organs of each system covered.
- Explain interrelationships among molecular, cellular, tissue, and organ functions in each system.
- Describe the interdependency and interactions of the systems.
- Explain contributions of organs and systems to the maintenance of homeostasis.
- Identify causes and effects of homeostatic imbalances.
- Describe modern technology and tools used to study anatomy and physiology.

Course Outline

Module-1 (10 Hours)

Scope of Anatomy and physiology. Terms and terminology used in Anatomy. Structure of cell, function of its components with special reference to mitochondria and microsomes.

Elementary tissues: Anatomy of epithelial tissue, muscular tissue, connective tissue and nervous tissue.

Skeletal System: Skeleton system with classification, types of bone, features of long bone, ossification, blood supply, Joints – classification with examples, structure of typical synovial joints, Joint disorders.

Practice: Demonstration of individual bone from skeleton.

Identification of different organs and system from chart.

Module-2 (13 Hours)

Cardiovascular System: Composition and functions of blood. Blood groups – ABO system and Rh factor and coagulation of blood. Brief information regarding disorders of blood. lymph – origin, circulation, functions of lymph and lymph nodes. Structure and functions of various parts of the heart. Blood pressure and its recording. Brief information about cardiovascular disorders.

Respiratory system: Introduction and functional anatomy of respiratory tract, physiology of respiration.

Practice: Demonstration the morphology of different blood cells

Measurement of Blood pressure, impulses, Heart beats, respiration rate etc.

Module-3 (15 Hours)

Urinary System: Various parts of urinary system and their functions, structure and functions of kidney. Physiology of urine formation. Patho-physiology of renal diseases and edema.

Digestive System: Anatomy of digestive system and their functions. Structure and functions of liver, physiology of digestion and absorption.

Endocrine System: Endocrine glands and Hormones. Reproductive system. Structure and function of sense organs.

Practice: Demonstration of various parts of body, tissues of body, parts of digestive

system, parts of respiratory system, parts of excretory system. Identification of different organs and system from chart

Suggested Readings:

1. Text book Anatomy & Physiology for nurses by Evelyn Pearce, Publisher Faber&Faber.
2. Text book Anatomy and Physiology for nurses by Sears, Publisher EdwardArnold.

3. Anatomy & Physiology- by Ross and Wilson, PublisherElsevier.
4. Anatomy& Physiology: Understanding the human body by Clark, Publisher Jones & Bartlett.
5. Anatomy and Physiology for nurses by Pearson, Publisher Marieb&Hoehn.
6. Anatomy and Physiology by N Murgesh, PublisherSatya

SC2-CUTM1729- Cell Biology

Subject Name	Code	Type of course	T-P-Pj	Prerequisite
Cell Biology	CUTM1729	Theory+ Project	3-0-1	Fundamental Science

Objective

- .Determine the parts of the cell membrane and the cell wall
- Distinguish the types and mechanism of mutation
- Compare and contrast the events of cell cycle and its regulation
- Understand the dynamic character of cellular organelles

Course Outcome

- Describe the fundamental principals cellular biology
- Develop a deeper understanding of cell structure and how it relates to cell functions.
- Understand how cells grow, divide, and die and how these important processes are regulated.
- Understand cell signaling and how it regulates cellular functions. Also how its dis-regulation leads to cancer and other diseases.

Course Outline

Module –I (12 Hr)

An Overview of Cells: History, Cell theory, Structure and Function of Cell and its Organelles: Biological membranes - Nucleus - Nuclear envelope, Nucleolus, Mitochondria, Chloroplasts, Lysosomes, Gloxysomes and Peroxisomes, endoplasmic reticulum, ribosomes, Golgi complex (Structural organization, function, marker enzymes of the above organelles), Cell types: prokaryotes vs.

eukaryotes; from single cell to multi-cellular organism; Different molecules of cell- water, salt and mineral ions etc.

Module- II (14 Hr)

Cell cycle and its regulation, Cellular communication and cell mobility: Cell cycle: G₀/G₁, S, G₂ and M phases (Cell Division: Mitosis, meiosis and cytokinesis); regulation of cell cycle; cell adhesion and roles of different adhesion molecules, gap junctions, Extra- Cellular Matrix (ECM), Cell-cell interaction and cell- ECM interaction, The cytoskeleton, Microtubule- based movement and microfilament -based movement.

Module-III (14 Hr)

Cell signaling, Programmed Cell Death (Apoptosis) and Cancer: Hormones and their receptors, cell surface receptor, signaling through G-protein coupled receptors (G-PCR), Tyrosine Kinase, signal transduction pathways, second messengers, regulation of signaling pathways, bacterial and plant two-component systems, bacterial chemotaxis, Intrinsic and Extrinsic apoptotic pathway, Caspase enzyme, Biology and elementary knowledge of development and causes of cancer; Tumor viruses, Oncogenes and tumor suppressor genes.

Suggested Readings:

1. The Cell a Molecular Approach (4th Edition) by Cooper & Hausman
<https://www.thebiomics.com/books/cell-biology/cell-molecular-approach-cooper-and-hausman-4th-ed.html>
2. Molecular Biology by Friefelder David, Publisher Narosa
www.alibris.com/Molecular-Biology-David..
3. Introduction to Cell biology by John K Young, World Scientific publishing company
www.overdrive.com/.../introduction-to-cell-biology
4. Introduction to biology, 3rd tropic edition by D G Maackean
[www.amazon.com/Introduction-Biology-D-G-Mackean/.](http://www.amazon.com/Introduction-Biology-D-G-Mackean/)

SC3-CUTM1730-Basic Medical Instrumentation and Techniques

Subject Name	Code	Type of course	T-P-Pj	Prerequisite
Basic Medical Instrumentation and Techniques	CUTM1730	Theor+Practice	2-2-0	Fundamental Science

Objective

- To learn the principle, instrumentation & application of Microscopy
- Principle, instrumentation & application of Centrifugation
- Principle of Spectroscopy

Course Outcome

- After completion of the course the student will be efficient in handling the microscopy equipment's.
- They will also be able to have idea about handling instruments like centrifuge, spectrophotometer, chromatography, flow cytometer, Automated and semi-automated Biochemistry analyzer.
- The conceptual understanding of the subject provides opportunities for skill enhancement and scopes for higher education.

Course Outline

Module -I (12 hrs)

Microscopic techniques: Principle, Instrumentation, Specimen preparation and Application: Phase-contrast microscopy, fluorescence microscopy, polarization microscopy, electron microscopy (Scanning and Transmission); Bacterial Colony Counter (Principle and working). Laminar Air Flow (Principle and working technique).

Practice: Demonstration of different Microscopes with their operation and maintain technique.

Module- II (14 hrs)

Colorimeter: Principle and Instrumentation; **Spectrophotometry:** Ultraviolet, Mass spectrophotometry; Flame photometry. **Centrifugation:** Principle; Preparative, Analytical, Density gradient centrifugation. **Cytometry:** Types, Flow cytometry and its applications.

Practice: Operation, Demonstration and Quality control of Centrifuge, UV-Vis spectrometer, Colorimeter.

Module- III (14 hrs)

Microtomy: Sectioning, Staining. Application, Principle and Application of: Fully Automated Biochemistry Analyser, Semi- automated Biochemistry Analyser, Coagulometer. Principle, working and uses of: Incubator, Hot air oven, Autoclave.

Practice: Demonstration of Auto/ Semi auto Analyzer; Working procedure of microtome, Incubator, Hot air oven, autoclave and others

Suggested Readings:

1. Wilson K and Walker J. (2010). Principles and Techniques of Biochemistry and Molecular Biology. 7th Ed., Cambridge University Press.
(e-Book link: <https://www.pdfdrive.com/principles-and-techniques-of-biochemistry-and-molecular-biology-e174866056.html>)
2. Nelson DL and Cox MM. (2008). Lehninger Principles of Biochemistry, 5th Ed., W.H. Freeman and Company.
(e-Book link: <https://www.pdfdrive.com/lehninger-principles-of-biochemistry-5th-edition-d164892141.html>)
3. Willey MJ, Sherwood LM & Woolverton C J. (2013). Prescott, Harley and Klein's Microbiology. 7thEd., McGraw Hill.
(e-Book link: <https://www.pdfdrive.com/prescott-harley-and-kleins-microbiology-7th-ed-e188166539.html>)
4. Labs for Life
(e-source link: <http://labsforlife.in/InstructionalVideo.aspx>
(e-Book link- <https://books.google.co.in/books?id=z9SzvsSCHv4C&printsec=frontcover&dq=instrumentation&hl=en&sa=X&ved=2ahUKEwjipqrO347qAhUjwzgGHRomCNUQ6wEwAHoECAIQAO#v=onepage&q=instrumentation&f=false>)

SC4-CUTM1732- Biochemistry

Subject Name	Code	Type of course	T-P-Pj	Prerequisite
Biochemistry	CUTM1732	Theory+ Practice	3-1-0	Fundamental Science

Objective

- To understand the concept of metabolism of carbohydrates
- To understand the significance of amino acids, proteins
- Use of enzymes in enhancing metabolic reactions
- Role of lipids

Course Outcome

- After completion of the course the student will be developed a very good understanding of various biomolecules which are required for development and functioning of cells.
- Would have understood the significance of carbohydrates in energy generation and as storage food molecules for cells.
- They would have understood the significance of proteins and enzymes in accelerating various metabolic activities.
- The conceptual understanding of the subject provides opportunities for skill enhancement and scopes for higher education.

Course Outline

Module- I

Structure of enzyme: Apoenzyme and cofactors, prosthetic group-TPP, coenzyme NAD, metal cofactors, Classification of enzymes.

Mechanism of action of enzymes: active site, transition state complex and activation energy. Lock and key hypothesis, and Induced Fit hypothesis.

Enzyme inhibition, enzyme kinetics.

Diagnostic value of serum enzymes: Creatinine kinase, Alkaline phosphatase, Acid phosphatase, LDH, SGOT, SGPT, Amylase, Lipase, Carbonic anhydrase etc.

Practice: Study of effect of temperature on enzyme activity
Study of effect of pH on enzyme activity

Module- II

Carbohydrates: Biomedical importance & properties of Carbohydrates, Classification,

Families of monosaccharides: aldoses and ketoses, trioses, tetroses, pentoses, and hexoses. Stereo isomerism of monosaccharides, epimers, Haworth projection formulae for glucose; chair and boat forms of glucose.

Metabolism: Glycogenesis & glycogenolysis, Glycolysis, citric acid cycle & its significance, Components of respiratory chain, energy relationships during cell respiration, types of respiration. HMP shunt & Gluconeogenesis, regulation of blood glucose level.

Practice: Estimation of Glucose in urine
Estimation of Glucose in blood

Module- III

Amino acids: Classification, essential & non-essential amino acids. Chemistry of Proteins & their related metabolism, Classification, biomedical importance.

Metabolism: Ammonia formation & transport, Transamination, Decarboxylation, Urea cycle, metabolic disorders in urea cycle, catabolism of amino acids.

Practice: Estimation of Protein in urine
Estimation of Protein in blood

Module- IV

Chemistry of Lipids & their related metabolism: Classification, biomedical importance, essential fatty acids. Brief outline of metabolism: Beta oxidation of fatty acids, fatty liver, Ketogenesis, Cholesterol & its clinical significance, Lipoproteins in the blood composition & their functions in brief, Atherosclerosis.

Diabetes mellitus: its types, features, gestation diabetes mellitus, glucose tolerance test, glycosuria, Hypoglycaemia & its causes.

Practice: Estimation of Bile pigment in urine
Estimation of Bile salts in urine

Suggested Readings:

1. Victor W. Rodwell, David A. Bender, Kathleen M. Botham, Peter J. Kennelly, P. Anthony Weil (2018) Harper's Illustrated Biochemistry. Mc Graw Hill.
(e-Book link: <https://www.pdfdrive.com/harpers-illustrated-biochemistry-d176838999.html>)
2. Nelson DL and Cox MM. (2008). Lehninger Principles of Biochemistry, 5th Ed., W.H. Freeman and Company.
(e-Book link: <https://www.pdfdrive.com/lehninger-principles-of-biochemistry-5th-edition-d164892141.html>)
3. Donald Voet, Judith G. Voet (2011) Biochemistry 4th Edition. Wiley Publishers.
(e-Book link: <https://www.pdfdrive.com/biochemistry-4th-edition-e165192126.html>)
4. Jeremy M. Berg, John L. Tymoczko, Lubert Stryer. Biochemistry 7th Edition. W.H. Freeman and Company, New York.
(e-Book link: <https://www.pdfdrive.com/biochemistry-seventh-edition-e167675390.html>)

Simulation links for labs:

1. Lecturio
(e-source link: <https://app.lecturio.com/#/course/s/8014>)
2. Labs for Life
(e-source link: <http://labsforlife.in/InstructionalVideo.aspx>)

SC5-CUTM1715 -Clinical Pathology

Subject Name	Code	Type of course	T-P-Pj	Prerequisite
Clinical pathology	CUTM1715	Theory+ Practice	3-1-0	Fundamental Science

Objective

- Analyze body fluid for diagnosis of disease
- Analyze waste product for diagnosis of disease
- Understanding DOT Policy
- Understand Physiological disorder and infectious disease
- Analysis of pregnancy

Course Outcome

- Able to collect pathological specimen
- Able to detect diabetes, ketosis, nephritis, jaundice and other physiological disorder
- Able to detect infectious disease (UTI, Hematuria, Filaria, Dysentery, Ulcer, TB, etc.)
- Preservation and processing of pathological sample.
- Identification of Parasites
- Analysis of Infertility disorder

Module-I (16 Hrs)

Introduction of clinical pathology, Composition, collection and preservation of urine, Physical examination of Urine, Chemical Examination of Urine - Sugar and Ketone bodies, Diabetes and Ketosis, Nephritis and UTI, Albumin, Phosphate, BJP, Bile Salt and Bile pigment, Chemical Examination of Urine - Multistix reagent strip, Jaundice, Microscopical Examination of Urine, Operation of Urine Analyzer, Pregnancy test, Report writing and report analysis of Urine

Practice: Operation of Urine analyzer, Benedict Test, Heat and Acid Test, Rothera's Test, Benzidine Test, Fouchet's Test

Lab:-

Urine Analysis: Collection and Physical Examination, Specific Gravity, Benedict's Qualitative test, Acetone Rothera's Test, Protein and BJP Test, Hay's Test and Fouchet's test, Benzidine test, Microscopical Examination, Pregnancy Test, Auto-mentation by Urine analyzer

Module-II (14 Hrs)

Respiratory Tract Infection: Gram Staining and ZN Staining, Basic of DOT Centre, Report writing and report analysis of sputum, Sputum for the diagnosis of Mycobacterium tuberculosis, Clinical significance and Report writing of Stool, Difference between Amoebic, Dysentery and Bacillary Dysentery, Microscopical Examination of Stool, Physical and Chemical examination of Stool, Composition, collection and preservation of stool

Practice: *Microscopic finding of stool, Morphology of stool parasite*

Lab:-

Stool Analysis: Collection and physical examination, Chemical Examination, Occult test and reducing sugar, Microscopical Examination: Protozoa, Microscopical Examination: Helminthes

Sputum Analysis: Collection and physical examination, Tuberculosis (ZN Stain), Respiratory infection (Gram Stain)

Module-III (15 Hrs)

Routine laboratory investigation of Pleural Fluid, Routine laboratory investigation of Pericardial Fluid, Routine laboratory investigation of Synovial Fluid, Synovial fluid: Collection and preservation, Examination of CSF related to Meningitis, Brain Tumour and other disorder, CSF: Composition, Collection, Preservation and physical examination, Report analysis and report writing of Semen, Semen examination for male infertility disorder, Semen: Composition, function, collection and physical examination

Practice: Gram stain, ZN Stain, General consideration on specimen collection

Lab:-

Semen Analysis: Collection and physical examination, Chemical Examination, Microscopical examination

CSF Analysis: Collection and Routine Examination

Synovial Fluid: Collection and Routine examination

Pleural Fluid: Collection and routine examination

Pericardial Fluid: Collection and routine examination

Bacteriological Examination of throat swab

Suggested Readings:

1. Textbook of Clinical laboratory methods and diagnosis by Gradwohls, Publisher Mosby
2. Medical laboratory technology Vol.1 by K. L. Mukherjee, 2007, Publisher Tata McGrawHill
3. Textbook of medical laboratory technology by Praful B Godkar, Publisher Bhalan
4. Medical laboratory science theory and practice by J Ochei and Kolhatkar, 2002, Tata McGraw-Hill, Publisher TBS

SC-6 - CUTM1736- Immunology

Subject Name	Code	Type of course	T-P-Pj	Prerequisite
Immunology	CUTM1736	Theory + Practice	3-2-0	Fundamental Science

Objective

- Understanding the concept of Innate & adaptive immune system; complement system; Hypersensitivity.
- Clinically relevant serological analysis for deeper understanding of antigen-antibody interaction.

Course Outcome

- Application of Immunology in disease diagnosis.
- The conceptual understanding of the subject provides opportunities for employability and scopes for higher education.

Course Outline

Module-I

Immunity: Classification, Measurement of immunity, Local immunity, Herd immunity. **Antigens:** Types of antigen, Epitope. Biological Classes of antigens, Superantigens.

Immunoglobulins: Antibody structure, Immunoglobulin classes.

Practice: Collection of blood sample by vein puncture
Separation and preservation of serum

Module-II

Complement System: Principal pathways of Complement activation, Quantitation of Complement (C) and its Components. Biosynthesis of complement, Complement Deficiencies.

Antigen-Antibody Reactions, Antigen-Antibody measurement, Parameters of serological tests. Serological Reactions.

Practice: Performing Serological tests: Widal test, VDRL test, ASO test, C-Reactive Protein test.

Rheumatoid factor (RF) test

Precipitation in agarose gel

Performing Ouchterlony Double diffusion test

Demonstration of SDS-PAGE

Demonstration of ELISA

Demonstration of Western blotting

Module-III

Immune Response: Types of Immune response, Humoral immunity, Cell-mediated Immune Responses, Cytokines, Immunological tolerance.

Hypersensitivity Reactions: Classification of hypersensitivity reactions, Type I Hypersensitivity (IgE Dependent). Type II Hypersensitivity: Cytolytic and Cytotoxic. Type III Hypersensitivity-Immune Complex-mediated, Type IV Hypersensitivity-Delayed Hypersensitivity.

Suggested Readings:

1. Kuby's Immunology (7th Ed) - by J. Owen, J. Punt, S. Strandford. Macmillan Higher Education, England.
(e-book link: <https://www.pdfdrive.com/kuby-immunology-7th-edition-2013-e44842271.html>)
2. Roitt's Essential Immunology (13th Ed)- by Seamus J. Martin, Dennis R. Burton, Ivan M. Roitt. Wiley Blackwell.
(e-book link: [http://dl.mehrsys.ir/pdf-books/Roitt_s%20Essential%20Immunology%20Thirteenth%20Edition\(www.myuptodate.com\).pdf](http://dl.mehrsys.ir/pdf-books/Roitt_s%20Essential%20Immunology%20Thirteenth%20Edition(www.myuptodate.com).pdf))
3. Prescott, Harley, and Klein's Microbiology (Seventh Edition)- by Joanne M. Willey, Linda M. Sherwood, Christopher J. Woolverton. McGrawHill.
4. Microbiology An Introduction (10th Edition)- by Gerard J. Tortora, Berdell R. Funke, Christine L. Case. Pearson.
5. Text book of Microbiology (7th Edition)- by Ananthanereyan & Paniker, Publisher Universities press.
(e-book link: <https://www.pdfdrive.com/textbook-of-microbiology-e177143667.html>)
6. Practical Immunology (4th Edition)- by Frank C. Hay, Olwyn M.R. Westwood. Blackwell Science.
(e-Book link: <https://www.pdfdrive.com/practical-immunology-d34330313.html>)

Online Tutorial links:

1. Fundamentals of Immunology: Innate Immunity and B-Cell Function
(Coursera link: <https://www.coursera.org/learn/immunologyfundamentalsimmunitybcells>)
2. Fundamentals of Immunology: T Cells and Signaling
(Coursera link: <https://www.coursera.org/learn/immunologyfundamentalstcellssignaling>)

3. Fundamentals of Immunology: Death by Friendly Fire
(Coursera link: <https://www.coursera.org/learn/immunology-friendlyfire>)
4. The Immune System: New Developments in Research
(edX link: <https://www.edx.org/course/the-immune-system-new-developments-in-research-par>)

SC-7- CUTM1737- Molecular Biology

Subject Name	Code	Type of course	T-P-Pj	Prerequisite
Molecular Biology	CUTM1737	Theory + Project	3-0-1	Fundamental Science

Objective

- To provide depth knowledge of biological or medicinal processes through the investigation of the underlying molecular mechanisms.
- Understanding of chemical and molecular processes that occur in and between cells. Understanding will become such that , can be able to describe and explain processes and their meaning for the characteristics of living organisms.

Course Outcome

- Conduct independent work in a laboratory.
- Read scientific articles and gain a critical understanding of their contents.
- Give a spoken and written presentation of scientific topics and research results.
- Present hypotheses and select, adapt and conduct molecular and cell-based experiments to either confirm or reject the hypotheses.

Course outline

Module I

Introduction: a. Introduction to molecular biology, b. Molecular biology of cell. Evolution and Molecular structure of cell and its organelles. Types of cells. Including different kinds of Prokaryotic and eukaryotic cells, Cell growth, Cell adhesion, cell junctions and extra cellular matrix organelles, Cell cycle, Cell membrane and its structure (fluid-mosaic model). Factors influencing on membrane fluidity, asymmetry of membrane and membrane transport (active and passive)

Project Topic: Causes, types and molecular mechanism of human cancer.

Module II

Molecular Nature of the Genetic Material in Prokaryotic and Eukaryotic Cells: Molecular biology of Genes, DNA: Molecular structure, types: Primary, secondary and tertiary, Double helix, types, Transferring information from DNA to RNA, Synthesis of RNA, Translation RNA: Molecular structure, types. Evolution of DNA and RNA, Gene and genetic codes.

Project Topic: Tumor suppressor gene and oncogene.

Module III

General Concept on: a. Regulation of the Gene Expression b. Regulating the Metabolism: The Lac-Operon system, Catabolic repression, Trp Operon system: regulating the biosynthesis of the tryptophan, Gene expression in Eukaryotic cells, Plasmids: types, maintenance and functions.

Project Topic: Human Genome Project.

Module IV

DNA Replication and Gene Expression: DNA Replication: Semi conservative Nature of DNA Replication, DNA Replication in prokaryotic Cells, DNA Replication in Eukaryotic cell, Enzymes involved in DNA Replication: DNA polymerases, Proofreading, post-replication Modification of DNA. Transferring information from DNA to RNA, Synthesis of RNA (Transcription), RNA polymerase, Initiation and Termination of Transcription, Post and co- transcription modification of the RNA. Protein Biosynthesis: Translation of the genetic code, Translation of m RNA, Role of r-RNA in protein synthesis, Forming the polypeptides- elongation, Termination of the protein biosynthesis.

Project Topic: Molecular basis, types, causes and a case study of the effects of DNA mutation.

Suggested Readings:

1. Molecular Biology of the gene (7th Ed) by James D. Watson.
E-book link- <https://www.pdfdrive.com/molecular-biology-of-the-gene-e158278674.html>
2. Genes XII by Lewin's.
E-book link- <https://www.pdfdrive.com/lewins-genes-xii-e168024578.html>
3. Molecular cell biology (5th Ed) by Lodish H.

E-book link-
[e15674865.html](https://www.pdfdrive.com/molecular-cell-biology-lodish-5th-ed-e15674865.html)

[https://www.pdfdrive.com/molecular-cell-biology-lodish-5th-ed-](https://www.pdfdrive.com/molecular-cell-biology-lodish-5th-ed-e15674865.html)

BASKET II

Discipline Core Courses

DC-1-CUTM1731-Haematology

Subject Name	Code	Type of course	T-P-Pj	Prerequisite
Hematology	CUTM1731	Theory+Practice	3-2-0	Basic Medical science

Objective

- The overall aims are that the student should obtain advanced knowledge of the most common hematologic diseases & understanding the concept of Blood cells and other blood components.
- Be able to handle an investigation of hemorrhagic disorder and laboratory abnormalities such as anaemia, polycythemia, leukopenia, leukocytosis, thrombocytopenia, thrombocytosis, elevated ESR etc within hematology.
- Clinically relevant hematological analysis for deeper understanding of Evaluate normal and abnormal cell morphology with associated diseases and other blood components.

Course Outcome

- Differentiate various laboratory test findings with their associated clinical conditions.
- Identify the various skills necessary to perform blood counts, evaluate blood elements, and report results within the stated limits of accuracy.
- Describe the various components of blood, their functions, and roles in various disease states.
- To be able to demonstrate good skills in the relevant Hematology laboratory methodology.
- Collection of blood for the investigations.
- Be able to distinguish the developmental stages of blood cells. It will also cover Bone marrow examination.
- To learn about tests carried out for hematological investigations.
- To be able to carry out blood sampling.

Course Outline

Module- I (8 Hrs)

Scope & importance of Hematology, important equipment and chemicals, various test performed in Hematology laboratory, Focusing different blood cells through microscope.

Practice: Demonstration of instruments used in hematology- Microscope, Blood Cell counter, Sahali's Apparatus.

Module- II (12 Hrs)

Identify and/or confirm the composition & function of various red blood cell inclusions. Function of normal cellular components. Formation of blood, Synthesis of blood in Bone marrow- Erythropoiesis, leucopoiesis, thrombopoiesis. Anticoagulants: definition, Uses, Different types of Anticoagulants., mode of action, their merits and demerits.

Morphology of normal blood cells, abnormal morphology & diseases.

Practice: Demonstration of different blood cell, their synthesis from slide presentation or chart. Demonstration the normal and abnormal morphology of different blood cells.

Module- III (10 Hrs)

Hematological Disorders

1. Classification of Anemia: Morphological & etiological.
2. Iron Deficiency Anemia: Distribution of body Iron, Iron Absorption, causes of iron deficiency, lab findings.
3. Megaloblastic Anemia: Causes, Lab findings.
4. Hemolytic Anemia: Definition, causes, classification & lab findings.

Bone Marrow: Cell composition of normal adult Bone marrow, Aspiration, Indication, Preparation & Staining, Special Stain for Bone Marrow -Periodic Acid Schiff, Sudan Black

Leukemia: Classification, Blood Picture, Differentiation of Blast Cells.

Practice: Collection of blood by different methods
Different normal and abnormal morphology of RBCs, WBCs, Platelet.

Module- IV (10 Hrs)

Collection of blood, Methods & Preparation of Stains and Smears

Practice:

Cleaning and drying of glass and plastic ware, Collection of venous and capillary blood, cleaning of glass-syringes and its sterilization. Preparation of buffers, Preparation of the stains and other reagents,

Preparation of peripheral blood film (PBF), To stain a peripheral blood Film by Leishman- stain, Haemoglobin estimation (Sahali's method and cyanmethaemoglobin method).

Module- V (10 Hrs)

Routine Hematological Tests:

Complete blood cell count, ESR, Differential Leukocyte count, Total leukocyte count, Bleeding time and Clotting time, Blood Grouping and Rh Typing.

Practice:

Complete Blood Counts, Determination of Haemoglobin, TRBC Count by Haemocytometers, TLC by Haemocytometer, Differential Leukocyte count, Determination of Platelet Count. Determination of ESR by wintrobes, Determination of ESR by Westergren's method, Determination of PCV by Wintrobes, Erythrocyte Indices- MCV, MCH, MCHC. Reticulocyte Count, Absolute Eosinophil Count, Bleeding time and Clotting time, Blood Grouping and Rh Typing

Suggested Readings:

1. Textbook of Medical Laboratory Technology P.B Gotkar Mumbai, Bhalani Publishing House
2. Text book of Medical Laboratory Technology by Paraful B. Godkar, Publisher Bhalani
3. Text book of Medical Laboratory Technology (2nd edition) by V.H Talib, Publisher CBS
4. Atlas of hematology (5th edition) by G.A. McDonald, Publisher Churchill Livingstone
5. Medical Laboratory Technology By K.L Mukharjee, Publisher McGraw Hill education pvtlimited
6. Text book of Medical Laboratory Technology (6th edition) by Ramnik Sood, Jaypee Publication.
7. Ebook link-<https://www.pdfdrive.com/hematology-basic-principles-and-practice-e176384006.html>
8. Ebook link-<https://www.pdfdrive.com/hematology-basic-principles-and-practice-expert-consult-online-and-print-expert-consult-title-online-print-5th-edition-e186195241.html>
9. Ebook link-
<https://books.google.co.in/books?id=6sfacydDNsUC&printsec=frontcover&dq=hematology&hl=en&sa=X&ved=2ahUKEwja9-ve3I7qAhUwzTgGHSMUDekQ6wEwAHoECAQQAQ#v=onepage&q=hematology&f=false>
10. Ebook link-
<https://books.google.co.in/books?id=QQcYAAAAYAAJ&printsec=frontcover&dq=hematology&hl=en&sa=X&ved=2ahUKEwja9-ve3I7qAhUwzTgGHSMUDekQ6wEwAnoECAIQQAQ#v=onepage&q=hematology&f=false>

DC-2- CUTM1733- Microbiology

Subject Name	Code	Type of course	T-P-Pj	Prerequisite
Microbiology	CUTM1733	Theory+ Practice	3-2-0	Fundamental Science

Objective

- To know various Culture media and their applications and also understand various physical and chemical means of sterilization
- To know General bacteriology and microbial techniques for isolation of pure cultures of bacteria, fungi and virus
- To master aseptic techniques and be able to perform routine culture handling tasks safely and effectively

Course Outcome

- This study demonstrates the theory and practical skills in microscopy and their handling techniques and staining procedures.
- Understanding the details of microbial cell organelles.
- Provides knowledge on growth of microorganism.
- Provides knowledge Culturing microorganism.

Course Outline

Module -1(14 Hours)

Microbiology: Definition, history, host- microbe relationship, and safety measures in a microbiology laboratory. Morphology of bacterial cell wall, Bacterial anatomy (Bacterial cell structure: including spores, flagella, pili and capsules). Sporulation. Classification of bacteria according to cell wall and shape (arrangement), Classification of micro-organisms. Growth and Nutrition of Microbes: General nutritional requirements of bacteria, Bacterial growth curve

Practice:

1. Handling of Microscope
2. To learn techniques for Inoculation of bacteria on culture media.
3. To isolate specific bacteria from a mixture of organisms.

Module-2 (11 Hours)

Sterilization: Definition, sterilization by dry heat, moist heat (below, at & above 100° C), Autoclave, Hot air oven, Radiation and Filtration, preventive measures, controls and sterilization indicators. Use of laminar flow in sterilization.

Antiseptics and Disinfectants: Definition, types, properties, mode of action and use of disinfectants and antiseptics, efficiency testing of disinfectants.

Practice:

4. To demonstrate simple staining (Methylene blue)
5. Bacterial identification: To demonstrate reagent preparation and procedure for Gram stain, Z-N staining, Capsule staining, Demonstration of flagella by staining methods, Spore staining, To demonstrate spirochetes by Fontana staining procedure

Module-3 (15 Hours)

Staining techniques: Methods of smear preparation, Gram stain, AFB stain, Albert's stain and special staining for spore, capsule and flagella, Culture Media, Liquid and solid media, defined and synthetic media, routine laboratory media (basal, enriched, selective, enrichment, indicator, and transport media). Different Culture, media their preparation and uses in microbial growth.

Practice:

6. Biochemical tests for identification of bacteria
7. Preservation of stock cultures of bacteria
8. Antibiotic susceptibility test

Suggested Reading:

1. Medical Laboratory Technology by Kanai Lal Mukherjee; Tata McGraw Hill, New Delhi
2. Microbiology by Prescott
3. An Introduction to Medical Laboratory Technology by FJ Baker; Butterworth – Heinemann; Oxford
4. Practical Book of Medical Microbiology by Satish Gupta; JP Brothers, New Delhi
5. Medical Laboratory Manual for Tropical Countries Vol. I and II by Monica Cheesbrough; Cambridge University Press; UK
6. Textbook of Medical Laboratory Technology by Praful B Godkar; Bhalani Publishing House, Mumbai
7. Text book of Medical Microbiology by Gruckshiank

DC-3- CUTM1734 - Medical Law and Ethics

Subject Name	Code	Type of course	T-P-Pj	Prerequisite
Medical Law and Ethics	CUTM1734	Theory+ Project	2-0-1	Fundamental Science

Objective

- The course provides an introduction to ethics generally and more specifically to medical ethics, examining in particular the principle of autonomy, which informs much of medical law. The course then considers the general part of medical law governing the legal relationship between medical practitioners and their patients. It considers the legal implications of the provision of medical advice, diagnosis and treatment. Selected medico-legal issues over a human life are also examined. These may include reproductive technologies, foetal rights, research on human subjects, organ donation, the rights of the dying and the legal definition of death.

Course Outcome

- The ethical underpinnings of the law as it relates to medicine,
- The law of negligence in the context of the provision of healthcare,
- Legal and ethical issues surrounding end and beginning of life decisions,
- The maintenance of professional standards in the healthcare profession, and
- The role of policy in the formation of law as it relates to medicine.

Course Outline

Module-1

1. The Indian medical council act, 2. Medical council of India (functions),3. Functions of state medical councils, 4. The declaration of Geneva

Module-2

1. Duties of medical practioners 2. Regarding red cross emblem 3. Professional secrecy 4. Privileged communication.

Module-3

1. Professional negligence 2. Medical mal occurrence 3. Contributory negligence 4. Criminal negligence

Module-4

1. Corporate negligence 2. Ethical negligence 3. Precautions against negligence 4. difference between professional negligence and infamous conduct.

Module-5

1. Malpractice litigation involving various specialities 2. Prevention of medical negligence 3. Supreme court of India guidelines on medical negligence 3. The therapeutic misadventure 4. Vicarious liability

Module-6

1. Products liability 2. medical indemnity insurance 3. Medical records 4. Consent in medical practice

Module-7

1. Euthenasia 2. Deaths due to medical care 3. Malingering

Text books

1. Medical Law and Ethics by Shaun D Pattinson, 5 th edition, 2017.

DC-4 - CUTM1720- Histology

Subject Name	Code	Type of course	T-P-Pj	Prerequisite
Histology	CUTM1720	Theory+Practice	3-1-0	Basic Medical Science

Objective

- Understanding the concept of histotechnology; Basic concepts about routine methods of examination of tissues Collection.
- perform routine laboratory procedures encompassing all major areas of the histology laboratory.
- accurately and proficiently embed tissue and understand the principles of microtomy.
- Clinically relevant onchological analysis for deeper understanding of abnormal cell growth at anywhere in human body.
- The conceptual understanding of the subject provides opportunities for employability and scopes for higher education.

Course Outcome

- In this section students will be made aware of terminology used in

histotechnology, various instruments and their maintenance and also learn the processing of various samples for histopathological investigations.

- Reception and labeling of histological specimens.
- Use of antiseptics, disinfectants and insecticides in a tissue processing laboratory.
- The students will learn about various staining procedures for demonstration of different substances & various cytological investigations.
- The students will learn about special staining procedures & handling & testing of various cytological specimens.

Course Outline

Module- I (8 Hrs)

Histotechnology, Care & Maintenance of histotechnology equipments and their parts and Safety measures of laboratory equipment used in histotechnology. Basic concepts about routine methods of examination of tissues, Collection and transportation of specimens for histological examination, fixation: Process, Various types of fixatives used in a routine histopathology laboratory- Simple fixatives, Compound fixatives, Special fixatives for demonstration of various tissue elements.

Practice: Care & maintenance of Histology equipments, Collection & transportation of specimens, Fixation

Module- II (8 Hrs)

Decalcification Criteria of a good decalcification agent, Technique of decalcification Followed with selection of tissue fixation, decalcification neutralization of acid and thorough washing. Various types of decalcifying fluids, Processing of various tissues for histological examination, Embedding, Schedule for manual or automatic Tissue processing, Components & principles of various types of a tissue processors.

Practice: -Method of Decalcification, Embedding, manual or automatic tissue processings schedule.

Module- III (10 Hrs)

Periodic Acid Schiff Staining, Impregnation and Mountains, Commonly used mountains in histotechnology lab. General Staining Procedures (routine H&E stain, PAP stain and other special stain) for Paraffin Infiltrated and Embedded tissue, To perform & practice the manual & automated Haematoxylin and Eosin staining technique, To perform & practice the Mallory's Phosphotungstic

Acid Haematoxylin (PTAH). Introduction of FNAC and its staining tech, museum technique, post mertum technique.

Practice:

Procedure for manual Staining and Automatic Staining Technique, FNAC technique, Museum technique(Hospital Visit), Post mertum technique(Hospital Visit).

Module- IV (8 Hrs)

Demonstration of instruments used for dissection Use of antiseptics, disinfectants and insecticides in a tissue processing laboratory Reception and labeling of histological specimens Preparation of various fixatives -Helly's fluid, Zenker's fluid, Bouin's fluid, Corney's fluid, 10% Neutral formalin, Formal saline, Formal acetic acid, Pereyn's fluid, prepare 70% alcohol from absolute alcohol. To perform embedding and casting of block.

Practice:

Use of antiseptics, disinfectants and insecticides in tissue processing laboratory, Preparation of various Fixatives, Labeling of Histological specimens, Embedding and Casting of block

Module- V (8 Hrs)

Tissue Processor, Microtomy, Honing and Stropping technique, Use of tissue floating bath, Use of incubator

Practice:

Processing of tissue by manual and automated processor. method To demonstrate various part and types of microtome. To learn sharpening of microtome knife (Honing and stropping technique) To perform section cutting, learn mounting of stained smears. To practice attachment of tissue sections to glass slides To learn using tissue floatation bath drying of sections in incubator (37⁰ C)

Suggested Readings:

1. Color text book of histology by Gartner & Hiatt, publisher Elsevier
2. Netter's essential histology by William Ovalle, publisher Elsevier
3. Histology E-book by Barry Mitchell, publisher Elsevier
4. Textbook of Histology (color atlas) by Krishna Garg, Indira Bahl, Mohini kaul, publisher CBS
5. Textbook of Histology and a Practical Guide by JP Gunasegaran, Publisher Elsevier
6. Textbook of Medical Laboratory Technology by Praful B Godkar, Publisher Bhalami
7. Ebook link-
https://books.google.co.in/books?id=qWScAQAAQBAJ&printsec=frontcover&source=gbs_ge_summary_r&cad=0#v=onepage&q&f=false

8. Ebook link-
https://books.google.co.in/books?id=MrpEDwAAQBAJ&printsec=frontcover&source=gbs_ge_summar_y_r&cad=0#v=onepage&q&f=false
9. Ebook link-
https://books.google.co.in/books?id=CERPdWAAQBAJ&printsec=frontcover&source=gbs_ge_summar_y_r&cad=0#v=onepage&q&f=false

DC-5- CUTM1727- Advanced Hematology

Subject Name	Code	Type of course	T-P-Pj	Prerequisite
Advanced Hematology	CUTM1727	Theory+Practice	3-1-0	Fundamental Medical science

Objective

- The overall aims are that the student should obtain advanced knowledge of the most common hematologic diseases & understanding the concept of Blood cells and other blood components.
- Demonstrate an understanding of the components of human blood and characteristics, functions, and abnormalities and disease states of each.
- Demonstrate proficiency in the skills necessary to perform blood cell counts, and evaluation of blood elements within stated limits of accuracy.
- Determine suitability of hematology specimens and dispose of them in the appropriate bio-hazard containers.

Course Outcome

- Differentiate various hematological procedures and the use of basic equipment essential to working in a Hematology Laboratory.
- Discuss differences between Quality control, Quality Assurance, and Continuing Quality Improvement principles as used in the Hematology Laboratory.
- Categorize various hematology analyses , operational principles of various hematology instruments, and troubleshooting of various instruments.

- Explain the principles and theories utilized in a variety of problem-solving situations.
- Compare and contrast hematology values under normal and abnormal conditions

Course Outline

Module-I (8 Hrs)

Quality assurance in hematology: Internal and external quality control including reference preparation Routine quality assurance, Protocol, Statistical analysis i.e. Standard deviation, Coefficient variation, accuracy and precision, Safety precautions in hematology. Basic concepts of automation in hematology with special reference to: Blood cell counter, Coagulometer.

Practice: Collection of blood from different body parts. Data and record Maintain, Handling hematological equipments.

Module-II (12 Hrs)

Bone marrow examination:

1. Composition and functions, Aspiration of bone marrow (Adults and children), Processing of aspirated bone marrow (Preparation & staining of smear)
2. Brief knowledge about examination of aspirated bone marrow (differential cell counts and cellular ratios) .Special Stain for Bone Marrow -Periodic Acid Schiff, Sudan Black
3. Leukemia: Classification, Blood Picture, Differentiation of BlastCells. Laboratory diagnosis of leukaemias , Processing and staining of trephine biopsy specimens.

Practice: Method of aspiration bone marrow, method of Processing and staining of trephine biopsy.

Module-III (10 Hrs)

L.E. cell phenomenon

1. Definition of L.E. cell, Demonstration of L.E. cell by various methods , Clinicals Physiological variations in Hb, PCV, TLC and Platelets. Investigations of a case suffering from bleeding disorders.
2. Quantitative assay of coagulation factors - a. Principle b. Procedure c. Mechanism d. Tests
3. Biomedical waste management in hematology laboratory (Other than Radioactive material)

Practice-: Demonstration of functional aspect of blood cell counter Study the RBCs abnormal morphological form -a. Variation in size, shape and staining Character, b. Red cell inclusion, c. Identify morphologically the- Immature Erythroid series of cells d. Immature Myeloid ad other WBCs series of cells

Module-4 (10 Hrs)

Demonstration of various parts of centrifuge; its functioning and care, Cleaning and drying of glass and plastic ware, Cleaning of glass, syringes and its sterilization. Preparation of various anticoagulants, Preparation of buffers, Preparation of the stains and other reagents.

Practice: Use centrifuge machine to separate serum & plasma from whole blood cells, Sterilization, Buffer & stain preparation.

Suggested Readings:

1. Textbook of Medical Laboratory Technology P.B Gotkar Mumbai, Bhalani Publishing House
2. Text book of Medical Laboratory Technology by Paraful B. Godkar, Publisher Bhalani
3. Text book of Medical Laboratory Technology (2nd edition) by V.H Talib, Publisher CBS
4. Atlas of hematology (5th edition) by G.A. McDonald, Publisher Churchill Livingstone
5. Medical Laboratory Technology By K.L Mukharjee, Publisher McGraw Hill education pvtlimited
6. Text book of Medical Laboratory Technology (6th edition) by Ramnik Sood, Jaypee Publication.
7. Ebook link-<https://www.pdfdrive.com/hematology-basic-principles-and-practice-e176384006.html>
8. Ebook link-<https://www.pdfdrive.com/hematology-basic-principles-and-practice-expert-consult-online-and-print-expert-consult-title-online-print-5th-edition-e186195241.html>
9. Ebook link-
<https://books.google.co.in/books?id=6sfacydDNsUC&printsec=frontcover&dq=hematology&hl=en&sa=X&ved=2ahUKEwja9-ve3I7qAhUwzTgGHSMUDekQ6wEwAHoECAQQAQ#v=onepage&q=hematology&f=false>
10. Ebook link-
<https://books.google.co.in/books?id=QQcYAAAAYAAJ&printsec=frontcover&dq=hematology&hl=en&sa=X&ved=2ahUKEwja9-ve3I7qAhUwzTgGHSMUDekQ6wEwAhoECAIQQAQ#v=onepage&q=hematology&f=false>

DC-6- CUTM1721- Research Methodology

Subject Name	Code	Type of course	T-P-Pj	Prerequisite
Research Methodology	CUTM1721	Theory+ Project	2-0-1	Fundamental Science

Objective

- To equip students with a basic understanding of the underlying principles of quantitative and qualitative research methods.
- Provide students with in-depth training on the conduct and management of research from inception to completion using a wide range of techniques.

Course Outcome

- Students can understand the ethical and philosophical issues associated with research in education
- This study provides knowledge on various modes of presenting and disseminating research findings.
- Enable students to acquire expertise in the use and application of the methods of data collection and analysis.
- Provide learning opportunities to critically evaluate research methodology and findings.
- Enable students to be reflexive about their role and others' roles as researchers.

Course Outline

Module- I (9 Hrs)

Introduction to Research: Definition, Scope, Limitations, and Types. Objectives of Research. Research Process: Proposal Development: Basic steps involved in the health research proposal development process Literature Review: Importance and Sources, Strategies for gaining access to information, Library search, Computer search.

Research Designs: Research Title and Objectives Criteria for selecting a research title, Formulation of research objectives, Types of research objectives, Qualities of research objective

Module- II (8 Hrs)

Data Collection: Secondary Data, Primary Data, and Methods of Collection. Scaling Techniques: Concept, Types, Rating scales & Ranking Scales, Scale Construction Techniques and Multi-Dimensional Scaling. Sampling Designs: Concepts, Types and Techniques and Sample size Decision.

Module- III (14 Hrs)

Research Hypothesis: Definition, Qualities of research hypothesis Importance and types of research hypothesis. Theory of Estimation and Testing of Hypothesis Small & Large Sample Tests, Tests of Significance based on t, F, Z test and Chi-Square Test. Designing Questionnaire. Interviewing, Tabulation, Coding, Editing. Interpretation and Report Writing.

Project: Writing a review on Nosocomial urinary tract infection.

Writing a research article on antibiotic resistance patterns in wound infections.

Writing a review on Virus culture

Literature survey on Covid-19

Suggested Readings :

1. Research Methodology by C.R. Kothari (3rd Ed)
2. Research Methodology In the Medical & Biological Sciences by Petter Laake et al.
3. Essentials of Research Design and Methodology by Geoffrey Marczyk et al.
4. WHO, Health Research Methodology: A guide for training in research Methods, 2nd Edition, WHO- WIPRO
5. A Student's Guide to Methodology by Clough P and Nutbrown C. Sage Publication.
6. National Ethical Guidelines for Health Research in Nepal, Available at Nepal Health Research Council.
7. Field Trials of Health Interventions in Developing Countries by Smith PG, Morrow.

DC-7 - CUTM1738- Analytical Biochemistry

Subject Name	Code	Type of course	T-P-Pj	Prerequisite
Analytical Biochemistry	CUTM1738	Theory+ Practice	3-2-0	Fundamental Science

Objective

- Understanding the concept of Biochemical analyzing instruments both automated and semi automated.
- To learn about how to Care & Maintenance of Equipment & Chemicals.
- To learn normal ranges of biochemical components in our body.
- Clinically relevant biochemical analysis for deeper understanding of all biochemical

components i.e., Proteins, Electrolytes, Hormones etc.

Course Outcome

- Understanding of instrumentation technique & principle of spectrophotometry, colometry, photometry and electrolyte analyzer.
- To learn about Various tests carried out for biochemical analysis & Hormone investigations.
- To learn about safety precautions and handling the equipment in biochemical laboratory.

Course Outline

Module- I (12 Hrs)

Chromatography: Paper, Thin layer, Column, Ion exchange, Affinity chromatography, Gel filtration, Gas Chromatography, HPLC, FPLC

Practice: Handling the Equipments and chemicals used in biochemical laboratory.

Module-II (12 Hrs)

Electrophoresis: Moving boundary, Zone (Paper Gel) electrophoresis, Immuno electrophoresis, Isoelectric focusing, 2-D electrophoresis. Principle, Instrumentation, Specimen preparation and Application of: X-ray diffraction, NMR, ESR

Practice: Estimate Erythrocyte sedimentation rate

Module- III (26 Hrs)

Principle and Application of: Fully Automated Biochemistry Analyser, Semi- automated Biochemistry Analyser, Coagulometer. Method of estimation and assessment for: a. Glucose tolerance test. Clearance test for renal function. Gastric analysis, LFT, KFT, Lipid profile, Qualitative test for Urobilinogens, Renal calculi, Barbiturates, T3, T4 and TSH, 17 Ketosteroids. Principles, clinical significance and procedures for estimation, of Acid phosphatase, Alkaline phosphatase, Lactate dehydrogenase, Aspartate transaminase, Alanine, transaminase and Creatine phosphokinase.

Practice: Glucose Tolerance Test, Clearance Test, Gastric juice collection, Gastric Analysis, Kidney Function Test, Liver Function Test, Lipid Profile, Renal calculi, Hormone Test

Suggested readings:

1. Handbook of Christen Medical Association, India (CMAI) Medical Laboratory Technology- Robert H.Carman. 2nd Edn. CMAI, New Delhi.
2. Text book of Medical Laboratory Technology, P.B. Godkar 2nd Edn. Bhalani Publication.
3. Handbook of Biochemistry by M. A. Siddique 8th Edn. Vijay Bhagat Scientific Book
4. Principle of Biochemistry by Lehninger
5. Biochemistry by Voet&Voet
6. Biochemistry by Stryer
7. Biochemistry of Metabolic process by Asim Kumar Roy, Kalyani Publication
8. Ebook link-
https://www.cartercenter.org/resources/pdfs/health/ephti/library/lecture_notes/health_science_students/medicalbiochemistry.pdf
9. Ebook link-
https://books.google.co.in/books?id=Je_pJfb2r0cC&printsec=frontcover&source=gbs_ge_summary_r&cad=0#v=onepage&q&f=false
10. Ebook link-
https://books.google.co.in/books?id=csPcDAAAQBAJ&printsec=frontcover&source=gbs_ge_summary_r&cad=0#v=onepage&q&f=false
11. Ebook link-
https://books.google.co.in/books?id=2FkXAAwAAQBAJ&printsec=frontcover&source=gbs_ge_summary_r&cad=0#v=onepage&q&f=false

DC8-CUTM1749-Applied Hematology

Subject Name	Code	Type of course	T-P-Pj	Prerequisite
Applied Hematology	CUTM1749	Theory+Practice	3-2-0	Basic Medical science

Objective

- The overall aims are that the student should obtain advanced knowledge of the most common hematologic diseases & understanding the concept of Blood cells and other blood components.
- Demonstrate an understanding of the components of human blood and characteristics, functions, and abnormalities and disease states of each.
- Demonstrate proficiency in the skills necessary to perform blood cell counts, and evaluation of blood elements within stated limits of accuracy.
- Determine suitability of hematology specimens and dispose of them in the

appropriate bio-hazard containers.

Course Outcome

- The students be made aware of Safety precautions, Quality assurance, biomedical waste management and automation in haematology. It will also cover Red cell abnormalities, Disorder of leukocytes, Investigations of a case suffering from bleeding disorders, To learn about tests carried out for hematological investigations.
- Understanding of Haemopoietic disorders, laboratory diagnosis of leukemia, hemolytic anemia.
- Collection & preservation of blood for the investigations.

Course Outline

Module-I (12 Hrs)

Laboratory diagnosis of leukaemias Definition and laboratory diagnosis of Leukamoid reactions. Cytochemical staining, procedure and their significance in various haemopoietic disorders. Laboratory diagnosis of iron deficiency anaemia, Laboratory diagnosis of megaloblastic anaemia ,Laboratory diagnosis of haemolytic anemia.

Practice: Collection of blood from different body parts. Data and record Maintain, Handling hematological equipments, Demonstrate the different abnormal morphology of RBCs in Anemia cases.

Module-II (8 Hrs)

Chromosomal studies in various hematological disorders and their significance. Mechanism of normal fibrinolysis and Laboratory diagnosis of hyperfibrinolysis. Mechanism and laboratory diagnosis of disseminated intravascular coagulation (DIC).

Practice: Laboratory diagnosis of Hyperfibrinolysis (D- dimer Method), laboratory diagnosis of disseminated intravascular coagulation (DIC)

Module-III (14 Hrs)

Laboratory diagnosis of Hemophilia and von-will brand disease. Laboratory diagnosis of Idiopathic thrombocytopenic purpura (ITP), Platelet function tests and their interpretation.

Practice: Complete Blood Count, Total Platelet Count, Bleeding time, Clotting time, Activated Partial Thromboplastin Time (APTT) Test, Prothrombin Time (PT)

Module-IV (12 Hrs)

Measurement of:

1. Blood volume, b. Determination of Red cell volume and Plasma volume, c. Red cell life span,
2. Platelet life span. Estimate serum iron, total iron, Hb-F, Plasma and urine hemoglobin. Demonstrate the presence of Hb-S by Sickling and solubility, Perform various Platelet function test.

Practice: Demonstrate the sickle cells, To estimate serum iron and total iron binding capacity. To estimate Hb-F in a given blood sample. To estimate plasma and urine. Haemoglobin in the given specimens. To demonstrate the presence of Hb-S by Sickling and solubility tests.

Suggested Readings:

1. Textbook of Medical Laboratory Technology P.B Gotkar Mumbai, Bhalani Publishing House
2. of Medical Laboratory Technology by Paraful B. Godkar, Publisher Bhalani
3. Text book of Medical Laboratory Technology (2nd edition) by V.H Talib, Publisher CBS
4. Atlas of hematology (5th edition) by G.A. McDonald, Publisher Churchill Livingstone
5. Medical Laboratory Technology By K.L Mukharjee, Publisher McGraw Hill education pvtlimited
6. Text book of Medical Laboratory Technology (6th edition) by Ramnik Sood, Jaypee Publication.
7. Ebook link-<https://www.pdfdrive.com/hematology-basic-principles-and-practice-e176384006.html>
8. Ebook link-<https://www.pdfdrive.com/hematology-basic-principles-and-practice-expert-consult-online-and-print-expert-consult-title-online-print-5th-edition-e186195241.html>
9. Ebook link-
<https://books.google.co.in/books?id=6sfacydDNsUC&printsec=frontcover&dq=hematology&hl=en&sa=X&ved=2ahUKEwja9-ve3I7qAhUwzTgGHSMUDekQ6wEwAHoECAQQAQ#v=onepage&q=hematology&f=false>
10. Ebook link-
<https://books.google.co.in/books?id=QQcYAAAAYAAJ&printsec=frontcover&dq=hematology&hl=en&sa=X&ved=2ahUKEwja9-ve3I7qAhUwzTgGHSMUDekQ6wEwAnoECAIQQAQ#v=onepage&q=hematology&f=false>

DC-9- CUTM1750- Immunopathology

Subject Name	Code	Type of course	T-P-Pj	Prerequisite
Immunopathology	CUTM1750	Theory+ Project	3-0-1	Fundamental Science

Objective

- To understand how the immune system is working, about the components of the immune system, their functioning, the defense mechanisms against different pathogens (viruses, bacteria ,and parasites), the pathogenesis of immune diseases (hypersensitivity ,autoimmunity, immunodeficiencies),and on the mechanisms underlying the rejection of the transplants and the antitumor immune response.
- It also provides knowledge of the main immunological techniques used in research and diagnostics.

Course Outcome

- To know and describe the organization and functioning of the immune system, its cells and its molecules.
- To know the principles of diagnostic tests described on immunological techniques.
- To know the fundamental stages of the immune system and its changes over the course of life (intrauterine life, newborn ,adult, elderly)
- The conceptual understanding of the subject provides opportunities for employability and scopes for higher education.

Course Outline

Module I (7 Hrs)

Basic Components of the Immune System, Immunological Techniques, Immune Regulation, Immunological Aspects of Infection, Immunological Aspects of Immunodeficiency Diseases.

Module II (8 hrs)

Autoimmunity, Blood related disorder, Chronic Lymphocytic Leukemia, Immunology of HIV Infections and other viral infection, Immunological Aspects of Allergy and Anaphylaxis, Immunological Aspects of Skin and venereal Diseases.

Module III (10 hrs)

Experimental Approaches to the Study of Autoimmune Rheumatoid Arthritis Diseases, Immunological Aspects of Cardiac Disease, Immunological Aspects of Chest Diseases Pulmonary Tuberculosis

(MDRT), and XDRT, Immunological Aspects of Gastrointestinal and Liver in case of Hepatitis, Immunological Aspects of Endocrine Disease (Thyroid, diabetes, hypertension), Immunological aspects of organ transplantation.

Suggested Readings:

1. Text book of Microbiology by Ananthanereyan&Paniker, Publisher Universitiespress
2. Short text book of Medical microbiology by Satish Gupte, Publisher Jaypeebrotthers
3. Medical laboratory Technology vol.I ,II, III by K L Mukherjee, Publisher McGraw Hill education
4. Medical Laboratory manual for tropical countries Vol II Microbiology by MoniaCheesbrough, publisher Butterworth Heinemannltd
5. Immunology by Ivan Roitt, JonathaanBrostoff and DavidMale.

DC-10- CUTM1748- Parasitology

Subject Name	Code	Type of course	T-P-Pj	Prerequisite
Parasitology	CUTM1748	Theory+Practice	3-2-0	Fundamental Science

Objective

- Describe basic morphology, life cycle, pathogenesis, lab diagnosis and treatment of parasites (Protozoa, metazoa and Helminth)
- Perform appropriate laboratory techniques used in the processing of specimens and identification of parasites.

Course Outcome

- Identification of pathogenic parasite in disease diagnosis and treatment.
- The conceptual understanding of the subject provides opportunities for employability and scopes for higher education.
- To serve as a resource for the clinical laboratories professionals in the different region.

Course Outline

Module-I

Introduction to Medical Parasitology, General characteristics and classification of protozoa and helminthes. Collection, Transport, processing and preservation of samples for routine parasitological investigations.

Practice: Method of sample Collection, Transport, processing and preservation of samples for routine parasitological investigations.

Module II

Morphology, life cycle and lab diagnosis of *Giardia* and *Entamoeba*, *T.solium*, *T.saginata*, malaria parasite with special reference to *P. vivax* and *P. falciparum* and *Leishmania donovani* (Kala azar). Morphology, life cycle and lab diagnosis of hook worm and round worm (*Ascaris lumbricoides* and *Anchylostoma duodenale*).Most common symptoms of parasitic infection and diagnosis and treatment methods. Procedures used in microscopic examination of stool from a parasitic infected individual.

Practice: Routine Stool examination for detection of intestinal parasites. Concentration techniques for demonstration of Ova (Principles and applications). Identification of adult worms from model's or slide's method.

Module III

Laboratory Diagnosis of Various Parasites: Direct method, Indirect method. Rapid Diagnostic Tests (RDTs), Quantitative buffy coat assay (QBC), Malaria Rapid diagnostic test (MRDT), Leishmanin test.

Practice: Demonstration of some rapid diagnostic method used for parasite identification.

Suggested Readings:

1. Textbook of medical Parasitology. (e-book link-<https://www.pdfdrive.com/textbook-of-medical-parasitology-textbook-of-medical-parasitology-e128716897.html>)
2. Parasitology book by K.D. Chatterjee. (e-book link-<https://sites.google.com/site/bkthtrpazg/atahrgiwu>, <https://www.goodreads.com/book/show/24366965-parasitology-protozoology-and-helminthology-with-two-hundred-fourteen>)

DC-11- CUTM1742- Basic Computer and Information Science

Subject Name	Code	Type of course	T-P-Pj	Prerequisite
Basic Computer and Information Science	CUTM1742	Practice	0-2-0	Fundamentals of Computer

Objective

- Identify the function of computer hardware components.
- Identify the factors that go into an individual or organizational decision on how to purchase computer equipment.
- Identify how to maintain computer equipment and solve common problems relating to computer hardware.
- Identify how software and hardware work together to perform computing tasks and how software is developed and upgraded
- Identify different types of software, general concepts relating to software categories, and the tasks to which each type of software is most suited or not suited.

Course Outcome

- Understand the fundamental hardware components that make up a computer's hardware and the role of each of these components.
- Understand the difference between an operating system and an application program, and what each is used for in a computer.
- Describe some examples of computers and state the effect that the use of computer technology has had on some common products

Course Outline

Module- I

Introduction to computer: introduction, characteristics of computer, block diagram of computer, generations of computer. Types of Input output devices. Processor and memory: The Central Processing Unit (CPU), main memory. Storage Devices.

Module- II

Introduction to MS-Word: introduction, components of a word window, creating, opening and inserting files, editing a document file, page setting and formatting the text, saving the document, spell checking, printing the document file, creating and editing of table, mail merge. Introduction to Excel: introduction, about worksheet, entering information, saving workbooks and formatting, printing the worksheet, creating graphs. Introduction to power-point: introduction, creating and manipulating presentation, views, formatting and enhancing text, slide with graphs.

Module- III

Introduction to MS-DOS: History of DOS, features of MS-DOS, MS-DOS Commands (internal and external). Introduction of windows: History, features, desktop, taskbar, icons on the desktop, operation with folder, creating shortcuts, operation with windows (opening, closing, moving, resizing, minimizing and maximizing, etc.). Computer networks: introduction, types of network (LAN, MAN, WAN, Internet, Intranet), network topologies (star, ring, bus, mesh, tree, hybrid). Internet and its Applications: definition, brief history, basic services (E-Mail, File Transfer Protocol, telnet, the World Wide Web (WWW)), www browsers, use of the internet.

Suggested readings:

1. Objective Computer Awareness
2. Computer Networking (Global Edition)

DC-12 - CUTM1725- Blood Banking

Subject Name	Code	Type of course	T-P-Pj	Prerequisite
Blood Banking	CUTM1725	Theory+ Project	3-0-1	Fundamental Science

Objective

- Understanding blood bank method, demonstrate knowledge of testing
- Knowledge of Anticoagulant used in blood bank
- Get knowledge about blood regulation policy
- Understanding solid organ transplantation and it's policy
- Basic of transfusion reaction

- Investigation related to blood bank

Course Outcome

- Perform phlebotomy and related donor room activity in blood bank
- Manage the blood bank
- Identifies and communicate abnormal test report by alerting supervisory personal
- Organize blood donation blood bank
- Inventory and stock management in blood bank
- Perform and maintain record of QC procedure related reagents, kits and equipments.

Course Outline

Module-I (11 Hrs)

Basic principle in blood banking, Blood bank organisation, Planning and documentation, NACO Blood bank policy, National blood policy, Equipment used in blood bank. Anticoagulant use in blood bank, Selection of blood donor, Rhesus blood group system, Human blood group system

Practice: Documentation, ABO Grouping, RH Typing, Operation of equipment.

Module-II (14 Hrs)

Auto-mentation technique used in blood bank, Techniques used for the separation of blood constituent, CBC, Blood preservation, Special investigation for processing of blood under the guide lines of NACO, Routine investigation for processing of blood, Phlebotomy in blood bank, Quality control in blood bank

Practice: Phlebotomy in blood bank, Cross matching and compatibility test, Measurement of Blood Pressure, Arrangement of blood bank lab

Module-III (20 Hrs)

Blood transfusion alternative, Prevention of diseases transmitted through blood transfusion, Transfusion reaction investigation, Transfusion reaction, Precaution taken for infusion of blood components, Pre-transfusion testing, Transfusion in solid organ transplantation, Exchange blood transfusion, Pre-surgical

blood transfusion, Blood and blood components transfusion, Selection of blood components, Apheresis and Hemapheresis

Practice: Routine hematological test, HIV, VDRL, Hbs-Ag, Other STD Test.

Suggested Readings:

1. Textbook of Clinical laboratory methods and diagnosis by Gradwohls, Publisher Mosby
2. Modern Blood Banking and transfusion Practice by Denise M Harming
3. Standards of blood bank by NACO (<http://naco.gov.in/sites/default/files/Standards%20for%20Blood%20Banks%20and%20Blood%20Transfusion%20Services.pdf>)
4. Handbook of blood banking and transfusion medicine (<http://www.uomisan.edu.iq/library/admin/book/77040715888.pdf>)
5. Medical laboratory technology Vol.1 by K. L. Mukherjee, 2007, Publisher Tata McGrawHill
6. Textbook of medical laboratory technology by Praful B Godkar, Publisher Bhalan
7. Medical laboratory science theory and practice by J Ochei and Kolhatkar, 2002, Tata McGraw- Hill, Publisher TBS

DC-13- CUTM1751- Medical Laboratory Management

Subject Name	Code	Type of course	T-P-Pj	Prerequisite
Medical Laboratory Management	CUTM1751	Theory+ Project	3-0-2	Fundamental Science

Objective

- Explain and apply principle of effective test utilization
- Interpret, implement and complying law, regulation, accrediting standards and guidelines of Govt. and NG organizations.
- Design, implement and evaluate resources in lab
- Communicate effectively with laboratory personnel and health care professional.
- Explain and apply the major principle and tactics of laboratory administration.

Course Outcome

- Become professional competent in medical laboratory
- Exhibit a sense of commitment to the ethical and human aspect of patient care
- Recognize the role of clinical laboratory scientist in the assurance of quality health care
- Application of safety and governmental regulation and standards as applied to medical laboratory practice.

Course Outline

Module-I (16 Hrs)

Ethics of pathological clinics, Code of conduct for medical laboratory personal, Safety measure in the laboratory, Organization of Pathology laboratory under board of quality control, Clinical laboratory science, Functional components of the clinical laboratory, A Standardized clinical laboratory set up, Various types of laboratories, PPE in labs, Important instruction to minimize infection in laboratory workers

Practice: PPE Practice, Lab Setup, Sample collection and preservation.

Module-2 (16 Hrs)

Release of laboratory reports, Clinical alerts , Reporting results: Basic format of pathology reports, Transportation and preservation of lab sample, Patient management for clinical sample collection, National and international agency for clinical laboratory accreditation, Good laboratory practice, Medical legal problems, Laboratory regulation, Factors affecting productivity of laboratory, Responsibility of lab worker

Practice: Report writing, Lab record management

Module-3 (14 Hrs)

Quality management system, NABL Policy, Clinical establishment act policy, Annual maintenance contract for laboratory, General safety precautions in case of STD and drug resistant tuberculosis, Procurement and supply management, Different types of laboratory record management, Laboratory information management system (LIMS), Profit and loss analysis, WHO Policy for medical lab

Practice: Management information system, Procurement management, Profit and loss analysis

Suggested Readings:

1. Textbook of Clinical laboratory methods and diagnosis by Gradwohls, Publisher Mosby
2. Medical laboratory technology Vol.1 by K. L. Mukherjee, 2007, Publisher Tata McGrawHill
3. Textbook of medical laboratory technology by Praful B Godkar, Publisher Bhalan
4. Medical laboratory science theory and practice by J Ochei and Kolhatkar, 2002, Tata McGraw- Hill, Publisher TBS

DC-14 - CUTM1753- Introduction to Quality and Patient Safety

Subject Name	Code	Type of course	T-P-Pj	Prerequisite
Introduction to Quality and Patient Safety	CUTM1753	Theory+ Project	3-0-2	Fundamental Science

Objective

- Knowing patient safety
- Report Distribution system
- Laboratory infection control Policy
- Bio-Medical waste management
- Understanding Patient rights
- ISO Policy for medical laboratory

Course Outcome

- Know about rights and duties of patient
- Know about right and duties of lab technician
- Understand various policy to manage lab
- Understand infection control procedure

Course Outline

Module-I (11 Hrs)

Human factor Engineering, Patient safety, Health literacy, Report distribution system,

Error in reporting system, responding to adverse events, Investigation of error/ Root cause analysis, Medical Error, The science of safety

Practice: Safety precaution in laboratory, Report distribution, Prescription reading

Module-II (11 Hrs)

Team work and communication, Leadership, Quality control policy, Major development and evaluation in diagnostic division, Clinical establishment act policy, National accreditation board of laboratory, ISO Policy for medical laboratory, Fire and safety policy for medical laboratory

Practice: Fire Safety in lab, Documentation for Lab establishment

Module-III (13 Hrs)

Personal protective equipment in the laboratory, AIDS and laboratory safety, Safety protection in lab in STD and other infectious disease., Biomedical waste management, Patient care in medical laboratory, Patient rights., Counselling of patient during phlebotomy, First aid in medical laboratory service.

Practice: PPE, Bio-Medical waste management, First-Aid, Patient Counseling

Suggested Readings:

1. Understanding the patient safety (LANGE clinical medicine)
2. Textbook of Clinical laboratory methods and diagnosis by Gradwohls, Publisher Mosby
3. Medical laboratory technology Vol.1 by K. L. Mukherjee, 2007, Publisher Tata McGrawHill
4. Textbook of medical laboratory technology by Praful B Godkar, Publisher Bhalan
5. Medical laboratory science theory and practice by J Ochei and Kolhatkar, 2002, Tata McGraw- Hill, Publisher TBS

DC-15 - CUTM1752- Mycology & Virology

Subject Name	Code	Type of course	T-P-Pj	Prerequisite
Mycology and virology	CUTM1752	Theory+ Practice	3-2-0	General biology

Objective

- To describe the characteristics and diseases caused by pathogenic viruses and fungi.
- To perform basic laboratory techniques in mycology, to isolate fungus from clinical samples.
- Understanding different methods of virus cultivation.
- Understanding collection, transportation and preservation methods of clinical specimen.

Course Outcome

- Broad idea about structure and basic characteristics of virus and fungus.
- Plan, write and implement research projects in virology and mycology analyze their results and publish these in peer-reviewed journals.
- Coordinate with concerned agencies regarding viral and fungal diseases and their outbreaks.
- Plan and execute epidemiological studies and provide advice in relation to viral diseases.

Course outline

Module I

Introduction to medical mycology, Basic concepts about superficial and deep Mycoses. Taxonomy and classification and general characteristics of various medically important fungi. Normal fungal flora. Morphological, cultural characteristics of common fungal laboratory contaminants, Culture media used in mycology and staining process.

Practice-: To prepare culture media used routinely in mycology. To perform all the staining techniques for identification of fungi as mentioned in theory syllabus.

Module II

Direct microscopy in Medical mycology laboratory. Processing of clinical samples for diagnosis of fungal infections i.e. Skin, nail, hair, pus, sputum, CSF and other body fluids. Techniques used for isolation and identification of medical important fungi Methods for identification of yeasts and moulds.

Practice-: To identify given yeast culture (By performing various identification techniques studied in theory). To identify given mould culture (By performing various identification techniques studied in theory). To demonstrate dimorphism in fungi. To process clinical samples for laboratory diagnosis of fungal infection that is from skin, hair and nail etc.

Module III

Introduction to medical virology, Classification of viruses. Introduction to medically important viruses (Both DNA and RNA). Collection, transportation and storage of sample for viral diagnosis .Staining techniques used in Virology. Processing of samples for viral diagnosis (Egg inoculation and tissue culture). Antiviral drugs.

Practice: Demonstration of fertilized hen egg. Demonstration of various inoculation routes in fertilized hen egg.

Suggested Readings:

1. Bailey & Scott's Diagnostic Microbiology (**e-book-<https://www.pdfdrive.com/bailey-scotts-diagnostic-microbiology-e187863782.html>**)
2. Basic virology by Edward K. Wagner. (*e-book -<https://www.pdfdrive.com/basic-virology-e18900518.html>*)
3. Essential in clinical microbiology by C A Kauffman and J D Sobel, 2nd Ed. (*Ebook-link-<https://www.pdfdrive.com/essentials-of-clinical-mycology-second-edition-e39564930.html>*)

DC-8- CUTM1754- Mini Project

Subject Name	Code	Type of course	T-P-Pj	Prerequisite
Mini Project	CUTM1754	Project	0-0-2	Basic Medical science

The student is supposed to carry out project work in assistance with a mentor. The project should be relevant to the syllabus and should be qualitatively initiated towards fetching a research publication/ case study/ clinical study/ community service/ survey on successful completion within the stipulated time.

Outcome: Research paper publication/ new idea generation/ case study/ clinical study/ community service/ survey.

DC-18- CUTM1756 - Project

Subject Name	Code	Type of course	T-P-Pj	Prerequisite
Project	CUTM1756	Project	0-0-12	Basic Medical science

Project work:

Suggested Project title

1. Antibacterial activity of sweet orange (citrus sinensis) on Staphylococcus aureus and Escherchia coli isolated from wound infected.
2. The incidence of Salmonella and Escherchia coli in livestock (Poultry) feeds
3. Microbial evaluation of milk from a dairy farm.
4. Gastroenteritis in primary school children (6-12yr) of specific locality.
5. Comparative analysis of microbial load of the main water production and water available to CUTM campus

DC-17- CUTM1755 - Internship

Subject Name	Code	Type of course	T-P-Pj	Prerequisite
Internship	CUTM1755	Project	0-0-12	Basic Medical science

Internship Thesis Guideline

This Guideline is designed to provide students the knowledge and practice of public health research activity, to enable them to carry out researches and solve research related problems and to help them in writing thesis and defend their work. Upon successful completion of the course, the students shall be able to:

1. Search relevant scientific literature
2. Develop a research proposal
3. Employ appropriate data collection techniques and tools
4. Manage collected data
5. Analyze data with appropriate statistical techniques
6. Write thesis
7. Defend the findings

Proposal Development:

At the ending of third year (Sixth Semester), students individually consultation with designated faculties and extensive literature survey will develop research proposal during the initial 6 months period.

Data Collection/ Thesis Writing:

Students will carry out data collection, data management, data analysis, and thesis writing during the remaining period (Six Semester).

The Dissertation should have following format:

1. Title
2. Introduction
3. Materials and Methods
4. Results
5. Discussion
6. Conclusion
7. Recommendation
8. References
9. Appendix

Internship

4. Case record
5. Lab management and ethics
6. Evaluation -Guide(internal)
 - Industries guide(external)
 - University-project report/ Viva

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Shaping Lives...
Empowering Communities...

MASTEROFSCIENCEINAPPLIED&CLINICALMICROBIOLOGY

2020

SYLLABUS

M.Sc.inAppliedandClinicalMicrobiology

Preface: Medical microbiology is the branch of medical science concerned with the prevention, diagnosis and treatment of infectious diseases. In addition, this field of science studies various clinical applications of microbes for the improvement of health. There are four kinds of microorganisms that cause infectious disease: bacteria, fungi, parasites and viruses and one type of infectious protein called Prion.

A medical microbiologist studies the characteristics of pathogens, their modes of transmission, mechanism of infection and growth. Using this information, a treatment can be revised.

Medical microbiologist often serves as a consultant to a physician, providing identification of a pathogen and suggesting treatment options.

Scope: M. Sc in Applied and Clinical Microbiology gives opportunity for specialized study in the field of medical & clinical microbiology. Candidates who successfully complete M. Sc in Applied and Clinical Microbiology course may obtain jobs as

- Specialized technologist in Microbiology or supervisor of clinical laboratories in hospitals.
- Laboratory scientist in Biomedical and research institutes.
- Teachers in training institutes of Medical Laboratory Technology/graduate & postgraduate programme of microbiology & related areas.
- Utilize or apply the concepts, theories and principles of laboratory science.
- Demonstrate the ability to plan and effect the change in laboratory practice and health care delivery system.
- Establish collaborative relationship with members of other disciplines.
- Demonstrate interest in continued learning and research for personal and professional advancement.
- Be able to interpret or guide the development of medical diagnostics in need locally and cheaply
- Be able to manage and guide appropriately equipped and staffed clinical microbiology laboratories
- Be a highly skilled human resource for the emerging pharmaceutical/medical industry
- Be able to participate in supervised or team-research in universities, industry or government
- Demonstrate advanced knowledge in the fields of Clinical Microbiology and Immunology, with excellent skills to teach and communicate this knowledge
- Demonstrate independent critical and analytical thinking, both within their field of study, and beyond, for the use of their knowledge for service to others.
- Be able to guide patient care and the public on the pathology, pathogenesis and clinical manifestation, mode of transmission, prevention and current control methods for infections of public health importance
- Be a highly skilled human resource in the management of an increasing number of patients with tissue/Organ transplants, Cancers and immunodeficiencies

- Be able to critique and evaluate the impact of the existing national disease control programs on the epidemiology of infectious diseases and advise on improving them
- Have acquired critical and analytical skills required for further studies in specialized areas of microbiology or related studies
- Identify and suggest possible solutions to ethical dilemmas that occur in their work and field of study, and understand the importance of professional ethics in all aspects of scientific communication and laboratory work
- Demonstrate competence in the laboratory, including application of the scientific method and appropriate use of basic and state-of-the-art laboratory tools and techniques
- Demonstrate written and oral skills necessary for communication of research, knowledge, and ideas to scientists and non-scientists alike

Programme: M.Sc. in Applied and Clinical Microbiology

Duration: Two years (Four semesters) full-time programme with 6 months internship in the last semester.

Eligibility: Bachelor's degree in any branch of Life Science / Agriculture / Pharmacy / Veterinary / Medicine (MBBS/BDS).

Examination: Examination rules will be as per guideline of CUTME Examination handbook.

Mini Project: A candidate will have to carry out a mini project work as mentioned in the course structure. After completion of the mini project, the student has to submit the dissertation of the mini project. Internal evaluation of the same (consisting of presentation and viva-voce) will be conducted by the respective School.

Internship: A candidate will have to undergo internship for a period of six calendar months in a hospital / Diagnostics Centre / Research Institution equipped with modern laboratory facility, which fulfills the norms decided by the University. Dissertation will be compulsory to all students. Students will carry out dissertation work individually or in the group of not more than three students. The format for dissertation / Internship report will be similar to the research thesis style; incorporating chapters on: Introduction, Materials and Methods, Results and Discussion and References / Bibliography. The dissertation will be submitted in a typed written and bound form.

Degree: The degree of M. Sc. in Applied and Clinical Microbiology course of the University shall be conferred on the candidates who have pursued the prescribed course of study for not less than two academic years and have passed examinations as prescribed under the relevant scheme and completed 6 months of compulsory internship in the last semester.

On successful completion of two years programme, with a minimum course credit of **96 credits**, the candidate will be awarded with “**Master of Science in Applied and clinical microbiology (M.Sc.CMB)**” from Centurion University.

**Master of Science in Applied and Clinical Microbiology
Programme structure**

BASKET 1	BASKET 2	BASKET 3	BASKET 4	TOTAL CREDITS
School Core Courses	Discipline Core Courses	Ability Enhancement Compulsory Course (AECC) To be selected from University Basket	Skill Courses (To be selected from University Basket)	
SC-1	DC-1	AECC-I	SFS-1	
SC-2	DC-2	AECC-II	SFS-2	
SC-3	DC-3		SFS-3	
SC-4	DC-4			
SC-5	DC-5			
SC-6	DC-6			
SC-7	DC-7			
SC-8	DC-8			
	DC-9			
	DC-10			
28 Credits	50 Credits	6 Credits	12 Credits	96 Credits (Minimum Credits required)

Master of Science in Applied and Clinical Microbiology

Programme structure

SEMESTER	BASKET1	BASKET2	BASKET3	BASKET4
	School Core Courses	Discipline Core Courses	Ability Enhancement Compulsory Course (AECC) To be selected from University Basket	Skill Courses (To be selected from University Basket)
I	SC-1 SC-2 SC-3 SC-4	DC-1		SFS-1

II	SC- 5SC- 6SC- 7	DC- 2DC- 3DC- 4	AECC- IAECC- II	SFS-2
III	SC-8	DC- 5DC- 6 DC-7 DC-8	AECC-III	SFS-3
IV		DC- 9DC- 10		
Minimum Credits required (96 Credits)	28 Credits	50 Credits	6 Credits	12 Credits

BASKET I
School Core Courses

Sl.No.	CODE	SUBJECT	SUBJECT TYPE (T+P+Pj)	CREDITS
SC-1	CUTM1708	Human Anatomy and Physiology	2+1+0	3
SC-2	CUTM1709	Analytical Techniques	3+1+0	4
SC-3	CUTM1710	Biological Chemistry	2+1+0	3
SC-4	CUTM1712	Clinical Hematology	3+1+0	4
SC-5	CUTM1715	Clinical Pathology	3+1+0	4
SC-6	CUTM1714	Cell and Molecular Biology	2+0+1	3
SC-7	CUTM1718	Clinical Biochemistry	2+1+0	3
SC-8	CUTM1720	Histology	3+1+0	4

BASKET II
Discipline Core Courses

Sl.No.	CODE	SUBJECT	SUBJECT TYPE (T+P+Pj)	CREDITS
DC-1	CUTM1711	General Microbiology	3+1+0	4
DC-2	CUTM1713	Systematic Bacteriology	3+1+0	4
DC-3	CUTM1717	Applied Microbiology	2+1+0	3
DC-4	CUTM1716	Medical Parasitology and Mycology	3+2+0	5
DC-5	CUTM1719	Immunology & Virology	3+2+0	5
DC-6	CUTM1722	Clinical Bacteriology	3+1+0	4
DC-7	CUTM1721	Research Methodology	2+0+1	3
DC-8	CUTM1754	Mini Project	0+0+2	2
DC-9	CUTM1755	Internship		12
DC-10	CUTM1756	Project		12

NOTE: Along with the School core and Discipline core subjects, the students need to opt for AECC Courses, Skill/ Domain/ Elective courses and value-added courses from the University Basket, as per the requirement by the University.

BASKETI
School Core Courses
SC1-CUTM1708-Human Anatomy and Physiology

Subject Name	Code	Type of course	T-P-Pj	Prerequisite
Human Anatomy and Physiology	CUTM1708	Theory+Practice	2-1-0	Fundamental Science

Objective

- To identify different types of cells and describe their functions.
- To identify the organelles of a typical cell and describe their functions.
- To identify the major components of the integumentary system and describe their functions.
- To identify the major structures of the skin and describe their functions.
- To identify the major components of the skeletal system and describe their functions.
- To identify the major components of the circulatory, endocrine, nervous system etc and describe their functions.

Course Outcome

- Use anatomical terminology to identify and describe locations of major organs of each system covered.
- Explain interrelationships among molecular, cellular, tissue, and organ functions in each system.
- Describe the interdependency and interactions of the systems.
- Explain contributions of organs and systems to the maintenance of homeostasis.
- Identify causes and effects of homeostatic imbalances.
- Describe modern technology and tools used to study anatomy and physiology.

Course Outline

Module-I (10 Hours)

Scope of Anatomy and physiology. Terms and terminology used in Anatomy. Structure of cell, function of its components with special reference to mitochondria and microsomes.

Elementary tissues: Anatomy of epithelial tissue, muscular tissue, connective tissue and nervous tissue.

Skeletal System: Skeleton system with classification, types of bone, features of long bone, ossification, blood supply, Joints – classification with examples, structure of typical synovial joints, Joint disorders.

Practice: Demonstration of individual bone from skeleton.

Identification of different organs and system from chart.

Module-II(13Hours)

Cardiovascular System: Composition and functions of blood. Blood groups – ABO system and Rh factor and coagulation of blood. Brief information regarding disorders of blood. Lymph – origin, circulation, functions of lymph and lymph nodes. Structure and functions of various parts of the heart. Blood pressure and its recording. Brief information about cardiovascular disorders.

Respiratory system: Introduction and functional anatomy of respiratory tract, physiology of respiration.

Practice: Demonstration of the morphology of different blood cells

Measurement of Blood pressure, impulses, Heartbeats, respiration rate etc.

Module-III(15Hours)

Urinary System: Various parts of urinary system and their functions, structure and function of kidney. Physiology of urine formation. Patho-physiology of renal diseases and edema.

Digestive System: Anatomy of digestive system and their functions. Structure and function of liver, physiology of digestion and absorption.

Endocrine System: Endocrine glands and Hormones. Reproductive system. Structure and function of sense organs.

Practice: Demonstration of various parts of body, tissues of body, parts of

digestive system, parts of respiratory system, parts of excretory system. Identification of different organs and system from chart

Suggested Readings:

1. Textbook Anatomy & Physiology for nurses by Evelyn Pearce, Publisher Faber & Faber.
2. Textbook Anatomy and Physiology for nurses by Sears, Publisher Edward Arnold.
3. Anatomy & Physiology- by Ross and Wilson, Publisher Elsevier.
4. Anatomy & Physiology: Understanding the human body by Clark, Publisher Jones & Bartlett.
5. Anatomy and Physiology for nurses by Pearson, Publisher Marieb & Hoehn.
6. Anatomy and Physiology by N Murgesh, Publisher Satya

SC2-CUTM1709- Analytical Techniques

Subject Name	Code	Type of course	T-P-Pj	Prerequisite
Analytical Techniques	CUTM1709	Theory+Practice	3-1-0	Fundamental Science

Objective

To learn the principle, instrumentation & application of Microscopy
Principle, instrumentation & application of Centrifugation
Chromatographic techniques
Electrophoretic techniques
Principle of Spectroscopy

Course Outcome

After completion of the course the student will be efficient in handling the microscopy equipment's.

They will also be able to have an idea about handling instruments like centrifuge, spectrophotometer, chromatography, flow cytometer, Automated and semi-automated Biochemistry analyzer.

They will gain knowledge on the principle behind and the application of NMR, X-ray diffraction, ESR.

The conceptual understanding of the subject provides opportunities for skill enhancement and scopes for higher education.

Course Outline

Module-I

Microscopic techniques: Principle, Instrumentation, Specimen preparation and Application: Phase-contrast microscopy, fluorescence microscopy, polarization microscopy, electron microscopy (Scanning and Transmission);

Bacterial Colony Counter (Principle and working).

Microtomy: Sectioning, Staining. Application.

Cytometry: Types, Flow cytometry and its applications.

Practice: Demonstration of different Microscopes with their operation.
Preparation of specimens for observing under microscopes.
Demonstration of Microtome.

Module-II

Centrifugation: Principle, Preparative, Analytical, Density gradient centrifugation.

Chromatography: Principles and Applications: Paper, Thin layer, Column, Ion exchange, Affinity chromatography, Gel filtration, Gas Chromatography, HPLC, FPLC.

Electrophoresis: Immunoelectrophoresis, Isoelectric focusing, 2-D gel electrophoresis.

Practice: Demonstration of Centrifuge

Demonstration of Chromatography techniques
Demonstration of Electrophoresis

Module-III

Colorimeter: Principle and Instrumentation; **Spectrophotometry:** Ultraviolet, Mass spectrophotometry; Flame photometry;

Principle, Instrumentation, Specimen preparation and Application of: X-ray diffraction, NMR, EPR. Principle and Application of: Fully Automated Biochemistry Analyser, Semi-automated Biochemistry Analyser, Coagulometer.

Practice: Demonstration of Semi automated Analyzer
Demonstration of Fully automated Analyzer

Suggested Readings:

1. Wilson K and Walker J. (2010). Principles and Techniques of Biochemistry and Molecular Biology. 7th Ed., Cambridge University Press.
(e-Book link: <https://www.pdfdrive.com/principles-and-techniques-of-biochemistry-and-molecular-biology-e174866056.html>)
2. Nelson D L and Cox M M. (2008). Lehninger Principles of Biochemistry, 5th Ed., W. H. Freeman and Company.
(e-Book link: <https://www.pdfdrive.com/lehninger-principles-of-biochemistry-5th-edition-d164892141.html>)

3. WilleyMJ, SherwoodLM&WoolvertonCJ.(2013).Prescott,HarleyandKlein's

Microbiology. 7th Ed., McGraw Hill.

(e-Book link: <https://www.pdfdrive.com/prescott-harley-and-kleins-microbiology-7th-ed-e188166539.html>)

4. LabsforLife (e-sourcelink: <http://labsforlife.in/InstructionalVideo.aspx>)

SC3- CUTM1710-Biological Chemistry

Subject Name	Code	Type of course	T-P-Pj	Prerequisite
Biological Chemistry	CUTM1710	Theory+Practice+ Project	2-1-0	General chemistry & Biology

Objective

Work to promote good health by teaching the public and other health professionals about diet and nutrition.

To demonstrate clinical disorders, the biochemical consequences of particular disease processes and the response to therapy.

To describe the various intracellular controls that govern the rate at which the metabolic pathway functions.

To explain the ways in which hormones work in human body and alter cellular activity by binding to intracellular receptors.

Course Outcome

Students will be able to demonstrate an understanding of fundamental biochemical principles, such as the structure/function of metabolic pathways, and the regulation of biological/biochemical processes.

Able to apply and effectively communicate scientific reasoning and data analysis in both written and oral forums.

Demonstrate a thorough knowledge of the intersection between the disciplines of Biology and Chemistry.

Appreciate the way in which practitioners in the disciplines of Biology and Chemistry intersect and bring their expertise to bear in solving complex problems involving living systems.

Course Outline

Module I

Chemical aspects of Food, Nutrition and Vitamins: Energy yielding nutrients and Calorific value of carbohydrates, fats and proteins. Basal metabolic rate (BMR) and Body Mass Index (BMI). The Food Pyramid. History, Chemistry, Absorption, transport, and storage of Vitamins, Metabolic functions and Biochemical manifestations of Water soluble Vitamins-B-Complex Vitamins : Vitamin –B1, Vitamin –B2, Vitamin-B3, Vitamin –B6, Biotin, Panthothenic acid, Folic acid, Vitamin-B12. Coenzymes of B-Complex Vitamins. Fat soluble Vitamins: Vitamin-A, Vitamin-D, Vitamin-E, Vitamin-K.

Practice: Calculation of BMR and BMI.

Module II

Cellular Respiration: Aerobic and anaerobic respiration; Energy yield and regulation. Oxidation of fatty acid, Transamination and Deamination reaction, Urea formation and transport, Ketogenesis.

Practice: Solutions: Definition, use, classification, preparation and storage. Stock and working solutions. Molar and Normal solutions of compounds and acids. (NaCl, NaOH, HCl, H₂SO₄)

Module III

Biochemical aspect of Hormone: Hormone receptors and intracellular messengers, Adenylate cyclase, protein kinase and phosphodiesterase. Role of Insulin, glucagon's, epinephrine and their mechanism of action.

Practice: Diabetes and other disorder identification.

Suggested Readings:

1. Lehninger Principles of Biochemistry (<https://www.pdfdrive.com/lehninger-principles-of-biochemistry-5th-edition-e164892141.html>)
2. Fundamentals of Biochemistry: Life at the Molecular Level (<https://www.pdfdrive.com/fundamentals-of-biochemistry-life-at-the-molecular-level-e186753533.html>)

SC4-CUTM1712-ClinicalHematology

Subject Name	Code	Typeofcourse	T-P-Pj	Prerequisite
ClinicalHematology	CUTM1712	Theory+Practice	3-1-0	BasicMedicalscience

Objective

The Clinical Hematology course will cover the diagnosis and management of blood cell disorders, anatomy and physiology of hematopoiesis, routine specialized hematology tests, analysis, classification, and monitoring of blood cell abnormalities.

Clinically relevant hematological analysis for deeper understanding evaluate normal and abnormal cell morphology with associated diseases and other blood components.

Be able to handle an investigation of hematological disorder and laboratory abnormalities such as anaemia, polycythemia, leukopenia, leukocytosis, thrombocytopenia, thrombocytosis, elevated ESR etc within hematology.

Course Outcome

- Differentiate various hematological procedures and the use of basic equipment essential to working in a Hematology Laboratory.
- Discuss differences between Quality control, Quality Assurance, and Continuing Quality Improvement principles as used in the Hematology Laboratory.
- Categorize various hematology analyses, operational principles of various hematology instruments, and troubleshooting of various instruments.
- Explain the principles and theories utilized in a variety of problem-solving situations.
- Define testing suitability standards for Hematology specimens.
- To be able to carry out blood sampling & Evaluate specimen acceptability.

Course Outline

Module-I(16Hrs)

Scope & importance of Haematology, important equipment and chemicals, various test performed in Haematology laboratory. Identify and/or confirm the composition of various red blood cell inclusions. Function of normal cellular components, Formation of blood, Erythropoiesis, thrombopoiesis. Anti coagulants, definition, Uses, Different types, mode of action, their merits and demerits. Morphology of normal blood cells, abnormal morphology & diseases, Hematological Disorder

Practice: Demonstration of instruments used in hematology -

Microscope, Blood Cell counter. Demonstration of different blood cell, their synthesis from slide presentation or chart. Demonstration the normal and abnormal morphology of different blood cells.

Module-II(18Hrs)

Collection and preservation of blood: different methods of collection (venous and capillary blood), preservation, changes in stored blood normal and absolute values in hematology, Preparation of peripheral blood film (PBF), To stain a peripheral blood Film by Leishman stain, Malaria thick smear preparation, Different types of stains, Romanowsky stains: principle of staining, Hemoglobin estimation (oxy Hb and cyanmethaemoglobin method), Complete Blood Cell Count: Total RBC count, Total WBC count, Platelet count, DLC value, HB, MCH, MCV, MCHC, Determination of ESR by wintrobe's, Determination of ESR by Westergren's method, Determination of PCV by Wintrobe's, Reticulocyte Count, Absolute Eosinophil Count, Morphology of Red Blood Cells.

Practice: Different methods of collection (venous and capillary blood), Preparation of DLC, TLC, TRBC etc. Estimation of ESR, Complete blood cell count, Blood grouping, Hb and values of MCH, MCV, MCHC, PCV, Staining & Smear preparation.

Module-III(14Hrs)

Hematological Disorders

1. Classification of Anemia: Morphological & etiological.
2. Iron Deficiency Anemia: Distribution of body Iron, Iron Absorption, causes of iron deficiency, lab findings. Megaloblastic Anemia: Causes, Lab findings.
3. Hemolytic Anemia: Definition, causes, classification & lab findings.

4. Laboratory diagnosis of Hemophilia and von-willbrand disease.
5. Laboratory diagnosis of Idiopathic thrombocytopenic purpura (ITP),
6. Platelet function tests and their interpretation.

Practice: Observation about different normal and abnormal morphology of RBCs, WBCs, Platelet, Bleeding Time & Clotting Time, PT & APTT.

Suggested Readings:

1. Textbook of Medical Laboratory Technology P.B Godkar Mumbai, Bhalani Publishing House
2. Textbook of Medical Laboratory Technology by Paraful B. Godkar, Publisher Bhalani
3. Textbook of Medical Laboratory Technology (2nd edition) by V.H Talib, Publisher CBS
4. Atlas of hematology (5th edition) by G.A. McDonald, Publisher Churchill Livingstone
5. Medical Laboratory Technology By K.L Mukharjee, Publisher McGraw Hill Education Pvt Limited
6. Textbook of Medical Laboratory Technology (6th edition) by Ramnik Sood, Jaypee Publication.
7. Ebook link - <https://www.pdfdrive.com/hematology-basic-principles-and-practice-e176384006.html>
8. Ebook link - <https://www.pdfdrive.com/hematology-basic-principles-and-practice-expert-consult-online-and-print-expert-consult-title-online-print-5th-edition-e186195241.html>
9. Ebook link - <https://books.google.co.in/books?id=6sfacydDNsUC&printsec=frontcover&dq=hematology&hl=en&sa=X&ved=2ahUKEwja9-ve3I7qAhUwzTgGHSMUDekQ6wEwAHoECAQQAQ#v=onepage&q=hematology&f=false>
10. Ebook link - <https://books.google.co.in/books?id=QQcYAAAAAYAAJ&printsec=frontcover&dq=hematology&hl=en&sa=X&ved=2ahUKEwja9-ve3I7qAhUwzTgGHSMUDekQ6wEwAhoECAIQQAQ#v=onepage&q=hematology&f=false>

SC5-CUTM1715-Clinical Pathology

Subject Name	Code	Type of course	T-P-Pj	Prerequisite
Clinical pathology	CUTM1715	Theory+Practice	3-1-0	Fundamental Science

Objective

Analyze body fluid for diagnosis of disease

Analyze waste product for diagnosis of disease

Understanding DOT Policy

Understand Physiological disorder and infectious disease

Analysis of pregnancy

Course Outcome

Able to collect pathological specimen
Able to detect diabetes, ketosis, nephritis, jaundice and other physiological disorders
Able to detect infectious disease (UTI, Hematuria, Filariasis, Dysentery, Ulcer, TB, etc)
Preservation and processing of pathological sample.
Identification of Parasites
Analysis of Infertility disorder

Course Outline

Module-I (16 Hrs)

Introduction of clinical pathology, Composition, collection and preservation of urine, Physical examination of Urine, Chemical Examination of Urine - Sugar and Ketone bodies, Diabetes and Ketosis, Nephritis and UTI, Albumin, Phosphate, Bile, Bile Salt and Bile pigment, Chemical Examination of Urine -

Multistix reagent strip, Jaundice, Microscopical Examination of Urine, Operation of Urine Analyzer, Pregnancy test, Report writing and report analysis of Urine

Practice: Operation of Urine analyzer, Benedict Test, Heat and Acid Test, Rothera's Test, Benzidine Test, Fouchet's Test

Lab:-

Urine Analysis: Collection and Physical Examination, Specific Gravity, Benedict's Qualitative test, Acetone Rothera's Test, Protein and Bile Test, Hay's Test and Fouchet's test, Benzidine test, Microscopical Examination, Pregnancy Test, Auto-mentation by Urine analyzer

Module-II (14 Hrs)

Respiratory Tract Infection: Gram Staining and ZN Staining, Basic of DOT Centre, Report writing and report analysis of sputum, Sputum for the diagnosis of Mycobacterium tuberculosis, Clinical significance and Report writing of Stool, Difference between Amoebic, Dysentery and Bacillary Dysentery, Microscopical Examination of Stool, Physical and Chemical examination of Stool, Composition, collection and preservation of stool

Practice: Microscopic finding of stool, Morphology of stool parasite

Lab:-

Stool Analysis: Collection and physical examination,

Chemical Examination, Occult test and reducing sugar, Microscopical Examination: Protozoa, Microscopical Examination: Helminthes

Sputum Analysis: Collection and physical examination, Tuberculosis (ZN Stain),

Respiratory infection (Gram Stain)

Module-III (15 Hrs)

Routine laboratory investigation of Pleural Fluid, Routine laboratory investigation of Pericardial Fluid, Routine laboratory investigation of Synovial Fluid, Synovial fluid: Collection and preservation, Examination of CSF related to Meningitis, Brain Tumour and other disorder, CSF: Composition, Collection, Preservation and physical examination, Report analysis and report writing of Semen, Semen examination for male infertility disorder, Semen: Composition, function, collection and physical examination

Practice: Gram stain, ZN Stain, General consideration on specimen collection

Lab:-

Semen Analysis: Collection and physical examination, Chemical Examination, Microscopical examination

CSF Analysis: Collection and Routine

Examination Synovial Fluid: Collection and Routine

examination Pleural Fluid: Collection and routine

examination Pericardial Fluid: Collection and routine

examination Bacteriological Examination of throat swab

Suggested Readings:

1. Textbook of Clinical laboratory methods and diagnosis by Gradwohl's, Publisher Mosby
2. Medical laboratory technology Vol. 1 by K. L. Mukherjee, 2007, Publisher Tata McGraw Hill
3. Textbook of medical laboratory technology by Praful B Godkar, Publisher Bhalan
4. Medical laboratory science theory and practice by J. Ochei and Kolhatkar, 2002, Tata McGraw-Hill, Publisher TBS

SC6-CUTM1714-Cell and Molecular Biology

Subject Name	Code	Type of course	T-P-Pj	Prerequisite
Cell and Molecular Biology	CUTM1714	Theory+Project	2-0-1	Fundamental Science

Objective

Understanding the central dogma of life
To understand the concept of gene regulation and its impact
The use of several molecular diagnostic techniques for disease interpretation

Course Outcome

After completion of the course the student will be gain knowledge of the significance of genes and proteins.
They will understand the mechanism of gene expression and protein synthesis,
The significance of gene expression regulation will become clear.
The students will understand the use of several molecular techniques in disease diagnosis.

Course Outline

Module-I

DNA structure. Salient features of double helix, Types of DNA. DNA topology - linking number, topoisomerases. Bidirectional and unidirectional replication, semi-conservative, semi-discontinuous replication.

Mechanism of DNA replication. Enzymes and proteins involved in DNA replication.

Module-II

RNA Structure. Transcription: Promoter, Polymerase and the transcription unit. **Transcription in Eukaryotes:** RNA polymerases, general Transcription factors. Split genes, concept of introns and exons, RNA splicing, spliceosome machinery, concept of alternative splicing, Polyadenylation and capping, Processing of rRNA, RNA interference: siRNA, miRNA and its significance.

Translational machinery: Charging of tRNA, aminoacyl tRNA synthetases. Mechanisms of initiation, elongation and termination of polypeptides in both prokaryotes and eukaryotes.

Malignant transformation of cells and role of oncogenes, Tumor virus, Proto- oncogenes, Tumorsuppressorgenes;Apoptosis,cellregeneration.

Module-III

Moleculardiagnosics: RecombinantDNA Technologyandits applications, Polymerasechainreaction andits application in diagnosis of pathogens, Site directed mutagenesis, DNA finger printing, DNaseFootPrinting, antisenseRNA technology, inheritedgeneticdisordersinmanandgenetherapy.

SuggestedReadings:

1. WatsonJD, Baker TA, BellSP, GannA, LevineMand LosickR(2008) MolecularBiologyoftheGene, 7thedition, Cold SpringHarbourLab.Press, PearsonPublication. (e-Booklink:<https://www.pdfdrive.com/molecular-biology-of-the-gene-e158278674.html>)
2. BruceAlberts, AlexanderJohnson, JulianLewis, DavidMorgan, MartinRaff, KeithRoberts, PeterWalter(2015)Molecular Biologyofthecell, 6thedition, TaylorandFrancisGroup. (e-Booklink:<https://www.pdfdrive.com/molecular-biology-of-the-cell-d184612905.html>)
3. Principles and Practice of Medicine- by Davidson, S. S., J. MacLeod and C.R.W. Edwards, 1991PublisherChurchillLivingstone. (e-Booklink: <https://www.pdfdrive.com/davidsons-principles-and-practice-of-medicine-d186204495.html>)
4. SambrookJandRussellDW.(2001).Molecular Cloning:ALaboratoryManual.4thEdition, ColdSpringHarbourLaboratorypress. (e-Book link:<https://www.pdfdrive.com/search?q=Sambrook+J+and+Russell+DW.+%282001%29.+Molecular+Cloning%3A+A+Laboratory+Manual.+4th+Edition&pagecount=&pubyear=&searchin=&more=true>)
5. GeoffreyM.Cooper, RobertE. Hausman(2007). TheCell, Amolecularapproach.4thASMPress, Washington,D.C. (e-Booklink:<https://www.pdfdrive.com/the-cell-a-molecular-approach-e186369576.html>)
6. B.PrimroseandR.M.Twyman(2006) PrinciplesofGeneManipulationandGenomics7th Edition.BlackwellPublishing. (e-Booklink: <https://www.pdfdrive.com/principles-of-gene-manipulation-and-genomics-e25845509.html>)

OnlineTutoriallinks:

1. DNADecoded(coursoralink:<https://www.coursera.org/learn/dna-decoded>)
2. DNAReplication(Lecturiolink:<https://app.lecturio.com/#/course/s/8020>)
3. Transcription(Lecturiolink:<https://app.lecturio.com/#/lecture/s/5990/35832>)

SC7-CUTM1718–ClinicalBiochemistry

Subject Name	Code	Type of course	T-P-Pj	Prerequisite
Clinical Biochemistry	CUTM1718	Theory+Practice	2-1-0	Basic Medical science

Objective

Understanding the concept of Biochemical analyzing instruments, chemicals and normal ranges of biochemical components in our body.

Clinically relevant biochemical analysis for deeper understanding of all biochemical components i.e., Proteins, Electrolytes, Hormones etc

Course Outcome

To learn about tests carried out for biochemical investigations.

Understanding of principle of biochemical Clinical biochemistry tests.

To learn normal ranges and abnormal ranges of biochemical components and hormones.

To study about diseases related to biochemical and hormone imbalance in human body.

Course

Outline Module-

I(10Hrs)

LFT, KFT, Lipid profile, Estimation of Glucose, Hormone test: T3, T4, TSH, Prolactin, 17 Kitosteroids

Practice: Demonstration the centrifuge machine, Demonstration of Colorimeter, Method of estimation and assessment for: a. Glucose tolerance test, Detection of sugar in Urine, Estimation of Protein in urine, Estimation of Liver function test, Kidney function test, Lipid profile, Thyroid

Module-II(10Hrs)

Metabolic disorders and Diagnostic enzymology: Disorders of metabolism: carbohydrate, Lipids, Amino acids and Nucleic acids. Diagnostic enzymes: Role of Enzymes in Clinical Practice: Marker enzymes in myocardium, liver and pancreas. Tumor markers, Radioisotope techniques

Module-III(14Hrs)

Organ function tests: Liver function tests, Bile pigment metabolism, tests for liver function. Jaundice and its type, Functions of Kidney, Urine formation and renal function tests disease of kidney, Renal Calculi: Theory of formation and analysis, Gastric Analysis, Composition of gastric juice, concepts of free and bound acid, Fractional Test Meal

Practice: Operation procedure of Centrifuge machine, colorimeter etc. Estimation of Liver function test, Kidney function test, Estimation of bile pigment, bile salt, bilirubin etc.

Suggested Readings

1. Textbook of Medical Laboratory Technology by P.B. Godker, Publisher Bhalani.
2. Textbook of Medical Biochemistry by Chatterjee & Shinde, Publisher JPB
3. Medical Laboratory Technology by Mukherjee
4. Principles of Biochemistry by Lehninger, Publisher Kalyani
5. Practical Clinical Biochemistry by Harold Varley, Publisher CBS.
6. Ebook link-
https://www.cartercenter.org/resources/pdfs/health/ephti/library/lecture_notes/health_sciences_students/medicalbiochemistry.pdf
7. Ebook link-
https://books.google.co.in/books?id=Je_pJfb2r0cC&printsec=frontcover&source=gbs_ge_summary_r&cad=0#v=onepage&q&f=false
8. Ebook link-
https://books.google.co.in/books?id=csPcDAAAQBAJ&printsec=frontcover&source=gbs_ge_summary_r&cad=0#v=onepage&q&f=false
9. Ebook link-
https://books.google.co.in/books?id=2FkXAwAAQBAJ&printsec=frontcover&source=gbs_ge_summary_r&cad=0#v=onepage&q&f=false

SC-8- CUTM1720-Histology

Subject Name	Code	Type of course	T-P-Pj	Prerequisite
Histology	CUTM1720	Theory+Practice	3-1-0	Basic Medical Science

Objective

Understanding the concept of histotechnology; Basic concepts about routine methods of examination of tissues Collection.

perform routine laboratory procedures encompassing all major areas of the histology laboratory.

accurately and proficiently embed tissue and understand the principles of microtomy.

Clinically relevant onchological analysis for deeper understanding of abnormal cell growth that anywhere in human body.

The conceptual understanding of the subject provides opportunities for employability and scopes for higher education.

Course Outcome

In this section students will be made aware of terminology used in histotechnology, various instruments and their maintenance and also learn the processing of various samples for histopathological investigations.

Reception and labeling of histological specimens.

Use of antiseptics, disinfectants and insecticides in a tissue processing laboratory.

The students will learn about various staining procedures for demonstration of different substances & various cytological investigations.

The students will learn about special staining procedures & handling & testing of various cytological specimens.

Module-I(8Hrs)

Histotechnology, Care & Maintenance of histotechnology equipments and their parts and Safety measures of laboratory equipment used in histotechnology. Basic concepts about routine methods of examination of tissues, Collection and transportation of specimens for histological examination, fixation: Process, Various types of fixatives used in a routine histopathology laboratory -

Simple fixatives, Compound fixatives, Special fixatives for demonstration of various tissue elements.

Practice: Care & maintenance of Histology equipments, Collection & transportation of specimens, Fixation

Module- II(8Hrs)

Decalcification Criteria of a good decalcification agent, Technique of decalcification Followed with selection of tissue fixation, decalcification neutralization of acid and thorough washing. Various types of decalcifying fluids, Processing of various tissues for histological examination, Embedding, Schedule for manual or automatic Tissue processing, Components & principles of various types of a tissue processors.

Practice: Method of Decalcification, Embedding, manual or automatic tissue processing schedule.

Module- III(10Hrs)

Periodic Acid Schiff Staining, Impregnation and Mounting, Commonly used mounting in histotechnology lab. General Staining Procedures (routine H&E stain, PAP stain and other special stain) for Paraffin Infiltrated and Embedded tissue, To perform & practice the manual & automated Haematoxylin and Eosin staining technique, To perform & practice the Mallory's Phosphotungstic Acid Haematoxylin (PTAH). Introduction of FNAC and its staining tech, museum technique, postmortem technique.

Practice: Procedure for manual Staining and Automatic Staining Technique, FNAC technique, Museum technique (Hospital Visit), Postmortem technique (Hospital Visit).

Module- IV(8Hrs)

Demonstration of instruments used for dissection Use of antiseptics, disinfectants and insecticides in a tissue processing laboratory Reception and labeling of histological specimens Preparation of various fixatives -Helly's fluid, Zenker's fluid, Bouin's fluid, Corney's fluid, 10% Neutral formalin, Formal saline, Formal acetic acid, Pereyn's fluid, prepare 70% alcohol from absolute alcohol. To perform embedding and casting of block.

Practice: Use of antiseptics, disinfectants and insecticides in tissue processing laboratory, Preparation of various Fixatives, Labeling of Histological specimens, Embedding and Casting of block

Module- V(8Hrs)

Tissue Processor, Microtomy, Honing and Stropping technique, Use of tissue floating bath, Use of incubator

Practice: Processing of tissue by manual and automated processor method. To demonstrate various part and types of microtome. To learn sharpening of microtome knife (Honing and stropping

technique) To perform section cutting, learn mounting of stained smears. To practice attachment of tissue sections to glass slides To learn using tissue floatation bath drying of sections in incubator (37⁰ C)

Suggested Readings:

1. Color textbook of histology by Gartner & Hiatt, publisher Elsevier
2. Netter's essential histology by William Ovalle, publisher Elsevier
3. Histology E-book by Barry Mitchell, publisher Elsevier
4. Textbook of Histology (color atlas) by Krishna Garg, Indira Bahl, Mohini Kaul, publisher CBS
5. Textbook of Histology and a Practical Guide by J P Gunasegaran, Publisher Elsevier
6. Textbook of Medical Laboratory Technology by Praful B Godkar, Publisher Bhalami
7. Ebook link-
https://books.google.co.in/books?id=qWSAQAAQBAJ&printsec=frontcover&source=gbs_ge_summary_r&cad=0#v=onepage&q&f=false
8. Ebook link-
https://books.google.co.in/books?id=MrpEDwAAQBAJ&printsec=frontcover&source=gbs_ge_summary_r&cad=0#v=onepage&q&f=false
9. Ebook link-
https://books.google.co.in/books?id=CERPDwAAQBAJ&printsec=frontcover&source=gbs_ge_summary_r&cad=0#v=onepage&q&f=false

BASKET II

Discipline Core Courses

DC-1-CUTM1711- General Microbiology

Subject Name	Code	Type of course	T-P-Pj	Prerequisite
General Microbiology	CUTM1711	Theory+Practice	3-1-0	Fundamental Science

Objective

<p>To know various culture media and their applications and also understand various physical and chemical means of sterilization</p> <p>To know General bacteriology and microbial techniques for isolation of pure cultures of bacteria, fungi and virus</p> <p>To master aseptic techniques and be able to perform routine culture handling tasks safely and effectively</p>
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Course Outcome

This study demonstrates the theory and practical skills in microscopy and their handling techniques and staining procedures.

Understanding the details of microbial cell organelles.

Provides knowledge on growth of microorganism.

Provides knowledge culturing microorganism.

Course

Outline Module-

I(12Hours)

History and scope of Microbiology, Recent trends and developments in modern microbiology. Identification, characterization and classification of microorganisms. Distinguishing characteristics between prokaryotic and eukaryotic cells. Structure and function of Cell wall of bacteria, cell membranes, flagella, pili, capsule, gas vesicles, carboxysomes, magnetosomes and phycobolosomes.

Practice:

1. Preparation of bacterial smear and staining – Gram's, Acid-fast, Staining of bacterial spores, flagella, capsule, spirochaetes
2. Demonstration of various parts of microscope and its functioning and care.

Module-II(12Hours)

Methods of sterilization: Physical methods – Dry heat, moist heat, radiation methods, filtration methods, chemical methods and their application. Concept of containment facility, sterilization at industrial level. Different staining techniques used in bacteriology.

Practice:

3. Demonstration of the different types of sterilization technique and operation of the instruments used in microbiological lab.
4. Preparation of media, cultivation of bacteria

Module-III(16Hours)

Bacterial nutrition – Nutritional requirement of bacteria. Cultivation of aerobes and anaerobes, Reproduction in bacteria and spore formation. Bacterial growth curve and bacterial nutrition Media. Culture Media, Liquid and solid media, defined and synthetic media, routine laboratory media (basal, enriched, selective, enrichment, indicator, and transport media).

Practice:

5. Biochemical tests for identification of bacteria
6. Preservation of stock cultures of bacteria

Suggested Readings:

1. Textbook of Microbiology - Ananthanarayan & Paniker (10th Ed)
2. Medical Microbiology - by Fritz H. Kayser et al
3. Medical Laboratory Technology by Kanai Lal Mukherjee, Publisher Tata McGraw Hill
4. Microbiology (7th Ed) - by Prescott
5. Practical Book of Medical Microbiology by Satish Gupta, Publisher Jaypee Brothers
6. Medical Laboratory Manual for Tropical Countries Vol. I and II by Monica Cheesbrough
7. Essential Medical Microbiology - by Rajesh Bhatia (4th Ed)
8. Clinical Laboratory Methods and Diagnosis by Gradwohl, 2000, Publisher Mosby
9. Medical Laboratory Science Theory and Practice, Jochei and Kolhatkar, 2002, Publisher TBS

DC-2- CUTM1713-Systematic Bacteriology

Subject Name	Code	Type of course	T-P-Pj	Prerequisite
Systemic Bacteriology	CUTM1713	Theory+Practice	3-1-0	Fundamental Science

Objective

To learn opportunities in the basic principles of medical microbiology and infectious disease.

To study mechanisms of infectious disease transmission, principles of aseptic practice, and the role of the human body's normal microflora.

To understand the importance of pathogenic bacteria in human disease with respect to infections of the respiratory tract, gastrointestinal tract, urinary tract, skin and soft tissue.

Course Outcome

The course provides the conceptual basis for understanding pathogenic microorganisms and the mechanisms by which they cause disease in the human body.

Recall the relationship of this infection to symptoms, relapse and the accompanying pathology.

Solve problems in the context of this understanding.

Course

Outline Module-

I(9Hrs)

Morphology, cultural characteristics, biochemical reaction, pathogenesis/disease caused & lab diagnosis, Prevention and Control of: Cocci (Gram Positive): Aerobic: Micrococcus spp., Staphylococcus spp., Streptococcus spp. Anaerobic: Peptococcus spp., Peptostreptococcus spp., *Vibrio* spp., Acidaminococcus spp, and others. Cocci (Gram Negative): Aerobic: *Neisseria* spp., Anaerobic Gram-negative bacteria.

Practice: Culture techniques
Culture media
Identification of *Staphylococcus* sp.

Module-II(12Hrs)

Morphology, cultural characteristics, biochemical reaction, pathogenesis/disease caused & lab diagnosis, Prevention and Control of: Aerobic non-spore forming gram positive bacilli: *Bacillus* spp., *Corynebacterium* spp., *Actinomyces*, *Nocardia* spp., *Mycobacterium* spp.- pathogenic, Tubercle bacilli and MOTT bacilli (Atypical mycobacterium) and Hansen's bacilli and others. Anaerobic: *Bifidobacterium* spp., *Eubacterium* spp., *Actinomyces* spp., *Propionibacterium*, *Clostridium* spp., and others.

Practice: Preparation of media
Media used
for biochemical identification & their uses
Identification of *Mycobacterium* sp.

Module-III(18Hrs)

Morphology, cultural characteristics, biochemical reaction, pathogenesis/disease caused & lab diagnosis, Prevention and Control of Gram- Negative Bacilli Aerobic: Enterobacteriaceae, *Citrobacter* spp., *Edwardsiella* spp, *Enterobacter* spp., *Escherichia coli*, *Ewingella*, *Hafnia* spp., *Klebsiella* spp., *Morganella* spp., *Proteus* spp., *Providencia* spp., *Salmonella* spp., *Serratia* spp., *Shigella* spp., *Yersinia* spp., *Vibrio* spp., *Pseudomonas* spp., *Chlamydia* and *Chlamydia*, *Brucella* spp., *Bordetella* spp., *Haemophilus* spp., *Mycoplasma* spp.

Practice: Culture methods & identification of common bacteria on media.

Antibiotic sensitivity testing.

Identification of *Escherichia*, *Klebsiella*, *Proteus* sp.

Suggested Readings:

1. Textbook of Microbiology- Ananthanarayan & Paniker (10th Ed)
2. Microbiology (7th Ed)- by Prescott
3. Medical Microbiology- by David Greenwood et al (Elsevier)
4. Essential Medical Microbiology- by Rajesh Bhatia (4th Ed)
5. Medical Microbiology- by Kayser et al
6. The short text book of medical microbiology- by Satis Gupte (10th Ed)

DC-3- CUTM1717- Applied microbiology

Subject Name	Code	Type of course	T-P-Pj	Prerequisite
Applied Microbiology	CUTM1717	Theory+Practice	2-1-0	Fundamental Science

Objective

To impart knowledge of the basic principles of bacteriology, virology, including the nature of pathogenic microorganisms, pathogenesis, laboratory diagnosis, transmission, prevention and control of diseases common in the country

Course Outcome

To know the applications of microbiology in diagnostics, hospitals and community

Course

Outline Module-

I (6 Hours)

The normal flora, collection and transport of clinical specimens, Collection and preliminary processing of specimens.

Practice:

Isolation of *Streptococcus mutans* from oral cavity
Procedure for sample collection from skin, ear.

Module-II (9 Hours)

Diagnostic microbiology- an approach to laboratory diagnosis, Rapid and automation methods in diagnostic microbiology, Molecular techniques in microbiology, Serological and skin tests

Practice: Demonstration of antigen-antibody reaction
Pus culture and sensitivity

Module-III(8Hours)

Microbiology in the service of human being, Community microbiology, Emerging and re-emerging Microbial disease, Nosocomial infections

Practice: Urine culture and sensitivity
Isolation of microorganism from spoiled fruit juice

Module-IV(6Hours)

Hospital and laboratory waste, Diagnostic virology, Emergency microbiology Bacteriology of Milk, Air and Water

Practice: Isolation of microorganism from curd Isolation of microorganism from Air

Suggested Readings:

1. Medical Parasitology by R. L. Chhpujani and Rajesh Bhatia, Jaypee publisher
2. Short textbook of medical microbiology by Satishgupt, Publisher Jaypee

DC-4-CUTM1716-Medical Parasitology and Mycology

Subject Name	Code	Type of course	T-P-Pj	Prerequisite
Medical Parasitology and Mycology	CUTM1716	Theory+Practice	3-2-0	Fundamental Science

Objective

Describe basic morphology, lifecycle, pathogenesis, lab diagnosis and treatment of parasites and fungi.

Perform appropriate laboratory techniques used in the processing of specimens and identification of parasites and fungi.

Describe basic principle and procedures of isolation of fungus and parasites from clinical samples like stool, vaginal swab etc.

Perform appropriate laboratory techniques used in the processing of specimens and identification of parasites and fungi.

Course Outcome

Identification of pathogenic parasite and fungus in disease diagnosis and treatment.

The conceptual understanding of the subject provides opportunities for employability and scopes for higher education.

To serve as a resource for the clinical laboratories professionals in the different region.

Module I

General Parasitology- Classification of medically important parasites, epidemiology of parasitic infections, immunology of human parasitic infections. Diagnostic parasitology- Systematic study of following parasites (Geographical distribution, habitat, morphology

and lifecycle, risk of infection, pathogenesis, laboratory diagnosis prophylaxis and serological diagnosis)

Practice: Collection & transport of specimens for examination of stool for parasites identification. Examination of other body fluids for parasites identification. Concentration techniques for demonstration of Ova (Principles and applications). Routine Stool examination for detection of intestinal parasites.

Module-II

Protozoa– Intestinal amoeba, free living pathogenic amoeba, giardia, trichomonas, balantidium, isospora, cryptosporidium, microspora, cyclospora Plasmodia, leishmania, trypanosoma, toxoplasma, babesia.

Helminthes– Cestodes–

Taenia, Echinococcus, Diphylobothrium, Hymenolepis, Multiceps, Trematodes–

Schistosoma, Fasciola, Fasciolepis, Paragonimus, Clonorchis, Opisthorchis. Nematodes–

Ascaris, Hookworm (Ancylostoma), Trichuris, Enterobius, Strongyloides, Filaria, Trichinella, Toxocara, Dracunculus Biological vectors.

Practice: Identification of adult worms from model's or slide's. Identification of different parasites their morphology from slide's. Culture techniques for parasites. Serological diagnostic methods.

Module-III

General Mycology – Fungus – Classification Fungal Structure & Morphology, Reproduction of fungi, Immunity to Fungal Infections. Culture Media in Mycology, Stains in Mycology. Normal fungal flora of human beings. Diagnostic Mycology - Epidemiology, Pathogenesis, Laboratory Diagnosis of Fungal Infections. Specimen collection, preservation, Transportation & Identification of Mycological Agent. Biochemical tests for fungal identification, Anti-fungal agents, invitro tests. Serological tests for mycotic infections. Use of laboratory animals in Mycology. Typing of fungi Preparation of fungal antigens & their standardization.

Practice: To prepare culture media used routinely in mycology. Diagnostic Methods in Mycotic Infections. Isolation and identification of fungus from clinical specimen. To perform all the stain in g techniques for identification of fungi.

Practice: Collection & transport of specimens Examination of stool for parasites. Examination of blood & bone marrow for parasites. Examination of other body fluids & biopsy specimens for parasites. Culture techniques for parasites. Serological diagnostic methods, skin tests.

Suggested Readings:

1. Parasitology book by K.D. Chatterjee.(e-book link- <https://sites.google.com/site/bkthtrtpazg/atahrgiwu>, <https://www.goodreads.com/book/show/24366965-parasitology-protozoology-and-helminthology-with-two-hundred-fourteen>
2. Textbook of medical Parasitology.(e-book link- <https://www.pdfdrive.com/textbook-of-medical-parasitology-textbook-of-medical-parasitology-e128716897.html>
3. Bailey & Scott's Diagnostic Microbiology (e-book- <https://www.pdfdrive.com/bailey-scotts-diagnostic-microbiology-e187863782.html>)

DC-5-CUTM1719-Immunology & Virology

Subject Name	Code	Type of course	T-P-Pj	Prerequisite
Immunology and Virology	CUTM1719	Theory+Practice	3-2-0	Fundamental Science

Objective

Understanding the concept of Innate & adaptive immune system; complement system; Hypersensitivity. Clinically relevant serological analysis for deeper understanding of antigen-antibody interaction. To understand the concept of cells of immune system and organs of immune

system.

To understand the properties of virus, diagnosis of important viruses and vaccination.

Course Outcome

The student will learn the application of Immunology in disease diagnosis.

Complement system followed by the body on encountering an Antigen.

Immune Response produced on encounter with foreign body.

The students will learn the role of immunity in fighting disease, along with consequence of undesirable expression of immune system such as, hypersensitivity and autoimmune disease.

They will gather knowledge regarding the properties, diagnosis of virus and vaccination against them.

The conceptual understanding of the subject provides opportunities for employability and scopes for higher education.

Course Outline

Module-I

Immunity: Concept of Innate and Adaptive immunity.

Immune Cells and Organs: Structure, Functions and Properties of: Immune Cells – Stem cell, T cell, B cell, NK cell, Macrophage, Neutrophil, Eosinophil, Basophil, Mast cell, Dendritic cell; and Immune Organs – Bone Marrow, Thymus, Lymph Node, Spleen, GALT, MALT, CALT

Antigens: Characteristics, Hapten, Epitopes, Adjuvants;

Antibody: Structure & its classes.

Antigen-Antibody interaction, avidity & affinity.

Serological Reactions: Principles of Precipitation, Agglutination, Immunodiffusion, Immunoelectrophoresis, ELISA, ELISPOT, Western blotting, Immunofluorescence, Immunoelectron microscopy.

Practice: Performing Serological tests: Widal test, VDRL test, ASO test, C-Reactive Protein test, Rheumatoid factor (RF) test

Precipitation in agarose gel

Performing Ouchterlony Double diffusion test

Demonstration of SDS-

PAGE Demonstration of

ELISA Demonstration of Western blotting

ting

Module-II

Complement System: Role of complement system in immune response, Complement components and Activation pathways.

Immune Response: Cell mediated and humoral Immunity.

Monoclonal antibodies: Production, characterization and applications.

Types of Autoimmunity and Hypersensitivity with examples; Immunodeficiencies, SCID, DiGeorge syndrome, Chediak-Higashi syndrome, Leukocyte adhesion deficiency, CGD.

Module-III

Virus: General properties, concept of viroids, virusoids, satellite viruses and Prions.

Structure of Viruses: Capsid symmetry, enveloped and non-enveloped

viruses. Isolation, purification and cultivation of viruses.

Serological diagnosis of virus infections.

Arthropod borne and rodent borne virus diseases, Picorna viruses and diseases, Hepatitis viruses, Rabies and other neuro viruses, Orthomyxo and paramyxo viruses, Coronaviridae, Pox, Adeno, Herpes, Reo, Rotavirus, HIV Viruses, Oncogenic viruses.

Vaccines: their Preparation and their immunization schedules.

Practice: Serological diagnosis of virus borne diseases: HBsAg, HIV

Suggested Readings:

1. Kuby's Immunology (7th Ed)-
by J. Owen, J. Punt, S. Strandford. Macmillan Higher Education, England.
(e-book link: <https://www.pdfdrive.com/kuby-immunology-7th-edition-2013-e44842271.html>)
2. Roitt's Essential Immunology (13th Ed)-
by Seamus J. Martin, Dennis R. Burton, Ivan M. Roitt. Wiley Blackwell.
(e-book link: [http://dl.mehrsys.ir/pdf-books/Roitt_s%20Essential%20Immunology%20Thirteenth%20Edition\(www.myuptodate.com\).pdf](http://dl.mehrsys.ir/pdf-books/Roitt_s%20Essential%20Immunology%20Thirteenth%20Edition(www.myuptodate.com).pdf))
3. Prescott, Harley, and Klein's Microbiology (Seventh Edition)-by Joanne M. Willey,

LindaM.Sherwood,ChristopherJ.Woolverton.McGrawHill.

4. MicrobiologyAnIntroduction(10thEdition)-byGerardJ.Tortora,BerdellR.Funke,Christine

- L. Case. Pearson.
5. Textbook of Microbiology (7th Edition) - by Ananthanereyan & Paniker, Publisher Universities Press. (e-book link: <https://www.pdfdrive.com/textbook-of-microbiology-e177143667.html>)
 6. Fundamentals of Molecular Virology (2nd Edition) - by Nicholas H. Acheson, Wiley Publishers. (e-Book link: <https://www.pdfdrive.com/fundamentals-of-molecular-virology-d157673335.html>)
 7. Principles of Virology (4th Edition) - by Jane Flint, Glenn F. Rall, Vincent R. Racaniello, Anna Marie Skalka, Lynn W. Enquist. ASM Press, Washington, DC. (e-Book link: <https://www.pdfdrive.com/principles-of-virology-d158020773.html>)
 8. Virology: Principles and Applications - by John B. Carter and Venetia A. Saunders. Wiley Publishers. (e-Book link: <https://rgmaisyah.files.wordpress.com/2013/12/virology-principles-and-applications.pdf>)
 9. Practical Immunology (4th Edition) - by Frank C. Hay, Olwyn M. R. Westwood. Blackwell Science. (e-Book link: <https://www.pdfdrive.com/practical-immunology-d34330313.html>)

Online Tutorial links:

1. Fundamentals of Immunology: Innate Immunity and B-Cell Function
(Coursera link: <https://www.coursera.org/learn/immunologyfundamentalsimmunitybcells>)
2. Fundamentals of Immunology: T Cells and Signaling
(Coursera link: <https://www.coursera.org/learn/immunologyfundamentalstcellssignaling>)
3. Fundamentals of Immunology: Death by Friendly Fire
(Coursera link: <https://www.coursera.org/learn/immunology-friendlyfire>)
4. Viruses & How to Beat Them: Cells, Immunity, Vaccines
(edX link: <https://www.edx.org/course/viruses-how-to-beat-them-cells-immunity-vaccines>)
5. The Immune System: New Developments in Research
(edX link: <https://www.edx.org/course/the-immune-system-new-developments-in-research-par>)

DC-6- CUTM1722- Clinical Bacteriology

Subject Name	Code	Type of course	T-P-Pj	Prerequisite
Clinical Bacteriology	CUTM1722	Theory+Practice	3-1-0	Fundamental Science

Objective

To confirm the suspicion of infectious bacterial disease.
To identify the etiologic agent by isolating the causative bacterial pathogen.

Course Outcome

To learn the diagnosis of bacteria from infective regions of the body

Study of their sensitivity

Examination of bacteria from common samples.

Study of control measures for nosocomial infection.

Students can safeguard himself & society and can work in diagnostics and hospitals

Course

Outline **Module-**

I (12 Hours)

Laboratory strategy in the diagnosis of various Infective syndromes: Samples of choice, Collection, transportation and processing of samples for laboratory diagnosis of the following complications: a) Septicemia and bacteraemia b) Upper Respiratory tract infections, c) Lower Respiratory tract infections d) Wound, skin, and deep sepsis, e) Urinary tract infections, f) Genital Tract infections, g) Meningitis, h) Gastro intestinal infections, i) Enteric fever, j) Tuberculosis (Pulmonary and Extra-pulmonary), k) Pyrexia of unknown origin

Practice: Collection of nasal swab and its culture Isolation of microorganism from wound

Module-II (6 Hours)

Antibiotic susceptibility testing in bacteriology- a. Definition of antibiotics, b. Culture medium used for Antibiotic susceptibility testing, c. Preparation and standardization of inoculum, d. Control bacterial strains, e. Choice of antibiotics, f. MIC and MBC, g. Various methods of Antibiotic susceptibility testing with special reference to Stokes method and Kirby-Bauer method, h.

Tests for production of β -lactamase

Practice:

Preparation and use of different media in bacteriology laboratory Antibiotic susceptibility testing

Module-3 (10 Hours)

Bacteriological examination of water, milk, food and air-

a. Examination of water - Collection and transportation of water sample, Presumptive coliform count, Eijkman test, Introduction and importance of other bacteria considered as indicators of faecal contamination

b. Examination of Milk and milk products - Basic Concepts regarding gradation of milk,
Various tests for Bacteriological examination

c. Examination of food articles - Basic Concepts regarding classification of food like frozen food,

canned food, raw food, cooked food etc. Various tests for Bacteriological examination with special reference to food poisoning bacteria

d. Examination of Air-

Significance of air bacteriology in healthcare facilities, Collection, processing and reporting of an air sample

Practice: Isolation of microorganisms from frozen food
Isolation of microorganisms from water

Suggested Readings:

1. Practical Medical Microbiology by Mackie & MacCartney Volume 1 and 2
2. Textbook of Microbiology by Ananthanereyan
3. Medical Microbiology by Paniker & Satish Gupte
4. Medical Microbiology - by Fritz H. Kayser et al
5. Bailey and Scott's Diagnostic Microbiology (12th) Ed
6. Medical Laboratory Technology vol. I, II, III by Mukherjee
7. Medical Laboratory manual for tropical countries Vol II Microbiology by Monia Cheesbrough

DC-7-CUTM1721-Research Methodology

Subject Name	Code	Type of course	T-P-Pj	Prerequisite
Research Methodology	CUTM1721	Theory+Project	2-0-1	Fundamental Science

Objective

To equip students with a basic understanding of the underlying principles of quantitative and qualitative research methods.
Provide students with in-depth training on the conduct and

Course Outcome

Students can understand the ethical and philosophical issues associated with research in education

This study provides knowledge on various modes of presenting and disseminating research findings.

Enable students to acquire expertise in the use and application of the methods of data collection and analysis.

Provide learning opportunities to critically evaluate research methodology and findings.

Enable students to be reflexive about their role and others' roles as researchers.

Course

Outline **Module-**

I(9Hrs)

Introduction to Research: Definition, Scope, Limitations, and Types. Objectives of Research. Research

Process: Proposal Development: Basic steps involved in the health research proposal development process Literature Review: Importance and Sources, Strategies for gaining access to information, Library search, Computer search,

Research Designs: Research Title and Objectives Criteria for selecting a research title, Formulation of research objectives, Types of research objectives, Qualities of research objective

Module- II(8Hrs)

Data Collection: Secondary Data, Primary Data, and Methods of Collection. Scaling Techniques: Concept, Types, Rating scales & Ranking Scales, Scale Construction Techniques and Multi-Dimensional Scaling. Sampling Designs: Concepts, Types and Techniques and Sample size Decision.

Module- III(14Hrs)

Research Hypothesis: Definition, Qualities of research hypothesis Importance and types of research hypothesis. Theory of Estimation and Testing of Hypothesis Small & Large Sample Tests, Tests of Significance based on t, F, Z test and Chi-

Square Test. Designing Questionnaire. Interviewing. Tabulation, Coding, Editing, Interpretation and Report Writing.

Project: Writing a review on Nosocomial urinary tract infection.

Writing a research article on antibiotic resistance patterns in wound infections. Writi

ngareviewonVirusculture

Literature surveyonCovid-19

SuggestedReadings:

1. ResearchMethodologybyC.R.Kothari(3rdEd)
2. ResearchMethodologyIntheMedical&BiologicalSciencesbyPetterLaakeetal.
3. EssentialsofResearchDesignand MethodologybyGeoffreyMarczyketal.
4. WHO,HealthResearchMethodology:AguidefortraininginresearchMethods,2ndEdition,W HO-WIPRO
5. AStudent’sGuidetoMethodologybyCloughPandNutbrownC.SagePublication.
6. National Ethical GuidelinesforHealth ResearchinNepal,Available atNepal HealthResearchCouncil.
7. FieldTrialsofHealthInterventionsinDevelopingCountriesbySmithPG,Morrow.

DC-8-CUTM1754-MiniProject

Subject Name	Code	Typeofcourse	T-P-Pj	Prerequisite
MiniProject	CUTM1754	Project	0-0-2	BasicMedical science

The student is supposed to carry out project work in assistance with a mentor. The project should be relevant to the syllabus and should be qualitatively initiated towards fetching a research publication/case study/ clinical study/ community service/ survey on successful completion within the stipulated time.

Outcome: Research paper publication/ new idea generation/ case study/ clinical study/ community service/survey.

DC-10-CUTM1756-Project

Subject Name	Code	Typeofcourse	T-P-Pj	Prerequisite
Project	CUTM1756	Project	0-0-12	BasicMedical science

Projectwork:

SuggestedProjecttitle

1. Antibacterial activity of sweet orange (citrus sinensis) on Staphylococcus aureus and Escherichia coli isolated from wound infected.
2. The incidence of Salmonella and Escherichia coli in livestock (Poultry) feeds

3. Microbialevaluationofmilkfromadairyfarm.

4. Gastroenteritis in primary school children (6-12yr) of specific locality.
5. Comparative analysis of microbial load of the main water production and water available to CUTM campus

DC-9- CUTM1755–Internship

Subject Name	Code	Type of course	T-P-Pj	Prerequisite
Internship	CUTM1755	Project	0-0-12	Basic Medical science

Internship Thesis Guideline

This Guideline is designed to provide students the knowledge and practice of public health research activity, to enable them to carry out researches and solve research related problems and to help them in writing thesis and defend their work. Upon successful completion of the course, the students shall be able to:

1. Search relevant scientific literature
2. Develop a research proposal
3. Employ appropriate data collection techniques and tools
4. Manage collected data
5. Analyze data with appropriate statistical techniques
6. Write thesis
7. Defend the findings

Proposal Development:

At the ending of third year (Sixth Semester), students individually consultation with designated faculties and extensive literature survey will develop research proposal during the initial 6 months period.

Data Collection/Thesis Writing:

Students will carry out data collection, data management, data analysis, and thesis writing during the remaining period (Six Semester). The Dissertations should have following format:

1. Title
2. Introduction
3. Materials and Methods
4. Results
5. Discussion
6. Conclusion
7. Recommendation
8. References

9. Appendix

Internship

1. Case record
2. Labmanagementandethics
3. Evaluation-Guide(internal)
 - a. -Industriesguide(external)
 - b. -University-projectreport/Viva

The following colour represents the syllabus revision, skill, employability and entrepreneurship.

Green : Skill

Pink : Employability

Sky : Entrepreneurship

Centurion University of Technology and Management Odisha

Choice Based Credit System

Course Structure & Syllabus

Civil Engineering



School of Engineering & Technology

2020

CBCS Structure

Basket	Basket Category	Minimum Credits to be acquired by Regular students	Minimum Credits to be acquired by Lateral Entry students
I	Foundation Courses in Sciences	17	06
II	Foundation Courses in Humanities & Management [A: 6 credit (choice), B: 6 credit (Compulsory)]	12	6(Job readiness) + 3
III	Smart Stack	25	25
IV	Foundation and Core Engineering Courses	58*	48
V	Domain/Skill/Internship/Minor Project/MOOC	48	32
	Total Credits	160	120

Course Structure

Basket I	Foundation Courses in Sciences		
Course Code	Course Title	Credit	Type (Theory+Practice+Project)
CUTM1001	Differential Equations and Linear Algebra	3	2+0+1
CUTM1002	Laplace & Fourier Transforms	3	2+0+1
CUTM1003	Complex Analysis & Numerical Methods	3	2+0+1
CUTM1004	Discrete Mathematics	3	2+0+1
CUTM1005	Probability & Statistics	3	2+0+1
CUTM1925	Calculus	3	2+0+1
CUTM1006	Mechanics for Engineers	3	2+1+0
CUTM1007	Optics and Optical Fibres	3	2+1+0
CUTM1008	Applied Analytical Chemistry	3	2+1+0
CUTM1009	Applied Engineering Materials	3	2+0+1
CUTM1010	Environmental Studies	2	0+0+2

Basket II	Foundation Courses in Humanities & Management [A: 6 credit (choice), B: 6 credit (Compulsory)]		
Course Code	Course Title	Credit	Type (Theory+Practice+Project)
CUTM1011	Optimisation Techniques	2	0-2-0
CUTM1012	Engineering Economics and Costing	3	2-0-1
CUTM1013	Project Management	3	2-0-1
CUTM1014	Gender, Human Rights and Ethics	3	1.5-0-1.5
CUTM1015	Climate Change, Sustainability and Organisation	3	1.5-0-1.5
CUTM1016	Job Readiness	6	0-6-0

Basket III	Smart Stack		
Course Code	Course Title	Credit	Type (Theory+Practice+Project)
CUTM1017	Industrial IOT and Automation	6	3-2-1
CUTM1018	Data Analysis and Visualisation using Python	4	0-1-
CUTM1019	Machine Learning using Python	4	1-2-1
CUTM1020	Robotic automation with ROS and C++	4	1-2-1
CUTM1021	Basics of Design Thinking	2	0-0-2
CUTM1022	System Integration with DYMOLA	2	0-0-2
CUTM1023	Smart Engineering Project (G2M)	3	0-0-3

Basket IV	Core Courses _Civil Engineering		
Course Code	Course Title	Credit	Type T+P+PJ
CUTM1073	Geotechnical Engineering	3	1-1-1
CUTM1069	Construction Material Testing	2	0-2-0
CUTM1061	Structural Detailing and Drawing	2	0-2-0
CUTM1063	Quantity Estimation & Costing	3	2-1-0
CUTM1060	Geometric Modeling	3	0-3-0
CUTM1071	Hydrology and Irrigation	3	1-1-1
CUTM1067	Surveying Techniques	3	1-2-0
CUTM1068	Geospatial Survey	3	1-2-0
CUTM1066	Concrete Technology	3	1-2-0
CUTM1065	Electrical, Plumbing, and Woodwork	3	1-2-0
CUTM1074	Design of Structure	4	1-3-0
CUTM1070	Road Engineering	2	1-1-0
CUTM1064	Construction Materials	2	0-0-2
CUTM1072	Water Supply and Sanitary Engineering	2	1-1-0
CUTM1081	Computer-Aided Engineering	3	0-2-1
CUTM1090	Hydraulic Machinery	2	1-1-0
CUTM1089	Fluid Mechanics with FVM	3	2-1-0
CUTM1062	Theories of Failure analysis using FEA	4	2-2-0
CUTM1059	Database Management Systems	3	2-1-0
CUTM1058	Programming in Java	3	2-1-0
CUTM1907	Disaster Preparedness & Planning Management	2	2-0-0
	Total Credits	58	

Basket V: Domain/Skill/MOOC/Minor Project/Internship/Applied Courses

Domain:

- Construction Planning Monitoring and Project Management
- Architectural and Structural Design
- Aerial Survey and Remote Sensing Applications
- GO-TO-MARKET

Centurion University of Technology and Management Odisha

CHOICE BASED CREDIT SYSTEM

COURSE STRUCTURE & SYLLABUS

BASKET - I



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Shaping Lives...
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School of Engineering & Technology

2020

**Course Structure
Basket - I**

Course Code	Course Title	Credits	Course Type T+P+PJ
CUTM1001	Differential Equations and Linear Algebra	3	2+0+1
CUTM1002	Laplace & Fourier Transforms	3	2+0+1
CUTM1003	Complex Analysis & Numerical Methods	3	2+0+1
CUTM1004	Discrete Mathematics	3	2+0+1
CUTM1005	Probability & Statistics	3	2+0+1
CUTM1925	Calculus	3	2+0+1
CUTM1006	Mechanics for Engineers	3	2+1+0
CUTM1007	Optics and Optical Fibres	3	2+1+0
CUTM1008	Applied Analytical Chemistry	3	2+1+0
CUTM1009	Applied Engineering Materials	3	2+0+1
CUTM1010	Environmental Studies	2	0+0+2

Syllabus

Differential Equations and Linear Algebra

Code	Course Title	Credit	T-P-PJ
CUTM1001	Differential Equations and Linear Algebra	3	2-0-1

Objective

- Introduce students to how to solve linear Differential Equations with different methods.
- To solve the system of linear equations appearing in the problems of electrical engineering, mechanical engineering etc.
- To use Eigen values and Eigen vectors in Control theory, vibration analysis, electric circuits, advanced dynamics problems.
- Introduce students how to solve first order and second order differential equations

Course outcome

- Understand the importance of linear functions in mathematics.
- Solve systems of linear equations using Gauss- elimination to reduce to echelon form.
- Learn fundamental concepts of ODE theories and where and how such equations arise in applications to scientific and engineering problems.
- Be competent in solving linear/non-linear 1st & higher order ODEs using analytical methods to obtain their exact solutions

Course content

Module-I

First order linear differential equations and its applications(Kirchhoff's law)

Project-1:Some applications of differential equations in RL electrical circuit problems

Module-II:

Second order linear homogeneous differential equations (Real roots, Real equal roots, Complex conjugate roots) and its applications.

Project-2: RLC Circuit, Pendulum

Module-III:

Second order linear non-homogeneous differential equations, Finding particular integral consisting of exponential, trigonometric functions (Sine, cosine) using inverse operator method

Project-3: Simple mass-spring system, Damped vibration system

Module IV:

Basic concepts of a matrices, solution of linear system of equations by Gauss elimination method, linearly independent and dependent of a vectors, rank of a matrix.

Project-4

Report on finding the traffic flow in the net of one-way streets

Module V:

Determinants and Cramer's Rule, Fundamental theorem of linear system of equations.

Module VI:

Eigenvalues and Eigen vectors of a matrix

Project-5

(i) Find the limit states of the Markov process model.

(ii) Find the growth rate in the Leslie model

Module VII:

Symmetric, Skew-Symmetric, Orthogonal Matrices and Properties

Project-6

To make a report to show that the product of two orthogonal matrices is orthogonal, and so is the inverse of an orthogonal matrix. What does this mean in terms of rotations?

Text Books:

1. Advanced engineering mathematics by Erwin Kreyszig, 8th edition
Chapter-6 (6.1-6.6), Chapter-7 (7.1,7.2)
2. Higher Engineering by B.V. Ramana
Chapter-8(8.1,8.2,8.21), Chapter-9 (9.2,9.3,9.5)

Reference Books:

1. J. Sinha Roy and S. Padhy, A Course of Ordinary and Partial Differential Equations, Kalyani Publishers, New Delhi.
2. G.B. Thomas, M.D. Weir, J.R. Hass, Thomas' Calculus, Pearson Publication.
3. R.G. Bartle, D.R. Sherbert, Introduction to Real Analysis, Wiley Publication

Laplace and Fourier Transform

Code	Course Title	Credit	T-P-PJ
CUTM1002	Laplace and Fourier Transform	3	2-0-1

Objective

- To describe the ideas of Fourier and Laplace Transforms and indicate their applications in the fields such as application of PDE, Digital Signal Processing, Image Processing, Theory of wave equations, Differential Equations and many others.
- To use Fourier series for solving boundary value problems appearing in scientific & engineering problems.

Course outcome

- Solve differential equations with initial conditions using Laplace transform.
- Evaluate the Fourier transform of a continuous function and be familiar with its basic properties.

Course content

Module-I (T-3-Pj-2)

Laplace Transforms, Properties of Laplace transforms, Unit step function.

Project-1

Make a short draft of properties of Laplace transform from memory. Then compare your notes with the text and write a report of 2-3 pages on these operations and their significance in applications.

Module-II (T-2-Pj-2)

Second shifting theorem, Laplace transforms of Derivatives and Integrals

Project-2

Find the Laplace transform of the following functions

Module-III (T-3-Pj-2)

Derivatives and Integrals of Transforms, Inverse Laplace transform.

Project 3:

Application of Unit step function (RC- Circuit to a single square wave).

Module- IV (T-2-Pj-2)

Solution of Differential Equation by using Laplace Transform.

Project 4: Find the solution of differential equation by using Laplace Transform.

Module-V (T-4-Pj-2)

Periodic function, Fourier series, Fourier series expansion of an arbitrary period, Half range expansions.

Project-5

Find the Fourier series expansion of a 2π periodic function.

Module-VI(T-3-Pj-2)

Complex form of Fourier series, Fourier Integrals, Different forms of Fourier Integral.

Project-6

Find the Fourier sine and cosine integral of the following functions.

Module-VII(T-3)

Fourier Transforms, Fourier sine and cosine Transforms.

Text Books:

- E. Kreyszig , Advanced Engineering Mathematics, Johnwiley& Sons Inc-8th Edition.Chapters:5(5.1 to 5.4(without Dirac's delta function) ,10(10.1,10.4 and 10.7-10.9(definitions only , no proofs))
- Highjer Engineering Mathematics by B.V.Ramana, Tata McGraw-Hill Education India, Inc-8th Edition.

Reference Books:

- 1) Advanced Engineering Mathematics by P.V.O' Neil Publisher: Thomson
- 2) Mathematical Methods by Potter & Goldberg ; Publisher : PHI

Complex Analysis and Numerical Methods

Code	Course Title	Credit	T-P-PJ
CUTM1003	Complex Analysis and Numerical Methods	3	2-0-1

Objective

- To understand about Complex variables and complex functions.
- To acquire the skill of evaluating contour integrals using Cauchy's integral formula and Cauchy's integral theorem.
- To understand the limitations of analytical methods and the need for numerical methods and the ability to apply these numerical methods to obtain the approximate solutions to engineering and mathematical problems.

Course Outcome

- To get equipped with the understanding of the fundamental concepts of functions of a complex variable along with the concepts of analyticity, Cauchy-Riemann relations and harmonic functions.
- Evaluate complex contour integrals applying the Cauchy integral theorem, Cauchy integral formula.
- Derive a variety of numerical methods for finding out solutions of various mathematical problems arising in roots of linear and non-linear equations, Solving differential equations with initial conditions and Evaluating real definite integrals.

Course Outline

Module I (T-3 hrs-P-0-hrs-P-0 hrs)

Functions of a complex variable, Analytic functions, Cauchy-Riemann equations (Without Proof), Harmonic and Conjugate harmonic functions, Cauchy's Integral Theorem (Without Proof).

Project-1 : Verification of Cauchy-Riemann equations for complex functions in Cartesian form and Polar form

Module II (T-3 hrs-P-0 hrs-P-2 hrs)

Cauchy's Integral Formula (Without Proof), Cauchy's Integral Formula for higher order derivatives (Without Proof), Taylor series.

Project-2 : Evaluation of contour integrals using Cauchy's Integral Formula

Module III (T-4 hrs-P-0 hrs-P-2 hrs)

Laurent series (Without Proof), Pole, Residue, Residue Theorem (Without Proof), Evaluation of Real integral Type-I.

Module – IV (T-2 hrs-P-0 hrs-P-2 hrs)

Interpolation, Lagrange interpolation polynomial.

Project-3 : Finding out the value of a given function at an interior point on an unequal interval using Lagrange interpolation polynomial

Module – V (T-3 hrs-P-0 hrs-P-2 hrs)

Forward and backward difference operators, Newton's forward and backward difference Interpolation formulae.

Project-4 : Finding out the value of a given function at an interior point on an equal interval using Newton's forward and backward difference interpolation formulae

Module – VI (T-2 hrs-P-0 hrs-P 2 hrs)

Numerical Integration, Trapezoidal rule, Simpson's one third rule.

Project-5 : Evaluation of real definite integrals using Trapezoidal rule and Simpson's one third rule

Module – VII (T-3 hrs-P-0 hrs-P-2 hrs)

Runge-Kutta 2nd & 4th order methods.

Project-6 : Finding out Numerical solutions of differential equations using Runge-Kutta 2nd& 4th order methods

Text Book:

1) Advanced Engineering Mathematics by E. Kreyszig Publisher: Johnwiley& Sons Inc-8th Edition Chapters : 12 (12.3, 12.4), 13 (13.2 to 13.4), 14.4, 15 (15.1 to 15.4 Only Type-I integral), 17 (17.3, 17.5), 19 (19.1).

Reference Books:

1) Advanced Engineering Mathematics by P.V. O'Neil Publisher: Thomson

- 2) Fundamentals of Complex Analysis (with Applications to Engineering and Science) by E.B. Saff & A.D. Snider Publisher: Pearson
- 3) Numerical Methods for Scientific and Engineering Computation by M. K. Jain, S. R. K. Iyengar & R.K. Jain; New Age International Publishers.
- 4) Introductory Methods of Numerical Analysis by S.S. Sastry; Third Edition, Prentice Hall India.

Discrete Mathematics

Code	Course Title	Credit	T-P-PJ
CUTM1004	Discrete Mathematics	3	2-0-1

Objective

- To understand mathematical reasoning in order to read, comprehend and construct Mathematical arguments as well as to solve problems, occurred in the development of programming languages
- To work with discrete structures such as graphs to study the structure of the world wide web, to model a computer network and to find the shortest path between two places in a transportation network

Course Outcome

- Apply the logical structure of proofs and work symbolically with connectives and quantifiers to produce logically valid, correct and clear arguments.
- Evaluate elementary mathematical arguments and identify fallacious reasoning
- Reformulate statements from common language to formal logic
- Apply truth tables and the rules of propositional and predicate calculus
- Model and solve real world problems using graphs, both quantitatively and qualitatively

Course Outline

Module -I

(4Hours)

Propositional Logic, Connectives, Truth tables of compound propositions, Propositional Equivalence.

Project 1: Given the truth values of the propositions p and q , find the truth values of the conjunction, disjunction, implication, bi-implication, converse, contrapositive and inverse.

Module -II (3Hours)

Theory of inference, Predicates and Quantifiers, Rules of Inference.

Project 2: Build valid arguments of a given set of propositional logics and quantified statements using rules of inferences.

Module -III (3 Hours)

Relations and its properties, Partial Ordering, POSET, Totally Ordered Set.

Project 3: Define the properties of a relation on a set using the matrix representation of that relation with examples.

Module -IV (3Hours)

Hasse Diagram, Maximal & Minimal Elements of a Poset, Greatest & Least Elements of a Poset, Supremum & Infimum of a Poset, Lattice.

Project 4: Find a Topological Sort of a Poset.

Module -V (3 Hours)

Introduction to Graph Theory, Graph Terminology and Special types of Graphs, Representation of Graphs.

Project 5: Describe how some special types of graphs such as bipartite, complete bipartite graphs are used in Job Assignment, Model, Local Area Networks and Parallel Processing.

Module -VI (3 Hours)

Graph Isomorphism, Connectivity, Euler and Hamiltonian Graphs, Planar Graphs, Graph Coloring.

Project 6(i): Describe the scheduling of semester examination at a University and Frequency Assignments using Graph Colouring with examples. Find also their Chromatic numbers.

Project 6(ii): List out 10 pairs of Non-isomorphic graphs and explain the reason behind it.

Project 6(iii): List out all features of Euler and Hamiltonian Graphs. Justify whether the given set of graphs are Euler and Hamiltonian. Construct a Gray Code where the code words are bit strings of length three.

Module -VII (4 Hours)

Trees and their Properties, Spanning Trees, Minimum Spanning Trees, Kruskal's Algorithm.

Project 7: Find a minimum spanning tree in a given weighted graph using Kruskal's Algorithm.

Text Books:

1. Discrete Mathematics and its Applications by K.H.Rosen, Publisher: TMH, Sixth Edition, 2009.
Chapters: 1(1.1 ,1.2,1.3, 1.5); 7(7.1,7.6); 8(8.1 to8.5, 8.7, 8.8);9(9.1,9.4,9.5).

Reference Books:

1. Discrete Mathematical Structures with Applications to Computer Science, J. P. Trembkay, R. Manohar, Tata MC Graw – Hill Edition 38th reprint, 2010.
2. Discrete and Combinatorial Mathematics by R.P.Grimaldi Publisher: Pearson, 5th Edition, 2003.
3. Discrete Mathematics and Applications by Thomas Koshy Publisher: Elsevier, 2004.
4. Discrete Mathematical Structures by B. Kolman, R.C. Busby & S. Ross Publisher: PHI, 5th Edition, 2003

Probability and Statistics

Code	Course Title	Credit	T-P-PJ
CUTM1005	Probability and Statistics	3	2-0-1

Objective

<ul style="list-style-type: none"> • To translate real-world problems into probability models. • To motivate students in an intrinsic interest in statistical thinking. • To recognize the role and application of probability theory, descriptive and inferential statistics in many different fields of science and engineering. • To apply probability and statistics in engineering and science like disease modeling, climate prediction and computer networks etc.
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Course outcome

- Define and illustrate the concepts of sample space, events and compute the probability and conditional probability of events.
- Define, illustrate and apply the concepts of discrete and continuous random variables, the discrete and continuous probability distributions.
- Define, illustrate and apply the concept of the expectation to the mean, variance and covariance of random variables.
- Compute probabilities based on practical situations using the Binomial, Poisson and Normal distributions.

Course content

Module I :(3 hrs+2 hrs)

Sample spaces and events; axiomatic definition of probability; Axioms of Probabilities

Project-1

A Report on Application of probability to control the flow of traffic through a highway system, a telephone interchange, or a computer processor

Module II :(3 hrs +2 hrs)

Mutually Exclusive Events, Dependent and Independent Events. Conditional Probability

Project-2

A Report on Dependent and Independent Events with Examples

Module III:(3 hrs +2 hrs)

Discrete random variables and probability distributions, Continuous random variables and probability

distributions , Mean ,Variance and Moment Generating Function of Distributions

Project-3

Application of random variables in Engineering Field

Module IV:(3 hrs +2 hrs)

Uniform Distribution, Binomial Distribution, Poisson Distribution

Project-4

Applications of Poisson distribution

Module V:(3 hrs +2 hrs)

Normal Distribution, Working with Normal Tables, Normal Approximation to the Binomial Distributions

Project-5

Normal Distribution utilized in statistics, business settings, and government entities.

Module VI:(3 hrs)

Statistics: Random Sampling, Population and Sample, Sample Mean and Variances, Point and Interval Estimations, Confidence Intervals

Module VII:(3 hrs +2 hrs)

Regression and Correlation Analysis: Correlation Coefficient, Co-variance independent random variables, linear regression of two variables

Project-6

Uses of Regression and Correlation Analysis in Business

Text Books:

1. Name of Author, Title, Publication, Edition

Advanced Engineering Mathematics by E. Kreyszig Publisher: John Willey & Sons Inc-8th Edition

Reference Books:

1.Statistical Methods by S.P. Gupta (31st Edition); Publisher: Sultan Chand & Sons.

2. Mathematical Statistics by S.C. Gupta & V.K. Kapur (10th Edition); Publisher: Sultan Chand & Sons.

Calculus

Code	Course Title	T-P-PJ	Prerequisite
CUTM1925	Calculus	2-0-1	

Objective

- To apply the concepts of derivative to find curvature and radius of curvature of a curve.
- To apply concepts of Vector Calculus to the problems related to models in work, circulation and flux Problems, hydrodynamics and fluid dynamics etc.

Course Outcome

- Calculate curvature and radius of curvature for a given curve.
- Determine the important quantities associated with scalar and vector fields.
- Find gradient of a scalar point function, divergence and curl of a vector point function.
- Evaluate line integral, double integral and applying these concepts to find out work done by a force, volume of regions in space, center of gravity of a mass etc.
- Transform double integral to line integrals, triple integrals to surface integrals, surface integrals to line integrals and vice versa.

Course Outline

Module-I(3hr+0hr+2hr)

Curvature and Radius of curvature in Cartesian form.

Project 1: To find radius of curvature (Parametric form)

Module-II(2hr+0hr+4hr)

Vector algebra: Algebraic operations, Scalar product, Inner product, Vector product, Scalar and vector triple product.

Project 2: Problems based on inner product, scalar and vector triple products.

Project 3: To find angle between two vectors, area of triangle and parallelogram, volume of parallelepiped and tetrahedron using vector algebra.

Module III(2hr+0hr+4hr)

Gradient of scalar point function, Directional derivatives, Divergence and curl of vector point functions, second order differential operator: the Laplacian operator.

Project 4: To prove the identities with regards to Gradient, Divergence and Curl.

Project 5: To find normal vector to a plane using Gradient of scalar point function.

Module-IV: (3hr+0hr+0hr)

Line Integrals (path dependence and path independence), double integrals.

Module-V: (3hr+0hr+0hr)

Surface Integrals, Triple Integrals

Module-VI: (4hr+0hr+2hr)

Green's and Gauss's Theorems (without proof) and their applications to evaluate the integrals.

Project 6: To find center of gravity and moments of inertia of a mass density

Module-VII: (3hr+0hr+0hr)

Stokes' Theorem (without proof) and its applications to evaluate the integrals.

Text Books:

1. A Text book of Calculus Part – II by Shanti Narayan, Publisher: S. Chand & Company Ltd. Chapters: 8 (Art. 24, 25 (only for Cartesian and parametric curves)).
2. Advanced Engineering Mathematics by E. Kreyszig, Publisher: John Willey & Sons Inc.- 8th Edition
Chapters: 8 (8.1 to 8.3, 8.9 to 8.11), 9 (9.1 to 9.7, 9.9).

Mechanics for Engineers

Code	Course Title	Credit	T-P-PJ
CUTM1006	Mechanics for Engineers	3	2-1-0

Objective

- To provide the students with a clear and thorough understanding on fundamentals of mechanics as applied to solve real-world problems.

Course outcome

- Use scalar and vector analytical techniques for analyzing forces in statically determinate structures.
- Analyze the frictional forces involved in planes, ladder friction and belt friction.
- Determine the centroid and moment of inertia of composite shapes.
- Apply fundamental concepts of kinematics and kinetics of particles to the analysis of simple, practical problems.
- Apply basic knowledge of mathematics and physics to solve real-world problems.

Course content

Module I: Force and Moment (4 Hrs. + 2 Hrs. practices)

Law of Transmissibility of a Force, Composition and Resolution of Forces, Resultant and Equilibrant, Resultant of Two and Several Forces, Moment of a Force and a Couple, Varignon's Principle of Moment

Practice-1: Verification of laws of parallelogram law of forces

Module II: Equilibrium

(3 Hrs. + 2 Hrs. practice)

System Isolation and Free Body Diagram, Particle Equilibrium, Lami's theorem, General Conditions of Equilibrium, Types of Supports and Support Reactions, Rigid Body Equilibrium.

Practice-2: To verify the condition of equilibrium by finding reactions at the support of a beam

Module III: Friction

(2 Hrs. + 2 Hrs. practice)

Basic Terms used in Dry Friction, Laws of Coulomb Friction, Equilibrium of Bodies on a Inclined Plane, Ladder Friction, Belt Friction

Practice-3: Determination of Angle of Repose

Module IV: Centroid**(2 Hrs.)**

Axis of Symmetry, Centroid of Lines, Areas and Volumes, Centroid of Composite Section.

Module V: Moment of Inertia**(3 Hrs. + 2 Hrs. practice)**

Rectangular and Polar Moment of Inertia, Radius of Gyration, Parallel Axis Theorem and Perpendicular Axis Theorem, Moment of Inertia of Composite Section

Practice-4: Determination of Moment of Inertia of a fly wheel.

Module VI: Kinematics of Linear Motion**(3 Hrs.)**

Kinematics of a Particle, Uniform and Variable Acceleration, Motion under Gravity

Module VII: Kinetics of Linear Motion**(3 Hrs. + 4 Hrs. Practice)**

Principles of Dynamics such as Newton's Second Law, Work-Energy Principle, Impulse-Momentum Principle, Law of Conservation Law of Momentum and Energy

Practice-5: Verification of Newton's second law of motion.

Practice-6: Verification of conservation of momentum in collision.

Text Books:

Engineering Mechanics; Statics and Dynamics by A. K. Tayal, Umesh Publications

Reference Books:

Engineering Mechanics by S. Timoshenko, D.H. Young and J.V. Rao, Tata McGraw Hill

Engineering Mechanics by D.S. Kumar, S.K. Kataria and Sons.

Optics and Optical Fibres

Code	Course Title	Credit	T-P-PJ
CUTM1007	Optics and Optical Fibres	3	2-1-0

Objective

- To train the students for the applications of the solar cell, laser and optical fiber in the field of engineering and technology.
- To learn and practice the techniques used by optical phenomenon so that these can be applied to actual field studies.

Course outcome

- Students should understand optical phenomena.
- Students should learn about different light sources and their use
- After completion of the course the students shall be able to understand the basic knowledge of solar cell, laser and optical fiber and instrumentation involved.
- Students should be able to understand optical fiber principle, operations and its applications.

Course outline

Module I: Reflection and Refraction (Derivation is not required) (3hours +2hours)

Reflection at plane surface, reflection at spherical mirrors, Paraxial rays and approximation. Sign convention, Location of the image formation, Spherical mirror equation, Refraction, Total internal reflection, Dispersion by a prism, Refraction through a prism.

Practice: 1

To determine the refractive index of glass slab using travelling microscope.

Module II: Lenses (Derivation is not required) (2hours+2hours)

Definition, Types of Lenses, Terminology associated with the Lens, Sign Convention Location of the image formation by graphical method for Lenses, Lens formula.

Practice: 2

To determine the dispersive power and Cauchy constants of the material of a prism using mercury source.

Module III: Interference (Derivation is not required) (2hours+2hours)

Superposition principle, definition of Interference, Coherence, Young's double slit experiment, Newton's rings theory- Determination of wave length of light.

Practice: 3

Newton's Rings-Refractive index of liquid

Module IV: Diffraction and Polarization (Derivation is not required) (3hours+2hours)

Types of diffraction, Fraunhofer diffraction at a single slit, Diffraction at N-parallel slits (plane diffraction grating) Polarisation, Types of polarized light and their representation, Brewster Law, Malus Law, polarization by double refraction, polarimeter, Applications of polarized light.

Practice: 4

To find grating element of a plan transmission diffraction grating.

Module V: Optical Properties and Laser (3hours+2hours)

Scattering, refraction, reflection, absorption & transmission, Introduction to optoelectronics, Concept of Light Emitting Diode, Stimulated and spontaneous emission, Basic principle of Lasers, Population inversion, Laser Pumping, Different levels of laser system, Ruby Laser, Applications of Lasers (Medicine, Metrology, Defenses, Nuclear energy, in communication, in consumer electronics industry)

Practice: 5

Wave length of LASER source by diffraction grating method

Module VI: Optical Fibers (3hours+1hours)

Introduction to fiber optics, structure of optical fibers, classification of optical fibers on the variation of refractive index, Classification of optical fibers on the variation of mode of transmission/core diameter, Numerical Aperture, Acceptance angle. Principle of optical fibers communication, optical communication (block diagram only),

Practice: 6

To find the numerical aperture of a given optic fiber and hence to find its acceptance angle.

Module VII: Optical Fibers (4hours+1hours)

Attenuation in optical fibers (Qualitative only-Scattering losses, Absorption losses, bending losses) Fiber Materials-Glass fibers, Plastic fibers, Light sources for fiber optics

V-number of an optical fiber, optical fiber cables design, optical fiber connection, fiber splices, fiber connectors. Application of optical fibers- Cable TV, Networking, Power companies, Imaging, Sensors, Medical (Dental surgery, Endoscopy, Surgery)

Practice: 7

Measurement of bending loss.

Text Books:

1. A Text Book of Optics by M.N. Avadhanulu, BrijLal, N. Subrahmanyam, S Chand; 23rd Rev. Edn. [Module I&II]
2. Engineering Physics, by D.Thirupathi Naidu, M.Veeranjaneyulu, V.G.S Book links,2017.[Module-III,IV]
3. Principles of Engineering Physics-2 by Md.Khan, S.Panigrahi, Cambridge University Press 2016. [module-V,VI&VII]

Reference Books:

1. Optics by AjoyGhatak, McGraw Hill Education; 6 edition, 2017.
2. Physics-I for engineering degree students by B.B. Swain and P.K.Jena.
3. Concepts in Engineering Physics by I Md. N. Kha, 2016.

Applied Analytical Chemistry

Code	Course Title	Credit	T-P-PJ
CUTM1008	Applied Analytical Chemistry	3	2-1-0

Course Objective

- Explain fundamental principles for environmental analytical methods (titration, electrochemistry, instrumentation and basic parameters of water, soil, fuel, etc)
- Point out suitable analytical techniques for analyzing a specific compounds in an environmental matrix

Course Outcome

- Apply quality control on chemical analysis and laboratory work and explain its importance
- Plan and carry out laboratory experiments, including data analysis and conclusions
- Point out suitable techniques for sampling and handling of environmental samples

Module-I(4Hrs)

Water analysis:

Water softening processes: Lime-Soda, Zeolite and Ion exchange methods. Removal of DO and dissolved CO₂ from water by De-aeration method, Desalination of Brackish water by Reverse

osmosis and electro dialysis process. Numericals on calculation of hardness of water, Lime-Soda calculation, Alkalinity of water.

1. Determination of hardness of water by EDTA method. (V. lab)
2. Determination of alkalinity of water. (V. lab)
3. [Determination of Dissolved Oxygen in water.](#) (V. lab)
4. [Determination of Biological Oxygen Demand.](#) (V. lab)
5. [Determination of Chemical Oxygen Demand.](#) (V. lab)

Module-II(2Hrs)

Soil Analysis:

Soil profile, Structure, and properties, Determination of soil properties, Fertility of the soil.

6. Determination of specific gravity of the soil by using pycnometer. (V. lab)
7. Determination of pH and electrical conductivity of soil sample.
8. Determination of moisture content in soil by oven drying method. (V. lab)

Module-III (4Hrs)

Fuel Chemistry-I:

Classification, combustion and chemical principles involved in fuel, calorific value: gross and net calorific values and their determination by bomb calorimeter. Proximate and ultimate analysis of coal and their importance. LPG, Water gas, producer gas, CNG.

9. Determination of calorific value of a fuel sample by using Bomb calorimeter. (V. lab)
10. Analysis of flue gases by Orsat's apparatus.

Module-IV (3Hrs)

Fuel Chemistry-II

Petroleum: its chemical composition and fractional distillation, cracking of heavy oil residues – thermal and catalytic cracking, knocking and chemical structure, octane number, synthesis and applications of bio-fuels, Photovoltaic cell.

11. Synthesis of biodiesel by transesterification process

Module-V(3Hrs)

Corrosion-Mechanisms, Factors affecting Corrosion; Protection from corrosion.

12. Estimation of ferrous ion in the given solution using standard potassium dichromate.

Module-VI (2Hrs)

Electrochemical Phenomenon

Electrochemical cell, Electrode potential, Determination of pH of a solution Using Calomel/Quinhydrone Electrode.

Module-VII(2Hrs)

Error in Chemical analysis

Types of errors, Accuracy and precision, Absolute and relative uncertainty, mean and standard deviation.

Applied Engineering Material

Code	Course Title	Credit	T-P-PJ
CUTM1009	Applied Engineering Material	3	2-0-1

Objective

- To give an introduction to materials, ceramics, polymers, and electronic materials in the context of a molecular level understanding and their application in various field

Course outcome

- Students will understand the physical/chemical behaviors of materials.
- Students will be able to select materials, based on their properties and behaviors, for a given application.
- Students will understand how molecular interactions to the behavior of material give rise to macroscopic properties.

Course content

Module I: New Materials/Nanomaterials (5hrs)

Nanostructures and Nanomaterials: classification (Dimensionality, Morphology/ shape/structure of nano-entities, New Effect/ Phenomena). Hybrid nanomaterials. Effect of size, structure, mechanism, and property on material performance. Applications of nanomaterials in catalysis, telecommunication and medicine.

Project

Synthesis of TiO_2 and ZnO nanoparticles by Sol Gel ,Sonication and Precipitaion method and study their application .

Module II: Carbon Nanomaterials (5hrs)

Carbon nanomaterials, such as graphene, carbon nanotubes (CNTs), crystalline diamond, and diamond-like carbon , Properties and application of fullerenes,

Project

Synthesis and Fabrication of Graphene and Graphene Oxide by sol-gel techniques

Module III: Polymer (5hrs)

Mechanism of polymerization and synthesis of polymers, Copolymerization, Viscoelasticity. Elastomers-structure, Conducting polymers and applications, Fabrication and moulding of

polymers, Synthesis, properties and uses PMMA, formaldehyde resins, melamine-formaldehyde-urea resins

Project

Preparation of polystyrene by anionic/cationic/emulsion polymerization method

Module IV: Composites (5hrs)

Composites: characteristics, types and applications, Nanocomposites , Polymer/ Metal oxide nanocomposites and its application

Project

Fabrication of Ceramic matrix particulate composite by powder metallurgy route.

Module V: Adhesives Lubricants (4hrs)

Adhesives, adhesive mechanism and applications, Lubricants-physical and chemical properties, types and mechanism of lubrication. Additives of lubricants and freezing points of lubricants

Module VI: Energy Storages material-I (4Hrs)

Fundamental aspects related to energy storage and conversion, lithium ion batteries, Lead acid batteries; Nickel Cadmium batteries; advanced batteries

Module VII: Energy Storages material-II(4Hrs.)

Super capacitors, fuel cells and Photovoltaic, Future of battery technology

Project

Fabrication of Fuel cell and its application

Text Books:

1. A Textbook of Engineering Chemistry, by Shashi Chawla
- 2.Engineering Chemistry, by P. C Jain and M. Jain
- 3.Advanced Polymer Chemistry, by M. Chanda

Reference Books:

4. Surfactants and Polymers in Aqueous Solution, by K. Holmberg, B. Jonsson, B. Kronberg and B. Lindman
5. Energy Scenario beyond 2100, by S. Muthukrishna Iyer

Environmental Studies

Code	Course Title	Credit	T-P-PJ
CUTM1010	Environmental Studies	2	0-0-2

Objective

- To introduces the environmental consequences of Industries on the human health and methods for minimizing their impact through technology and legal system to the undergraduate students.

Course outcome

- After learning this course one should be able to control pollution at individual level and also gains an idea about conservation of natural resources and its management.

Course content

Module-I: Fundamentals of Environmental Sciences

Assignment-1: Multidisciplinary nature of Environmental science

Assignment-2: Components of Environment

Assignment-3: scope and importance of environmental science

Module: II Ecology and Ecosystem

Assignment-1: Structure and function of ecosystem

Assignment-2: Types of ecosystem

Assignment-3: Ecological Succession

Module III- Biodiversity and its conservation

Assignment-1: Concepts of Biodiversity

Assignment-2:Biodiversity at local level, global level and National level

Assignment-3: Conservation of Biodiversity

Module IV- Natural resources and its conservation

Assignment-1: Land resources and its conservation

Assignment-2: Forest resources and its conservation

Assignment-3:Water resources and its conservation

Assignment-4:Energy resources and its conservation

Module V Environmental pollutions and its control measure

Assignment-1: Soil pollution

Assignment-2: Water pollution

Assignment-3: Air pollution

Assignment-4: Noise pollution

Module VI Natural Hazards and Disaster management

Assignment-1: Concepts of natural hazards

Assignment-2: Different types of natural hazards: cyclone, earthquake, volcanic eruption etc.

Assignment-3: Process of disaster preparedness and its management

Assignment-4: Solid waste management

Module VII Environmental issues and laws

Assignment-1: Major environmental issues like climate change, global warming, green house effects, Ozone layer depletion, Acid rain

Assignment-2: Water Act, 1974

Assignment-3: Air Act, 1981

Assignment-4:Environmental protection act, 1986

Reference Books:

1. Environmental Studies by U.N. Dash & H. D. Kumar, India Tech Publication, New Delhi
2. Environmental Studies by R. Rajagopalan Oxford University Press
3. Environmental Science and Engineering, 2E, by Aloka Debi, University Press

Centurion University of Technology and Management Odisha

CHOICE BASED CREDIT SYSTEM

COURSE STRUCTURE & SYLLABUS

BASKET - II



Centurion
UNIVERSITY
Shaping Lives...
Empowering Communities...

School of Engineering & Technology

2020

Course Structure

Basket - II

Course Code	Course Title	Credits	Course Type T+P+PJ
CUTM1011	Optimisation Techniques	2	0-2-0
CUTM1012	Engineering Economics and Costing	3	2-0-1
CUTM1013	Project Management	3	2-0-1
CUTM1014	Gender, Human Rights and Ethics	3	1.5-0-1.5
CUTM1015	Climate Change, Sustainability and Organisation	3	1.5-0-1.5
CUTM1016	Job Readiness	6	0-6-0

Syllabus

Optimization Techniques

Code	Course Title	Credit	T-P-PJ
CUTM1011	Optimization Techniques	2	0-2-0

Course Rationale:

Operations research (OR) have many applications in science, engineering, economics, and industry and thus the ability to solve OR problems are crucial for both researchers and practitioners. Being able to solve the real life problems and obtaining the right solution requires understanding and modelling the problem correctly and applying appropriate optimization tools and skills to solve the mathematical model. The goal of this course is to teach you to formulate, analyse, and solve mathematical models that represent real-world problems. We will also discuss how to use EXCEL for solving optimization problems

Course Objectives:

To learn about the operations research techniques, model formulation and applications used to solve business decisions by using computer software

Course Outcomes: After completion of the course students

LO1. Ability to apply the theory of optimization methods and algorithms to develop and for solving various types of optimization problems

LO2. Ability to go in research by applying optimization techniques in problems of Engineering and Technology

LO3. Ability to solve the mathematical results and numerical techniques of optimization theory to concrete Engineering problems by using computer software

Course contents

Module-I: Linear Programming: Graphical Method, Simplex method, Penalty Method,

Module-II: Transportation Models, Assignment Models, Sequencing and Scheduling Models by Johnson's Algorithm

References Recommended:

Books

- Harvey M. Wagner, *Principles of Operations Research*, Englewood Cliffs, Prentice-Hall, 1969
- S D Sharma and Himansu Sharma, *Operations Research: Theory, Methods and Applications*, 15 Edition, Kedarnath Ramnath & Co

External Links:

<https://www.informs.org/Resource-Center/INFORMS-Student-Union/Consider-an-Analytics-OR-Career>

<https://www.informs.org/>

https://en.wikipedia.org/wiki/Operations_research

Google and YouTube

Journals:

- International Journal of operations Research
- European Journal of Operations Research
- **International Journal of Operations Research and Optimization**

Engineering Economics and Costing

Code	Course Title	Credit	T-P-PJ
CUTM1012	Engineering Economics and Costing	3	2-0-1

Course Rationale:

This course aims at providing the student with advanced concepts of engineering economic analysis and its role in engineering decision making.

Course Objectives:

CO1. Facilitate students to understand the basics of Economics and its application in the field of engineering

CO1.Enable students to understand the concepts of the time value of money and techniques for evaluation of engineering project

CO1.Equip students with the skills required to understand cost statements/records of the product and its effect on decision making

Course Outcomes: After completion of the course students

LO1. Apply the microeconomics concepts related to business and its impact on enterprise

LO1.Develop an awareness and understanding time value of money and techniques for evaluation of engineering project

LO1.Apply cost concepts to analyse common business management decisions such as pricing a product and services.

Course contents

Module: I: Engineering Economics – Nature and scope

General concepts on Micro & Macro Economics. The Theory of demand, Demand function, Law of demand and its exceptions, Elasticity of demand, Law of supply and elasticity of supply.

Theory of production, Law of variable proportion, Law of returns to scale.

Module-II: Time value of money:

Simple and compound interest, Cash flow diagram, Principle of economic equivalence. Evaluation of engineering projects: Present worth method, Future worth method, Net present value method, internal rate of return method, Cost-benefit analysis in public projects.

Depreciation: Meaning Causes, Factors affecting depreciation, Methods of providing depreciation, Straight Line Method & Diminishing Balance Method

Module-III

Cost concepts, Elements of costs, Preparation of cost sheet, Segregation of costs into fixed and variable costs. Break-even analysis (Simple numerical problems to be solved)

Indian Banking System: Banks: Meaning, nature, characteristic of the Indian banking system, functions of commercial banks, functions of Reserve Bank of India, Overview of Indian Financial System.

Books

- Riggs, Bedworth and Randhwa, “Engineering Economics”, McGraw Hill Education India.
- Mithani, D.M., Principles of Economics. Himalaya Publishing House
- Mishra, S. “Engineering Economics & Costing”, PHI
- Sullivan and Wicks, “Engineering Economics”, Pearson
- Paneer Seelvan, R., “Engineering Economics”, PHI
- Gupta, G.S., “Managerial Economics”, TMH
- Lal and Srivastav, “Cost Accounting”, TMH

Links to websites:

- <http://courseware.cutm.ac.in/>

Project Management

Code	Course Title	Credit	T-P-PJ
CUTM1013	Project Management	3	2-0-1

Course Objective:

- The successful development and implementation of all project's procedures.
- Learn project management methodology to initiate and manage projects efficiently and effectively
- Acquire key project management skills and strategies for Productive guidance, efficient communication and supervision of the project's team
- The achievement of the project's main goal within the given constraints

Course outcome:

- Develop a Project Charter document for any project
- Develop Project Management Plan document
- Acquire 10 knowledge area identified by PMI and its application while delivering a projects
- Implement the Project and Prepare a project document that they have undertaken as a learning tool
- Qualify CAPM/PMP certification offered by PMI

Course Content:

Unit: I

Project Management framework; Introduction to Project Management; Project Life Cycle and Organisation, Project vs. Operational work, Stakeholders, Organisational Influences

Project Management Process for a Project, groups, Initiating, planning, executing, monitoring &controlling and closing process groups.

Project management Knowledge area;

Project Integration Management; Develop project charter, develop project management plan, direct and manage project execution, monitor and control project work, perform integrated change control, close project or phase.

Unit: II

Project Scope Management; collect requirements, define scope, create WBS, verify scope, control scope

Project Time Management; Define activities, sequence activities, estimate, develop and schedule

Project Cost Management; Estimate costs, determine budget, control costs

Unit: III

Project Quality Management; Plan quality, perform quality assurance, perform quality control

Project HR Management; Develop HR plan, acquire project team, develop and manage project team

Project Communications Management; Identify stakeholders, plan communication, distribute information, manage expectation of stake holders, report performance

Unit: IV

Project Risk Management; Plan risks; identify risks, perform quality and quantitative risk analysis, plan risk responses, monitor and control risks

Project Procurement Management; Plan procurements, conduct procurements, administer procurements, close procurements

Project Stakeholders Management;Identifying stakeholders, stakeholder analysis, engagement

Note: Students can use any of these software for their project; MS. Excel/ Bitrix 24/Primavera/ Microsoft Projects

Books Recommended:

- 1) Project Management: A Managerial Process, Clifford F Gray & Eric W Larson, Tata McGrawHill [Text book]
- 2) A Guide to the Project Management Body of Knowledge, 6th Edition, PMI
- 3) Project Management- A system Approach to Planning, Scheduling and Controlling (Harold Kerzner). CBS Publishers and Distributors, New Delhi.
- 4) Projects, Preparation, Appraisal and Implementation (Prasanna Chandra), 3rd Edition, Tata Mc Graw Hill, New Delhi.
- 5) Project Management (Nagarajan, K), New Age Publishers, New Delhi.
- 6) Project Management. A Managerial Approach (Meredith, R.J and Mantel, S.J), Wiley (India).

Gender, Human Rights and Ethics

Code	Course Title	Credit	T-P-PJ
CUTM1014	Gender, Human Rights and Ethics	3	1.5-0-1.5

Course Objectives

This course is about gender, human rights and ethics in which the student will be sensitized and exposed to related issues in the context of business and organisations in India. The specific objectives are:

- To develop an understanding of gender, human rights and ethics in an unequal society like India
- Sensitisation of how gender, human rights and ethics are significant in organisations.
- Integrating concerns related to gender, human rights and ethics in organisations.

Course Outcomes

- Understanding the complexity of issues and challenges relating to gender, human rights and ethics
- Be sensitive to gender, human rights and ethics within an organizational context,
- To integrate concerns related to gender, human rights and ethics into the policies, processes and systems in an organization.

Course Syllabus

Module 1

- Difference between sex and gender; social construction of gender and its outcomes in the form of behavior, roles, gender based division of labour, hierarchy; gender relations.
- Gender issues in organisations - significance of relations between structures, practices, context, interactions and power for construction of gender at organisational level
- Gender implications at workplace, management and leadership, Laws and Acts
- Comparing different types of organisations; how to create a gender sensitive organisation.

Module 2

- Introduction to human rights, Meaning and Definition, Types
- Human Rights Law: Protection, violation and the legal framework for their protection - International Human Rights Law, Universal Declaration of Human Rights
- Conflicts of Rights and its Significance to Organisations: Challenges of the past and challenges for the future. Persistence of social discrimination and inequality; efforts in the search for justice for past violations, continued struggle for human rights and accountability in an organisational context.

Module 3

- Introduction to and study of ethics; Indian and Western ethics
- Different ethical systems and perspectives; ethical relativism and its implications, utilitarianism, duty ethics and virtue ethics in organisations
- Critique of various ethical positions and develop their own position in an organizational context.

Session Plan

Session 1

Basic concepts on sex and gender; social construction of gender; constitutional provisions for gender equality.

PPT 1 - [Introduction to Gender](#)

1.5 mins video on Gender Equality and Poverty

<https://www.youtube.com/watch?v=4viXOGvvu0Y>

Session 2

Gender issues in different sectors – Health, Education, Governance, Livelihoods

PPT 2 - [Gender issues in health](#)

PPT 3 - [Gender issues in education](#)

PPT 4 - [Gender issues in Governance](#)

1.3 mins video on gender stereotypes and education

<https://www.youtube.com/watch?v=nrZ21nD9I-0>

Session 3

Approaches to address gender inequality – WID, WAD and GAD

PPT 5 - [WID WAD GAD](#)

TED talk by Deepa Bhardwaj - True equality is when both women and men have a voice - 13 mins

https://www.youtube.com/watch?v=BSRTZ_q4RX8

Session 4 & 5

Gender and organizational issues

PPT 6 - Gender and Organisations

PPT 7 - Gender Equality in Organisations

PPT 8 - Gender Mainstreaming and Attitude in Workplace

PPT 9 - Gender Sensitisation

3.22 mins on The Future of Gender Equality in Work by ILO

https://www.ilo.org/global/about-the-ilo/multimedia/video/institutional-videos/WCMS_558508/lang--en/index.htm

4.22 mins video on Gender Based Analysis

<https://www.youtube.com/watch?v=p6w-d1mmjFU>

Free Readings

Gender and Development - Concepts and Definitions

Gender and Organisational Change Training

Project

-Gender Responsive Governance in times of COVID 19

<https://in.one.un.org/gender-responsive-governance-in-the-times-of-covid-19/>

- SDG - Gender Equality Goal 5

<https://in.one.un.org/page/sustainable-development-goals/sdg-5/>

- Gender, Sustainability and Environment

Women Environment and Sustainable Development A Ca

- Good Practices of Gender Mainstreaming in India

Good Practices for Gender Mainstreaming

- Gender Equality Case Study

Gender Equality - Kerala Case Study

Session 6

Basic concepts on human rights; history of human rights; current significance

Videos on Basic concepts of human rights

<https://www.youtube.com/watch?v=ew993Wdc0zo>

<https://www.youtube.com/watch?v=JpY9s1Agbsw>

Videos on History of Human Rights

<https://www.youtube.com/watch?v=nDgIVseTkuE>

https://www.youtube.com/watch?v=6XXGF_V8_7M

Session 7

Violation and legal framework for the protection of human rights

Video on the Paris Principles

https://www.youtube.com/watch?v=ZEgD7pdXt_c

Video on Protection of Human Rights Act 1993 (for reference, bilingual)

<https://www.youtube.com/watch?v=qAiiOyL5WAw>

Session 8

Human rights and sustainability framework

Video on Human Rights and Sustainable Development

<https://www.youtube.com/watch?v=mHHy1gDn4x8>

Session 9 & 10

Human rights in the organizational context

Video on Why should your company care about human rights

<https://www.youtube.com/watch?v=mCtNx3hHZ08>

Video on UN Reporting Framework: Salient Human Rights Issues

<https://www.youtube.com/watch?v=LswDupgiZug>

Books:

1. *Arihants UGC NET Human Rights and Duties*

2. *Kapoor, S. K. Central Law Agency's Human Rights under International Law and National Law*

Ciapham Andrew, 2015, Human Rights: A Very Short Introduction, Oxford University Press

Smith Rhona, 2015, Textbook on International Human Rights, Oxford University Press

Free Online Sources:

<https://www.humanrightscareers.com/.../10-human-rights-study-books-you-can-download>

<https://www.humanrightscareers.com/courses/>

Session 11

Basic concepts in ethics

PPT - [Introduction to Ethics](#)

Video on Ethics defined

<https://www.youtube.com/watch?v=4vWXpzlL7Mo>

Session 12

Theoretical perspectives – utilitarianism, virtue ethics, duty ethics

PPTs - [Duty Ethics](#)

[Utilitarianism](#)

[Virtue Ethics](#)

Video on Utilitarianism

https://www.youtube.com/watch?v=-FrZl22_79Q

Video on virtue ethics

<https://www.youtube.com/watch?v=NMblKpkKYao>

Video on deontology (duty) ethics

<https://www.youtube.com/watch?v=wWZi-8Wji7M>

Project (self exploration through case studies)

Fraudulent Books 1

Gifts from the Boss's Friend 1

Gifts from the Sales Representative 1

Session 13

Ethical relativism

PPT - Ethical Relativism

Video on Moral relativism

<https://www.youtube.com/watch?v=5RU7M6JSVtk>

Project (self-exploration through case studies)

Mining Data docx 1

Office Affair 2

On-time Delivery

Session 14 & 15

Ethics in organisations

Video on ethics in the workplace

<https://www.youtube.com/watch?v=0mUxMpMTT28>

Project (self-exploration through case studies)

Falsifying Attendance 1

Family Loyalty vs. Meritocracy 1

Rumors 1

The Supervisor's Choice 1

Books

Frankena, WK, 1973, Ethics (2nd Edition), Pearson.

Singer, P. 2011, Practical Ethics (3rd ed), Cambridge University Press.

Smart, JJC and Williams, B. 1973, Utilitarianism: For and Against, Cambridge University Press.

Climate Change, Sustainability and Organisations

Code	Course Title	Credit	T-P-PJ
CUTM1015	Climate Change, Sustainability and Organisations	3	1.5-0-1.5

Course Rationale:

This course is about climate change, sustainability and its implications for organisations. Climate change and sustainability are closely interlinked. Students will be exposed to related issues, challenges and debates on the subjects. They will develop an understanding of how organizational performance gets affected by climate change today. As organisations grow and diversify in India, there is a need to sensitise Management students to the significance of climate change and its impact on humanity and environment; Sustainable Development Goals (SDGs) and integrated reporting framework for sustainability of organisations.

Module 1: Climate Change and Organisations

Course Objectives:

- CO1. To develop an understanding about climate change in general, responses and debates
- CO2. To create awareness about the impact of climate change on organisations in performance, growth and sustainability
- CO3. To facilitate in developing reference points to factor in aspects of climate change in organizational planning and development

Course Outcomes:

- LO1. Students will be exposed to current climate change issues, challenges and debates
- LO2. They will be sensitive to its implications for organisations in different sectors
- LO3. The course will equip the students of Management to develop strategies for perspective planning of organisations

Course Contents:

1. Basics of climate change; impacts on various sectors; responses and mitigation efforts by the state and non-state agencies; debates and critiques
2. Sectoral implications of climate change – Agriculture and Forestry; Transportation; Buildings; Energy; Industry and Manufacturing
3. Climate change – specific impacts (Migration, Disasters and Pandemics)
4. Mitigation and adaptation keeping the sustainability of business organisations

Projects: Case study, videos, small group workshops, book reviews

Session Plan for Module 1 – Climate Change and Organisations (10 one hour sessions)

Session 1: Basic concepts of climate change, impacts, issues and challenges

Session 2: Responses and mitigation efforts by state and non-state agencies

Session 3: Debates and critiques on climate change

Session 4: Climate change and ecosystem

Session 5: Climate change and social sector – health, education and livelihood/food security

Session 6: Climate change and infrastructure and services – buildings, transportation, communication, electricity/energy

Session 7: Mitigation and adaptation of climate change impacts on business organisations

Session 8 and 9: Climate change impacts of migration, disasters and pandemics – societal and organisational implication

Session 10: Develop reference points to factor into perspective planning and development of organisations

Module 2 – Sustainability in Organisations

Course Objectives:

CO1. To develop an understanding of sustainable development, SDGs and their relevance for sustainability of organisations

CO2. To comprehend the application of the Integrated Reporting Framework for Sustainability in business.

Course Outcomes:

LO1. The student will develop an understanding of perspectives on SDGs, sustainability and development in the context of organisations

LO2. Argue the business case for sustainability informed by an understanding of the impact of current global and local economic, social and environmental pressures (including pandemics)

LO3. Develop an Action Plan through a Case Study for integrating sustainability across an organisation's value chain

LO4. Develop and apply the Integrated Reporting Framework for Sustainability through a case.

Course Contents:

1. Sustainable development, debates, SDGs, challenges and opportunities; The business case and leadership for action
2. Regulatory environment and International policy; Integrated Reporting Framework for Sustainability
3. Production and consumption; Design, technology, and planning for sustainability
4. Communication and marketing; Collaboration and partnerships

Projects: Small group exercises, case analysis, video and book reviews

Session Plan for Module 2 – Sustainability in Organisations (10 one hour sessions)

Session 1: Sustainable development basics and introduction to SDGs (rationale, issues and challenges for India)

Session 2 to 6: Discussion on the 17 SDGs

Session 7: SDGs and its relevance for organisations

Session 8 to 10: Integrated framework for reporting sustainability in organisations; factoring aspects of SD into performance of organisations

The 17 sustainable development goals (SDGs) to transform our world:

GOAL 1: No Poverty

GOAL 2: Zero Hunger

GOAL 3: Good Health and Well-being

GOAL 4: Quality Education

GOAL 5: Gender Equality

GOAL 6: Clean Water and Sanitation

GOAL 7: Affordable and Clean Energy

GOAL 8: Decent Work and Economic Growth

GOAL 9: Industry, Innovation and Infrastructure

GOAL 10: Reduced Inequality

GOAL 11: Sustainable Cities and Communities

GOAL 12: Responsible Consumption and Production

GOAL 13: Climate Action

GOAL 14: Life Below Water

GOAL 15: Life on Land

GOAL 16: Peace and Justice Strong Institutions

GOAL 17: Partnerships to achieve the Goal

Videos – Climate Change

1. CSE Climate Change Analysis - <https://www.youtube.com/watch?v=5fyT3-9kxU4> (7.5 mins)

2. Climate Change is having Massive Impact on Indian Farmers - <https://www.youtube.com/watch?v=A8gcGalzqlw> (8.5 mins)
3. Climate Change in India: The Risks we face (NDTV) - <https://www.youtube.com/watch?v=AT1yi1tDenM> (20.28 mins)

Videos – Sustainable Development

1. Short Videos (5) on Sustainable Development Goals and one TED Talk <https://developmenteducation.ie/blog/2017/09/5-videos-sustainable-development-goals-worth-view-useful-ted-talk/>
2. Overview of Sustainable Development Goals - <https://www.youtube.com/watch?v=s190sjqYRdg> (7.43 mins)

Projects:

1. Climate change impacts on agriculture and policy responses – what is the current practice and its implications for the sector and people; give your own recommendations based on your understanding of issues, challenges, debates, critiques.
2. Marine fishing – fisherfolk
3. Forest dwellers
4. Business organisations – MSMEs, manufacturing, service industries; application of the integrated framework for sustainability reporting

Job

Readiness

Code	Course Title	Credit	T-P-PJ
CUTM1016	Job Readiness	6	0-6-0

Course Objectives

Develop additional skills (verbal, logical, quantitative and reasoning) required to enhance employability as well as the entrepreneurial ability of the students

Course Outcomes

Achieve the following scores as a minimum:

IELTS 6.5

Verbal: 60% (average of 10 exams)

Quantitative: 60% (average of 10 exams)

Logical Reasoning: 60% (average of 10 exams)

Note: A student will be awarded the credits and grades as outlined in the attached presentation:

<https://drive.google.com/file/d/1Wst-jdAJuHHVtYC4F-p3SKuw1PHWOI1U/view?usp=sharing>

Course Syllabus

Course Division

Course I: IELTS - Reading, Listening, Speaking and Writing

Course II: IELTS Verbal

Course III: Quantitative Aptitude

Course IV: Logical Reasoning

Course I: IELTS - Reading, Listening, Speaking and Writing

Module I: IELTS Reading (18hrs)

- Skimming and Scanning
- Sentence Completion
- Choose the Correct options (A, B, C, D)
- Locating the Specific Information
- Assessment on Reading Skill

Module II: IELTS Listening (6hrs)

- Notes/ Form/Table completion
- Label the Map/Passage, Multiple Choice Questions

- Complete the Sentences, Listening to Find Information
- Assessment on Listening Skills

Module III: IELTS Speaking (18hrs)

- Speaking about yourself, your family, your work and your interests
- Introduction & Interview
- Topic Discussion (e.g, Environment, Covid 19, Job)
- Assessment on Speaking Skills

Module IV: IELTS Writing (6 hrs)

- Summarising the chart, table or graph
- Comparing and contrasting graphs and tables
- Describing maps & diagrams
- Agreeing & disagreeing
- Expressing a personal view & opinion
- Assessment on Writing Skill
- CV Writing (2nd year)
- Letter Writing
- Email Writing(2nd year)
- Getting Started –writing an introduction

Course II: IELTS Verbal

Module I: Grammar (4 Hrs)

- Articles
- Prepositions
- Subject-Verb
- Spotting Errors
- Sentence Correction

Module II: Vocabulary (5 Hrs)

- Synonyms
- Antonyms

- Contextual Vocabulary

Module III: Reading Comprehension (3 Hrs)

- Paragraph/ Sentence Completion
- Jumbled Sentences/ Jumbled Paragraph
- Reading Comprehension

Module IV: Verbal Analogies (3 Hrs)

Course III: Quantitative Aptitude

Module I: Number System & Operation (14 Hrs)

- Speed Math-1 : Multiplication tricks, Square, cube, square root, Cube root tricks
- Speed Math-2 : Speed Calculations
- Number System-01 : Operation on Numbers, Classification of Numbers, Tests of Divisibility, Unit Digit Calculation
- Number System-02 : Arithmetic Progression, Geometric Progression, Factors & Factorials, Trailing Zeroes, Remainder Theorem
- HCF & LCM : Concepts, short tricks, question discussion
- Average : Concepts, short tricks, question discussion
- Assessments

Module II: Basic Arithmetic (16 Hrs)

- Percentage-01 : Basics of Percentage, Effective percentage, shortcuts
- Percentage-02 : Advanced questions and discussions
- Profit & Loss-01 : Basics and advanced questions of Profit & Loss and shortcuts
- Profit & Loss-02 : MRP, Discount, Successive discount
- Ratio & Proportion : Types of ratios, Basics & Advanced Question
- Age : Concepts & Shortcuts
- Partnership : Concepts & Shortcuts
- Mixture & Alligation : Rule of Alligation, Basics & Advanced question, Short tricks
- Assessments

Module III: Time & Analysis (17 Hrs)

- Time, Speed, Distance : Concepts, Problems based on relations, Average speed, Stoppage time
- Trains : Relative Speed & All types of train problems
- Boats & Streams : Basics, Upstream, Downstream & Shortcuts
- Race : All concepts & Shortcuts
- Time & Work : Efficiency, wages, alternative day, chain rule
- Pipes & Cistern : Positive & Negative work
- Simple Interest : Concepts & Shortcuts on Simple Interest & Installments
- Compound Interest : Concepts & Shortcuts on Simple Interest & Installments
- Logarithm : All Formulae, concepts & Shortcuts
- Assessments

Module IV: Advanced Arithmetic (16 Hrs)

- Equation : Linear & Quadratic
- Permutation : All concepts & Shortcuts on factorial, fundamental principles of counting
- Combination : All concepts & Shortcuts on Selection (Groups/teams)
- Probability : Terms related to Probability, Event, Theorems related Probability, Conditional Probability. Shortcuts on coins, dices, balls, cards, etc
- Data Interpretation : (Bar/Pi-Chart /Line) graph
- Mensuration : Area & Volume
- Height & Distance : Lines of Sight, Horizontal line, Angle of Elevation, Angle of Depression
- Assessments

Course IV: Logical Reasoning

Module I: Verbal Reasoning-I (14 Hrs)

- Series-1 : Number series (Missing & Wrong)
- Series-2 : Letter, Alpha numeric, Miscellaneous series
- Coding & Decoding : Letter Coding, Number coding, Message coding, Substitution coding, Conditional coding
- Word Problem : Analogy, Odd man out, word formation, letter pair
- Logical Thinking : Brain Riddles
- Assessments

Module II : Verbal Reasoning-II (14 Hrs)

- Order & Ranking : Ranking & Sequence
- Direction Sense Test : Shortest Distance, Angular movement concept and Dusk & Dawn
- Clock : Concepts of Angle, Reflex angle, Right angle Opposite, Coincide and Incorrect clock
- Calendar : All concepts & Shortcuts
- Blood Relation : Jumbled-up descriptions, coded relations, Relation Puzzles
- Assessments

Module III : Non Verbal Reasoning (14 Hrs)

- Cubes & Dices
- Cubes & Cuboids
- Embedded Figure & Figure series
- Figure Puzzle & Figure grouping
- Figure Counting
- Mirror & Water Image
- Paper Cutting & Paper folding
- Assessments

Module IV: Advanced Reasoning (16 Hrs)

- Sitting Arrangement : Circular, Square, Rectangular, Linear, Triangular

- Puzzle : Box, Floor, Month, Day
- Advanced Puzzle : 3 variable
- Logical Venn Diagram
- Syllogism
- Statement & Conclusion
- Data Sufficiency
- Assessments

Centurion University of Technology and Management Odisha

CHOICE BASED CREDIT SYSTEM

COURSE STRUCTURE & SYLLABUS

BASKET - III



Centurion
UNIVERSITY

Shaping Lives...
Empowering Communities...

School of Engineering & Technology

2020

**Course Structure
Basket - III**

Course Code	Course Title	Credits	Course Type T+P+PJ
CUTM1017	Industrial IOT and Automation	6	3-2-1
CUTM1018	Data Analysis and Visualisation using Python	4	0-1-3
CUTM1019	Machine Learning using Python	4	1-2-1
CUTM1020	Robotic automation with ROS and C++	4	1-2-1
CUTM1021	Basics of Design Thinking	2	0-0-2
CUTM1022	System Integration with DYMOLA	2	0-0-2
CUTM1023	Smart Engineering Project (G2M)	3	0-0-3

Industrial IoT and Automation

Code	Course Title	Credit	T-P-PJ
CUTM1017	Industrial IoT and Automation	6	3-2-1

Objective

- Students will learn the new evolution in hardware, software, and data.
- While the promise of the Industrial Internet of Things (IIoT) brings many new business prospects, it also presents significant challenges ranging from technology architectural choices to security concerns.
- Students acquire upcoming Industrial Internet of Things: Roadmap to the Connected World Course offers important insights on how to overcome these challenges and thrive in this exciting space.

Course outcome

- Discover key IIoT concepts including identification, sensors, localization, wireless protocols, data storage and security
- Explore IoT technologies, architectures, standards, and regulation
- Realize the value created by collecting, communicating, coordinating, and leveraging the data from connected devices
- Examine technological developments that will likely shape the industrial landscape in the future
- Understand how to develop and implement own IoT technologies, solutions, and applications
- At the end of the program, students will be able to understand how to develop and implement their own IoT technologies, solutions, and applications.

Course content

MODULE 1: Introduction & Architecture

Theory

What is IIoT and connected world? The difference between IoT and IIoT, Architecture of IIoT, IOT node.

Challenges of IIOT

Hands-On

1. Introduction to Arduino, ESP8266, Introduction to raspberry Pi.

MODULE2: IIOT Components

Theory:

Fundamentals of Control System, introductions, components, closed loop & open loop system.

Introduction to Sensors (Description and Working principle): What is sensor? Types of sensors, working principle of basic

Sensors -Ultrasonic Sensor, IR sensor, MQ2, Temperature and Humidity Sensors (DHT-11).Digital switch, Electro

Mechanical switches.

Practice:

2. Measurement of temperature & pressure values of the process using raspberry pi/node mcu.
3. Modules and Sensors Interfacing (IR sensor, ultrasonic sensors ,Soil moisture sensor) using raspberry pi/node mcu.
4. Modules and Actuators Interfacing (Relay, Motor, Buzzer) using raspberry pi/node mcu.

MODULE 3: Communication Technologies of IIoT

Theory:

Communication Protocols: IEEE 802.15.4, ZigBee, Z Wave, Bluetooth, BLE, NFC, RFID

Industry standards communication technology (LoRAWAN, OPC UA, MQTT), connecting into existing Modbus and Profibus

Technology, wireless network communication.

Practice:

5. Demonstration of MQTT communication
6. Demonstration of LoRa communication.

MODULE 4: Visualization and Data Types of IIoT

Theory:

Front end EDGE devices, enterprise data for IIoT, emerging descriptive data standards for IIoT, cloud data base, cloud

Computing, fog or edge computing,

Connecting an Arduino /raspberry pi to the Web: Introduction, setting up the Arduino/raspberry pi development

Environment, Options for Internet connectivity with Arduino, configuring your Arduino/raspberry pi board for the IoT.

Practice:

7. Visualization of diverse sensor data using dashboard (part of IoT's 'control panel')
8. Sending alert message to the user.

MODULE 5:

Theory

Extraction from Web: Grabbing the content from a web page, Sending data on the web, troubleshooting basic Arduino

issues, types of IoT interaction , Machine to Machine interaction (M2M).

Practice

9. Device control using mobile Apps or through Web pages.

10. Machine to Machine communication

MODULE 6: Control & Supervisory Level of Automation

Theory

Programmable logic controller (PLC), real-time control system, Supervisory Control & Data Acquisition (SCADA).

HMI in an automation process, ERP &MES

Practice

11. Digital logic gates programming using ladder diagram

12. Implementation of Boolean expression using ladder diagram

13. Simulation of PLC to understand the process control concept.

Module 7: Application of IIOT

Case study: Health monitoring, Iot smart city, Smart irrigation, Robot surveillance

Text Books:

1. Industrial IoT Challenges, Design Principles, Applications, and Security by Ismail Butun (editor)
2. Internet of Things with Arduino Cookbook, Marco Schwartz, ISBN 978-1-78528-658-2

Reference Books:

1. The Internet of Things in the Industrial Sector, Mahmood, Zaigham (Ed.) (Springer Publication)
2. Industrial Internet of Things: Cybermanufacturing System, Sabina Jeschke, Christian Brecher, Houbing Song, Danda B. Rawat (Springer Publication)
3. Internet of Things- A Hands on Approach, Arshdeep Bahga and Vijay Madiseti , Universities Press , 2015.

Data Analysis and Visualization Using Python

Code	Course Title	Credit	T-P-PJ
CUTM1018	Data Analysis and Visualisation Using Python	4	0-1-3

Objective

- How to tell a story from data
- How to marshal the data for storyline
- The ability to develop visualisation to tell the story
- The focus is on analysis of data using visualisation as a tool

Course outcome

- To create impactful visualization with good story line.

Course content

Module-I

STORY BOARD DEVELOPMENT

The objective and flow of the story to be understood through cases

Module-II

DATA READING USING PYTHON FUNCTIONS

Python libraries: Pandas, NumPy, Plotly, Matplotlib, Seaborn, Dash

Data collection from online data sources, Web scrap, and data formats such as HTML, CSV, MS Excel, data compilation, arranging and reading data, data munging

Module-III

DATA VISUALSATION USING PYTHON LIBRARIES

Different graphs such as Scatterplot, Line chart, Histogram, Bar chart, Bubble chart, Heatmaps etc.

Dashboard Basics – Layout, Reporting, Infographics, Interactive components, live updating

Projects List

1. COVID 19
2. World Development Indicators
3. ERP dashboarding
4. Details of Social/ Empowerment schemes of Govt. etc.

References:

<https://www.programmer-books.com/wp-content/uploads/2019/04/Python-for-Data-Analysis-2nd-Edition.pdf>

<https://towardsdatascience.com/data-visualization/home>

Reading materials and videos available on internet on how to use ANACONDA, JUPYTER NOTEBOOK and Python Libraries

Machine Learning using Python

Code	Course Title	Credit	T-P-PJ
CUTM1019	Machine Learning using Python	4	1-2-1

Objective

- Understand the meaning, purpose, scope, stages, applications, and effects of ML.
- Explore important packages of python, such as numpy, scipy, OpenCV and scikit-learn.

Course outcome

- Students will able to Create and incorporate ML solutions in their respective fields of study.

Course content

Module 1 – Application and Environmental-setup (12 hrs)

- Applications of Machine Learning In different fields (Medical science, Agriculture, Automobile, mining and many more).
- Supervised vs Unsupervised Learning based on problem Definition.
- Understanding the problem and its possible solutions using IRIS datasets.
- Python libraries suitable for Machine Learning(numpy, scipy, scikit-learn, opencv)
- Environmental setup and Installation of important libraries.

Module 2 - Regression (8 hrs)

- Linear Regression
- Non-linear Regression
- Model Evaluation in Regression
- Evaluation Metrics in Regression Models
- Multiple Linear Regression

- Feature Reduction using PCA
- Implementation of regression model on IRIS datasets.

Module 3 - Classification (24 hrs)

- Defining Classification Problem with IRIS datasets.
- Mathematical formulation of K-Nearest Neighbour Algorithm for binary classification.
- Implementation of K-Nearest Neighbour Algorithm using sci-kit learn.
- Classification using Decision tree.
- Construction of decision trees based on entropy.
- Implementation of Decision Trees for Iris datasets .
- Classification using Support Vector Machines.
- SVM for Binary classification
- Regulating different functional parameters of SVM using sci-kit learn.
- SVM for multi class classification.
- Implementation of SVM using Iris datasets .
- Implementation of Model Evaluation Metrics using sci-kit learn and IRIS datasets.

Module 4 - Unsupervised Learning (12 hrs)

- Defining clustering and its application in ML .
- Mathematical formulation of K-Means Clustering.
- Defining K value and its importance in K-Means Clustering.
- Finding appropriate K value using elbow technique for a particular problem.
- Implementation of K-Means clustering for IRIS datasets

Projects

- To be defined based on respective study area of student.

References:

Text Book:

1. Ethem Alpaydin, Introduction to Machine Learning, Second Edition,
<http://mitpress.mit.edu/catalog/item/default.asp?ttype=2&tid=12012>.

Web Resource:

1. <https://towardsdatascience.com/beginners-guide-to-machine-learning-with-python-b9ff35bc9c51>

Robotic automation with ROS and C++

Code	Course Title	Credit	T-P-PJ
CUTM1020	Robotic automation with ROS and C++	4	1-2-1

Course Content:

1. Robotic Automation Introduction
2. Sensors & Controllers
3. Sequential robot control
4. ROS & C++
5. Project

Course Objectives

- To upgrade knowledge levels of robotic application in modern industries
- Project based training

Course Outcomes

- Advanced knowledge on robotic automation
- Understand different types of devices to which robotic modules are connected
- Provide the knowledge about understand various types of robotic applications.
- Industry based project & advanced learning.

Course Syllabus

Module – 1

Robotic Automation Introduction

- 1.1 Basic's of automation
- 1.2 Use of robots in industry.

Module - 2

Sensor's requirement in robots.

- 2.1 Selecting sensors as per the project.
- 2.2 Specification checking of sensors.
- 2.3 Interfacing of sensor to controllers.

Practice

- P2.1 TILT, PROXIMITY, TEMPERATURE, HUMIDITY, SMOKE, FINGERPRINT
- P2.2 BLUETOOTH, ESP8266, GPS, GSM

Module - 3

Controllers and output port handling.

- 3.1 Concept of 8951 controller
- 3.2 Concept of Arduino and concept of Raspberry Pi.

Practice

- P3.1 Port handling of 8951
- P3.2 Port handling of Arduino
- P3.3 Port handling of Raspberry Pi

Module- 4

Sequential robot control

- 4.1 Designing of sequential robot control system.
- 4.2 Writing of programs in different programming languages.
- 4.3 Controlling of input/output devices.

Practice

- P4.1 Programming of controllers with different programming languages
- P4.2 Designing of sequential control robot.

Module- 5

ROS & C++

- 5.1 What is Ubuntu & ROS?
- 5.2 Requirement and application of ROS.
- 5.3 ROS based simulation of Turtlbot.
- 5.4 Adding of robot with wheel & sensor. Placing robot inside Gazebo.

Practice:

- P5.1 Ubuntu basic command.

P5.2 Installation of Ubuntu, ROS & Gazebo

P5.3 Turtlebot control application

P5.4 Gazebo based robot control and simulation.

P5.5 Python and C++ based programming to control robot.

Virtual LAB : Using ROBOMASTER (AWS)

Projects

1. Mobile controlled robot
2. Autonomous operated robot.
3. 3. Location targeted robot

Basics of Design Thinking

Code	Course Title	Credit	T-P-PJ
CUTM1021	Basics of Design Thinking	2	0-0-2

Course Rationale:

Steve Jobs famously said “Design is just not what it looks or feels like. Design it how it works”. Design Thinking is described as a discipline where designer’s sensibility and methods match with the needs of users. It draws on logic, imagination, intuition and systemic reasoning to explore the possibilities of a solution to a challenge and to create desired outcomes that benefit the end user. So, if you are among the one who is constantly thinking of solving a problem of business or society, it is ideal for you. This course will help you with the basics of design thinking and through an action centric learning approach, lead to creatively explore the challenges and by using the design thinking tool propose innovative solutions.

Course Objectives: The course aims to

- To orient the participants with the basics of the design thinking process
- To familiarize participants with the elements of Design thinking

Course Outcome: After completion of the course the students

- will be able to apply the design thinking process to innovative problem solving

Course contents:

Module: I

Basics of Design Thinking, Why Design Thinking, Design Thinking Mindset (Inspiration, Ideation and Implementation) Design thinking process, (Empathy, Define, Ideate, Prototype, Test). Cases of application of Design thinking approach (Intuit, IDEO, Infosys, IBM, Google, Apple, Jubilant Foods)

Module: II

Executing a Design Thinking Project- Apply Interviewing and empathy building technique, Drawing inferences from the observations, Defining a point of view, Ideation process, developing and testing prototypes and writing a story of a minimum viable solution.

Projects-

- Develop a customer friendly insulin pump design
- Develop a new customer experience for buying a diamond ring online
- Develop a new disease monitoring device for health workers working in remote areas.
- Designing an integrated machinery for end to end farm activities for small and marginal farmers.
- Design a Fund raising campaign

Recommended References:

Books: Tom Kelly & Jonathan Littman (2001). “The Art of Innovation” Broadway Publication.

System Integration with DYMOLA

Code	Course Title	Credit	T-P-PJ
CUTM1022	System Integration with DYMOLA	2	0-0-2

Course Objectives

- To provide powerful multi-disciplinary systems engineering through compatible model libraries for a large number of engineering domains.
- To design high-fidelity modeling of complex integrated systems.
- To design intuitive modeling i.e. advanced, formally defined object-oriented modeling language.
- To enable users to easily build their own components or adapt existing ones to match their unique needs.
- To provide hardware-in-the-loop simulations (HILS) i.e. real-time simulation with AurdinoUno, Python, Matlab, 3D real-time animation, CAD files import capability.
- To increase the ability to integrate with complex 3D geometry for integrated simulation.
- To increase powerful model management, calibration & optimization capabilities.

Course Outcomes

- The use of open standards such as DYMOLA (Modelica and FMI) is a key enabler to better understand the behavior of systems and to work and communicate accurately with partners and suppliers.
- DYMOLA is not only capable to support an ad-hoc modeling level, such as functional behavior or detailed design, but is also able to convert these predictive models into real-time models.
- The user can able to create new elements in an easy and intuitive way, to answer to its own modeling requirements.
- Future Centurions are ready for operating in many industries including automotive, aerospace, architecture, Motorsport, energy, and high tech.

Course Syllabus

Module 1 - Introduction Dymola and Modelica library

Package Browser, Component Browser, Parameter and Variable Editor Simulation

Window,

Modeling, and Simulation.

The Modeling window is used to compose models and model components.

The Simulation experiment on the model, plot results and animate the behavior.

Creating user-defined models and scripting using Modelica language.

Role Play – Explore the pre-defined libraries and Models, Creating a Package

Practice Project - Preparation of animated projects

<https://www.youtube.com/watch?v=39xyI0k>

<https://www.youtube.com/watch?v=FN8LlnTwzVE&t=314s>

Module 2 – Physical Modeling using DYMOLA

Import of user-defined libraries and packages, interfacing with physical models using ArduinoUno.

The Simulation experiment on the model using multi-domain libraries such as mechanical, electrical, control, thermal, pneumatic, hydraulic, powertrain, thermodynamics, vehicle dynamics, air-conditioning domains

Dymola interface that is stored in the Python package

Role Play – Explore the pre-defined libraries and Models, Creating a Package

Practice Project - Preparation of projects using user-defined packages, Systems Physics with Modelica/Dymola

<https://www.youtube.com/watch?v=xlpHwX-W3Ns>

Module 3 – Animation and 3D view Using DYMOLA

MultiBody Frame Connector, Building a Mechanical Model, Concept of Furuta

Role Play - Practical session by students for students

Practice Project - Modeling of animated projects using the MultiBody library.

<https://www.youtube.com/watch?v=c9Ar2b4X5rQ>

<https://www.youtube.com/watch?v=k7ILBASaEJg>

Session Plan

Session 1

Project 1

Simulating a model – Modeling of Integrated circuits

Description: Use of Electrical and Electronics components.

Workbench Use: Behavior Modelling, Functional and Logical Design.

Session 2

Project 2

Simulating a model -Creating a model for Electric DC Motor

Description: Design a DC Motor Model, Test, and Simulation, Creating a library for components, Creating a model for motor drive, Scripting.

Workbench Use: Behavior Modelling, Modelica Standard Library.

Session 3

Project 3

Simulating a model -Simple Pendulum with Frictionless joint Using Multi-Body Library

Description: Design the Simple pendulum and the Furuta joint using Dymola and Modelica language. Friction joint for the Mechanical equipment.

Workbench Use: Behavior Modelling.

Session 4

Project 4

Simulating a model – Pick and Place Robot

Description: 5 Axis Pick and Place Robot Design, Validation, and Optimization in the 3DS platform.

Workbench Use: Behavior Modelling, Functional and Logical Design. Part design and Assembly Design.

<https://www.youtube.com/watch?v=9RgdZUvEjPw>

Session 5

Project 5

Simulating a model – 3D Printer Design

Description: Design All System and Sub System of the 3D Printer, Validation and Simulation using 3Ds Platform.

Workbench Use: Behavior Modelling, Functional and Logical Design. Part design and Assembly Design.

Session 6

Project 6

Simulating a model – Bicycle Behavior Modeling

Description: Design Power Train, Driving Cycle, part design, and Simulation.

Workbench Use: Behavior Modelling, Functional and Logical Design. Part design and Assembly Design.

Session 7

Project 7

Simulating a model – Refrigerator Compartment Door Design using Thermal Library

Description: This component model the airflow through the door of a refrigerator or freezer compartment.

Workbench Use: Behavior Modelling, Functional and Logical Design. Part design and Assembly Design.

Session 8

Project 8

Simulating a Model – Engine Analytic Using MultBody Library.

Description: Engine analytic, an engine with 6 cylinders, 6 planar loops, 1 degree of freedom, and analytic handling of kinematic loops.

Workbench Use: Behavior Modeling.

Session 9

Project 9

Simulating a model – Control the real and Digital servo motor ArduinoUno Library

Description: Control the Real and Digital Servo motor with simulation.

Workbench Use: Behavior Modelling, Arduino based System Design, and Functional and logical design.

Session 10

Project 10

Simulating a model – Virtual Universes with Poppy Humanoid Using ArduinoUno Library

Description: Virtual universes with a human assistant robot with simulation.

Workbench Use: Behavior Modelling, Arduino based System Design, Functional, and logical design.

Session 11

Project 11

Simulating a model – Implementation of Model using Python Library

Description: Modeling using python library, validation and optimization in the 3Ds platform.

Workbench Use: Behavior Modelling, Functional and Logical Design. Part design and Assembly Design.

Session 12

Project 12

Simulating a model – Industrial Robot Design

Description: 6 Axis industrial robot design, validation, and optimization in the 3Ds platform.

Workbench Use: Behavior Modelling, Functional and Logical Design. Part design and Assembly Design.

Session 13

Project 13

simulating a model – Temperature Control System Using State Graph

Description: The model contains an electric circuit with a heating resistor and a switch.

Workbench Use: Behavior Modelling.

<https://www.youtube.com/watch?v=zz-crJOG0&t=26s>

<https://www.youtube.com/watch?v=Zl592ARjnpU>

Session 14

Project 14

Simulating a model – Magnetic Ball System using Magnetic Library

Description: The electronic circuit consists of a voltage source, a resistor, and an inductor in the form of a tightly wound coil. An iron ball beneath the inductor experiences a gravitational force as well as an induced magnetic force (from the inductor) that opposes the gravitational force.

Workbench Use: Behavior Modelling.

Session 15

Project 15

Simulating a Model – Design of Water to Steam Converter Using Fluid Library

Description: Create a package under Fluid_Package called Water_To_Steam using temperature sensors.

Workbench Use: Behavior Modelling.

Session 16

Project 16

Simulating a Model – Design of Liquid Valve Control Using Fluid Library

Description: Building a simple circuit with two valves and a volume block.

Workbench Use: Behavior Modelling.

https://www.youtube.com/watch?v=P_YI3RiTI14

Syllabus

Geotechnical Engineering

Code	Course Title	Credit	T-P-PJ
CUTM1073	Geotechnical Engineering	3	1-1-1

Objective

- Perform Moisture content, Specific gravity, Atterberg limits tests.
- Perform Grain size distribution, Proctor tests.
- Perform Unconfined compression, Triaxial tests.
- Perform California Bearing Ratio, Vane Shear tests.
- Perform Sand replacement, Core cutter, Permeability tests.

Course Outcome

- To obtain knowledge about soil properties and methods of soil properties determination in the laboratory, using field tests and considering comparable experience. Basic stability and deformation problems. Principle of spread and deep foundation design. To understand fundamental knowledge of geotechnical works for soil improvement, interaction of structure and subsoil. Basic design methods for excavation and foundation pits with dewatering and sealing systems.
- Design and analyse Shallow foundations manually as well as using STAAD Pro
- Design and analyse Deep foundations manually as well as using STAAD Pro
- Carry out Moisture content, Specific gravity, Atterberg limits tests.
- Carry out Grain size distribution, Proctor tests.
- Carry out Unconfined compression, Triaxial tests.
- Carry out California Bearing Ratio, Vane Shear tests
- Carry out Sand replacement, Core cutter, Permeability tests.

Course content

Module I:(5hrs)

Theory :(2hrs)

- (a) INTRODUCTION: Soil formation - soil structure and clay mineralogy - Adsorbed water - Mass- volume relationship - Relative density.

- (b) INDEX PROPERTIES OF SOILS: Grain size analysis - Sieve and Hydrometer methods - Consistency Limits and Indices - I.S. Classification of soils
- (c) PERMEABILITY: Soil water - capillary rise - flow of water through soils - Darcy's law- permeability - Factors affecting - Determination of coefficient of permeability - Permeability of layered systems
- (d) SEEPAGE THROUGH SOILS: Total, neutral and effective stresses - quick sand condition - Seepage through soils - Flow nets: Characteristics and Uses (Basic appraisal only) .

Practice:(3hrs)

1. Determination of water content of soil (1hrs)
2. Determination of specific gravity of soil(1hrs)
3. Grain size analysis by sieving (Dry sieve analysis) (1hrs)

Module II: (5hrs)

Theory :(1.5hrs)

- (e) BCOMPACTION: Mechanism of compaction - factors affecting - effects of compaction on soil properties. Field compaction Equipment - compaction control.
- (f) CONSOLIDATION: Stress history of clay; e-p and e-log p curves - magnitude and rate of 1-D consolidation- Terzaghi's Theory.

Practice:(3:30hrs)

4. Determination of field density by sand replacement method.(1hrs)
5. Determination of consolidation properties of soils.(1:15mins)
6. Determination of unconfined compressive strength of soil(1:15mins)

Module III: (6hrs)

Theory :(1.5hrs)

- (g) SHEAR STRENGTH OF SOILS: Mohr - Coulomb Failure theories
- (h) STRESS DISTRIBUTION IN SOILS: Normal and shear stresses on a plane, Boussinesq's solution.

Practice:(1hrs)

7. Determination of shrinkage limit; Determination of permeability by constant head method (1hrs)

Project :(3:30 hrs)

Types of shear strength test to be delivered as project mode, rest of the topics to be dealt in classroom teaching mode, Mathematical Derivations to be limited to classroom activity. They should not be a part of External Evaluation.

Module IV: (7hrs):

Theory:(1hrs)

(i)DESIGN OF SHALLOW FOUNDATIONS: Introduction, Different types of shallow foundations, (j)DESIGN OF DEEP FOUNDATIONS: Introduction, Different types of deep foundations, Design methodology for piles.

Practice: (1hrs)

8. California bearing ratio test (1hrs)

Project :(5hrs)

Design calculation of shallow foundation to be done in project mode using STAAD Pro software.

design calculation of pile capacity, Analysis of pile group, Settlement of pile group, Concept of negative skin friction, Piles subjected to lateral loads, Pile load test, Design and construction of well foundation. Design of cantilever sheet piles and anchor sheet piles to be done in practice mode as well as project mode using STAAD Pro software.

Module V: (4:30 hrs):

Theory:(2hrs)

(k) FOUNDATIONS IN DIFFICULT GROUNDS: Introduction, Techniques of ground improvement, Foundations in swelling soil, Foundations in collapsible soil, Use of soil reinforcement.

(l) MACHINE FOUNDATIONS: Introduction, Free and forced vibration, Lysmer's method, dynamically loaded foundations, Dynamic soil properties, Vibration isolation .
BASIC APPRAISAL ONLY.NO NUMERICAL PROBLEMS)

Practice:(2:30hrs)

9. Determination of shear parameters by Direct shear test(1:30hrs)

10. Determination of compaction properties by standard proctor test. (1hrs)

Module VI: (5 hrs)

Practice: (1 hrs)

11. Determination of shear parameters by Tri-axial test. (1hrs)

Project :(4 hrs)

STABILITY OF SLOPES: soil stabilization measures. Slope stability solutions to done using software Stability analysis of rigid walls, (MATLAB)

Module VII:(2hrs)

- (0) EARTH PRESSURE: Types of Earth pressure. Rankine's Active and passive earth pressure, Smooth Vertical wall with horizontal backfill. Extension to Soil, Coulombs wedge theory.
- (p) DESIGN OF RETAINING STRUCTURES: Introduction, Different types of retaining structures

E Books: Jain A K and Jain A K. 2005. Soil Mechanics and Foundations. Laxmi Publications (P) Ltd. New Delhi.

Ranjan Gopal and Rao A S R. 1993. Basic and Applied Soil Mechanics. Welley Easters Ltd., New Delhi.

Singh Alam. 1994. Soil Engineering Vol. I. CBS Publishers and Distributions, Delhi.

Construction Material Testing

Code	Course Title	Credit	T-P-PJ
CUTM1069	Construction Material Testing	2	0-2-0

Objective

- Understand the range of various materials for Civil Engineering projects.
- Understand relevant properties of common construction materials.
- Perform measuring, testing and evaluating the results.

Course Outcome

- Test, measure, and evaluate the best use of building and construction materials.
- Gain knowledge about how to determine the standard quality of construction materials.

Course Content

MODULE I : PROPERTIES OF CEMENT (3 Hrs)

Chemical composition test (01 Hr)

Fineness test of cement (comparison study) (01 Hr)

Soundness test of cement (comparison study) (01 Hr)

MODULE II: PROPERTIES OF STEEL (3 Hrs)

1. Ultimate Tensile strength test (01 Hr)

2. % of Elongation test (01 Hr)

3. Bend & rebend test (01 Hr)

Module III: PROPERTIES OF CEMENT CONCRETE (5 Hrs)

1. Gradation of Coarse Aggregates (01 Hr)

2. Flakiness Indes & Elongation Index (01 Hr)

3. Silt Content (01 Hr)

4. Preparation of cube mould for durability test (02 Hr)

Module IV : PROPERTIES OF BRICKS (2 Hrs)

1. Compression test on Bricks. (01 Hr)

2. Absorption test of brick. (01 Hr)

Module V : PROPERTIES OF TILES AND MARBLES (3 Hrs)

3. Test on tiles breaking strength. (01 Hr)
4. Water absorption test for marbles. (01 Hr)
5. Hardness test for marbles. (01 Hr)

Module VI : PROPERTIES OF TIMBER MATERIALS(5 Hrs)

1. Test on moisture content on timber. (02 Hr)
2. Air permeability, water tightness and wind resistance test for window and doors. (03 Hr)

Module VII : PROPERTIES OF BUILDING STRUCTURE(5 Hrs)

1. Slip Resistance Checking. (01 Hr)
2. Weather resistance and durability test. (02 Hr)
3. Test on durability of recycled concrete aggregates. (02 Hr)

Text Books

1. B.N Dutta 'Estimating and Costing in Civil Engineering', UBS Publishers & Distributors (P) Ltd, 2010.
2. M.S Shety, S. CHAND Publication, 2006.
3. Building and Construction Materials: Testing and Quality Control (Lab Manual Series) Paperback – 1 July 2017 by M.L. Gambhir (Author), Neha Jamwal (Author).
4. Building Construction and Materials (SI Units) Paperback – 1 January 2017 by Gurcharan Singh (Author)

References

1. Indian standards for tests on concrete materials and mix design.
2. Standard Data Book for Analysis and Rates, IRC, New Delhi, 2003

Structural Detailing and Drawing

Code	Course Title	Credit	T-P-PJ
CUTM1061	Structural Detailing and Drawing	2	0+2+0

Objective

- To introduce the students to basic theory and concepts of Structural Drawing, STAAD Pro and the classical methods for the analysis of building drawings.
- On completion of this course the students will be able to know the process of making sketches, types of projections, designing of beam, columns and shear walls.

Course Outcome

- Perform free hand sketching of basic geometrical constructions and multiple views of objects. Concept of projection, Types of section, PEB structure & Steel structure work.
- Demonstrate STAAD- PRO, & its uses. Do frame structure, steel structure & applying properties, loads, shear force and bending moment. Do design of steel, /concrete structure & bridge design.

Course Content

MODULE 1 – INTRODUCTION OF ENGINEERING DRAWING (02 hrs)

Setting of paper size, drawing of title block with border line - Drawing of Types of line, their properties, and arrow head - Types of scale, dimensioning rules & their uses.

MODULE 2 – ORTHOGRAPHIC AND ISOMETRIC PROJECTION (04 hrs)

Concept of projection - Types of projection and applying symbol of projection - Isometric scale - Isometric view.

MODULE 3 – SECTIONING (04 hrs)

Types of section – Application - View positioning - steel structure - PEB structure & Steel structure work - Syphon , culvert & bridge design - Stair ,door & ventilator design and calculation.

MODULE 4 – INTRODUCTION OF STAAD Pro (02 hrs)

Introduction to structural design & analysis, brief introduction about RCC structure - Doing frame structure - Calculating coordinate points, properties of building.

MODULE 5 – PLANE & SPACE FRAME STRUCTURE

(03 hrs)

Load, types & uses of load, calculation of dead load, live load & floor load - Working with design and analysis of building & steel structure, preparation of RCC report - Applying load (wind load, seismic load, floor load, live load, dead load) using by water tank, tower, truss & multi stored building.

MODULE 6 – DESIGN OF BEAM AND COLUMN

(02 hrs)

Design of beam and column, file transfer, concrete design, steel design, slab design, shear force /bending moment, solve some error - Using I.S code to define concrete design, steel & transfer to file from AutoCAD to STAAD PRO through DXF file.

MODULE 7 – SHEAR WALL DESIGN

(03 hrs)

Describe about Shear wall design, & foundation - Using surface panel models to design shear wall (RC walls) & lift rooms, using STAAD -foundation to design, pile, mat, and isolated, combined footings - bridge deck design & stair case design - Response spectrum & foundation design foundation design.

Text Books:

1. Bhatt N.D. and Panchal V.M., “Engineering Drawing”, Charotar Publishing House, 50th Edition, 2010.
2. Luzzader, Warren.J. and Duff,John M., “Fundamentals of Engineering Drawing with an introduction to Interactive Computer Graphics for Design and Production, Eastern Economy Edition, Prentice Hall of India Pvt. Ltd, New Delhi, 2005.
3. Basant Agarwal and Agarwal C.M., “Engineering Drawing”, Tata McGraw Hill Publishing Company Limited, New Delhi, 2008

References:

1. Gopalakrishna K.R., “Engineering Drawing” (Vol. I&II combined), Subhas Stores, Bangalore, 2007.
3. Shah M.B., and Rana B.C., “Engineering Drawing”, Pearson, 2nd Edition, 2009.
4. Venugopal K. and Prabhu Raja V., “Engineering Graphics”, New Age International (P) Limited, 2008.

Publication of Bureau of Indian Standards:

1. IS 10711 – 2001: Technical products Documentation – Size and layout of drawing sheets.
2. IS 9609 (Parts 0 & 1) – 2001: Technical products Documentation – Lettering.
3. IS 10714 (Part 20) – 2001 & SP 46 – 2003: Lines for technical drawings.
4. IS 11669 – 1986 & SP 46 – 2003: Dimensioning of Technical Drawings.

5. IS 15021 (Parts 1 to 4) – 2001: Technical drawings – Projection Methods.

Quantity Estimation & Costing

Code	Course Title	Credit	T-P-PJ
CUTM1063	Quantity Estimation & Costing	3	2+1+0

Objective

- To make familiar with calculation of quantities for different item of works & provide knowledge about estimation of buildings through Estimator-2.0 software
- On completion of this course the students will be able to know the process of making animation of buildings, Sketch up of building plans and building models.

Course Outcome

- Estimating, brick calculations & cost for different materials, foundation & footing calculations.
- Gain knowledge about how to schedule & estimate different construction works both manually and using software.

Course Content

Module - I: BUILDING (2 Hrs)

Reading of Plans, Sections and detailed Drawings Related to buildings; preparation of Quantities and Units. Introduction of estimating & different types of estimate - Requirements for building estimate purpose of estimate - Plinth area estimate, cube rate estimate, annual estimate & maintenance estimate - Brick calculation & cost for different material - No. of brick required for area, weight of bricks, different bricks densities.

Practice Sessions:

1. Study of construction drawings and preparation of WBS. (01 Hr)
2. Detailed estimates for a Shopping Complex using Estimator-2.0 software. (01 Hr)
3. Detailed estimates for a hostel Building using Estimator-2.0 software. (01 Hr)
4. Detailed estimates for a hospital using Estimator-2.0 software. (01 Hr)

Module -II : CULVERT (2 Hrs)

Estimations and Quantity Surveying: Reading of Plans, Sections and detailed Drawings Related to irrigation structures; preparation of Quantities and Units.

1. Detailed estimates (Manual) for a Slab culvert with right angled/ Splayed wing wall. (01

Hr)

2. Detailed estimates (Manual) for a box culvert. (01 Hr)
3. Detailed estimates (Manual) for a Hume pipe Culvert. (01 Hr)

Module –III: ROAD (2 Hrs)

Estimations and Quantity Surveying: Reading of Plans, Sections and detailed Drawings Related to Roads structures; preparation of Quantities and Units.

1. Detailed estimates (Manual) for a road. (01 Hr)

Module - IV: SLOPED ROOF (2 Hrs)

Estimations and Quantity Surveying: Reading of Plans, Sections and detailed Drawings Related to Sloping roof/Roof truss structures; preparation of Quantities and Units.

1. Detailed estimate (Manual) for a timber roof truss. (01 Hr)
2. Detailed estimate (Manual) for a roof cover of GI sheets. (01 Hr)

Module –V: QUANTITY SURVEY (2 hrs)

Estimations and Quantity Surveying; Preparation of Quantity of materials per unit rate of work; Estimating labor.

- Quantity of materials required for different items of works in buildings (Manual). (01 Hr)
Quantity of different types of labor required for different items of works (Manual). (01 Hr)

Module-VI: RATE ANALYSIS OF BUILDING

Specifications; Rate Analysis as per State Govt. and CPWD Standards.

1. Development of Excel Sheet for Rates, Specifications and Cost Estimates. (01 Hr)
2. Rate Analysis and Cost Estimates for a Shopping Complex using Estimator-2.0 software. (01 Hr)
3. Rate Analysis and Cost Estimates for a hostel Building and a hospital. (01 Hr)

Module-VII: RATE ANALYSIS OF CULVERT & ROAD

Specifications; Rate Analysis as per State Govt. and CPWD Standards

1. Rate Analysis and Cost Estimates for a Slab culvert with right angled wing wall using Estimator-2.0 software. (01 Hr)
2. Rate Analysis and Cost Estimates for an arch culvert. (01 Hr)
3. Rate Analysis and Cost Estimates for a road. (01 Hr)

MODULE VIII – PROJECT PREPARATION

1. Road section C & L-section. (01 Hr)
2. Report of detailed estimation with hard copy. (01 Hr)

Text Books

1. B.N Dutta ‘Estimating and Costing in Civil Engineering’, UBS Publishers & Distributors (P) Ltd, 2010.
2. B.S.Patil, ‘Civil Engineering Contracts and Estimates’, University Press, 2006.
3. D.N. Banerjee, ‘Principles and Practices of Valuation’, V Edition, Eastern Law House, 1998.

References

1. Arbitration and Conciliation Act, 1996
2. Standard Bid Evaluation Form, Procurement of Good or Works, The World Bank, April 1996
3. Standard Data Book for Analysis and Rates, IRC, New Delhi, 2003.

Geometric Modeling

Code	Course Title	Credit	T-P-PJ
CUTM1060	Geometric Modeling	3	0+3+0

Objective

- To introduce the students to basic theory and concepts of AutoCad, Revit and the classical methods for the analysis of building drawings.
- On completion of this course the students will be able to know the process of making sketches, dimensions, 3D Modeling and rendering.

Course Outcome

- Demonstrate use of CAD in Civil Construction, basic knowledge of operating software & commands, and benefit of civil developments in the construction industry. Do 2d & 3d drafting /design with AUTO CAD software.
- Architectural modeling set up units & element properties, annotating, detailing, presentation tools, printing, export/import with Revit Architecture Software.

Course content

MODULE 1 - 2D SKETCHES AND DIMENSIONING

1. Study for Drafting and Modeling – Coordinate systems (absolute, relative, polar). (1 Hr)
2. Drawing of a Section for a duplex building. (1 Hr)
3. Drawing of an elevation for a duplex building with dimensions. (2 Hrs)

MODULE 2 - 3D SKETCHES AND PROJECTION OF DUPLEX

1. Drawing of front view and top view of simple solids like prism, pyramid, cylinder, cone, etc, and dimensioning. (1 Hr)
2. Drawing front view, top view and side view of objects and projection of duplex building (2 Hrs)

MODULE 3 – BUILDING PLAN AND TRUSS

1. Drawing of a plan of residential building (Two bed rooms, kitchen, hall, etc.) (2 Hrs)
2. Drawing of a simple steel truss. (1 Hr)
3. Drawing sectional views of prism, pyramid, cylinder, cone, etc, (1 Hr)

MODULE 4 – INTRODUCTION OF REVIT ARCHITECTURE (02hrs)

1. Installing Autodesk Revit architecture and understanding the user interface. (1 Hr)
2. Creation of plan for a project by using level and sketching elements. (2 Hrs)

MODULE 5 - 3D MODELING WITH RIVET

1. Drawing isometric projection of simple objects. (1 Hr)
2. Creation of 3-D models of simple objects and obtaining 2-D multiview drawings from 3-D model. (2 Hrs)
3. Creation of 3d syphon, 3d canal fall, 3d water tank, 3d of trusts & 3d of foot over bridge. (2 Hrs)
4. Assembly drawing & attribute text - Annotation, block & w-block & leader. (2 Hrs)

MODULE 6 – WORKING WITH PROJECT AND WORK PLANES (04hrs)

1. Working with basic building components, site design and massing studies. (2 Hrs)
2. Setting color for wall, about sectioning libraries, basic knowledge of building. (2 Hrs)

MODULE 7 – ANNOTATION AND DETAILING AND RENDERING (04 hrs)

17. Creating text notes, grids, and levels. (1 Hr)
18. Working with label and detailing. (1 Hr)
19. Understanding the rendering workflow, using lights, and creating a lighting fixture. (1 Hr)
20. Displaying a light source in a view, controlling the position of a spotlight in a building model & adding plants and entourage. (2 Hr)

Text Books:

1. Groover M.P. and Zimmers E.W. Jr., “CAD/CAM, Computer Aided Design and Manufacturing”, Prentice Hall of India Ltd, New Delhi, 1993.
2. Krishnamoorthy C.S. Rajeev S., “Computer Aided Design”, Narosa Publishing House, New Delhi, 1993.
3. Sikka V. B., A Course in Civil Engineering Drawing, 4th Edition, S.K. Kataria and Sons, 1998.
4. George Omura, "Mastering in AUTOCAD 2002", BPB Publications, 2002.

Reference Books:

1. Shah.M.G., Kale. C.M. and Patki. S.Y., "Building Drawing with an Integrated Approach to Built.
2. Verma.B.P., "Civil Engineering Drawing and House Planning", Khanna Publishers, 1989.
3. Marimuthu V.M., Murugesan R. and Padmini S., "Civil Engineering Drawing-I", Pratheeba Publishers, 2008.

4. A Guide to building information modeling for Owners, Managers, Designers, Engineers, and Contractors, John Wiley and Sons. Inc., 200.

Hydrology and Irrigation

Code	Course Title	Credit	T-P-PJ
CUTM1071	Hydrology and Irrigation	3	1-1-1

Course objective

- To study the basic principles and movement of groundwater and properties of ground water flow.
- To study the watershed characters and applications.
- To study the ground water resources mapping and surface water resources mapping.
- To study the hydrological disaster and role of earth observation technology.

Course outcome

- An ability to manipulate hydrological data and undertake widely used data analysis.
- An ability to use the techniques, skills, and modern engineering tools related to groundwater modelling.
- Project oriented skills shall be gained by students to work efficiently in survey, planning, design and construction in the irrigation sector.

Module I: Hydrology Theory 2 hr

Hydrological cycle, Types of Rainfall, Precipitation - measurement - average precipitation over a basin, evaporation, transpiration, infiltration - Infiltration indices. Runoff -Overland flow, Types of aquifers.

Practice: 2hr

1. Determination of infiltration capacity using double ring infiltrometer.

Module II: Hydrograph 3hr

Direct runoff, Base flow, separation of base flow- Hydrograph, Unit hydrograph - Assumptions of Unit hydrograph, derivation of unit hydrograph from direct runoff hydrograph, Computation of direct runoff hydrograph for different storms using unit hydrograph theory. 1hr

Practice:

2. Construction of double mass curve using Python hr
3. Hydrograph analysis using Python. 1h

Module III: Flood Management and Rainwater Harvesting 4hr

Indian rivers and floods, Causes of floods, Flood damage analysis. Design flood, Flood estimation, Frequency analysis, Flood routing through reservoirs and open channels. 1hr

Necessity of Rainwater harvesting, Importance of Rain water harvesting, Rainwater harvesting methods, Conservation and Harvesting of rain. Types and design of water harvesting structures; traditional rain water harvesting structures. 1hr

Practice:

4. Mapping of Drainage order from toposheets 1hr
5. Calculation of area and length of drainage. 1hr

Module IV: Groundwater Pollution & Quality Analysis 3hr

Sources of pollution; Potential evaluation of groundwater pollution; Physical, Chemical, Biological analysis, Surface and subsurface investigations of groundwater. 1hr

Practice:

6. Physio-chemical analysis of groundwater in laboratory 2hr

Module V: Reservoir 2hr

Types, Investigations, Site selection, Zones of storage, Safe yield, Reservoir capacity, Reservoir sedimentation and control. Introduction to Dams, types of dams, spillways and ancillary works, Site assessment and selection of type of dam, Information about major dams and reservoirs of India.

Module VI: Hydropower Engineering: 2hr

Dams and their causes of failure, planning of water resources projects, single and multipurpose projects, Reservoir Planning: Storage capacity of reservoirs, Yield from reservoir, Mass curve, Reservoir losses, reservoir sedimentation.

Module VII: Irrigation 6hr

Irrigation Engineering: Water requirements of crops, consumptive use, quality of water for irrigation, duty and delta, irrigation methods and their efficiencies. 1hr

Canals: Distribution systems for canal irrigation, canal capacity, canal losses, alignment of main and distributary canals, most efficient section, lined canals, their design, regime theory - Kennedys and Lacey's theories. Lined canals, Water logging - causes and control. 1hr

Practice :

7. Design of irrigation canal using Kennedy's and Lacey's theory. 1hr
8. Design of lined canal. 1hr
9. Design of tank surplus and vertical drop weir. 1hr
10. Design of head regulators and cross regulators. 1hr

Seminars:

1. Interlinking of River
2. Estimation of Evapotranspiration over land surface
3. Groundwater identification and estimation
4. Runoff computations
5. Attribution of Hydrologic Changes in a Tropical River Basin to Rainfall Variability.

Students take up group projects and deal with the following activities during the project. The project Report should contain the below gate process.

E Books:

1. Todd D.K., (2000) Ground Water Hydrology , John Wiley and Sons,
2. K., subramanya (2008) Engineering Hydrology, Tata McGraw-Hill Publishing Company Limited.
3. Ahmadi, A., Akhbari., M., and Karamouz, M (2011) Groundwater Hydrology: Engineering, Planning and Management, CRC Press.
4. Saeid Eslamian (2014) Handbook of Engineering Hydrology: Environmental hydrology and water management, CRC Press.
5. Malcolm. G. Anderson and Jeffrey J Mc Donnell (2005) Encyclopedia of hydrological Science, J Wiley.

Surveying Techniques

Code	Course Title	Credit	T-P-PJ
CUTM1067	Surveying Techniques	3	1-2-0

Objective:

To study the temporary adjustment of survey instruments by standard methods ,levelling and cross sectioning survey and setting out works.

To do various field works with the help of Total station.

To carry out topographic survey

Course Outcome:

- Carry out temporary adjustment of survey instruments by standard methods ,levelling and cross sectioning survey and setting out works
- Carry out topographic survey
- Doing centering, leveling & measuring coordinate points of area and calculation, transfer to data from Total station to software spectrum link
- Doing field work using of simple machine parts such as Total –Station, Auto- level

Course outline:

Module-1(2Th) HRS

Historical survey practice: Introduction to surveying: Classification, Basic Principle, List of Instruments used in surveying.

Module-II (2Th+4Pr) HRS

Leveling: Concept and principles of levelling, different types of levelling, their application ,selection of station points, staff measurement locations, ideal location for etc. ,computation of Reduced levels through rise and fall method and height of collimation method, standard procedure for conducting leveling works , Identification of errors, understanding their source and rectifying the same ,different causes of errors in the leveling works, their impact on the project, procedure for laying slopes and gradients for roads, bridges, pipelines, canals etc ,errors in slope alignment and their implications, identification & rectifications ,procedures for making entries in the field book and make necessary calculations

Practices:

1. Calculation of RL using HI and Rise and fall method.
2. Longitudinal and cross sectional Leveling
3. Check Leveling

Module-III (2+5)HRS

Total station: Parts of the instrument, operational panel, guide light, basic key operation, display functions, setting up the instrument, focusing and target sighting, angle measurement, setting the horizontal, distance and angle measurement, REM measurement, coordinate

measurement ,to view the data/ points collected, area calculation, data download.

Practices:

4. Distance, angle and slope Measurements
5. Traverse adjustment (With help of software)
6. Area calculation using Total station

Module-IV (1Th+5 Pr)HRS

Applications of total station :Detail survey i.e., data collection., Height measurement (Remove elevation measurement- REM,Fixing of missing pillars (or) Setting out (or) Stake out, Resection. etc. Remote distance measurement (RDM) or Missing line measurement (MLM).

Practices:

7. Height measurement (Remote elevation measurement- REM).
8. Fixing of missing pillars (or) Setting out (or) Stake out.

Module-V (1Th+3Pra) HRS

Concept of topographic survey, its importance and different methods of conducting topographic survey using modern and conventional instruments, calculations required for plotting contours, Interpretation and importance of contours. Knowledge of scale and key while plotting a contour map, represent topography of the area in required scale, different methods of computing levels.

Practice:

9. Preparation of contour maps using total station and surfer software.

Module-VI (2Th+4Pra) Hrs

Curves: Types of curves, Properties– simple, compound, reverse and transition curve. of works

Practices:

10. Setting out of different curves (simple, compound, reverse and transition) using Total Station

Module-- VII (4 hours)

Setting out of works

11. Setting out of Building
12. Setting out of culvert

Text Books:

1. Surveying Vol I & II, III B C Purnima, Laxmi Publication.
2. Surveying, volume 1&2 BY S.K.Duggal, TMH publisher.

Reference Books:

1. Surveying & Levelling by T.P Kanitkar& V S Kulkarni

E Books:

1. Source of reference; NSQF

Online Source: NPTEL Videos (www.nptel.ac.in)

Geospatial Survey

Code	Course Title	Credit	T-P-PJ
CUTM1068	Geospatial Survey	3	1-2-0

Objective:

- To teach the basic concept of Geospatial Technology and to do various field works with the help of digital surveying instruments.
- To provide basics of digital surveying and mapping of earth surface using GPS, DGPS, GPR

Course Outcome:

- Gain knowledge about the structure of spatial data including file associations, attribute tables, Metadata, coordinate systems, and projections
- Carryout measurements Differential Global Positioning System (DGPS)/ Global Navigation Satellite System (GNSS) in the field.
- Preparation & digitization of different topography map with the help of Arc-GIS software
- Utility mapping using GPR

Module I: GIS(1Th+4Pra)Hrs

Geographic Information System: Introduction, Definition of GIS, Components of GIS, Geographical concepts, Input data for GIS Types of output products, Application of GIS Practice:

1. Introduction to GIS (Overview, Features, About the software, Main user interface, Main menu Project menu; Layer menu; View menu; Bookmarks menu; Plug-ins menu; Help menu, Toolbar, Legend window, Preview map, add data to the map area, Opening and saving projects)
2. Building a catalog of geographic data (Arc Catalog, folder connection, inside the catalog, folder location, create a working copy of the data, connect directly to your copy of the data, and remove folders that do not need)

Module II: GIS Data types (2Th+4Pra)Hrs

Introduction: GIS data types: Data representation: Data sources: Typical GIS data sets Data acquisition, Data verification and editing, Dereferencing of GIS data, Spatial data errors Spatial data models, Spatial data structures, Modelling surfaces , Modelling networks , GIS database and database management system

1. Introduction to Google Earth, Convert Shape file to KML Format, Extract data From Google Earth, Extract Point Data, Extract Polygon data, Extract line data, Convert KML File to shape file, overlaying an image into google earth

2. Exploring data and adding it to a map (The Contents tab, The Metadata tab, add a layer to a map, import metadata, Search for items, map compose)
3. Managing a dataset (Define a shape file's coordinate system, modify attributes in database tables, calculate attribute values in ArcMap, Update the table's metadata, create a layer using the related attributes, Add the vegetation type layer to the map)
4. ArcGIS Graphics language (generalization, symbology, and colour effect, change symbology and use transparency in creative ways)

Module III: Spatial Data Analysis (1Th+5Pra)Hrs

Spatial Data Analysis: Introduction, Data analysis terminology, Measurement of length, perimeter and area. Queries. Reclassification. Buffering and neighborhood functions. Data integration-map overlay. Spatial interpolation. Surface analysis. Network analysis. Digital terrain visualization

Practice:

1. Topology (Concept of topology, topology in different GIS format, Coverage, shapefile, DXF-Drawing Exchange File, Geodatabase, Topology principle, Topological Error and Correction process, creating personal Geodatabase, creating a features dataset)
2. Buffering and Editing tools: (Buffering in ArcGIS, add the data layer, create the buffer, conflation, extend the line, Erase point, Flip line, Snap, trim line, Densefy, create a polygon, create point, Create polygon)
3. Creation DEM , DSM,TIN from SRTM/Cartosat Data

Module IV: Global Positioning System (2Th+3Pra)Hrs

Introduction of Global Positioning System, Satellite constellation, GPS signals and data, Geo-Positioning-Basic Concepts. Discussion on NAVSTAR, GLONASS, GALLILEO, COMPASS. Basic geodesy, Geoid /datum/ Ellipsoid-definition and basic concepts, Coordinate Systems, Special Referencing system, Map Scale, Scale factors, Indian geodetic System Segments of GPS:Control Segment, Space Segments, User Segment-operations of GPS, accuracy, error sources and analysis, methodology for collection of data, adjustment computations and analysis. Selection of datum, units and scale; GPS measurement. GPS Positioning Types-Absolute Positioning

Practice:

10. Setting of instrument, Observation, Data downloading and processing, Plotting of points, Georeferencing, Error calculation.

Module V: Differential Global Positioning System(2Th+3Pra)Hrs

Differential positioning Methods-Static & Rapid static, Kinematic-Real time kinematic Survey. DGPS-GPS data processing and Accuracy. Selection of Reference Station, Reference Station Equipment: GPS receiver, GPS antenna. Radio and its types, Radio Antenna GP. Application of GPS in Surveying and Mapping, Navigation, Military, Location Based Services, Vehicle tracking, etc. Limitation of GPS & DGPS

Practice:

11.Instrument Setup (Base station and Rover), Post-Processed Kinematic (PPK); Single point observation, Double point with baseline processing methods, Triangulation method, Real-Time Kinematic (RTK);Navigation system, Collection of Ground Control Point (GCP), Data export to GIS software.

Module VI: Ground Penetrating Radar(1Th+3Pra)Hrs

GPR Explain working principle of ground penetrating radar (GPR), Describe the type of antennas used with GPR for different type of underground material detection, Use ground penetrating radar until a predefined depth from sub-surface based on the conductivity of material. Explain use of sketch/single line diagram (SLD).Describe the use of GPS/DGP in sync with GPR to get all data populated on map. Describe the use of other Utility locator like electromagnetic locator and other utility locators

Practice:

12.Instrument setup, Utility mapping (Waterline, electric line, etc.), Processing of data

Module VII: (1Th+3Pra)Hrs

Explain GPR screen reading for the data being recorded, Describe the use of Roadometer with GPR to measure distance, Explain all the connecting cables used with GPR, Describe the power source and running capacity of GPR batteries, Explain handling the GPR and it's components, Describe how to transport GPR instrument, Use appropriate GPR antenna for described type of survey, Demonstrate the assembly of GPR equipment, Demonstrate the GPR data collection using cross section .

Text Books:

- 1.Remote sensing and GIS 2nd Edition, Basudeb Bhatt, Oxford Publication
2. Anji Reddy, M. Remote sensing and Geographical information system, B.S. Publications, 20011.

Concrete Technology

Code	Course Title	Credit	T-P-PJ
CUTM1066	Concrete Technology	3	1-2-0

Course Objective:

- To study properties of cement, sand and aggregate.
- To determine the correct proportion of cement, sand and aggregate ratio for the concrete.
- To perform tests for cement, sand and aggregate
- To perform tests for concrete.
- To supervise and monitor concrete casing and casting for building construction.

Course Outcome:

- Demonstrate test and analysis of cement, aggregate, sand, effect of water cement ratio.
- Prepare concrete, carry out simple formwork and reinforcement with the application of modern Power Tools.
- Prepare reinforcement of different R.C.C. members i.e, Foundation, beams, columns, slabs, Retaining Wall, etc.
- Erect scaffolding and make the intricate formwork at different locations.
- Prepare a bar bending schedule and demonstrate bar bending and calculate the estimated quantity of materials.
- Make different types of arches and lintels with chajja.
- Layout different types of vertical movement according to shape, location, materials by using stair, lift, ramp and escalator.

Course Syllabus

Module I : Aggregate/Sand (5hrs)

Theory:

Aggregate, classification (IS : 383), Grading, Characteristics (grading, fineness modulus), Bulking of fine aggregate, Deleterious substances, factors affecting the strength of concrete. Water, water quality, water requirement for hydration & workability, the effect of impurities present in water, Admixture, the meaning of terms, functions, classification, waterproofing and permeability reducing admixture. Construction Chemicals, Interpretation of specifications manufactures, Meaning of terms, functions, Classification (IS : 4082), waterproofing and permeability reducing admixture. (1hrs)

Practice:

1. Perform sieve analysis on aggregate and determine to grade. (01 hrs)
2. Determine the presence of silt and clay and Perform a test to determine bulking of sand. (01 hrs)

3. Specific Gravity, Water Absorption And Natural Course Of Fine & Coarse Aggregate. (1hr)
4. Aggregate Impact Test, Aggregate Crushing Test (1hr)

Module II: Preparation of Cement Concrete (3hrs)

Theory:-

Preparation of concrete Methods used, merits and demerits of methods, tools and equipment used and precautions to be taken for the following processes, batching, mixing, transportation, placing, compaction, curing, finishing, strength & durability requirements (IS : 456 - 2000), stripping of formwork, application of modern power tools, classification & specifications of concrete, classification of concrete according to grade, weight & methods of mixing ready mixed concrete, self-levelling concrete. (1hr)

Practice:-

Prepare concrete and lay at required places using power tools, (2hrs)

Module III: Workability of Concrete (3.5hrs)

Theory: Introduction to concrete, properties, workability of concrete (0.5hr)

Practice:

1. Workability of Fresh Concrete by (3hr)
 - (a) Slump cone method
 - (b) Compaction factor
 - (c) Flow table methods.

Module IV: Strength of concrete (7hrs)

Theory:

Nominal mixed and design mixed concrete, properties of concrete- workability & consistency, segregation, bleeding, strength, durability, impermeability, volume, stability, R.C.C. members for foundation, beams, columns, slabs, retaining wall etc. Scaffolding & formwork - Definitions of common technical terms used in Scaffolding, formwork. Types & applications Different materials used in formwork. Methods and tools used for formwork. Safety precautions to be observed in scaffolding and formwork Defects in formwork Shuttering /removal of formwork. Maintenance & repair of formwork Plain cement concrete (PCC) & Reinforced cement concrete. Properties of PCC & RCC in the green state and hardened state Importance of formwork and reinforcement in construction. (3hrs)

Practice:

1. Compressive strength of concrete (2hr)
 - (a) Cube Specimen
 - (b) Cylinder Specimen
2. Splitting tensile strength of cylinder. (2hr)

Module V : Design-mix concrete(5 hrs)

Principles of mix proportioning, probabilistic parameters, factors governing selection of mix. Road note - 4, DOE, ACI and IS method of concrete mix design, Variability of test results, acceptance criteria, various IS code provisions. (1hr)

Practice:

1. Preparation of design-mix concrete (2hr)
2. Concrete shotcreting (1hr)
3. Pressure grouting of concrete (1hr)

Module VI: Reinforcement in Concrete (5 hrs)

Theory:

Structural elements & characteristics (simply supported, continuous, fixed, cantilever, overhang), the importance of the use of reinforcement in concrete, tools used in bar bending correct use of tools, different operation in bar bending (straightening of bars, cutting of bars, bending of bars, placing of bars, binding of bars, fixing of cover blocks). (1hr)

Practice:

Making of shuttering & supports with uprights and wedges for Arches, Lintels and Lintels with Chajjahs. (2hrs)

Cutting, bending & placing of reinforcement. (2hrs)

Module VII: Special concreting techniques (7hr):

Theory:

Review of behavior and characteristics of high strength concrete, high performance concrete, fiber reinforced concrete, mass concrete, lightweight and heavyweight concrete, Precast concrete. Pumped concrete, concrete, underwater concrete, pre-placed concrete, vacuum dewatered concrete, hot and cold weather concreting, Ready mixed concrete. (3hr)

Practice:

1. Preparation of Lightweight concrete mix. (1hr)
2. Preparation of Fibre reinforced concrete. (1hr)
3. Preparation of concrete with solid wastes.(1hr)
4. Reactive Powder Concrete design. (1hr)

Reference: NSQF level 6

Electrical, Plumbing and Wood Works

Code	Course Title	Credit	T-P-PJ
CUTM1065	Electrical, Plumbing and Wood Works	3	1-2-0

Course Objectives

- To understand the installation for electrical systems in a building.
To study carpentry work in the building, installation of doors, windows, etc.
To understand and demonstrate installation of plumbing systems in the building.

Course Outcomes

- Identify timber and perform sawing and planing using hand and power tools.
Demonstrate surface finish with exact sizing by planing operation.
Prepare different wooden Joints. (Range of skill - framing joint, Housing joints, broadening joints, Lengthening joints)
Make small wooden job as per drawing with schedule sizes of timber or alternatives of timber i.e. FRP, MDF, FOAM using various hardware.
Make different types of doors and windows with fixing of components.
Demonstrate joining of electrical wire and carry out soldering, crimping observing related safety precautions.
Demonstrate Electrical wiring with fixing of accessories conforming ISI rules (Range of skills - different types of Electrical wiring, joining of Fuses, fixing of MCB, a connection of lamp with switch and different fitting, etc.)
Demonstrate installation of electrical appliances, Earthing and estimate costing of wiring
Prepare a Simple pipe connection demonstrating cutting, joining of pipes with different methods using different types of fittings.
Prepare layout of soil pipe and waste pipe with different types of sanitary fittings

Course Syllabus

Module I: Carpentry Tools (5 hrs)

Theory:

Defects in timber, diseases of timber, knots, shakes, grains, etc. Carpentry hand tools, measuring tools and uses. Work holding devices, power tools, viz. saws, drills, etc. Description of Carpentry Joinery, Planing, Moulding, Rebating, Chamfering, Sawing, Etc. Type of different planes and their proper uses in woodwork. Description, function and its size setting, knowledge of sharpening and uses, etc. knowledge of using marking gauges. Important instruments are necessary for checking flatness and twistness of the surface. Sharpening and grinding angle of the cutter. (2hr)

Practice:-

Identify different wooden sample pieces i.e.- softwood & hardwood, wooden grains, etc. & their applications Annual ring, knots, shakes & chinks, etc.). Demonstrate the application of hand tools, measuring tools, and work holding devices. Demonstrate the use of different power tools, viz. saws, drills, etc. Perform sawing, planing, Moulding, Rebating, Chamfering, etc. using different types of saws, and planes. Sharpen and set different type saw blades and planer blades/ cutters. (---2hrs)

Planing face, face edge, etc. Demonstrate the use of marking, mortise gauge, etc. Test the accuracy of flatness and twist-ness of the surface by using a try square. Demonstrate the use of winding strips, cross planing, edge planing. Demonstrate a portable power planer machine and its function. (---2 hrs)

Module II: Woodwork (5 hrs)

Theory:

Portable power planer - useful in modern woodwork and new technology design. Description of different types of joints. Uses of joint:- Framing joint angle joint and lengthening joint, housing joint, broadening joint, etc. Wood products - Industrial forms of timber - Veneer - Laminated sheet - Fibreboard - Hardboard - Plywood, Calculation of timber required for Wall Bracket. List the sequence of operations of the job. Doors –Parts, Location, standard sizes, types. Windows-types. Ventilators-purpose-types. (2hr)

Practice:

Make framing joint - Mortise and tenon Joint (Single and double, Plain hunched Mitre corner,) Make Housing joints - Full housing, Bridle, Stopped housing. Make broadening joints - Simple butt joint, Riveted butt joint, etc. Lengthening joints: End half-lap joint, End overlap joint, End bends lap joint, slopping scarf, racking scared, half lapping scarf, table scarf joint, etc. (---2hrs)

Make a joint on the hardwood to make a small frame. Stopped the Tenon & Mortise joint on the hardwood in the frame to set themselves. Make shelves by six pieces of hardwood with a single lapped half-lap dovetail joint with frame (two nos. of selves). (---2hrs)

Module III: Electrical Tools and Wiring (7hr)

Theory:-

Electrical Wiring:- Safety precaution and elementary first aid. Artificial respiration and treatment of electrical shock. Elementary electricity and its units. General ideas of the supply system. Wireman's tools kit. Wiring materials. Electrical fittings. System of wirings. Wiring installation for domestic lightings. Conductor, insulator, semiconductor, cable joints, measurement of cable. Types of Fuses, MCB soldering, ELCB, RCCB, ABCB, MCCB AC and DC, AC fundamentals, polyphase types of electrical wiring Different Electrical wiring accessories, ISI rules of wiring Illumination. Earthing, types of earthing Earthing Pit. (1hr)

Practice:-

Prepare terminations of cable ends. Practice on skinning, twisting, and crimping. Identify various types of cables and measure conductor size using SWG and micrometer. (---1hrs)

Make a simple twist, married, Tee, and western union joints. Make Britannia straight, Britannia Tee, and rat tail joints. Practice in Soldering of joints/lugs. (---1hrs)

Demonstrate different electrical wiring systems with fixing of different accessories. Make electrical Fuse joints, fixing MCB.(---2hrs)

Module IV: Electrical Appliances (7hrs)

Theory

Different electrical appliances, accessories, Voltmeter. Estimation and costing of wiring. Explanation and working of different types of transformers and their classification. (1hr)

Practice:

Connect lamps with switches. Staircase circuit wiring. (---1hrs)

Install earthing in different positions. Install and connect electrical appliances and take a reading with Voltmeter. Prepare materials list and cost of wiring. (---1 hrs)

Identify transformer, test and use. (--1hrs)

Module V: Plumbing Tools (7hrs)

Theory:- Plumbing tools, materials used in plumbing, Different types of pipes, fittings and Joints - GI, PVC, AC, SW, CI, lead, steel - Properties and use in plumbing work. Method of cutting and joining of pipes. Drills - types and uses. Tap and Dies - types and uses, calculation of Tap drill size. (2hr)

Practice:-

Perform a Simple pipe connection using G.I. Pipes, socket, elbow, tee, reducing elbow, G.I. union, cap plug, reducer, Three face elbow, reducing socket, plug, G.I. nipple, etc. (2hrs).

Perform Joining of pipe with – thread joint, lead joint, flange joint, cement joint, D. Joint, etc. (---1 hrs)

Module VI Plumbing pipe fitting (7hrs)

Theory:

Sanitary Technical terms - sewer, sewage, sullage, etc. -Soil pipe and waste pipe fitting Different types of water closets Different types of urinal port Kitchen sinks, Bathtub, Washbasin. Water meter, installation of the water meter. Removal of airlock Purification of water Mineral matter, Hardness, Causes of Scale formation & their Removal. (1hr)

Practice:

Perform Joining of pipe with Elbow joint, socket joint, Tee joint, reducing elbow joint, floor trap joint, etc. (---1 hrs)

The layout of soil pipe and waste pipe to the sanitary fitting using different types of fitting viz. Door junction, door Bend, H.R. bend, Plain Bend, Double door junction, inverter junction, cowel , floor trap, Gully trap, P-trap etc. (---2 hrs)

Fitting of I.W.C with a high-level cistern. Fitting of the washbasin. Fitting of E.W.C. with a low-level cistern. Fitting a kitchen sink. Fitting of the bathtub. Fitting a urinal pot with an auto cistern. (---2hrs)

Module VII: Installations (5 hrs)

Theory:

Water Purification: Treatment plants for different groundwater contaminants, Treatment plants for surface water. Types of damages in taps, valves, water meter, and tanks - Method of rectification Water supply - Sources of water Storage of water Distribution of water Different types of valves used in Plumbing, Types of tanks R.C.C., P.V.C. Iron tanks etc. (1 hrs)

Practice:

Install a water meter. Remove the airlock. Determination of pH by pH meter. (----1 hrs)

Recondition taps, valves & flushing tank, test for correct functioning. Prepare a water supply pipeline system in residential buildings using different types of valves, fittings, and appliances. (---1 hrs)

Reference NSQF Level 5

Design of Structures

Code	Course Title	Credit	T-P-PJ
CUTM1074	Design of Structures	4	1-3-0

Course Objectives

To teach the basic theoretical aspects and contemporary issues in the design and fabrication of reinforced concrete members

To teach the basic fundamental behavior of different sections, bolts, members of steel structure used in construction.

To analyze and Design of Concrete Structures and Pre-Engineered Building(PEB) by using Software ETABS

Course Outcomes

To gain the knowledge of RCC design calculation with relevant Indian Standards.

After completion of the courses the students will gain knowledge of Pre-Engineered design calculation with relevant Indian Standards

Students will develop the skill of converting client's requirements to structural drawing by using ETABS.

Course Syllabus

Course content (50 Hours)

Module I: Building Structural Frame (9 Hours):

Introduction to Reinforced Concrete, Mechanical Properties of Concrete, Flexural Analysis, Combined Flexure and Axial Load, Shear analysis. Limit State Method using Indian Standard Codes.

Practice:

1. Draw grids, Reference planes and joints, create new project models and introduction of the layout. (2hr)
2. Draw building structural frame and define material properties (4hrs)

Module II: Load definition to Building frame (5 Hours):

Modeling of Building, Load Calculations, Seismic weight, Base shear, Storey shear, Mass source, diaphragm, Meshing of Slab.

Practice:

3. Building structural frame- Define Properties, Material, Section, Mass source, Load pattern, load combinations

- Define Section Properties + Section Property Modifiers (1hr)
- Load Pattern (Gravity Loads + Earthquake (seismic) Loads (0.5hr)
- Wind Loads, Dead loads, super dead loads and live loads introductory(0.5hr)
- Define Load combination (Manual + Auto)(0.5hr)
- Meshing for Slabs, Walls, beams and Columns (0.5 hr)
- Assign Loads to structure as per IS Codes(0.5)
- Define Mass Source (For Lateral analysis)(0.5 hr)
- Pier Labels and Spandrel Labels for shell members such as shear walls and retaining RCC walls (1hr)

Module III: Analysis and check for Safety (10 Hours):

Analysis checks, Post design checks, Pushover analysis, response spectrum analysis, time history analysis.

Practice:

4. P Delta Analysis Check (How to include P-delta effects) (2hr)
5. Center of Mass and Center of Rigidity (and Building Eccentricity Check)(1hr)
6. Mass (Weight) Irregularity check as per the code (1hr)
7. Story Displacement, Story Drift checks as per code (1hr)
8. Torsional Irregularity check(1hr)
9. Modal Analysis Case [Eigen or Ritz Vectors], Time period (1hr)
10. Time History Analysis (2hrs)

Module IV: Reinforcement Detailing and scheduling (6 Hours):

- Reference of IS codes IS SP 34-1987 (Theory) (1hr)
- IS 13920-1993 Ductile Detailing of RC structures (Theory) (1 hr)

Practice:

11. Detailing of Beams, Columns and slabs using Autocad (4hr)

Module V: Design of Foundations using SAFE foundation (6 Hours):

Introduction to SAFE foundation, familiarizing tools used in SAFE foundation. Types of foundations introduction, isolated footing design, combined footing design and mat foundation design.

Practice:

12. Importing ETABS model file into the SAFE foundation software (0.5 hr)

13. design of isolated footing (1 hr)

14. design of combined footing (1 hr)

15. design of mat foundation (1 hr)

Module VI: Materials and Specifications of Steel/ Pre-Engineered Building (PEB) Structures (06 Hours):

PRE-ENGINEERED BUILDING COMPONENTS: Primary System: Main frames, Gable End Frame - Secondary frame system: Sizes and Properties of Purlins & Girts – Bracing System: Rod, angle, Portal, Pipe bracing – Sheeting and Cladding: Roof Sheeting and Wall sheeting – Accessories: Turbo Ventilators, Ridge vents, Sky Lights, Louvers, Insulation, Stair cases.

Practice:

16. DESIGN LOADS ON PRE-ENGINEERED BUILDINGS. Design of PEB frame under the influence of Dead, Live, Collateral, Wind, Seismic and Other applicable Loads. Serviceability Limits as per code IS:800. (4hrs)

Module VII: PEB DESIGN METHODOLOGY (8 Hours):

Practice:

17. Design Parameters of PEB Frames - Depth of the section, Depth to Flange width ratios, Thickness of Flange to thickness of Web ratio. d/t_w , b_f/t_f ratios of sections as per IS code. Section Sizes as per Manufacturing Limitations. Analysis and Design of Rigid Frames. Rigid Frame Moment Connection, Shear Connection- Anchor bolt and base plate design (Pinned and Fixed). (8hrs)

Text Books:

1. Reinforced Concrete design-S. N. Sinha. Tata McGraw-Hill, New Delhi

2. S K Duggal, " Design of steel structures",2012.

3. S. Ramamurtham and R. Narayan, " Design of steel structures" ,2014

Reference:

1. PEB design using ETABS

2. Etabs Full - Video

Road Engineering

Code	Course Title	Credit	T-P-PJ
CUTM1070	Road Engineering	3	1-1-1

Course Objectives

- To introduce transportation engineering principles with emphasis on designing principal element of highways along with the safe and efficient operation of highways.

Course Outcomes

- Students will gain knowledge on planning, material selection for construction, Economics and finance and designing of elements on highway.
- Acquire the skill of designing the geometric elements of highway using CIVIL 3D software.

Course Syllabus

THE CLASSES WILL BE DELIVERED IN FLIP CLASS MOD

Module I: Highway introduction planning and development (1 hr)

Highway planning in India, development, rural and urban roads, road departments in India, road classification, road authorities i.e. IRC, NHAI, CRRI, NHDP etc.

Module II: Materials Characteristics and construction (6 hrs)

Introduction, physical and engineering properties of materials of pavement surfaces: Pavement quality concrete (PQC), Plain cement concrete(PCC), Hot Mix Asphalt (HMA), wearing courses, base, sub-base treated layers, types of bitumen, cutback bitumen, bitumen emulsion, tar, types of tar, bituminous mix design.

Practice Sessions:

Test on aggregate

Los angeles abrasion test.

Aggregate crushing test

Aggregate Impact value test

Specific gravity, water absorption, and bulk density

Test on bitumen

Penetration test of bitumen

Ductility value test of bitumen
Softening point test of bitumen
Flash and Fire point test of bitumen
Specific gravity of bitumen
Flakiness index and elongation index test of Aggregate

Test on mix design

Marshall Stability Test of bitumen

Test on subgrade

California bearing ratio test

Module III: Geometric design of roads (12 hrs)

Theory

Introduction to geometry design: Objective of geometric design, Design speed, cross-section elements, pavement surface characteristics-skid resistance, traffic volume, number of lanes, level of services, sight distance, horizontal alignment, vertical alignment, Superelevation, camber, cross-section, lane width.

Practice Sessions:

Design of Horizontal Alignment using CIVIL 3D software.

Design of Vertical Alignment using CIVIL 3D software.

Design of Superelevation using CIVIL 3D software.

Create a profile using CIVIL 3D software.

Module IV: Pavement Engineering (8 hrs)

Design of Flexible pavements and Rigid pavements according to standards.

Practice Sessions:

Design of flexible pavements

Design of rigid pavement

Module V: Traffic Engineering (4 hrs)

Introduction to traffic engineering, road user characteristics, vehicular characteristics, various traffic studies and their application (field study), traffic signals, traffic signs and road marking, parking studies, traffic operations-accident prevention and safety methods, rotary intersection, ITS (intelligent transportation system) Various types of intersection and their design concept

Practice Sessions:

Junction design using civil 3d software

Vehicle volume counts (field study)

Module VI: Construction methodologies (3 hrs)

Cement Concrete Roads: Joints in pavements, Arrangement of joints, joint filler and sealer, Introduction, Components, I-Girder, Box culvert, VUP (Vehicle underpasses), PUP (Pedestrian underpasses), Road construction equipment, Machines used, Estimate a road project, PPP model.

Practice Sessions:

Estimate a road project

Module VII: Pavement evaluation and rehabilitation (1 hr)

Pavement failures, quality control causing deterioration and environmental factors, types of maintenance, maintenance of bituminous and concrete surfaces, roughness measurement, special repairs in pavements, strengthening and widening of an existing road.

Text Books:

k.khanna and C.E.G JUSTO, Highway engineering.

R Kadiyali, Traffic engineering and N B Lal, Principles and practice of highway engineering, Khanna Publications, 2005

Construction Materials

Code	Course Title	Credit	T-P-PJ
CUTM1064	Construction Materials	2	0-0-2

Course Objectives

- To introduce students to various materials commonly used in civil engineering construction and their properties.

Course Outcomes

- **Knowledge:** Able to learn basic theory about main building- and construction materials.
- **Skills:** Able to make the right and well-founded choice of materials.
- **General competence:** Understand how properties of materials that are important in engineering can be related to the characteristics of the material.

Course Syllabus

THE CLASSES WILL BE DELIVERED IN FLIPCLASS MODE.

MODULE I: STRUCTURAL AND NONSTRUCTURAL

MATERIALS (3 hrs)

Overview of Materials and Building/Structural Types, Factors Affecting Choice of Materials and Structural Form, Mechanical Properties, Non-Mechanical Properties (physical properties, durability), Individual Building Materials Manufacturing, Properties, Comparative Behavior, Structural Steel, Composition, Material Properties, and Behaviour, Non-ferrous metals.

MODULE II: STONES, BRICKS, CONCRETE BLOCKS (3 hrs)

Stone as a building material, Criteria for selection, Refractory bricks, Concrete blocks, Lightweight concrete blocks, Air Cleaning Bricks, Passive Cooling Ceramics or hydro ceramic bricks, Fly ash bricks, AAC, ECA, CLC blocks, EPS Building.

MODULE III: TIMBER, ROOF & FLOORING MATERIALS (4 hrs)

Timber, Market forms, Industrial Timber, Plywood, Mass timber, laminated timber and glue, laminated timber, Veneer, thermocol, Panels of laminates, Steel, Aluminum and Other Metallic Materials, Composition, Aluminium composite panel, Market forms, Mechanical treatment, Granite, Tile flooring, Cladding of tiles, materials according to types of roof, Elements of a pitched roof, Trussed roof, Steel Truss, Different roofing materials, R.C.C. Roof.

MODULE IV: NONSTRUCTURAL MATERIALS, ACCESSORIES, AND FINISHES (5 hrs)

Materials for doors and windows, Paneled door, Flush door, Collapsible door, Rolling shutter, PVC Door, Review of Nonstructural Materials and Criteria for Selection, Polymer Floor Finishes, Paints, varnishes, enamel, distemper, Tiles, Acoustic Treatment, Drywalls, Anchors, plumbing and sanitary fittings.

MODULE V: EXTERIOR WALL MATERIALS (4 hrs)

Gypsum Area Separation Walls, Insulated Vinyl Siding, Tilt, Up Walls, OVE Framing, ICF Walls, House Wrap Installation Tips, Common Cladding Alternatives, Insulated Wall Panels, WPC sheets, Cinder Block Walls, GFRG panels, Alusion panels, 3D, printed bioplastics.

MODULE VI: NEW GENERATION CONSTRUCTION MATERIALS (4 hrs)

Glass, Ceramics, Sealants for joints, Fibre glass-reinforced plastic, Clay products, Refractories, Composite materials, Types, Applications of laminar composites, Fibre textiles, Geomembranes and Geotextiles for earth reinforcement, Illuminating Cement, Prefabricated panels, Bubble deck slab, Terracotta hollow brick, Cigarette Butts, Recycled cardboard, Sensitile, electrified wood, flexicombo, Richlite, liquid granite, carbon fibre, bendable concrete, concrete canvas, low e glass, transparent aluminum, paper insulation, Concrete, Masonry, Programmable Cement, Strand Rods, Concrete: Admixture, translucent concrete, FRP, Shotcrete, Epoxy resin, and grouting.

MODULE VII: GREEN AND SUSTAINABLE CONSTRUCTION MATERIALS (2 hrs)

Bamboo, Reclaimed wood, cork, mycelium, recycled steel, straw bales, rammed earth, hempcrete, grasscrete, GGBFS, CSF, geopolymer, Silica fume, Fly ash, Red Mud, copper slag, construction demolition waste, waste plastic.

Text Books:

1. Varghese.P.C, "Building Materials", PHI Learning Pvt Ltd, New Delhi, 2012.
2. Rajput. R.K., "Engineering Materials", S. Chand and company Ltd., 2008.

Water supply and Sanitary Engineering

Code	Course Title	Credit	T-P-PJ
CUTM1072	Water supply and Sanitary Engineering	3	1-1-1

Course Objectives

- To enable the students understand about the drinking water, sources, quality, demand, conveyance, water treatment, design of treatment units, Waste water treatment, STP and solid waste collection, treatment along with house plumbing and different sanitary fittings

Course Outcomes

- To understand the principles of treatment units and their design units of drinking water, solid and liquid waste water treatment units; its recycle, reuse or disposal methods along with hands on practice of house plumbing and sanitary fittings

.Course Syllabus

Module 1: Sources, Quality and Demand of water (Three hours)

Importance and necessity of water supply Engineering; Sources of water; Suitability of water; Choice of source; Types of demand Population forecast; Computation of quantity of water; Fluctuation in demand; Factors affecting demand; Impurities in water; Collection of water sample; Physical Chemical and Biological tests; Standards of quality of water

Module 2 Treatment of water (Three hours)

Objectives of water treatment; Location of water treatment plant; Layout of water treatment plant; Basic principles of working of treatment plant; Various stages of treatment of influent water; ; Functioning of Coagulation treatment plant; Sedimentation; Filtration; Disinfection

Practice session (2Hours)

Practice 1: Predict Population from given field data by various methods

Practice II: Calculation of hardness of water from the observed field data

Module 3: Conveyance of Water (Three Hours)

Pumps and selection (out line only); Types of pipes used for conveyance; Pipe joints; Laying of Pipes; Distribution system; Types of valves; Types of Meters; Pipe fittings and fixtures of different materials their advantages and disadvantages; Necessity; Methods to prevent leaks; Measures for conservation of water

Practice session (2hours)

Practice III: Design lay out of pipe system from the overhead tank to different supply terminals.

Practice IV: **Laboratory works:** Determination of pH value, Turbidity and hardness of water sample

Module 4: Sanitation system (Four Hours)

Objective of sewage disposal; Methods of sewage collection; Conservancy system; Water carriage system; Classification of Drains; Sewer section; Sewer joint; Manhole; Flushing tank; Catch basin; Laying of sewer; Appurtenances and its locations; Maintenance of sewer; Procedure for maintenance of sewerage system; Causes of trouble and odor; Sewer cleaning operations; Requirements of maintenance; Functions of each maintenance equipment and tool; Safety measures for sewer-men

Practice session (2hours)

Practice V: Preparation of AUTOCAD layout plans/ sketches of different Water treatment plant, Sewage treatment plant, sedimentation tank, filters, Manholes, Flushing tanks etc.

Practice VI: Design of Septic tank using HEC software

Module 5: Sewage Treatment and Disposal (Two Hours)

Characteristics of sewage; Sampling of sewage; Treatment of sewage; B.O.D. Test, C.O.D. test; Methods of sewage disposal (STP)

Practice Session (2hours)

Practice VII: Design of Manhole from given field data

Practice VIII: Determination of B.O.D. and C.O.D. of waste water sample

Module 6: Plumbing gadgets and Sanitary fittings (Two Hours)

Plumbing tools; Pipes and pipe fittings; Fixing and jointing pipes and accessories; Traps; House drainage plant; Plumbing practice and operations; Safety and precautions; Sanitary fittings

Field Visit: Four hours

Water treatment plant and a sewage treatment plant must be followed by a field Visit report

Module 7: Recycling and disposal of Waste Water and Solid Waste (Three Hours)

Sewage Treatment plant; Different recycling method with respect to quality of waste water; Utilization and management of solid waste;

Seminar: (Two hours)

The students are made groups and topics related to water supply, Municipal/rural waste disposal system, storm water disposal and Sewerage disposal systems

Suggested Reading

1. Text Book of water supply and sanitary Engineering ; S K Hussain : Oxford and IBH
2. Water supply & Sanitary Engg; : Vazirani & Chandola :Khanna Publishers
3. Municipal and Rural Sanitation :Ehlers & Steel :Mc Graw hill book
4. Elements of Public Health Engineering. :K.N.Duggal :S.Chand & Co.

Computer Aided Engineering

Code	Course Title	Credit	T-P-PJ
CUTM1081	Computer Aided Engineering	3	0-2-1

Objective

- This course will help student to use structural scenario, thermal scenario and to do Structural analysis and Thermal analysis of various problems.

Course Outcome

- Create complete finite element models
- Submit and monitor analysis jobs
- View and evaluate simulation results

Course content

Module I: Material and Selection Properties

(6 Hrs)

Property Module, Material Definitions, Linear Elasticity, Large Strain Elasticity, Metal Plasticity, Material Calibration, Material Databases, Section Properties

Practice:

1. Analysis of crack in pressure vessel
2. Cable stayed bridge simulation

Module II: Element Selection Criteria

(6 Hrs)

Solid Element Selection, Structural vs. Continuum Elements, Modeling Bending Using Continuum Elements, Stress Concentrations

Practice:

3. Stress analysis of rail road with wheel.
4. Bike frame structural analysis

Module III: Meshing

(8 Hrs)

Mesh Module, Mesh Elements Mesh Generation Workflow, Local Fine-tuning Quality Checks, Mesh Compatibility, Mesh Convergence, Dependent and Independent Part Instances

Practice:

5. Airplane bracket structural analysis
6. Structural analysis of wind turbine blade

Module IV: Boundary Condition

(6 Hrs)

Step Module, Analysis Steps and Procedures, Output Requests, Output Files
Load Module, Loads and Boundary Conditions, Initial Conditions

Practice:

7. Generative structural analysis applied for design optimization
8. Stress analysis on a backhoe

Module V: Contact

(6 Hrs)

Mechanical Contact Properties, Contact Domain, Contact Formulation and Controls, Handling
Initial Over closures, Contact Output

Practice:

9. Analysis of Economizer.
10. Analysis of Screw Jack

Module VI: Analysis Procedures

(6 Hrs)

Model and Analysis Steps, Analysis Procedures, The static, general analysis procedure, Finding
a converged solution, The Static, Linear Perturbation procedure, Buckle procedure, Frequency
Procedure, The dynamic, explicit analysis procedure, Stability Limit, Analysis Continuation
Techniques

Practice:

11. Steady state analysis of a composite bar.

Module VII: Thermal Analysis

(8 Hrs)

Steady State Heat Transfer, Transient Heat Transfer, Thermal Interfaces, Thermal Stress
Analysis

Practice:

12. Temperature distribution in radiators used in automobiles
13. Oven radiation simulation
14. Steady state thermal analysis of tungsten coil with internal heat generation
15. Thermal analysis of disc brake

Projects

1. Thermal Analysis of PV Solar Pannel

2. Structural and thermal analysis of Green House
3. Structural analysis of Quadcopter.
4. Structural analysis of landing gear.
5. Numerical study on different types of fins.
6. Overhead tank failure analysis.
7. Analysis of Rocket Nozzle
8. Analysis of BAJA SAE
9. Structural and Thermal Analysis of Downdraft Gasifier
10. Structural and Thermal Analysis of Stirling Engine
11. Structural Analysis of Hydraulic Press
12. Structural Analysis of Elevating Conveyor

Text Books/ Reference Books/ Reference Material

1. SIMULIA: 3DS Learning Space

Source of reference: 3DS peer learning

Hydraulic Machinery

Code	Course Title	Credit	T-P-PJ
CUTM1090	Hydraulic Machinery	2	1-1-0

Objective

- To emphasize Principle of operation of hydraulic machines and their system design
- To familiarize their huge applications in different industries

Course Outcome

- After completion of the course, the students will have a strong foundation on the pertinent equations to engineering design of the machines for required applications.
- Students will learn to determine performance characteristics of fluid machinery by using various simulation tools

Course content

Module I: Principle of Operation of Hydraulic Machinery

(2 hrs)

Introduction to hydraulic machines: Classification and operation principle, Euler equation for turbo machines: net head developed by pump and Turbines

Module II: Radial and Axial flow pumps

(8 hrs)

Velocity triangle of pumps, effect of inlet swirl on velocity triangles, Constructional features of Centrifugal Pump, design aspect, working principle and efficiencies, work done by the impeller, priming, specific speed, NPSH, effect of swirl on the cavitations, working principle and design aspect of gear oil pump.

Practice:

1. Flow analysis of fluid of Centrifugal pump through Simulia software
2. Flow analysis of gear oil pump through Simulia software
3. Performance Characteristics of Centrifugal Pump through Virtual lab

Module III: Positive displacement Pumps

(3 hrs)

Working principle of Reciprocating Pump, discharge, work done and power requirement, ideal indicator diagram, and slip, characteristic H-Q curve of positive displacement pump

Practice:

4. Performance Characteristics of Double Acting Reciprocating Pump through Virtual lab.

Module IV: Hydraulic Turbine: Impulse Turbine

(6 hrs)

Classification, definitions of heads and efficiencies, Pelton Wheel - Construction and working principle, work done and hydraulic efficiency, design aspects.

Practice:

5. Simulation of Pelton Turbine through simulia software
6. Performance Characteristics of Pelton Turbine through Virtual lab.

Module V: Hydraulic Turbine: Reaction Turbine

(6 hrs)

Reaction turbine (Francis, Kaplan) -Components, working principle, work done and efficiency, draft tube, specific speed, cavitations

Practice:

7. Performance Characteristics of Francis Turbine Simulia software.
8. Simulation of Kaplan turbine through Virtual lab.

Text Books:

1. R.K. Bansal, Fluid Mechanics and Hydraulic Machines, Laxmi Publications, ninth edition

Reference Books:

1. P.N. Modi & S.N. Seth, Hydraulics & Fluid Mechanics, Rajsons Publications Pvt. Ltd, Twentieth Edition

Source of reference;

1. <https://nptel.ac.in/course.html>
2. www.vlabs.ac.in

Fluid Mechanics with Finite Volume Method

Code	Course Title	Credit	T-P-PJ
CUTM1089	Fluid Mechanics with Finite Volume Method	3	2-1-0

Objective

- To learn To learn fundamentals of computational methods like FVM for solving linear and non-linear partial differential equations related to fluid dynamics
- To emphasizes the basic underlying fluid mechanical principles governing energy transfer in a fluid flow systems with their performances in different field of engineering applications

Course Outcome

- After completion of the course, the students will able to evaluate finite difference/volume schemes on model problems of computational fluid dynamics.
- Students will learn to develop steady state mechanical energy balance equation for fluid flow systems, estimate pressure drop in fluid flow systems

Course content

Module I: Introduction to Finite volume Method

(6 hrs)

Fundamentals of Finite volume methods, different types of finite volume grids, approximation of surface and volume integrals; interpolation methods, Review of governing equations, Classification of governing equations , Staggered and co-located formulation

Practice:

1. 2D mapped Mesh for rectangular pipe
2. 2D mapped Meshing for Aerofoil.

Module II: Grid generation

(6 hrs)

Grid generation, creating, updating and managing meshes, Steady diffusion equation on structured meshes, Unsteady diffusion equation on structured meshes, Linear system solvers, finite volume discretization of steady and unsteady diffusion equation, Finite volume discretization of convection-diffusion problem

Practice:

3. 3D structure mesh of Circular Cylinder
4. 3D unstructured mesh with primes layers for Aerofoil

5. 3D coarse/ medium/ fine sweep mesh for pipe

Module III: Incompressible flow field calculation with finite volume method (5 hrs)

Navier-stokes equation, Discretization of the Momentum Equation: Stream Function-Vorticity approach and Primitive variable approach, Staggered grid and Collocated grid solutions of Navier-stokes equation with finite volume method, boundary condition, Reynolds averaged Navier-Stokes equations.

Module IV: Fluid kinematics (2 hrs)

Types of flow, Continuity equation (in one, two & three dimension steady state fluid flow analysis with finite volume method, velocity and acceleration fields, streamline, streak line, path line, velocity potential function and stream function, Rotation and vorticity.

Module V: Fluid Dynamics with Finite volume method (4 hrs)

Lagrangian and Eulerian Approach, Euler's equation of motion along a stream line for ideal flow, Principle of conservation of energy with finite volume method, Integration of Euler's equation along a stream line, Bernoulli's equation

Practice:

6. Fluid Analysis of Bernoulli's equation: Flow in a contracting pipe through CFD simulation

Module VI: Flow through Pipes (5 hrs)

Reynolds's Experiment, Laws of Laminar and Turbulent Friction, Introduction Turbulence modeling through Finite volume method, Hagen Poiseuille Equation for laminar flow through pipe, Darcy-Weisbach Equation for Turbulent flow through pipe.

Practice:

7. Fluid Analysis of Laminar flow in 3D Circular Pipe through CFD simulation
8. CFD Simulation of the Water Flow Passing Through a Converging Pipe.
9. CFD Analysis to determine the frictional losses in the pipe.

Module VII: Flow Measurement (5 hrs)

Flow through small orifice meter, Mouthpiece, Velocity Measurement using Pitot tube, Prandtl tube, Flow measurement in pipes-Flow, Venturi Meter, Flow rate Measurement in channel-Weir and Notches

Practice:

10. CFD Analysis of Fluid flow through Orifice meter
11. CFD Analysis of Fluid flow through adjustable channel
12. CFD Analysis of Fluid flow simulation through Venturi Meter

Text Books:

1. R.K. Bansal, Fluid Mechanics and Hydraulic Machines, Laxmi Publications, ninth edition

Reference Books:

2. P.N. Modi & S.N. Seth, Hydraulics & Fluid Mechanics, Rajsons Publications Pvt. Ltd, Twentieth Edition

Source of reference;

3. <https://nptel.ac.in/course.html>
4. <https://nptel.ac.in/courses/112/105/112105218/>
5. <https://nptel.ac.in/courses/112/105/112105183/>
6. <https://nptel.ac.in/courses/112/105/112105182/>

Theories of Failure Using Finite Element Analysis

Code	Course Title	Credit	T-P-PJ
CUTM1062	Theories of Failure Using Finite Element Analysis	4	2-2-0

Objective

- To educate the students on basic theories behind mechanics of solids.
- To educate the students on Finite Element Analysis concept applicable to Practical conditions.
- To educate the students on Failure Criterion which will be useful for designing Practical problems.
- To educate the students on using 3D Experience Tools for analysis of various mechanical structures and load transmitting elements.

Course Outcome

- Students will have knowledge and practical engineering skills in analysis of mechanical strength of structures and load transmission elements and will be able to design them based on input data.
- Students will be able to deploy 3D Experience Platform to develop design solutions.
- Students will be able to apply the Concept of Meshing and Failure Criteria to Practical Problems which will lead Economical and safe in Design Aspect.

Course content

Module I Introduction to Finite Element Analysis (FEA) and 3D Experience Platform - (4(T)+5(P)) (9 Hours)

Introduction to FEA: Need for Studying FEA; Types of Analysis; Discretization of a Structure; Element Shapes, Nodes and Degrees of Freedom; Mesh Refining, Element Aspect Ratio, Use of Symmetry, Principle of Convergence; General Procedure of FEA.

Material failure Behaviour: Stress–Strain Diagrams for Ductile and Brittle Materials. Equivalent stresses for varying orientations, Principal stresses, maximum shear stress, Mohr's circles.

Practice:

1. Introduction to 3D Experience Platform: About the Apps and their Applications from Engineering Point of View.
2. Analysis of Steel Bridge – Simulation using 3D Experience Tool.
3. Tensile Test using Simulation 3D Experience Tool.
4. Stress Strain Curve of a Ductile Material (Mild Steel) using Universal Testing Machine

Module II Mesh Generation and Modeling of Truss Structure (1(T)+ 4(P) (5 Hours)

Mesh Generation and Methods of Meshing and Types of Meshing. Procedure for selecting the method of meshing and type of meshing. Importance and application of Stiffness Matrix for different types of elements and the procedure for getting the results.

Practice:

5. 3D Experience Simulia – Modelling and Meshing of Transmission line tower.

Module III Stresses and Deflection Criteria: (5(T)+ 4(P) (9 Hours)

Procedure for Drawing Shear Force and Bending Moment Diagrams, Point of Contra Flexure.

Stresses (No Derivation): Simple or Pure Bending, Flexure Formula, Section Modulus, Neutral Axis, Determination of Bending Stresses, Shear Stress Distribution for Different Sections.

Deflection : Equation of Elastic Curve, Direct Integration Method

Practice:

6. 3D Experience Simulia – Modelling and Finite Element Analysis of Framed Structure subjected Earthquake Loads.

Module IV: Theories of Failure: (2(T)+ 4(P) (6 Hours)

Theories of Failure: Failure Under Biaxial Loading, Rankine's Theory, Guest's or Tresca's Theory, Von Mises Theory, Graphical Representation of Failure, Safety Factors, Prevention of Failure in Design Stage, Diagnosis of Failure In Post-Manufacturing Stage.

Practice:

7. 3D Experience Simulia: Bicycle Frame Structural Analysis

Module V: Torsion: (3(T)+ 4(P) (7 Hours)

Torsion: Torsion Equation, Design of Shafts, Power Transmitted by Shafts, Composite Shafts, Combined Bending and Torsion, Closed-Coiled Helical Springs, Spring Connected in Series and Parallel.

Dynamic Analysis: Fundamentals of Vibration; Evaluation of Natural Frequencies and Mode Shapes (Eigen values and Eigenvectors); Non-linear Analysis, Fatigue Analysis. Structures Subjected to Blast Loads.

Practice:

8. Simulation: Static and Dynamic Analysis of Shaft

Module VI Pressure Vessels (1(T)+ 2(P) (3 Hours)

Longitudinal and Hoop Stress in Thin-walled Pressure Vessels Subjected to Internal Pressure.

Practice:

9. Simulation: Crack Analysis of Thin walled Pressure Vessels.

Module VII Fatigue and Fracture: (3(T)+ 4(P) (7 Hours)

Fatigue: Failure Under Cyclic Loading, Endurance Limit. S-N Curve, Stress Concentration, Goodman and Soderberg Criteria.

Fracture: Types of Failure, Brittle and Ductile Fracture, Basic Modes of Fracture. Griffith's Analysis, Crack Growth and Stress Intensity Factor.

10. Fatigue Analysis of Crankshaft of Two-Wheeler

Text Books:

1. Strength of Materials, S.S. Rattan, Tata Mc-Graw Hill Publication.
2. Advanced Mechanics of Materials, A.P. Boresi and R.J. Schmidt, Willey India

Reference Books:

1. Elements of Fracture mechanics, Prashant Kumar, McGraw Hill Education (India)
2. Engineering Mechanics of Solids, Egor P. Popov, Pearson publication
3. Strength of Materials, R.K.Bansal, Laxmi Publications.

Disaster Preparedness & Planning Management

Code	Course Title	Credit	T-P-PJ
CUTM1907	Disaster Preparedness & Planning Management	2	2-0-0

The overall aim of this course is to provide broad understanding about the basic concepts of Disaster Management with preparedness as a Civil Engineer. Further, the course introduces the various natural hazards that can pose risk to property, lives, and livestock, etc. and understanding of the social responsibility as an engineer towards preparedness as well as mitigating the damages.

Course objectives of the course are i) To Understand basic concepts in Disaster Management ii) To Understand Definitions and Terminologies used in Disaster Management iii) To Understand Types and Categories of Disasters iv). To Understand the Challenges posed by Disasters vi) To understand Impacts of Disasters Key Skills

Outcomes: The student will develop competencies in → the application of Disaster Concepts to Management → Analyzing Relationship between Development and Disasters. → Ability to understand Categories of Disasters and → realization of the responsibilities to society

Syllabus

Module 1: Introduction - Concepts and definitions: disaster, hazard, vulnerability, risks severity, frequency and details, capacity, impact, prevention, mitigation).

Module 2: Disasters - Disasters classification; natural disasters (floods, draught, cyclones, volcanoes, earthquakes, tsunami, landslides, coastal erosion, soil erosion, forest fires etc.); manmade disasters (industrial pollution, artificial flooding in urban areas, nuclear radiation, chemical spills, transportation accidents, terrorist strikes, etc.); hazard and vulnerability profile of India, mountain and coastal areas, ecological fragility.

Module 3: Disaster Impacts - Disaster impacts (environmental, physical, social, ecological, economic, political, etc.); health, psycho-social issues; demographic aspects (gender, age, special needs); hazard locations; global and national disaster trends; climate change and urban disasters.

Module 4: Disaster Risk Reduction (DRR) - Disaster management cycle – its phases; prevention, mitigation, preparedness, relief and recovery; structural and non-structural measures; risk analysis, vulnerability and capacity assessment; early warning systems, Postdisaster environmental response (water, sanitation, food safety, waste management, disease control, security, communications); Roles and responsibilities of government, community, local institutions, NGOs and other stakeholders; Policies and legislation for disaster risk reduction, DRR programmes in India and the activities of National Disaster Management Authority.

Module 5: Disasters, Environment and Development - Factors affecting vulnerability such as impact of developmental projects and environmental modifications (including of dams, landuse changes, urbanization etc.), sustainable and environmental friendly recovery; reconstruction and development methods.

Text/Reference Books:

1. <http://ndma.gov.in/> (Home page of National Disaster Management Authority)
2. <http://www.ndmindia.nic.in/> (National Disaster management in India, Ministry of Home Affairs).
3. Pradeep Sahni, 2004, Disaster Risk Reduction in South Asia, Prentice Hall.
4. Singh B.K., 2008, Handbook of Disaster Management: Techniques & Guidelines, Rajat Publication.
5. Ghosh G.K., 2006, Disaster Management, APH Publishing Corporation
6. Disaster Medical Systems Guidelines. Emergency Medical Services Authority, State of California, EMSA no.214, June 2003
7. Inter Agency Standing Committee (IASC) (Feb. 2007). IASC Guidelines on Mental Health and Psychosocial Support in Emergency Settings. Geneva: IASC

DOMAIN				
Sl. No.	Code	Subject Name	T-P-P	Credits
Domain	ASCU2020	Aerial Surveying and Remote Sensing Applications		4-10-4
1.	CUAS2020	REMOTE SENSING & DIGITAL IMAGE PROCESSING	2-2-0	4
2.	CUAS2021	GEOSPATIAL TECHNOLOGY AND ITS APPLICATION	2-2-0	4
3.	CUAS2022	PHOTOGRAMMETRY AND ITS APPLICATION	0-2-0	2
4.	CUAS2023	LIDAR REMOTE SENSING AND ITS APPLICATIONS	0-2-0	2
5.	CUAS2024	HYPER-SPECTRAL REMOTE SENSING AND ITS APPLICATION	0-2-0	2
6.	CUAS2025	PROJECT	0-0-4	4
			Total	18

DOMAIN

Aerial Surveying and Remote Sensing Applications

Course Title	Code	Type of course	T-P-PJ	Prerequisite
Aerial Surveying and Remote Sensing Applications	ASCU2020	Theory + Practice + Project	4 - 10 - 4	Nil

Courses Division:

- | | |
|--|-----------------|
| 1. Remote Sensing & Digital Image Processing | (2-2-0) 45Hours |
| 2. Geospatial Technology and its Application | (2-2-0)45Hours |
| 3. Photogrammetry and its Application | (0-2-0) 25Hours |
| 4. Lidar Remote sensing and its Applications | (0-2-0) 25Hours |
| 5. Hyper-spectral Remote Sensing and its Application | (0-2-0) 25Hours |

6. Project

(0-0-4) 54Hours

Objective:

- Apply the principles of Remote Sensing and GIS to collect, map and retrieve spatial information.
- Plan, assess and evaluate natural and manmade systems using geospatial models and methods.
- Use geospatial tools and techniques for natural resources planning and management.

Course Outcome:

- Identify specific data and methodologies for effective mapping and evaluation of natural resources.
- Develop geospatial models and tools to address the social and engineering problems
- Design multi-criteria geospatial systems for decision-making process
- Work in a team using geospatial tools and environment to achieve project objectives.
- Pursue lifelong learning for professional advancement

Evaluation System: As per university norms

Remote Sensing and Digital Image Processing

Subject Name	Code	Type of course	Credit	T-P-P	Prerequisite
Remote Sensing and Digital Image Processing	CUAS2020	T+P	4	2-2-0	NIL

Module: I Basic Concept of Remote Sensing (4+6) Hours

Introduction of Remote Sensing: Principles of RS and its Type; Energy sources and Radiation principles, Pixel, DN value, Energy equation; EMR and Spectrum; EMR interaction with Atmosphere; scattering, Absorption, Atmospheric window, Black body radiation; EMR interaction with earth surface features, reflection, absorption, emission and transmission, Spectral signature; Interaction with vegetation, soil, water bodies; Advantage of RS over conventional method, Limitation, Ideal remote sensing.

Practice:

1. Installation of Image Processing software's
2. Download satellite data from GLOVIS / Earth Explorer / Bhuvan etc.
3. Layer stacking
4. LUT and Image Subset
5. Spectral Signature mapping (soil, vegetation, water)

Module: II Digital Image (2+3) Hours

Data acquisition: Procedure, Reflectance and Digital numbers; Intensity, Reference data, Ground truth, Analog to digital conversion, FCCs, TCC, Platforms and sensors; orbits ,types, Resolutions; Image Interpretation; visual- Interpretation keys.

Practice:

1. FCCs and TCC
2. Resolution
3. Image Interpretation

Module: III Satellite Information and Principles (2+3) Hours

Land observation satellites, characters and applications; PSLV, GSLV, Satellite, Platform Types; LANDSAT series; IRS series; IKONOS Series; QUICKBIRD series; Weather/Meteorological satellites; INSAT series, NOAA, Applications, Marine observation satellites; OCEANSAT

Practice:

1. Image filtering and Band ratioing
2. Mosaicking

Module: IV Image Acquisition and Format (2+4) Hours

Digital Image Processing; Export and import, Data formats; BSQ, BIL, BIP, Run length encoding, Image Compression Data products.

Practice:

1. Export and Import
2. Histogram
3. Subset using AOI

Module: V Image Processing (3+4) Hours

IMAGE RECTIFICATION; Pre-processing and Post processing Geometric distortion; sources and causes for distortion, rectification, GCP, Resampling, Image registration; Radiometric distortion; sources and causes, atmospheric correction.

Practice: (Spectral Python and ENVI)

1. Geometric correction
2. Radiometric correction
3. Atmospheric correction

Module: VI Image Classification (4+4) Hours

IMAGE CLASSIFICATION; Classification techniques, types, Supervised and Un-supervised; Principal Component Analysis (PCA); Image Enhancement; Accuracy assessment.

Practice:

1. PCA analysis (spectral Python and ENVI)
2. NDVI, DVI, NDWI calculation
3. Image classification in Spectral angel Mapper
4. MNF Ratoing
5. Supervised Classification(spectral Python and ENVI)
6. Un-supervised Classification(spectral Python and ENVI)
7. Image Enhancement(ENVI)
8. Accuracy Assessment(ENVI)

Module: VI Remote Sensing and Its application (3+4) Hours

Microwave RS and its application; Thermal RS and its application; Optical RS and its application; Sensor and its types.

Practice: Using Spectral Python

1. Application of microwave remote sensing (Structural Trend line mapping)
2. Application of thermal remote sensing and case study(Land surface Temp. estimation)
3. Application of optical remote sensing and case study

Geospatial Technology and its Application

Module I: GIS & Cartography (2+4) Hours

Components of GIS, Types of Data in GIS, Scale Application of GIS, Advantage and limitation of GIS. History and development of Cartography; Definition, scope and concepts of cartography, Characteristics of Map; Categories of maps, Methods of mapping, relief maps, thematic maps.

Practice:

1. **Symbology** (generalization, symbology, and colour effect, change symbology and use

Subject Name	Code	Type of course	Credit	T-P-P	Prerequisite
Geospatial Technology and its Application	CUAS2021	T+P	4	2-2-0	NIL

transparency in creative ways) using GRASS and QGIS

Geo-referencing (Map to Image and Image to Image), Projection, Data base creation: Digitization using Point, line and polygon, Edit, Clip, Intersect, Union, Merge, Join and subset. Attribute table editing

2. **Google Earth** (Convert Shape file to KML Format and KML File to shape file, Import data into Google earth, Bhuvan view, Extract data From Google Earth, Extract Point Data, Extract Polygon data, Extract line data, overlaying an image into Google earth)

Module: II Data analysis tools(2+4) Hours

Raster data spatial analysis, Network analysis, Vector operations and analysis, Data editing, Primary and secondary data. Data model and data structure, Geodatabase and metadata, GIS data model, Overlay analysis, Network modeling, Data Structure Models, Spatial interpolation; measurement and analysis methods, Advantage and disadvantage

Practice:

1. Linking of spatial and Non-spatial data and queries, Joining tabular data with the feature attribute data, Non-spatial query, Spatial query, Spatial join, Vector based spatial analysis, Raster based spatial data analysis
2. Buffering and Creation of Contour
3. Network Analysis

Module: III Multi-criteria analysis and decision making (3+4) Hours

Principles and elements of multiple-criteria decision making, Classification of Multiple-criteria Decision Problem: Multi-objective Vs Multi-attribute, Decision Alternatives and constraints, Criterion weighting, Decision rules, Multiple-criteria decision making in spatial data analysis.

Introduction to AHP, Basic Principles of AHP, Effect Table, Pair Wise comparison, Consistency, Weightage, performance score, Case studies involving AHP

Practice:

1. Mapping accident locations using Linear Referencing technique.
2. Preparation of raster layers for Multicriteria Analysis
3. Solving a spatial problem using Multicriteria Analysis (Spatial AHP)

Module: IV Digital Elevation Model (DEM) (2+4) Hours

Concept of DEM, Various techniques to generate DEM, Importance of spatial resolution to DEM, Integration of DEM to satellite data, Common derivatives of DEM, Slope, Aspects, TIN, Sources of DEM, Laminations and future of DEM.

Practice:

1. Google earth to DEM, 3D Map preparation, Contour to DEM, TIN and Aspect
2. DEM based surface Hydrology modeling,
3. LiDAR classification, DEM from LiDAR

Module: V Geospatial Technology for Water resources Engineering (3+4) Hours

Watershed, types, divide catchment, command area, stream types, Drainage network, different pattern; morphometric analysis, Bifurcation ratio analysis; Assessment of **Groundwater potential zones** and Groundwater mapping; Site selection for recharge structures, Hydrogeological Mapping GIS applications to ground water studies.

Practice:

1. Mapping of catchment, command area
2. Drainage network analysis
3. Morphometric analysis
4. Mapping of Groundwater potential zones

Module: VI Geospatial Technology for Environmental Engineering (3+4) Hours

Monitoring atmosphere constituents; air pollution, industrial activity, modeling using GIS, Resource development in remote areas, Impacts of anthropogenic activity, Solid Waste management; Water Pollution, Shortest path Identification, Network analysis.

Practice:

1. Air pollution mapping
2. Solid waste management

3. Water pollution

Photogrammetry and Application

Practice Experiments:

3.1 Scale determination from aerial photo

3.2 Aerial photo Interpretation

3.3 Use of Parallax bar and determination of Height from stereo pair

3.4 Satellite DEM and ortho Image generation

Subject Name	Code	Type of course	Credit	T-P-P	Prerequisite
Photogrammetry and Application	CUAS2022	T+P	2	0-2-0 25Hours	NIL

3.5 Primary and additive colour creation

3.6 Stereo test

3.7 Mosaic

3.8 Stereoscopic vision

3.9 Relief displacement

3.10 Analog to digital conversion, Orientation of stereo model and Determination of Height

3.11 Aerial mapping using DRONE

3.12 Mosaicking of aerial Photo

3.13 Correction and rectification

3.14 DTM generation Image correction, Link between GIS and Digital Photogrammetry and Ortho Image generation

LIDAR Remote Sensing and Application

Subject Name	Code	Type of course	Credit	T-P-P	Prerequisite
LIDAR Remote Sensing and Application	CUAS2023	T+P	2	0-2-0 25Hours	NIL

Practice Experiments:

4.1 Download of LIDAR data

4.2 Layer stacking

4.3 Data Validation

4.4 Georeferencing Technology

4.5 Boresight Calibration - Lidar Data Pre-processing

4.6 Project Coverage Verification - Review Lidar Data against Field Control

4.7 Lidar data errors and rectifications, - processes calibration of Lidar data - artifacts and anomalies - Lidar Error Budget.

4.8 Noise Removal and other sensor-related artifacts - Layer Extraction - Automated Filtering

4.9 Manual Editing and Product Generation – Surface Editing - Hydrologic Enforcement

4.10 Breaklines, Contours, and Accuracy Assessment

4.11 Topographic Mapping, flood inundation analysis, line-of-sight analysis

4.12 Forestry, various types of LIDAR sensors-, vegetation metric calculations - specific application software.

4.13 Corridor mapping system, data processing and quality control procedures.

4.14 Modelling

Hyperspectral Remote Sensing and Application

Practice Experiments:

5.1 Introduction to ENVI, Python and Downloading, Displaying, and Analyzing Hyperspectral Imagery

5.2 Atmospheric Correction of Hyperspectral Imagery.

5.3 MNF rationing from Hyperspectral(EO1)

5.4 Hyperspectral Image Classification Using Spectral Angle Mapper (SAM) & Spectral

Subject Name	Code	Type of course	Credit	T-P-P	Prerequisite
Hyperspectral Remote Sensing and Application	CUAS2024	T+P	2	0-2-0 25Hours	NIL

Feature Fitting (SFF).

5.5 Hyperspectral Imagery Classification Using an Unsupervised Neuron fuzzy System.

5.6 Application of Hyperspectral Imagery in Geological Studies.

5.7 Hyperspectral Signatures & Feature Fitting.

5.8 Hyperspectral Remote Sensing for Agriculture and soil Studies.

5.9 Hyperspectral Remote Sensing for Forestry Applications.

5.10 Hyperspectral Remote Sensing for Urban Studies.

5.11 Mineral identification from Hyperspectral imagery

5.12 Python Programming for Hyperspectral data analysis.

Project

List of Projects :

1. Flood inundation mapping and Risk Evaluation using Geospatial Technology.

2. Landslide Hazard mapping using GIS and RS.

Subject Name	Code	Type of course	Credit	T-P-P	Prerequisite
Project	CUAS2025	Project	4	0-0-4	NIL

3. Land use and Land cover Dynamics using Earth observation Technology.

4. Mangrove change detection study using Multi-Temporal satellite data.

5. Solid waste management and shortest path identification using GIS Technology.

6. Watershed management using GIS Technology.

7. Identification Mineral mapping using GIS and RS.

8. Crop Health Monitoring using Geospatial Technology.

9. Identification of Hydrocarbon Locales using space inputs and Geospatial Technology.

10. Ground water exploration using GIS and RS Techniques.

11. Interlinking of River using GIS Technology.

12. Biomass estimation using Space Technology.

13. Land surface Temperature mapping using RS Technology.

14. Climate Change study using Earth Observation Technology.

15. Erosion and Accretion study of Shorelines and its impact in coastal habitats.

Students take up group projects and deal the following activities during the project. The project Report should contain below gate process.

Step 1: Functional Planning of the project and Objective Identification

Step 2: Literature Review

Step 3: Preparation of Flow chart for Methodology

Step 4: Layer creation and GIS analysis

Step 5: Identifying the possible Risks involved (specific to the project)

Step 6: Report writing

Each student is expected to do an individual project. At the completion of a project the student will submit a project report, which will be evaluated (end semester assessment) by duly appointed examiner(s). This evaluation will be based on the project report and a viva voce examination on the project. Student will be allowed to appear in the final viva voce examination only if he / she has submitted his / her project work in the form of paper for presentation / publication in a conference / journal and produced the proof of acknowledgement of receipt of paper from the organizers / publishers.

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Domain Track Title: CONSTRUCTION PLANNING, MONITORING AND PROJECTMANAGEMENT

Track Total Credits =Theory + Practice + Project = 16 (4- 6 - 6)

Courses Division (list all divisions):

PHASE I.	Study of Drawings and Plan Hours	(0+2+0)	25
PHASE II.	Project Scheduling & Management Hours	(2+1+0)	30
PHASE III.	Quantity Estimation and Equipment Management Hours	(0+1+1)	25

PHASE IV	Site Study and Study on Contract Laws	(2+1+0)	30
Hours			
PHASE V.	Concepts of Quality Control and Checking	(0+1+1)	25
Hours			
PHASE VI.	Site Supervision Project	(0+0+4)	54
Hours			

Domain Track Objectives:

- Students will be able to work with the latest trend of the construction industry needs.
- Understand different methods of project delivery and the roles and responsibilities of all constituents involved in the design and constant process.
- Give the students experience, supervision and direction in recognizing and applying the concepts of project management and construeplanning.

Domain Track Course Outcomes:

- Students will plan various projects relating to advanced building technology with trust.
- Students will be churned as Construction Manager, Project Engineer, Site Supervisor and Project Consultant.
- Maintain and develop the pupils' ability to put their knowledge of theory into practice using forms of construction.

Domain Syllabus:

PHASE I- STUDY OF DRAWINGS 2+2+0

Inputs required completing the project

1. To ensure the student to read about the technical terms in various building drawings.
2. To give hands on practice to the students in preparing blue prints of a proposed construction.

To fulfill the requirement of the INPUTS the candidate has to learn the following steps:

TYPES OF INPUT

TYPE OF STUDY

Preparation of Site Map Practice	Theory + Drawing
Preparation of Electrical and Plumbing drawing Practice	Theory + Drawing
Preparation of Bar Bending Schedule and Carpentry drawing Practice	Theory + Drawing
Structural Detailing of building components Practice	Preparation of Building layouts Theory + Drawing
Report Preparation Practice	Review
Field Work Report Practice	Presentation

Phase II: PROJECT SCHEDULING & MANAGEMENT 0+2+0

1. WBS
2. Equipment Scheduling
3. Labour Scheduling
4. Material Scheduling
5. Financial Resource allocation.

To fulfill the requirement of the INPUTS the candidate has to learn the following steps:

TYPES OF INPUT

TYPE OF STUDY

Preparation of Functional Planning	Practice
Detail analysis report about the information of an equipment	Practice
Preparation of datasheet of construction labors	Practice
Preparation of materials list required for the project	Project
Scheduling the resources of the project	Project
Report Preparation	Report
Review	Presentation

PHASE III QUANTITY ESTIMATION AND EQUIPMENT MANAGEMENT

- 1 Identify the particular equipment to be used in the construction project they will undertake.
- 2 Prepare plans for economic management by estimating the costs of the total construction works.

To appraise the student with the aspects related to functioning, operation and maintenance of various construction equipment.

To fulfill the requirement of the INPUTS the candidate has to learn the following steps:

<u>TYPES OF INPUT</u>	<u>TYPE OF STUDY</u>
Planning & Selection of Equipment Learning }	Practice (Self-
Economics of Equipment and procurement techniques. Learning }	Practice (Self-
Estimation for total construction cost. Learning }	Practice (Self-
Estimation for total labor and material Learning }	Practice (Self-
Preparation of BOQ. (Lab)	Estimator 2.0
Review	Presentation

PHASE IV SITE STUDY AND STUDY ON CONTRACT LAWS
2+2+0

To learn about the methods of marking layouts and pre construction process.
 To study the various types of construction contracts and their legal aspects and provisions.
 To fulfill the requirement of the INPUTS the candidate has to learn the following steps:

<u>TYPES OF INPUT</u>	<u>TYPE OF STUDY</u>
Marking Layouts of proposed plan.	Field work
Preparation of Site Map Practice	Surveying
Design of contract documents Tenders Prequalification-Bidding- Accepting- Evaluation of Tender from Technical Class Room Practice	Theory+
Contractual and Commercial Points of View. Legal Requirements, Insurance and Bonding, Laws Governing Sale, Purchase and Use of Urban and Rural Land-Land Revenue Codes-Tax Laws Class Room Practice	Theory+
Assessment (Lab) Examination	

PHASE-V 0+1+1 CONCEPTS OF QUALITY CONTROL AND CHECKING

Inputs required completing the project

- To enlighten the student with the tools of total quality management process.
- To give hands on practice to the students in preparing quality assessment schedules and inspection check list
- Carryout the field and laboratory tests for quality assessment in construction industry.

To fulfill the requirement of the INPUTS the candidate has to learn the following steps:

<u>TYPES OF INPUT</u>	<u>TYPE OF STUDY</u>
Generation of sample QC inspection Check list for Practice (Self- Learning) Industrial building.	
Generation of sample QC inspection Check list for Institutional building. (Self- Learning)	Practice
Generation of sample QC inspection Check list for Apartment building. (Self-Learning)	Practice
Generation of sample QC inspection Check list (Self- Learning) Road Structures.	Practice
Report Preparation.	Report
Review.	Presentation

PHASE VI SITE SUPERVISION PRACTICES 0+0+2

To demonstrate supervision of concreting task such as form finish concrete structure, complex structure, slip fc concreting and concreting in extreme weather condition.

Supervise, monitor and evaluate performance of subordinates at workplace.

To study about the processes of various stages of construction on the field.

To fulfill the requirement of the INPUTS the candidate has to Learn the following steps:

<u>TYPES OF INPUT</u>	<u>TYPE OF STUDY</u>
------------------------------	-----------------------------

Supervise and monitor the execution of System/shuttering

Carpentry works.	Practice (Self-Learning)
Supervise and monitor the execution of concreting works.	Practice (Self-Learning)
Supervise and monitor the execution of bar bending works	Practice (Self-Learning)
Supervise and monitor the execution of scaffolding works.	Practice (Self-Learning)
Supervise and monitor the daily- Labour works (DPR).	Practice (Self-Learning)
Assessment (Review)	Presentation

REPORT WRITING

Students take up group projects and deal the following activities during the course of their project.

- Functional Planning of the project
- Identification of Objects
- Literature Review
- Preparation of Flow chart for Methodology
- Sequences of construction process
- Identifying the possible Risks involved (specific to the project)
- Result and Discussion
- Conclusion
- Recommendation
- **References**

Software Handling

- 1 Auto CAD
2. Revit Architecture
- 3 M. S. Project
- 4 Primavera
- s Estimator 2.0

Domain Track Title : Architectural and Structural Design

Track Total Credits (0-15-5)

Courses Divisions:

1. Critical thinking and presenting it with digital platform (AutoCAD leads to 3D base) (0-3-0)
2. Scope to enrich by exposing them to BIM modelling (0-5-0)
3. Design and failure analysis of structure (0-5-0)
4. Amalgamation of architecture and civil requirements using Generative Apps (0-2-0)
5. Project(0-0-5)

Domain Track Objectives:

1. To teach the Principles of architectural building design.
2. To familiarise the student with practicing life in construction industry and orient their learnings towards practical application in the field
3. Make a difference with cutting edge technology

Domain Track Course Outcomes:

1. Strong understanding of architectural design and scope for innovative ideas
2. Case study based practical solution with actual site visits/live buildings
3. Modelling of structural elements and failure analysis
4. Time saving estimations/structural calculations using digital tool

Domain Syllabus:

1. Critical thinking and presenting it with digital platform (37.5 Hrs) (AutoCAD leads to 3D base)

- 1.1 Introduction to Architectural Design
- 1.2 The need and scope of with basics of Design Principles
- 1.3 Ergonomic data and its application
- 1.4 Hands-on experience with designing their own house or hostel
- 1.5 The need of digital drive for 2D design expressions
- 1.6 Basics of AutoCAD, Conceptualization of Design: Own House drafting/Hostel
- 1.7 Addition of Creativity and modifying the design
- 1.8 Study the impact of Geological data, climatological data on design
- 1.9 Modification of design based on hydrology, soil, site conditions

- 1.10 Carving out a meaningful design in terms of architecture and structure both
- 1.11 Application of 2D design/ welcoming them in the world of 3D design
- 1.12 Basics of 3D concepts and commands
- 1.13 Practical techniques for saving area/cost
- 1.14 Presenting a wholesome idea before moving to BIM

2. Scope to enrich by exposing them to BIM modelling (62.5 Hrs)

- 2.1 Introduction to BIM modelling
- 2.2 The need and scope of with live examples
- 2.3 Ergonomic data and its application
- 2.4 Applying learnings to a bigger scale hotel/flat scheme/hostels
- 2.5 Incorporation of site factors
- 2.6 Realistic approach road and building bye-laws
- 2.7 The magic of *Importing previous plans & reorient them to achieve larger scale in no time*
- 2.8 Prepare specifications in BIM
- 2.9 Estimating all the quantities in a very short time
- 2.10 Concepts of CATIA
- 2.11 Layer wise calculation for pipelines, electrical ducts, AC units etc
- 2.12 Introducing structural layers for design
- 2.13 Cross check with grid formation, foundation calculation & column orientation
- 2.14 Data and record for 3D design of individual aspects for the next level

3. Design and Failure Analysis of Structure (62.5 Hrs)

- 3.1 Introduction to steel structures. Modeling, Analysis and design of steel truss in as per AISC 360
- 3.2 Linear buckling analysis of structures

- 3.3 Introduction to PEB, Modelling PEB and assigning properties, load cases, design parameters, Analysis and extracting results.
- 3.4 Introduction to lattice steel structures. Modelling, Analysis and design of lattice steel structures.
- 3.5 Reading design results and optimising the steel structure.
- 3.6 Modelling, Analysis and design of portal frame as per AISC 360 and ASCE 07-16
- 3.7 Introduction to nonlinear static analysis. Perform pushover analysis.
- 3.8 Introduction and modelling of composite deck platform
- 3.9 Modelling of deck slab and assigning section properties with releases
- 3.10 Assigning specifications and diaphragm to the structures
- 3.11 Define and calculate seismic and wind loads as per ASCE 07 and ATC hazards
- 3.12 Define load cases and load combinations, Deflection check concept, floor vibration analysis.
- 3.13 Analyse composite structure and extract results.
- 3.14 How to import CAD MODEL, Design and analysis of multi storey residential building based on different loading criteria (based Code on IS456:2000),Creating plate elements and shear walls.
- 3.15 Design and analysis of frame structures based on different loading criteria (based Code on IS456:2000)
- 3.16 Design, analysis of Foundations (Isolated footing and Combined footing based on code IS456:2000)
- 3.17 Design, analysis of structural elements e.g. Beam, column, Slab (one way and Two way) (based Code on IS456:2000 and BS8007)
- 3.18 Error and warning analysis, Report generation

4. Amalgamation of Architecture and Civil Requirements using Generative Apps or Derivatives of Parametric Design (25 Hrs)

- 4.1 Optimisation of steel cost- using permutation & combination of steel/foundation type or small changes in architectural design
- 4.2 Segregated services
- 4.3 Revising PERT/CPM paths
- 4.4 Addition of storage spaces
- 4.5 Façade treatment/modification
- 4.6 Inclusion of basement/parking areas/bunkers
- 4.7 Reduction of construction cost
- 4.8 Site development and slope calculation (in brief)
- 4.9 Mitigating hydrological impacts on difficult sites

Session Plan for the Entire Domain:

1. Critical thinking and presenting it with digital platform (37.5 Hrs)

Session 1: Architectural Design Basics

<https://www.youtube.com/watch?v=k4dVgbuxBAw>

Session 2: Stages of Architectural Design

<https://www.youtube.com/watch?v=pv-O5VdVjdM>

Session 3: Fundamentals of Building Planning

<https://www.youtube.com/watch?v=LIY7f6kK3Jk>

Session 4: Visualisation of plans

Session 5: Basics of AutoCAD

<https://www.youtube.com/watch?v=hO865EIE0p0>

Session 6: Making a simple floor plan in AutoCAD

<https://www.youtube.com/watch?v=-iX-ZyvOiQA>

Session 7: Creative Design

<https://www.youtube.com/watch?v=YHNYaQzsRf8>

Session 8: Creativity in building design (sample/live case analysis)

<https://www.youtube.com/watch?v=MDtIcrDAPFk>

Session 9: Design is a thinking process

<https://www.youtube.com/watch?v=vmHoGicPQQQ>

Session 10: Modification and correction

Session 11: Adding variables like: Climatology, soil data and hydrology

Session 12: Arriving at a creative and unique solution

Session 13: Printing the ideas in brain

Session 14: Basics of 3D design

https://www.youtube.com/watch?v=MZ89_ozNWIA

Session 15: Exploring various platforms to express the idea in VR

https://www.youtube.com/watch?v=il7m1Ta7_eQ

Session 16: Detailing in 3D

Session 17: Practical techniques for saving area/cost

Session 18: Hands on practice for optimisation of design

2. Scope to enrich by exposing them to BIM modelling (62.5 Hrs)

Session 1: A thorough introduction to BIM

<https://hmcarchitects.com/news/building-information-modeling-benefits-for-architecture-and-construction-2019-06-05/>

Session 2: BIM's extent and various applications

Session 3: Case study and live applications/examples

<https://www.linkedin.com/pulse/200612engineeringtemplateexample-mansukim/?trackingId=tW9ftWdlwLMES034UU2meg%3D%3D>

Session 4: Introduction to bigger scale problems based on previous sample design

Session 5: Time saving factor using 3D skills

<https://www.linkedin.com/pulse/200612engineeringtemplateexample-mansukim/?trackingId=tW9ftWdlwLMES034UU2meg%3D%3D>

Session 6: Specification generation in BIM

<https://www.cadcr.com/bim-and-specifications-writing-the-great-disconnect/>

Session 7: Estimation of quantities

<https://estimationqs.com/bim-vs-bills-of-quantities-3d-model-quantity-takeoff/>

Session 8: 5D estimation and BIM/adding another dimension to BIM

<http://biblus.accasoftware.com/en/perspectives-on-5d-bim-the-fifth-dimension-of-bim-linked-to-construction-estimate/>

Session 9: Layer of services: water supply and Sanitation

Session 10: Calculation and Fitting nitty-gritty

Session 11: Electrical Layout and BIM

https://www.youtube.com/watch?v=SSkl_vT7cCQ

Session 12: Electrical Layout: drawing and estimation

<https://www.youtube.com/watch?v=r5p3LOqPMiM>

Session 13: AC layout ducting (only introduction)

Session 14: Centreline plan and Cross check with grid formation

<https://www.youtube.com/watch?v=dPHYi-fYcnk>

Session 15: Reorientation of columns and beams to form a strong frame

<https://www.youtube.com/watch?v=nKZy4MB-0zY>

Session 16: Cross check in 3D-Quick Revit analysis/SAP

<https://www.youtube.com/watch?v=pIRqWvD0Wqw>

Session 17: Basics of foundation calculation & column

<https://www.youtube.com/watch?v=SUf5h2ulf2U>

Session 18: Report generation

Session 19: Presentation with achievements in project

3. Design and Failure Analysis of the Structure

Session 1: Introduction to Steel Structures, Various types of trusses, Purlins, girders and Sag Rods.

<https://youtu.be/dZctrAnZeI>

Session 2: Modelling of Steel Truss in STAAD as per AISC 360

Session 3: Analysis and Design of Steel Truss in STAAD as per AISC 360

Session 4: Introduction to Linear Buckling Analysis

Session 5: Perform Buckling Analysis for I Shape Column

Session 6: Perform Buckling Analysis for I Shaped Steel Girder

Session 7: Introduction to Pre-Engineered Buildings (PEB)

<https://youtu.be/N024hmP2PYU>

Session 8: Modelling of PEB Shed and Assigning Properties

<https://youtu.be/T2AafFV-KS0>

Session 9: Define Load Cases and Combinations

Session 10: Calculation and Assignment of Dead and Live Loads as per IS 875 and NBC 2016

Session 11: Assignment of Wind Loads on PEB Shed as per the Indian Standards

Session 12: Assigning Analysis and Design Parameters with Extracting Design Results

Session 13: Introduction to Lattice Steel Truss Structures

Session 14: Practical Reference for a Lattice Steel Truss Structure

Session 15: Modelling of Lattice Steel Truss Structure

Session 16: Analysis and Design of Lattice Steel Truss Structure

Session 17: Reading Design Results and Optimizing the Steel Structure

Session 18: Detailed Explanation of Wind Loads as per ASCE07-16

Session 19: Modelling of Portal Frame as per AISC 360 and ASCE07-16

Session 20: Analysis and Design of Portal Frame as per AISC 360 and ASCE07-16

Session 21: Introduction to Non Linear Static Analysis i.e. Pushover Analysis

Session 22: Perform Pushover Analysis for a Steel Frame in STAAD Pro.

Session 23: Introduction to Steel and Composite Buildings

Session 24: Introduction to Cold Formed Steel Structures, Introduction and Modelling of Composite Deck Platform

Session 25: Modelling of Deck Slab and Assigning Section properties with Releases

Session 26: Assigning Specifications, Releases and Diaphragm to the Structure

Session 27: Define and Calculate Seismic and Wind Loads as per ASCE 07 and ATC Hazards

<https://youtu.be/tV3l7SDmiwk>

Session 28: Define Load Cases and Load Combinations

Session 29: Define Analysis and Composite Structure Design Commands

Session 30: Analyzing and Designing the Structure as per AISC 360 for Composite beams

Session 31: Floor Vibration Analysis and Generation of Design Report

Session 32: Deflection Check Concept i.e. DJ1 and DJ2 Design Command

Session 33: Introduction to Plate Girders

Session 34: Design of Plate Girders as per AISC 360

Session 35: Introduction to Linear Cable Analysis and Cable Supported Structures

Session 36: Linear Cable Analysis of a Guyed Tower in STAAD Pro.

Session 37: Introduction to Lifting Arrangement and Basic Modelling of Suspended Arrangement

Session 38: Advanced Cable Analysis and Extraction of the Results

Session 39: Modelling of Steel Structure Platform and defining Load Cases, Combination

<https://youtu.be/YBWPn5jmMGs>

Session 40: Defining Properties, Analysis and Design Parameters

Session 41-42: How to import CAD MODEL, Design and analysis of multi storey residential building based on different loading criteria (based Code on IS456:2000)

<https://youtu.be/xb2I5-89O28>

<https://youtu.be/uGZjESwS6z0>

Session 43: Creating plate elements and shear walls.

<https://youtu.be/YKNfjEmN5O4>

Session 44-45: Design and analysis of frame structures based on different loading criteria (based Code on IS456:2000)

https://youtu.be/_I1qYBIspbk

Session 46-47: Design, analysis of Foundations (Isolated footing and Combined footing based on code IS456:2000)

<https://youtu.be/be20IIMaRS4>

Session 48-49: Design, analysis of structural elements e.g. Beam, column, Slab (one way and Two way) (based Code on IS456:2000 and BS8007)

<https://youtu.be/NXP2cmL8fmY>

<https://youtu.be/-17O4ZSZ9VY>

<https://youtu.be/XueRfUsznhI>

<https://youtu.be/8BX8wDuuVFk>

<https://youtu.be/7hguBoqCajE>

<https://youtu.be/GTDCjEtXI60>

Session 50-51: Error and warning analysis, Report generation

4. Amalgamation of Architecture and Civil Requirements using Generative Apps or Derivatives of Parametric Design (25 Hrs)

Session 1: Variable analysis using BIM: plan, grid, column numbers and even reinforcement detailing

Session 2: Revising estimations in no time

Session 3: Achieving cost effectiveness

Session 4: Checking services' paths-Layering of services

Session 5: Addressing the coinciding issues with services

Ex: AC duct and electrical conduits

Session 6: Visual realisation of reinforcement in all the elements

Session 7: Arriving on shortest timeline-Revising PERT/CPM

Session 8: Exploring possibilities for additional spaces in design

Ex: storage, intermediate water tank, parking area

Session 9: Façade treatment

<https://study.com/academy/lesson/facade-in-architecture-definition-design.html>

Session 10: Dynamic façade design

<https://www.homedit.com/cool-building-facades/>

Session 11: Site development –Phase wise

Session 12: Site development – After completion year wise

Session 13: Scope for future addition/intervention by developer

Session 14: Estimation of effective saving- in terms of time/money/gain

List of Projects:

1. Small scale (initial) with interior

1.a. Hostel room

1.b. Individual home

1.c. Duplex bungalow

1.d. Shop

2. Live/ ongoing Project/Turn key basis

2.a. Multi storey building

2.b. Hospital

2c. Hostel

2.d. Office Building

3. Highway geometry design

4. Design and analysis industrial ware house

5. Design and analysis of auditorium with proper load calculation, load cases, load combination based on code (IS 456:2000 and BS 8007).

6. Design of bridge deck slab

1. Gate Process for Project

1. Gate 0: Project Identification

2. Gate 1: Planning

3. Gate 2: Modelling

4. Gate 3: Design and simulation

5. Gate 4: Documentation

2021-22

**CENTURION UNIVERSITY OF TECHNOLOGY AND
MANAGEMENT, ODISHA**

SCHOOL OF PARAMEDICS & ALLIED HEALTH SCIENCES



Centurion
UNIVERSITY

Shaping Lives...
Empowering Communities...

BACHELORE OF SCIENCE IN CLINICAL MICROBIOLOGY

2021

SYLLABUS

Preface: Clinical Microbiology helps to diagnose and prevent disease through clinical laboratory tests. It is complementary to medical science. It involves analysis of body matter such as Collection of samples like body fluid, tissue, and blood and diagnoses them. It also covers micro-organism screening, sterilization of laboratorial environment and equipments, Antibiotic sensitivity tests.

Clinical Microbiologists are an integral part of the medical profession. These professionals get involved in practical and technical work to aid correct diagnosis and effective functioning of Microbiological Laboratory.

With adequate knowledge and experience, Clinical Microbiologist having +2 Sc with biology qualification can work in supervisory or management positions in laboratories and hospitals. They can also work as Laboratory Manager/Consultant/supervisor, health care Administrator, Hospital Outreach coordination, laboratory information system Analyst/Consultant, educational consultant/coordinator etc. Additional opportunities are available in molecular diagnostics, molecular biotechnology companies and in vitro fertilization laboratories as well as in research labs.

Programme: B. Sc. in Clinical Microbiology.

Duration: Three years (Six semesters) full-time programme with 6 months internship in the last semester.

Eligibility: +2 Science with Physics, Chemistry & Biology or equivalent degree

Examination: Examination rules will be as per guideline of CUTM Examination hand book.

Mini Project: A candidate will have to carry out a mini project work as mentioned in the course structure. After completion of the mini project, the student has to submit the dissertation of the mini project. Internal evaluation of the same (consisting of presentation and viva-voce) will be conducted by the respective School.

Internship: A candidate will have to undergo internship for a period of six calendar months in a hospital/Diagnostics Centre/ government or private organization, equipped with modern microbiology laboratory facility or in a fully equipped pathology laboratory, which fulfills the norms decided by the University.

Dissertation will be compulsory to all students. Students will carry out dissertation work individually or in the group of not more than three students. The format for dissertation/Internship report will be similar to the research thesis style; incorporating chapters on: Introduction, Materials and Methods, Results and Discussion and References / Bibliography. The dissertation will be submitted in a typewritten and bound form.

Degree: The degree of B. Sc. in Clinical Microbiology course of the University shall be conferred on the candidates who have pursued the prescribed course of study for not less than three academic years and have passed examinations as prescribed under the relevant scheme and completed 6 months of compulsory internship in the last semester.

On successful completion of three years programme, with a minimum course credit load of **140 credits**, the candidate will be awarded with “**Bachelor of Science in Clinical Microbiology (B. Sc. CMB)**” from Centurion University.

BACHELOR OF SCIENCE IN CLINICAL MICROBIOLOGY

Programme structure

BASKET 1	BASKET 2	BASKET 3	BASKET 4	TOTAL CREDITS
School Core Courses	Discipline Core Courses	Ability Enhancement Compulsory Course (AECC) To be selected from University Basket	Skill Courses (To be selected from University Basket)	
SC-1 SC-2 SC-3 SC-4 SC-5 SC-6 SC-7	DC-1 DC-2 DC-3 DC-4 DC-5 DC-6 DC-7 DC-8 DC-9 DC-10 DC-11 DC-12 DC-13 DC-14 DC-15 DC-16 DC-17 DC-18 DC-19	AECC-I AECC-II	SFS-1 SFS-2 SFS-3 SFS-4 SFS-5	
28 Credits	86 Credits	6 Credits	20 Credits	140 Credits (Minimum Credits required)

BASKET I
School Core Courses

Sl. No.	CODE	SUBJECT	SUBJECT TYPE (T+P+Pj)	CREDITS
SC-1	CUTM1708	Human Anatomy and Physiology	2+1+0	3
SC-2	CUTM1729	Cell Biology	3+0+1	4
SC-3	CUTM1730	Medical Instrumentation and Technique	2+2+0	4
SC-4	CUTM1732	Biochemistry	3+1+0	4
SC-5	CUTM1715	Clinical Pathology	3+1+0	4
SC-6	CUTM1736	Immunology	3+2+0	5
SC-7	CUTM1737	Molecular Biology	3+0+1	4

BASKET II
Discipline Core Courses

Sl. No.	CODE	SUBJECT	SUBJECT TYPE (T+P+Pj))	CREDITS
DC-1	CUTM1731	Haematology	3+2+0	5
DC-2	CUTM1733	Microbiology	3+2+0	5
DC-3	CUTM1734	Medical Law and Ethics	2+0+1	3
DC-4	CUTM1713	Systemic Bacteriology	3+1+0	4
DC-5	CUTM1735	Systemic Virology & Mycology	3+2+0	5
DC-6	CUTM1721	Research Methodology	2+0+1	3
DC-7	CUTM1738	Analytical Biochemistry	3+2+0	5
DC-8	CUTM1740	Public Health Microbiology	3+1+0	4
DC-9	CUTM1739	Pharmaceutical Microbiology	3+1+0	4
DC-10	CUTM1741	Industrial Microbiology	3+0+1	4
DC-11	CUTM1742	Basic Computer and Information Science	0+2+0	2
DC-12	CUTM1746	Epidemiology	2+0+1	3
DC-13	CUTM1747	Diagnostic Bacteriology	3+2+0	5
DC-14	CUTM1745	Diagnostic Mycology	3+1+0	4
DC-15	CUTM1743	Diagnostic Virology	3+0+1	4
DC-16	CUTM1744	Diagnostic Parasitology	3+1+0	4
DC-17	CUTM1754	Mini Project	0+0+2	2
DC-18	CUTM1755	Internship		12

DC-19	CUTM1756	Project		12
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NOTE: Along with the School core and Discipline core subjects, the students need to opt for AECC Courses, Skill/ Domain/ Elective courses and value- added courses from the University Basket, as per the requirement by the University.

BASKET I

School Core Courses

SC1- CUTM1708- Human Anatomy and Physiology

Subject Name	Code	Type of course	T-P-Pj	Prerequisite
Human Anatomy and Physiology	CUTM1708	Theory+ Practice	2-1-0	Fundamental Science

Course Objective

To identify different types of cells and describe their functions.

To identify the organelles of a typical cell and describe their functions.

To identify the major components of the integumentary system and describe their functions.

To identify the major structures of the skin and describe their functions

To identify the major components of the skeletal system and describe their functions.

To identify the major components of the circulatory, endocrine, nervous system etc and describe their functions.

Course Outcome

Use anatomical terminology to identify and describe locations of major organs of each system covered.

Explain interrelationships among molecular, cellular, tissue, and organ functions in each system.

Describe the interdependency and interactions of the systems.

Explain contributions of organs and systems to the maintenance of homeostasis.

Identify causes and effects of homeostatic imbalances.

Describe modern technology and tools used to study anatomy and physiology.

Course Outline

Module-I (10 Hours)

Scope of Anatomy and physiology. Terms and terminology used in Anatomy. Structure of cell, function of its components with special reference to mitochondria and microsomes.

Elementary tissues: Anatomy of epithelial tissue, muscular tissue, connective tissue and nervous tissue.

Skeletal System: Skeleton system with classification, types of bone, features of long bone, ossification, blood supply, Joints – classification with examples, structure of typical synovial joints, Joint disorders.

Practice: Demonstration of individual bone from skeleton.

Identification of different organs and system from chart.

Module-II (13 Hours)

Cardiovascular System: Composition and functions of blood. Blood groups – ABO system and Rh factor and coagulation of blood. Brief information regarding disorders of blood. lymph – origin, circulation, functions of lymph and lymph nodes. Structure and functions of various parts of the heart. Blood pressure and its recording. Brief information about cardiovascular disorders.

Respiratory system: Introduction and functional anatomy of respiratory tract, physiology of respiration.

Practice: Demonstration the morphology of different blood cells

Measurement of Blood pressure, impulses, Heart beats, respiration rate etc.

Module-III (15 Hours)

Urinary System: Various parts of urinary system and their functions, structure and functions of kidney. Physiology of urine formation. Patho-physiology of renal diseases and edema.

Digestive System: Anatomy of digestive system and their functions. Structure and functions of liver, physiology of digestion and absorption.

Endocrine System: Endocrine glands and Hormones. Reproductive system. Structure and function of sense organs.

Practice: Demonstration of various parts of body, tissues of body, parts of digestive

system, parts of respiratory system, parts of excretory system. Identification of different organs and system from chart

Suggested Readings:

1. Text book Anatomy & Physiology for nurses by Evelyn Pearce, Publisher Faber&Faber.
2. Text book Anatomy and Physiology for nurses by Sears, Publisher EdwardArnold.

3. Anatomy & Physiology- by Ross and Wilson, PublisherElsevier.
4. Anatomy& Physiology: Understanding the human body by Clark, Publisher Jones & Bartlett.
5. Anatomy and Physiology for nurses by Pearson, Publisher Marieb&Hoehn.
6. Anatomy and Physiology by N Murgesh, PublisherSatya

SC2-CUTM1729- Cell Biology

Subject Name	Code	Type of course	T-P-Pj	Prerequisite
Cell Biology	CUTM1729	Theory+ Project	3-0-1	Fundamental Science

Course Objective

<p>.Determine the parts of the cell membrane and the cell wall</p> <p>Distinguish the types and mechanism of mutation</p> <p>Compare and contrast the events of cell cycle and its regulation</p> <p>Understand the dynamic character of cellular organelles</p>
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Course Outcome

<p>Describe the fundamental principals cellular biology</p> <p>Develop a deeper understanding of cell structure and how it relates to cell functions.</p> <p>Understand how cells grow, divide, and die and how these important processes are regulated.</p> <p>Understand cell signaling and how it regulates cellular functions. Also how its dis- regulation leads to cancer and other diseases.</p>

Course Outline

Module –I (12 Hr)

An Overview of Cells: History, Cell theory, Structure and Function of Cell and its Organelles: Biological membranes - Nucleus - Nuclear envelope, Nucleolus, Mitochondria, Chloroplasts, Lysosomes, Gloxysomes and Peroxisomes, endoplasmic reticulum, ribosomes, Golgi complex (Structural organization, function, marker enzymes of the above organelles), Cell types: prokaryotes vs. eukaryotes; from single cell to multi-cellular organism; Different molecules of cell- water, salt and

mineral ions etc.

Module- II (14 Hr)

Cell cycle and its regulation, Cellular communication and cell mobility: Cell cycle: G₀/G₁, S, G₂ and M phases (Cell Division: Mitosis, meiosis and cytokinesis); regulation of cell cycle; cell adhesion and roles of different adhesion molecules, gap junctions, Extra- Cellular Matrix (ECM), Cell-cell interaction and cell- ECM interaction, The cytoskeleton, Microtubule- based movement and microfilament -based movement.

Module-III (14 Hr)

Cell signaling, Programmed Cell Death (Apoptosis) and Cancer: Hormones and their receptors, cell surface receptor, signaling through G-protein coupled receptors (G-PCR), Tyrosine Kinase, signal transduction pathways, second messengers, regulation of signaling pathways, bacterial and plant two-component systems, bacterial chemotaxis, Intrinsic and Extrinsic apoptotic pathway, Caspase enzyme, Biology and elementary knowledge of development and causes of cancer; Tumor viruses, Oncogenes and tumor suppressor genes.

Suggested Readings:

1. The Cell a Molecular Approach (4th Edition) by Cooper & Hausman
<https://www.thebiomics.com/books/cell-biology/cell-molecular-approach-cooper-and-hausmn-4th-ed.html>
2. Molecular Biology by Friefelder David, Publisher Narosa www.alibris.com/Molecular-Biology-David.
3. Introduction to Cell biology by John K Young, World Scientific publishing company www.overdrive.com/.../introduction-to-cell-biology
4. Introduction to biology, 3rd tropic edition by D G Maackean www.amazon.com/Introduction-Biology-D-G-Mackean/.

SC3-CUTM1730-Basic Medical Instrumentation and Techniques

Subject Name	Code	Type of course	T-P-Pj	Prerequisite
Basic Medical Instrumentation and Techniques	CUTM1730	Theor+Practice	2-2-0	Fundamental Science

Course Objective

To learn the principle, instrumentation & application of Microscopy

Principle, instrumentation & application of Centrifugation

Principle of Spectroscopy

Course Outcome

After completion of the course the student will be efficient in handling the microscopy equipment's.

They will also be able to have idea about handling instruments like centrifuge, spectrophotometer, chromatography, flow cytometer, Automated and semi- automated Biochemistry analyzer.

The conceptual understanding of the subject provides opportunities for skill enhancement and scopes for higher education.

Course Outline

Module -I (12 hrs)

Microscopic techniques: Principle, Instrumentation, Specimen preparation and Application: Phase–contrast microscopy, fluorescense microscopy, polarization microscopy, electron microscopy (Scanning and Transmission); Bacterial Colony Counter (Principle and working). Laminar Air Flow (Principle and working technique).

Practice: Demonstration of different Microscopes with their operation and maintain technique.

Module- II (14 hrs)

Colorimeter: Principle and Instrumentation; **Spectrophotometry:** Ultraviolet, Mass spectrophotometry; Flame photometry. **Centrifugation:** Principle; Preparative, Analytical, Density gradient centrifugation. **Cytometry:** Types, Flow cytometry and its applications.

Practice: Operation, Demonstration and Quality control of Centrifuge, UV-Vis spectrometer, Colorimeter.

Module- III (14 hrs)

Microtomy: Sectioning, Staining. Application, Principle and Application of: Fully Automated Biochemistry Analyser, Semi- automated Biochemistry Analyser, Coagulometer. Principle, working and uses of: Incubator, Hot air oven, Autoclave.

Practice: Demonstration of Auto/ Semi auto Analyzer; Working procedure of microtome, Incubator, Hot air oven, autoclave and others

Suggested Readings:

1. Wilson K and Walker J. (2010). Principles and Techniques of Biochemistry and Molecular Biology. 7th Ed., Cambridge University Press.
(e-Book link: <https://www.pdfdrive.com/principles-and-techniques-of-biochemistry-and-molecular-biology-e174866056.html>)
2. Nelson DL and Cox MM. (2008). Lehninger Principles of Biochemistry, 5th Ed., W.H. Freeman and Company.
(e-Book link: <https://www.pdfdrive.com/lehninger-principles-of-biochemistry-5th-edition-d164892141.html>)
3. Willey MJ, Sherwood LM & Woolverton C J. (2013). Prescott, Harley and Klein's Microbiology. 7thEd., McGraw Hill.
(e-Book link: <https://www.pdfdrive.com/prescott-harley-and-kleins-microbiology-7th-ed-e188166539.html>)
4. Labs for Life
(e-source link: <http://labsforlife.in/InstructionalVideo.aspx>)

(e-Book link- <https://books.google.co.in/books?id=z9SzvsSCHv4C&printsec=frontcover&dq=instrumentation&hl=en&sa=X&ved=2ahUKEwjipqrO347qAhUjwzGHRomCNUQ6wEwAHoECAIQAAQ#v=onepage&q=instrumentation&f=false>)

SC4-CUTM1732- Biochemistry

Subject Name	Code	Type of course	T-P-Pj	Prerequisite
Biochemistry	CUTM1732	Theory+ Practice	3-1-0	Fundamental Science

Course Objective

<p>To understand the concept of metabolism of carbohydrates</p> <p>To understand the significance of amino acids, proteins</p> <p>Use of enzymes in enhancing metabolic reactions</p> <p>Role of lipids</p>

Course Outcome

After completion of the course the student will be developed a very good understanding of various biomolecules which are required for development and functioning of cells.

Would have understood the significance of carbohydrates in energy generation and as storage food molecules for cells.

They would have understood the significance of proteins and enzymes in accelerating various metabolic activities.

The conceptual understanding of the subject provides opportunities for skill enhancement and scopes for higher education.

Course Outline

Module- I

Structure of enzyme: Apoenzyme and cofactors, prosthetic group-TPP, coenzyme NAD, metal cofactors, Classification of enzymes.

Mechanism of action of enzymes: active site, transition state complex and activation energy. Lock and key hypothesis, and Induced Fit hypothesis.

Enzyme inhibition, enzyme kinetics.

Diagnostic value of serum enzymes: Creatinine kinase, Alkaline phosphatase, Acid phosphatase, LDH, SGOT, SGPT, Amylase, Lipase, Carbonic anhydrase etc.

Practice: Study of effect of temperature on enzyme activity
Study of effect of pH on enzyme activity

Module- II

Carbohydrates: Biomedical importance & properties of Carbohydrates, Classification,

Families of monosaccharides: aldoses and ketoses, trioses, tetroses, pentoses, and hexoses. Stereo isomerism of monosaccharides, epimers, Haworth projection formulae for glucose; chair and boat forms of glucose.

Metabolism: Glycogenesis & glycogenolysis, Glycolysis, citric acid cycle & its significance, Components of respiratory chain, energy relationships during cell respiration, types of respiration. HMP shunt & Gluconeogenesis, regulation of blood glucose level.

Practice: Estimation of Glucose in urine
Estimation of Glucose in blood

Module- III

Amino acids: Classification, essential & non-essential amino acids. Chemistry of Proteins & their related metabolism, Classification, biomedical importance.

Metabolism: Ammonia formation & transport, Transamination, Decarboxylation, Urea cycle, metabolic disorders in urea cycle, catabolism of amino acids.

Practice: Estimation of Protein in urine
Estimation of Protein in blood

Module- IV

Chemistry of Lipids & their related metabolism: Classification, biomedical importance, essential fatty acids. Brief outline of metabolism: Beta oxidation of fatty acids, fatty liver, Ketogenesis, Cholesterol & its clinical significance, Lipoproteins in the blood composition & their functions in brief, Atherosclerosis.

Diabetes mellitus: its types, features, gestation diabetes mellitus, glucose tolerance test, glycosuria, Hypoglycaemia & its causes.

Practice: Estimation of Bile pigment in urine
Estimation of Bile salts in urine

Suggested Readings:

1. Victor W. Rodwell, David A. Bender, Kathleen M. Botham, Peter J. Kennelly, P. Anthony Weil (2018) Harper's Illustrated Biochemistry. Mc Graw Hill.
(e-Book link: <https://www.pdfdrive.com/harpers-illustrated-biochemistry-d176838999.html>)
2. Nelson DL and Cox MM. (2008). Lehninger Principles of Biochemistry, 5th Ed., W.H. Freeman and Company.
(e-Book link: <https://www.pdfdrive.com/lehninger-principles-of-biochemistry-5th-edition-d164892141.html>)
3. Donald Voet, Judith G. Voet (2011) Biochemistry 4th Edition. Wiley Publishers.
(e-Book link: <https://www.pdfdrive.com/biochemistry-4th-edition-e165192126.html>)
4. Jeremy M. Berg, John L. Tymoczko, Lubert Stryer. Biochemistry 7th Edition. W.H. Freeman and Company, New York.
(e-Book link: <https://www.pdfdrive.com/biochemistry-seventh-edition-e167675390.html>)

Simulation links for labs:

1. Lecturio
(e-source link: <https://app.lecturio.com/#/course/s/8014>)
2. Labs for Life
(e-source link: <http://labsforlife.in/InstructionalVideo.aspx>)

SC5-CUTM1715 -Clinical Pathology

Subject Name	Code	Type of course	T-P-Pj	Prerequisite
Clinical pathology	CUTM1715	Theory+ Practice	3-1-0	Fundamental Science

Course Objective

Analyze body fluid for diagnosis of disease
Analyze waste product for diagnosis of disease
Understanding DOT Policy
Understand Physiological disorder and infectious disease
Analysis of pregnancy

Course Outcome

Able to collect pathological specimen
Able to detect diabetes, ketosis, nephritis, jaundice and other physiological disorder
Able to detect infectious disease (UTI, Hematuria, Filaria, Dysentery, Ulcer, TB, etc.)
Preservation and processing of pathological sample.
Identification of Parasites
Analysis of Infertility disorder

Course Outline

Module-I (16

Hrs)

Introduction of clinical pathology, Composition, collection and preservation of urine, Physical examination of Urine, Chemical Examination of Urine - Sugar and Ketone bodies, Diabetes and Ketosis, Nephritis and UTI, Albumin, Phosphate, BJP, Bile Salt and Bile pigment, Chemical Examination of Urine - Multistix reagent strip, Jaundice, Microscopical Examination of Urine, Operation of Urine Analyzer, Pregnancy test, Report writing and report analysis of Urine

Practice: Operation of Urine analyzer, Benedict Test, Heat and Acid Test, Rothera's Test, Benzidine Test, Fouchet's Test

Lab:-Urine Analysis: Collection and Physical Examination, Specific Gravity, Benedict's Qualitative test, Acetone Rothera's Test, Protein and BJP Test, Hay's Test and Fouchet's test, Benzidine test, Microscopical Examination, Pregnancy Test, Auto-mentation by Urine analyzer

Module-II (14 Hrs)

Respiratory Tract Infection: Gram Staining and ZN Staining, Basic of DOT Centre, Report writing and report analysis of sputum, Sputum for the diagnosis of Mycobacterium tuberculosis, Clinical significance and Report writing of Stool, Difference between Amoebic, Dysentery and Bacillary Dysentery, Microscopical Examination of Stool, Physical and Chemical examination of Stool, Composition, collection and preservation of stool

Practice: Microscopic finding of stool, Morphology of stool parasite

Lab:- Stool Analysis: Collection and physical examination, Chemical Examination, Occult test and reducing sugar, Microscopical Examination: Protozoa, Microscopical Examination: Helminthes

Sputum Analysis: Collection and physical examination, Tuberculosis (ZN Stain), Respiratory infection (Gram Stain)

Module-III (15 Hrs)

Routine laboratory investigation of Pleural Fluid, Routine laboratory investigation of Pericardial Fluid, Routine laboratory investigation of Synovial Fluid, Synovial fluid: Collection and preservation, Examination of CSF related to Meningitis, Brain Tumour and other disorder, CSF: Composition, Collection, Preservation and physical examination, Report analysis and report writing of Semen, Semen examination for male infertility disorder, Semen: Composition, function, collection and physical examination

Practice: Gram stain, ZN Stain, General consideration on specimen collection

Lab:- Semen Analysis: Collection and physical examination, Chemical Examination, Microscopical examination

CSF Analysis: Collection and Routine Examination

Synovial Fluid: Collection and Routine examination

Pleural Fluid: Collection and routine examination

Pericardial Fluid: Collection and routine examination

Bacteriological Examination of throat swab

Suggested Readings:

1. Textbook of Clinical laboratory methods and diagnosis by Gradwohls, Publisher Mosby
2. Medical laboratory technology Vol.1 by K. L. Mukherjee, 2007, Publisher Tata McGrawHill
3. Textbook of medical laboratory technology by Praful B Godkar, Publisher Bhalan

4. Medical laboratory science theory and practice by J Ochei and Kolhatkar, 2002, Tata McGraw-Hill, Publisher TBS

SC-6 - CUTM1736- Immunology

Subject Name	Code	Type of course	T-P-Pj	Prerequisite
Immunology	CUTM1736	Theory + Practice	3-2-0	Fundamental Science

Course Objective

Understanding the concept of Innate & adaptive immune system; complement system; Hypersensitivity.

Clinically relevant serological analysis for deeper understanding of antigen- antibody interaction.

Course Outcome

Application of Immunology in disease diagnosis.

The conceptual understanding of the subject provides opportunities for employability and scopes for higher education.

Course Outline

Module-I

Immunity: Classification, Measurement of immunity, Local immunity, Herd immunity. **Antigens:**

Types of antigen, Epitope. Biological Classes of antigens, Superantigens.

Immunoglobulins: Antibody structure, Immunoglobulin classes.

Practice: Collection of blood sample by vein puncture
Separation and preservation of serum

Module-II

Complement System: Principal pathways of Complement activation, Quantitation of Complement (C) and its Components. Biosynthesis of complement, Complement Deficiencies.

Antigen-Antibody Reactions, Antigen-Antibody measurement, Parameters of serological tests.

Serological Reactions.

Practice: Performing Serological tests: Widal test, VDRL test, ASO test, C-Reactive Protein test,
Rheumatoid factor (RF) test
Precipitation in agarose gel
Performing Ouchterlony Double diffusion test
Demonstration of SDS-PAGE
Demonstration of ELISA
Demonstration of Western
blotting

Module-III

Immune Response: Types of Immune response, Humoral immunity, Cell-mediated Immune Responses, Cytokines, Immunological tolerance.

Hypersensitivity Reactions: Classification of hypersensitivity reactions, Type I Hypersensitivity (IgE Dependent). Type II Hypersensitivity: Cytolytic and Cytotoxic. Type III Hypersensitivity-Immune Complex-mediated, Type IV Hypersensitivity-Delayed Hypersensitivity.

Suggested Readings:

1. Kuby's Immunology (7th Ed) - by J. Owen, J. Punt, S. Strandford. Macmillan Higher Education, England.
(e-book link: <https://www.pdfdrive.com/kuby-immunology-7th-edition-2013-e44842271.html>)
2. Roitt's Essential Immunology (13th Ed)- by Seamus J. Martin, Dennis R. Burton, Ivan M. Roitt. Wiley Blackwell.
(e-book link: [http://dl.mehrsys.ir/pdf-books/Roitt_s%20Essential%20Immunology%20Thirteenth%20Edition\(www.myuptodate.com\).pdf](http://dl.mehrsys.ir/pdf-books/Roitt_s%20Essential%20Immunology%20Thirteenth%20Edition(www.myuptodate.com).pdf))
3. Prescott, Harley, and Klein's Microbiology (Seventh Edition)- by Joanne M. Willey, Linda M. Sherwood, Christopher J. Woolverton. McGrawHill.
4. Microbiology An Introduction (10th Edition)- by Gerard J. Tortora, Berdell R. Funke, Christine L. Case. Pearson.
5. Text book of Microbiology (7th Edition)- by Ananthanereyan & Paniker, Publisher Universities press.
(e-book link: <https://www.pdfdrive.com/textbook-of-microbiology-e177143667.html>)
6. Practical Immunology (4th Edition)- by Frank C. Hay, Olwyn M.R. Westwood. Blackwell Science.
(e-Book link: <https://www.pdfdrive.com/practical-immunology-d34330313.html>)

Online Tutorial links:

1. Fundamentals of Immunology: Innate Immunity and B-Cell Function

(Coursera link: <https://www.coursera.org/learn/immunologyfundamentalsimmunitybcells>)

2. Fundamentals of Immunology: T Cells and Signaling
(Coursera link: <https://www.coursera.org/learn/immunologyfundamentalstcellssignaling>)
3. Fundamentals of Immunology: Death by Friendly Fire
(Coursera link: <https://www.coursera.org/learn/immunology-friendlyfire>)
4. The Immune System: New Developments in Research
(edX link: <https://www.edx.org/course/the-immune-system-new-developments-in-research-par>)

SC-7- CUTM1737- Molecular Biology

Subject Name	Code	Type of course	T-P-Pj	Prerequisite
Molecular Biology	CUTM1737	Theory + Project	3-0-1	Fundamental Science

Course Objective

To provide depth knowledge of biological or medicinal processes through the investigation of the underlying molecular mechanisms.

Understanding of chemical and molecular processes that occur in and between cells. Understanding will become such that , can be able to describe and explain processes and their meaning for the characteristics of living organisms.

Course Outcome

Conduct independent work in a laboratory.
 Read scientific articles and gain a critical understanding of their contents.
 Give a spoken and written presentation of scientific topics and research results.
 Present hypotheses and select, adapt and conduct molecular and cell-based experiments to either confirm or reject the hypotheses.

Course outline

Module I

Introduction: a. Introduction to molecular biology, b. Molecular biology of cell. Evolution and Molecular structure of cell and its organelles. Types of cells. Including different kinds of Prokaryotic and eukaryotic cells, Cell growth, Cell adhesion, cell junctions and extra cellular matrix organelles,

Cell cycle, Cell membrane and its structure (fluid-mosaic model). Factors influencing on membrane fluidity, asymmetry of membrane and membrane transport (active and passive)

Project Topic: Causes, types and molecular mechanism of human cancer.

Module II

Molecular Nature of the Genetic Material in Prokaryotic and Eukaryotic Cells: Molecular biology of Genes, DNA: Molecular structure, types: Primary, secondary and tertiary, Double helix, types, Transferring information from DNA to RNA, Synthesis of RNA, Translation RNA: Molecular structure, types. Evolution of DNA and RNA, Gene and genetic codes.

Project Topic: Tumor suppressor gene and oncogene.

Module III

General Concept on: a. Regulation of the Gene Expression b. Regulating the Metabolism: The Lac-Operon system, Catabolic repression, Trp Operon system: regulating the biosynthesis of the tryptophan, Gene expression in Eukaryotic cells, Plasmids: types, maintenance and functions.

Project Topic: Human Genome Project.

Module IV

DNA Replication and Gene Expression: DNA Replication: Semi conservative Nature of DNA Replication, DNA Replication in prokaryotic Cells, DNA Replication in Eukaryotic cell, Enzymes involved in DNA Replication: DNA polymerases, Proofreading, post-replication Modification of DNA. Transferring information from DNA to RNA, Synthesis of RNA (Transcription), RNA polymerase, Initiation and Termination of Transcription, Post and co- transcription modification of the RNA. Protein Biosynthesis: Translation of the genetic code, Translation of m RNA, Role of r-RNA in protein synthesis, Forming the polypeptides- elongation, Termination of the protein biosynthesis.

Project Topic: Molecular basis, types, causes and a case study of the effects of DNA mutation.

Suggested Readings:

1. Molecular Biology of the gene (7th Ed) by James D. Watson.
E-booklink-<https://www.pdfdrive.com/molecular-biology-of-the-gene-e158278674.html>
2. Genes XII by Lewin's.

E-book link- <https://www.pdfdrive.com/lewins-genes-xii-e168024578.html>

3. Molecular cell biology (5th Ed) by Lodish H.

E-book link- <https://www.pdfdrive.com/molecular-cell-biology-lodish-5th-ed-e15674865.html>

BASKET II

Discipline Core Courses

DC-1-CUTM1731-Haematology

Subject Name	Code	Type of course	T-P-Pj	Prerequisite
Hematology	CUTM1731	Theory+Practice	3-2-0	Basic Medical science

Course Objective

The overall aims are that the student should obtain advanced knowledge of the most common hematologic diseases & understanding the concept of Blood cells and other blood components.

Be able to handle an investigation of hemorrhagic disorder and laboratory abnormalities such as anaemia, polycythemia, leukopenia, leukocytosis, thrombocytopenia, thrombocytosis, elevated ESR etc within hematology.

Clinically relevant hematological analysis for deeper understanding of Evaluate normal and abnormal cell morphology with associated diseases and other blood components.

Course Outcome

Differentiate various laboratory test findings with their associated clinical conditions.

Identify the various skills necessary to perform blood counts, evaluate blood elements, and report results within the stated limits of accuracy.

Describe the various components of blood, their functions, and roles in various disease states.

To be able to demonstrate good skills in the relevant Hematology laboratory methodology.

Collection of blood for the investigations.

Be able to distinguish the developmental stages of blood cells. It will also cover Bone marrow examination.

To learn about tests carried out for hematological investigations.

To be able to carry out blood sampling.

Course Outline

Module- I (8 Hrs)

Scope & importance of Hematology, important equipment and chemicals, various test performed in Hematology laboratory, Focusing different blood cells through microscope.

Practice: Demonstration of instruments used in hematology- Microscope, Blood Cell

counter

, Sahli's Apparatus.

Module- II (12 Hrs)

Identify and/or confirm the composition & function of various red blood cell inclusions. Function of normal cellular components. Formation of blood, Synthesis of blood in Bone marrow- Erythropoiesis, leucopoiesis, thrombopoiesis. Anticoagulants: definition, Uses, Different types of Anticoagulants., mode of action, their merits and demerits. Morphology of normal blood cells, abnormal morphology & diseases.

Practice: Demonstration of different blood cell, their synthesis from slide presentation or chart.

Demonstration the normal and abnormal morphology of different blood cells.

Module- III (10

Hrs) Hematological

Disorders

1. Classification of Anemia: Morphological & etiological.
2. Iron Deficiency Anemia: Distribution of body Iron, Iron Absorption, causes of iron deficiency, lab findings.
3. Megaloblastic Anemia: Causes, Lab findings.
4. Hemolytic Anemia: Definition, causes, classification & lab findings.

Bone Marrow: Cell composition of normal adult Bone marrow, Aspiration, Indication, Preparation & Staining, Special Stain for Bone Marrow -Periodic Acid Schiff, Sudan Black

Leukemia: Classification, Blood Picture, Differentiation of Blast Cells.

Practice: Collection of blood by different methods

Different normal and abnormal morphology of RBCs, WBCs, Platelet.

Module- IV (10 Hrs)

Collection of blood, Methods & Preparation of Stains and Smears

Practice:

Cleaning and drying of glass and plastic ware, Collection of venous and capillary blood, cleaning of glass-syringes and its sterilization. Preparation of buffers, Preparation of the stains and other reagents,

Preparation of peripheral blood film (PBF), To stain a peripheral blood Film by Leishman- stain, Haemoglobin estimation (Sahli's method and cyanmethaemoglobin method).

Module- V (10 Hrs)

Routine Hematological Tests:

Complete blood cell count, ESR, Differential Leukocyte count, Total leukocyte count, Bleeding time and Clotting time, Blood Grouping and Rh Typing.

Practice:

Complete Blood Counts, Determination of Haemoglobin, TRBC Count by Haemocytometers, TLC by Haemocytometer, Differential Leukocyte count, Determination of Platelet Count. Determination of ESR by wintrobes, Determination of ESR by Westergren's method, Determination of PCV by Wintrobes, Erythrocyte Indices- MCV, MCH, MCHC. Reticulocyte Count, Absolute Eosinophil Count, Bleeding time and Clotting time, Blood Grouping and Rh Typing

Suggested Readings:

1. Textbook of Medical Laboratory Technology P.B Gotkar Mumbai, Bhalani Publishing House
2. Text book of Medical Laboratory Technology by Paraful B. Godkar, Publisher Bhalani
3. Text book of Medical Laboratory Technology (2nd edition) by V.H Talib, Publisher CBS
4. Atlas of hematology (5th edition) by G.A. McDonald, Publisher Churchill Livingstone
5. Medical Laboratory Technology By K.L Mukharjee, Publisher McGraw Hill education pvtlimited
6. Text book of Medical Laboratory Technology (6th edition) by Ramnik Sood, Jaypee Publication.
7. Ebook link-<https://www.pdfdrive.com/hematology-basic-principles-and-practice-e176384006.html>
8. Ebook link-<https://www.pdfdrive.com/hematology-basic-principles-and-practice-expert-consult-online-and-print-expert-consult-title-online-print-5th-edition-e186195241.html>
9. Ebook link-
<https://books.google.co.in/books?id=6sfacydDNsUC&printsec=frontcover&dq=hematology&hl=en&sa=X&ved=2ahUKEwja9-ve3I7qAhUwzTgGHSMUdekQ6wEwAHoECAQQAQ#v=onepage&q=hematology&f=false>
10. Ebook link-
<https://books.google.co.in/books?id=QQcYAAAAAYAAJ&printsec=frontcover&dq=hematology&hl=en&sa=X&ved=2ahUKEwja9-ve3I7qAhUwzTgGHSMUdekQ6wEwAnoECAIQQAQ#v=onepage&q=hematology&f=false>

DC-2- CUTM1733- Microbiology

Subject Name	Code	Type of course	T-P-Pj	Prerequisite
Microbiology	CUTM1733	Theory+ Practice	3-2-0	Fundamental Science

Course Objective

To know various Culture media and their applications and also understand various physical and chemical means of sterilization

To know General bacteriology and microbial techniques for isolation of pure cultures of bacteria, fungi and virus

To master aseptic techniques and be able to perform routine culture handling tasks safely and effectively

Course Outcome

This study demonstrates the theory and practical skills in microscopy and their handling techniques and staining procedures.

Understanding the details of microbial cell organelles.

Provides knowledge on growth of microorganism.

Provides knowledge Culturing microorganism.

Course Outline

Module –I (14 Hours)

Microbiology: Definition, history, host- microbe relationship, and safety measures in a microbiology laboratory. Morphology of bacterial cell wall, Bacterial anatomy (Bacterial cell structure: including spores, flagella, pili and capsules). Sporulation. Classification of bacteria according to cell wall and shape (arrangement), Classification of micro-organisms. Growth and Nutrition of Microbes: General nutritional requirements of bacteria, Bacterial growth curve

Practice:

1. Handling of Microscope
2. To learn techniques for Inoculation of bacteria on culture media.
3. To isolate specific bacteria from a mixture of organisms.

Module-II (11 Hours)

Sterilization: Definition, sterilization by dry heat, moist heat (below, at & above 100° C), Autoclave, Hot air oven, Radiation and Filtration, preventive measures, controls and sterilization indicators. Use of laminar flow in sterilization.

Antiseptics and Disinfectants: Definition, types, properties, mode of action and use of disinfectants and antiseptics, efficiency testing of disinfectants.

Practice:

1. To demonstrate simple staining (Methylene blue)
2. Bacterial identification: To demonstrate reagent preparation and procedure for Gram stain, Z-N staining, Capsule staining, Demonstration of flagella by staining methods, Spore staining, To demonstrate spirochetes by Fontana staining procedure

Module-III (15 Hours)

Staining techniques: Methods of smear preparation, Gram stain, AFB stain, Albert's stain and special staining for spore, capsule and flagella, Culture Media, Liquid and solid media, defined and synthetic media, routine laboratory media (basal, enriched, selective, enrichment, indicator, and transport media). Different Culture, media their preparation and uses in microbial growth.

Practice:

1. Biochemical tests for identification of bacteria
2. Preservation of stock cultures of bacteria
3. Antibiotic susceptibility test

Suggested Reading:

1. Medical Laboratory Technology by Kanai Lal Mukherjee; Tata McGraw Hill, New Delhi
2. Microbiology by Prescott
3. An Introduction to Medical Laboratory Technology by FJ Baker; Butterworth – Heinemann; Oxford
4. Practical Book of Medical Microbiology by Satish Gupta; JP Brothers, New Delhi
5. Medical Laboratory Manual for Tropical Countries Vol. I and II by Monica Cheesbrough; Cambridge University Press; UK
6. Textbook of Medical Laboratory Technology by Praful B Godkar; Bhalani Publishing House, Mumbai
7. Text book of Medical Microbiology by Gruckshiank

DC-3- CUTM1734 - Medical Law and Ethics

Subject Name	Code	Type of course	T-P-Pj	Prerequisite
Medical Law and Ethics	CUTM1734	Theory+ Project	2-0-1	Fundamental Science

Course Objective

The course provides an introduction to ethics generally and more specifically to medical ethics, examining in particular the principle of autonomy, which informs much of medical law. The course then considers the general part of medical law governing the legal relationship between medical practitioners and their patients. It considers the legal implications of the provision of medical advice, diagnosis and treatment. Selected medico-legal issues over a human life are also examined. These may include reproductive technologies, foetal rights, research on human subjects, organ donation, the rights of the dying and the legal definition of death.

Course Outcome

- The ethical underpinnings of the laws relates to medicine.
- The law of negligence in the context of the provision of healthcare, Legal and ethical issues surrounding end and beginning of life decisions,
- The maintenance of professional standards in the healthcare profession, and
- The role of policy in the formation of law as it relates to medicine.

Course Outline

Module-1

1. The Indian medical council act, 2. Medical council of India (functions),3. Functions of state medical councils, 4. The declaration of Geneva

Module-2

1. Duties of medical practioners 2. Regarding red cross emblem 3. Professional secrecy 4. Privileged communication.

Module-3

1. Professional negligence 2. Medical mal occurrence 3. Contributory negligence 4. Criminal negligence

Module-4

1. Corporate negligence 2. Ethical negligence 3. Precautions against negligence 4. difference between professional negligence and infamous conduct.

Module-5

1. Malpractice litigation involving various specialities 2. Prevention of medical negligence 3. supreme court of India guidelines on medical negligence 3. The therapeutic misadventure 4. Vicarious liability

Module-6

1. Products liability 2. medical indemnity insurance 3. Medical records 4. Consent in medical practice

Module-7

1. Euthenasia 2. Deaths due to medical care 3. Malingering

Text books

1. Medical Law and Ethics by Shaun D Pattinson, 5 th edition, 2017.

DC-4 - CUTM1713- Systemic Bacteriology

Subject Name	Code	Type of course	T-P-Pj	Prerequisite
Systemic Bacteriology	CUTM1713	Theory+ Practice	3-1-0	Fundamental Science

Course Objective

To learn opportunities in the basic principles of medical microbiology and infectious disease.

To study mechanisms of infectious disease transmission, principles of aseptic practice, and the role of the human body's normal microflora.

To understand the importance of pathogenic bacteria in human disease with respect to infections of the respiratory tract, gastrointestinal tract, urinary tract, skin and soft tissue.

Course Outcome

The course provides the conceptual basis for understanding pathogenic microorganisms and the mechanisms by which they cause disease in the human body.

Recall the relationship of this infection to symptoms, relapse and the accompanying pathology.

Explain the methods of microorganism's control, e.g. chemotherapy & vaccines.

Course Outline

Module –I (9

Hrs)

Morphology, cultural characteristics, biochemical reaction, pathogenesis/disease caused & lab diagnosis, Prevention and Control of: Cocci (Gram Positive): Aerobic: Micrococcus spp., Staphylococcus spp., Streptococcus spp. Anaerobic: Peptococcus spp., Peptostreptococcus spp., Villanelle spp., Acidaminococcus spp, and others. Cocci (Gram Negative): Aerobic: Neisseria spp., Anaerobic Gram-negative bacteria.

Practice: Culture techniques
Culture media
Identification of *Staphylococcus* sp.

Module -II (12 Hrs)

Morphology, cultural characteristics, biochemical reaction, pathogenesis/disease caused & lab diagnosis, Prevention and Control of : Aerobic non-spore forming gram positive bacilli: Bacillus spp., Corynebacterium spp., Actinomyces, Nocardia spp., Mycobacterium spp.-pathogenic, Tubercle bacilli and MOTT bacilli (Atypical mycobacterium) and Hansen's bacilli and others. Anaerobic: Bifidobacterium spp., Eubacterium spp., Actinomyces spp., Propionebacterium, Clostridium spp., and others.

Practice: Preparation of media
Media used for biochemical identification & their uses
Identification of *Mycobacterium* sp.

Module -III (18 Hrs)

Morphology, cultural characteristics, biochemical reaction, pathogenesis/disease caused & lab diagnosis, Prevention and Control of Gram- Negative Bacilli Aerobic: Enterobacteriaceae, Citrobacter spp , Edwardsiella spp ,Enterobacter spp , Escherichia coli, Ewingella , Hafnia spp., Klebsiella spp.,

Morganella spp., Proteus spp., Providencia spp., Salmonella spp., Serratia spp., Shigella spp., Yersinia

spp., *Vibrio* spp., *Pseudomonas* spp., *Chlamydia* and *Chlamydia*, *Brucella* spp., *Bordetella* spp., *Haemophilus* spp., *Mycoplasma* spp.

Practice: Culture methods & identification of common bacteria on media.
 Antibiotic sensitivity testing.
 Identification of *Escherichia*, *Klebsiella*, *Proteus* sp.

Suggested Readings:

1. Textbook of Microbiology- Ananthanarayan & Paniker (10th Ed)
2. Microbiology (7th Ed)- by Prescott
3. Medical Microbiology- by David Greenwood et al (Elsevier)
4. Essential Medical Microbiology- by Rajesh Bhatia (4th Ed)
5. Medical Microbiology- by Kayser et al
6. The short text book of medical microbiology- by Satis Gupte (10th Ed)

DC-5- CUTM1735- Systemic Virology & Mycology

Subject Name	Code	Type of course	T-P-Pj	Prerequisite
Systemic Virology & Mycology	CUTM1735	Theory+ Practice	3-2-0	Fundamental Science

Course Objective

To learn opportunities in the basic principles of medical microbiology and infectious disease.

To study mechanisms of infectious disease transmission, principles of aseptic practice, and the role of the human body's normal microflora.

To understand the importance of pathogenic Virus and fungus in human disease with respect to infections of the respiratory tract, gastrointestinal tract, urinary tract, skin and soft tissue.

Course Outcome

The course provides the conceptual basis for understanding pathogenic microorganisms and the mechanisms by which they cause disease in the human body.

Recall the relationship of this infection to symptoms, relapse and the accompanying pathology.

Explain the methods of microorganism's control, e.g. chemotherapy & vaccines.

Solve problems in the context of this understanding.

Course Outline

Module-1 (18 Hours)

Structure, cultivation and properties of Viruses. Classification of Medically Important Viruses. Genetic material, Organ system involved, Transmission.

Replication of Viruses, Virus Host Interaction, Bacteriophage. Epidemiology, Pathogenesis, Treatment, Prevention and Control of Viral Diseases (DNA Viruses) *Adenoviridae*, *Poxviridae*, *Herpes viridae*, Epidemiology, Pathogenesis, Treatment, Prevention & Control of Viral Diseases (RNA Viruses) *Orthomyxoviridae*, *Paramyxoviridae*, *Picornaviridae*, *Corona viridae*, *Rhabdoviridae*, *Retrovirida*.

Practice:

1. Demonstration of virus isolation techniques.
2. Demonstration of cell and tissue culture techniques used for virus isolation
3. Serological techniques used in diagnostic virology

Module-2 (7 Hours)

Mycology, Classification, Scope and medical importance of fungi. General Structure of Fungus and Yeast. Laboratory Methods of Fungal Isolation and Identification. Superficial and Cutaneous Mycoses. Subcutaneous Mycoses. Systemic Mycosis caused by Endemic Dimorphic Fungal Pathogens, Opportunistic Mycoses

Practice:

4. Organization of laboratory – Mycology
5. Preparation of different media, chemical and stain for fungus study
6. Microscopic examination of saprophytic molds / Collection of agar plates for exposure

Module-3 (15 Hours)

Pathogenic Group of Fungi: Opportunistic pathogens, True pathogens: *Blastomyces dermatitidis*, *Cooccidioides immitis*, *Paracoccidioides brasiliensis*, *Histoplasma capsulatum*. A. Dermatophytes: *Mycrosporum* (Hair, skin), *Tricophyton* (Skin, hair, nail), *Epidermophyton* (Skin, nail), *Aspergillus spp.* Dermatomycosis (*Candida albicans*, *Cryptococcus neoformans*)

Practice:

7. Slide culture technique for Superficial infections
8. Culture and identification of yeasts
9. Processing of specimens in Mycology lab

Suggested Reading:

1. Textbook of Microbiology- Ananthanarayan & Paniker (10th Ed)
2. Medical Microbiology-by Fritz H. Kayser et al
3. Fundamental medical mycology / Errol Reiss, H. Jean Shadomy, and G. Marshall Lyon III
4. Essential Medical Microbiology- by Rajesh Bhatia (4th Ed)
5. Clinical Microbiology Procedures Handbook- by Amy L. Leber (4th Ed)
6. The short text book of medical microbiology- by Satis Gupte (10th Ed)

DC-6- CUTM1721- Research Methodology

Subject Name	Code	Type of course	T-P-Pj	Prerequisite
Research Methodology	CUTM1721	Theory+ Project	2-0-1	Fundamental Science

Course Objective

To equip students with a basic understanding of the underlying principles of quantitative and qualitative research methods.

Provide students with in-depth training on the conduct and management of research from inception to completion using a wide range of techniques.

Course Outcome

Students can understand the ethical and philosophical issues associated with research in education

This study provides knowledge on various modes of presenting and disseminating research findings.

Enable students to acquire expertise in the use and application of the methods of data collection and analysis.

Provide learning opportunities to critically evaluate research methodology and findings.

Enable students to be reflexive about their role and others' roles as researchers.

Course Outline

Module- I (9

Hrs)

Introduction to Research: Definition, Scope, Limitations, and Types. Objectives of Research. Research Process: Proposal Development: Basic steps involved in the health research proposal development process Literature Review: Importance and Sources, Strategies for gaining access to information, Library search, Computer search.

Research Designs: Research Title and Objectives Criteria for selecting a research title, Formulation of research objectives, Types of research objectives, Qualities of research objective

Module- II (8 Hrs)

Data Collection: Secondary Data, Primary Data, and Methods of Collection. Scaling Techniques: Concept, Types, Rating scales & Ranking Scales, Scale Construction Techniques and Multi-Dimensional Scaling. Sampling Designs: Concepts, Types and Techniques and Sample size Decision.

Module- III (14 Hrs)

Research Hypothesis: Definition, Qualities of research hypothesis Importance and types of research hypothesis. Theory of Estimation and Testing of Hypothesis Small & Large Sample Tests, Tests of Significance based on t, F, Z test and Chi-Square Test. Designing Questionnaire. Interviewing. Tabulation, Coding, Editing. Interpretation and Report Writing.

Project: Writing a review on Nosocomial urinary tract infection.

Writing a research article on antibiotic resistance patterns in wound infections.

Writing a review on Virus culture

Literature survey on Covid-19

Suggested Readings:

1. Research Methodology by C.R. Kothari (3rd Ed)
2. Research Methodology In the Medical & Biological Sciences by Petter Laake et al.
3. Essentials of Research Design and Methodology by Geoffrey Marczyk et al.
4. WHO, Health Research Methodology: A guide for training in research Methods, 2nd Edition, WHO- WIPRO
5. A Student's Guide to Methodology by Clough P and Nutbrown C. Sage Publication.
6. National Ethical Guidelines for Health Research in Nepal, Available at Nepal Health Research

Council.

7. Field Trials of Health Interventions in Developing Countries by Smith PG, Morrow.

DC-7 - CUTM1738- Analytical Biochemistry

Subject Name	Code	Type of course	T-P-Pj	Prerequisite
Analytical Biochemistry	CUTM1738	Theory+ Practice	3-2-0	Fundamental Science

Course Objective

Understanding the concept of Biochemical analyzing instruments both automated and semi automated.

To learn about how to Care & Maintenance of Equipment & Chemicals.

To learn normal ranges of biochemical components in our body.

Clinically relevant biochemical analysis for deeper understanding of all biochemical components i.e., Proteins, Electrolytes, Hormones etc.

Course Outcome

Understanding of instrumentation technique & principle of spectrophotometry, colometry, photometry and electrolyte analyzer.

To learn about Various tests carried out for biochemical analysis & Hormone investigations.

To learn about safety precautions and handling the equipment in biochemical laboratory.

Course Outline

Module- I (12 Hrs)

Chromatography: Paper, Thin layer, Column, Ion exchange, Affinity chromatography, Gel filtration, Gas Chromatography, HPLC, FPLC

Practice: Handling the Equipments and chemicals used in biochemical laboratory.

Module-III (12 Hrs)

Electrophoresis: Moving boundary, Zone (Paper Gel) electrophoresis, Immuno electrophoresis, Isoelectric focusing, 2-D electrophoresis. Principle, Instrumentation, Specimen preparation and Application of: X-ray diffraction, NMR, ESR

Practice: Estimate Erythrocyte sedimentation rate

Module- III (26 Hrs)

Principle and Application of: Fully Automated Biochemistry Analyser, Semi- automated Biochemistry Analyser, Coagulometer. Method of estimation and assessment for: a. Glucose tolerance test. Clearance test for renal function. Gastric analysis, LFT, KFT, Lipid profile, Qualitative test for Urobilinogens, Renal calculi, Barbiturates, T3, T4 and TSH, 17 Ketosteroids. Principles, clinical significance and procedures for estimation, of Acid phosphatase, Alkaline phosphatase, Lactate dehydrogenase, Aspartate transaminase, Alanine, transaminase and Creatine phosphokinase.

Practice: Glucose Tolerance Test, Clearance Test, Gastric juice collection, Gastric Analysis, Kidney Function Test, Liver Function Test, Lipid Profile, Renal calculi, Hormone Test

Suggested readings:

1. Handbook of Christen Medical Association, India (CMAI) Medical Laboratory Technology- Robert H.Carman. 2nd Edn. CMAI, New Delhi.
2. Text book of Medical Laboratory Technology, P.B. Godkar 2nd Edn. Bhalani Publication.
3. Handbook of Biochemistry by M. A. Siddique 8th Edn. Vijay Bhagat Scientific Book
4. Principle of Biochemistry by Lehninger
5. Biochemistry by Voet&Voet
6. Biochemistry by Stryer
7. Biochemistry of Metabolic process by Asim Kumar Roy, Kalyani Publication
8. Ebook link-
https://www.cartercenter.org/resources/pdfs/health/ephti/library/lecture_notes/health_science_students/medicalbiochemistry.pdf
9. Ebook link-
https://books.google.co.in/books?id=Je_pJfb2r0cC&printsec=frontcover&source=gbs_ge_summary_r&cad=0#v=onepage&q&f=false
10. Ebook link-
https://books.google.co.in/books?id=csPcDAAAQBAJ&printsec=frontcover&source=gbs_ge_summary_r&cad=0#v=onepage&q&f=false
11. Ebook link-
https://books.google.co.in/books?id=2FkXAwAAQBAJ&printsec=frontcover&source=gbs_ge_summary_r&cad=0#v=onepage&q&f=false

DC-8- CUTM1740- Public Health Microbiology

Subject Name	Code	Type of course	T-P-Pj	Prerequisite
Public Health Microbiology	CUTM1740	Theory+ Practice	3-1-0	Fundamental Science

Course Objective

To learn the occurrence, abundance and distribution of microorganism in the community and their role in the associated with Public health and also learn different methods for their detection and characterization.

To understand the basic principles of environment microbiology and be able to apply these principles to understanding and solving environmental problems – Water pollution and waterborne diseases, Air pollution and airborne infections.

Course Outcome

Understanding the role of microbiologist in public health

Study of Air borne & water borne infection

Course Outline

Module- 1 (7 Hours)

Introduction to Public Health: Definition, scope, concept and importance of public health microbiology, Roles of microbiologist in public health, Concept of health and disease, Indicators of health, Microbial association of water, air and soil, Basic concept on pollution (air, water, noise, radiation and waste pollution) and public health hazard in the community.

Practice:

1. Isolation and identification of microorganism from different food products: meat, canned juice, milk, cheese and ice cream.
2. Isolation and Identification of microorganisms (hospital acquired infection)

Module- 2(14 Hours)

Air Borne Infections:

1. Introduction: Air and its composition, Microbial air pollution, Sources of air pollution &

control, Indicator of air pollution – WHO guide line (microbial pollution).

2. Air borne diseases: Transmission of pathogens, Respiratory infection (Viral, bacterial, fungal), Sources of infection, characters of organisms and controls of: Bacterial pneumonia, Diphtheria, Tuberculosis, Influenza, Measles.

3. Method of measuring microorganisms in air.

Practice:

3. Selection, collection, preservation and transportation of samples from the community to the laboratory.

Module- 3 (19 Hours)

Water Borne Infections:

1. Introduction: Definition of wholesome and safe water, Nature, cycle, sources, importance and quality (WHO guide line) of water. Water pollution and sanitation,
2. Microorganisms in water: Transmission of pathogens, Water borne diseases (Viral, bacterial, protozoal), Sources of infection, characters of organisms and control of: Hepatitis, Cholera, Typhoid, Amoebiasis, Giardiasis, Poliomyelitis. Water Pollution Control.

3. Method of Measuring Microorganisms in Water. Water Treatment, Control of Water Borne Diseases.

Practice:

4. Isolation and Identification of microorganisms from air.
5. Isolation and Identification of microorganisms from water and evaluation of water quality

Suggested Readings:

2. A Text Book of Microbiology, by Ghimire P. & Parajuli K. Vidhyarthi Pustak Bhandar Publication, Kathmandu.
3. Text Book of Social and Preventive Medicine by Park JE and Park K
4. Evidence Based Public Health by Brownson, RC., Baker, EA., Leet. TL., Follespie. KN, Oxford University Press
5. The Quest for Health, Educational Enterprises, Kathmandu, by Dixit H.
6. Epidemiology for Public Health Practice, by Friis, RH., and Sellers, TA, 2nd Edition, Gaithersburg, MD: Aspen Publication,
7. Modern Food Microbiology, by Jay, J, H 3rd Edition CBS Publication and Distributors Delhi 1987.
8. Introduction to Soil Microbiology, Martin Alexander, by Academic press, 1961.

DC-9- CUTM1739- Pharmaceutical Microbiology

Subject Name	Code	Type of course	T-P-Pj	Prerequisite
Pharmaceutical Microbiology	CUTM1739	Theory+ Practice	3-1-0	Fundamental Science

Course Objective

Understanding of types & synthesis of antimicrobial agents

Manufacture of antibiotics

To understand the mechanism of action of antibiotics

To study how microorganisms are known to develop resistance to antibiotics

Course Outcome

With the completion of the course, the students will acquire detailed knowledge of antimicrobial agents, their mechanism of action and basis of resistance of microbes to these antimicrobials, formulations.

They will develop an understanding of different types of disinfectants/antiseptics and their uses, evaluation of their bactericidal and bacteriostatic action.

The conceptual understanding of the subject provides opportunities for employability and scopes for higher education.

Course Outline

Module- I

Pharmaceutical Microbiology: Chemical disinfectants, Antiseptic, Antibiotics, static and cidal activity.

Types of Antibiotics. Synthetic Antimicrobial Agents, Antifungal drug, Antiviral drug.

Practice: Sterilization methods used in Microbiology Lab

Isolation of human pathogens in sterile condition

Module-II

Manufacture of Antibiotics: Production of penicillin, Production of Streptomycin. Assessment of New Antibiotics: Parameters for determination of the usefulness of antibiotics (in vitro and in vivo). Pharmacokinetics and Pharmacodynamics of Antimicrobial agents. Antibiotic Assay: Microbiological methods: Disc diffusion technique, Dilution technique. Microbial Spoilage and Preservation of Pharmaceutical Products.

Practice: Test for Bacteriostatic and Bactericidal activity:

Disc test

Dilution test

Module- III

Mechanisms of Action of Antibiotics: Cell wall synthesis inhibitors, Inhibitors of protein biosynthesis, Inhibitors of tetrahydrofolate, Disorganize the cytoplasm membrane. Mode of action of Antibiotics (Cell wall synthesis inhibitors, Inhibitors of protein biosynthesis, Inhibitors of tetrahydrofolate, Disorganize the cytoplasm membrane). Bacterial Resistance to Antibiotics. Biochemical mechanisms of resistance, Genetic basis of antibiotic resistance. Problems in antibiotic therapy due to resistance.

Practice: Screening of herbal plants for Antibiotic activity

Sterility testing of pharmaceuticals

Bacteriological analysis of water

Suggested Readings:

1. W B Hugo and A D Russel, Pharmaceutical Microbiology, 2nd Edition
(e-Book link: <https://www.pdfdrive.com/hugo-and-russells-pharmaceutical-microbiology-e34745384.html>)
2. T H Sandal Pharmaceutical Microbiology: Essentials for quality assurance and quality control. Woodhead Publishing Series.
(e-Book link: <https://www.pdfdrive.com/pharmaceutical-microbiology-essentials-for-quality-assurance-and-quality-control-e157918748.html>)
3. Willey MJ, Sherwood LM & Woolverton C J. (2013). Prescott, Harley and Klein's Microbiology. 7thEd., McGraw Hill.
(e-Book link: <https://www.pdfdrive.com/prescott-harley-and-kleins-microbiology-7th-ed-e188166539.html>)

Online tutorial links:

1. Lecturio link
(<https://app.lecturio.com/#/course/s/6956>)

DC-10 - CUTM1741- Industrial Microbiology

Subject Name	Code	Type of course	T-P-Pj	Prerequisite
Industrial Microbiology	CUTM1741	Theory+Project	3-0-1	General Microbiology

Course Objective

Describe the use of microorganism in different industries to produce valuable products like drugs, beverages and different food products etc.

To developed skills for growing microorganisms in the laboratory for the production of different products by different microorganisms.

Course Outcome

Students has acquired a fairly good knowledge of how microbes are used in the fermentative production of organic acids, alcohols, enzymes, antibiotics and various foods in the industry.

Enhances analytic ability of various physical parameters which affect production of industrial products by the microorganisms and the safety aspects of the production and use of these products.

The conceptual understanding of the subject provides opportunities for employability and scopes for higher education.

Developes laboratory skills in producing alcohol and enzymes by fermentative process using bacteria/yeast.

Course Outline:

Module 1

Introduction to Industrial Microbiology: Introduction, History, Definition and scope. Industrial

Equipment and Uses. Fermentation Process: Primary and secondary screening, Detection and assay of fermentation products- Physical and chemical assays, Biological assay Stock culture, Fermentation media, Inoculums preparation, Increasing products.

Project Topic: 1. Design a protocol for the treatment of community sewage in your locality.

Module II

Typical Fermentation Process: Antibiotic drug fermentation - Penicillin, Streptomycin, Bacterial insecticide, Other antibiotics. Acetone, Lactic acid, Brewing. Biological Waste Treatment / Bioremediation: Anaerobic fermentation. Production of: Vitamin, Vaccines, Milk & Milk Products, Food, Baker's yeast, Food and feed yeasts, Mushrooms, Vinegar(Acetic acid) Enzymes: Amylase, Proteolytic enzyme, Pectinases, Invertase Other enzymes.

Project Topic:

1. Detail fermentation process of a food product and the advantages of fermented food.
2. Fermenter Designing

Module III

Industrial sewage and its treatment: Introduction, Industrial pollution, Types of sewage. Microbiology of Domestic sewage and industrial sewage. Methods for the treatment of industrial effluent and sewage-Primary treatment, secondary treatment and tertiary treatment.

Project Topic:

1. Impacts of industrial pollution on Society and Environment and its prevention and control.

Suggested Readings:

1. Industrial Microbiology (2nd Ed.) by A. H. Patel.
2. Modern industrial Microbiology and Biotechnology.
(E-book link- <https://www.pdfdrive.com/modern-industrial-microbiology-and-biotechnology-e33452862.html>)
3. L. E. Casida, JR., *Industrial Microbiology*, 1991, Wiley Eastern Limited, New Delhi,

DC-11- CUTM1742- Basic Computer and Information Science

Subject Name	Code	Type of course	T-P-Pj	Prerequisite
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Basic Computer and Information Science	CUTM1742	Practice	0-2-0	Fundamentals of Computer
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Course Objective

Identify the function of computer hardware components.

Identify the factors that go into an individual or organizational decision on how to purchase computer equipment.

Identify how to maintain computer equipment and solve common problems relating to computer hardware.

Identify how software and hardware work together to perform computing tasks and how software is developed and upgraded

Identify different types of software, general concepts relating to software categories, and the tasks to which each type of software is most suited or not suited.

Course Outcome

Understand the fundamental hardware components that make up a computer's hardware and the role of each of these components.

Understand the difference between an operating system and an application program, and what each is used for in a computer.

Describe some examples of computers and state the effect that the use of computer technology has had on some common products

Course Outline

Module- I

Introduction to computer: introduction, characteristics of computer, block diagram of computer, generations of computer. Types of Input output devices. Processor and memory: The Central Processing Unit (CPU), main memory. Storage Devices.

Module- II

Introduction to MS-Word: introduction, components of a word window, creating, opening and inserting files, editing a document file, page setting and formatting the text, saving the document, spell checking, printing the document file, creating and editing of table, mail merge. Introduction to Excel:

introduction, about worksheet, entering information, saving workbooks and formatting, printing the worksheet, creating graphs. Introduction to power-point: introduction, creating and manipulating presentation, views, formatting and enhancing text, slide with graphs.

Module- III

Introduction to MS-DOS: History of DOS, features of MS-DOS, MS-DOS Commands (internal and external). Introduction of windows: History, features, desktop, taskbar, icons on the desktop, operation with folder, creating shortcuts, operation with windows (opening, closing, moving, resizing, minimizing and maximizing, etc.). Computer networks: introduction, types of network (LAN, MAN, WAN, Internet, Intranet), network topologies (star, ring, bus, mesh, tree, hybrid). Internet and its Applications: definition, brief history, basic services (E-Mail, File Transfer Protocol, telnet, the World Wide Web (WWW)), www browsers, use of the internet.

Suggested readings:

1. Objective Computer Awareness
2. Computer Networking (Global Edition)

DC-12 - CUTM1746- Epidemiology

Subject Name	Code	Type of course	T-P-Pj	Prerequisite
Epidemiology	CUTM1746	Theory+Project	2-0-1	Fundamental Science

Course Objective

<p>Understand the basic epidemiological methods and study designs.</p> <p>Understand and discuss population-based perspective to examine disease and health – related events.</p> <p>Discuss the ethical issues in epidemiological research.</p> <p>Explain the importance of epidemiology for informing scientific, ethical, economic and political discussion of health issues.</p> <p>Describe a public health problem in terms of person, place, and time.</p> <p>Evaluate the strengths and limitations of epidemiologic reports</p>

Apply concepts, methods, and tools of public health data collection, analysis and interpretation, and the evidence-based reasoning and informatics approaches that are essential to public health practice.

Course Outcome

Distinguish between definitions of epidemiology and clinical epidemiology and public health research.

Apply the terminology of the Epidemiologic Triad to an infectious disease.

Describe the important historic events in the field of epidemiology.

Course Outline

Module-I (8

Hrs).

Introduction to Principles of Epidemiology: History, Definition, and scope of epidemiology, Achievements in epidemiology, Terms & Terminologies used in epidemiology. Measuring Health and Disease: Definitions of health and disease, Measures of disease frequency Use of available information, Comparing disease occurrence

Module-II (6 Hrs)

Concept of Epidemiological Study: Basic concepts of epidemiology Descriptive / Analytical, Applied/Experimental, Field Epidemiology. Concept of Prevention and Control of Diseases: Causation in epidemiology: The concept of cause, Establishing the cause of a disease Epidemiological markers, Phenotypic and genetic markers including molecular epidemiology. Disease surveillance: Clinical, Laboratory

Module-III (6 Hrs)

Communicable disease epidemiology, Clinical epidemiology, Environmental & occupational epidemiology, Nutritional epidemiology, Reproductive epidemiology, Social epidemiology, Food epidemiology. Epidemiology, Health services and health Policy: Health care planning, Monitoring & evaluation, The planning cycle, Epidemiology, public policy and health policy, Healthy public policy in

practice

Suggested Readings:

1. Basic Epidemiology. By Beaglehole R., Bonita R., Kjellstrom , World Health Organization, Geneva, https://books.google.com/books/about/Basic_Epidemiology.html?id=AAZGobMNTXgC
2. Field Epidemiology, By B Gregg, 2nd Edition, Oxford University Press, 2002
academic.oup.com/aje/article/156/8/783/78217
3. Gordis L. *Epidemiology*, 2nd Edition, WB Saunders Company Aharcourt Health Sciences Company, Philadelphia. [www.bookdepository.com/Epidemiology-Leon-Gordis/..](http://www.bookdepository.com/Epidemiology-Leon-Gordis/)
4. Epidemiology in Medicine, by LippincottEilliams and Wilkins, and Walters Kluwer Company wkauthorservices.editage.com/.../medicine.html
5. Epidemiology, Principle and Method, McMahon B, Trichopoulos D, by 2nd Edition, Boston, Little, Brown.

DC-13- CUTM1747 - Diagnostic Bacteriology

Subject Name	Code	Type of course	T-P-Pj	Prerequisite
Diagnostic Bacteriology	CUTM1747	Theory+ Practice	3-2-0	Fundamental Science

Course Objective

To confirm the suspicion of infectious bacterial disease.

To identify the etiologic agent by isolating the causative bacterial pathogen.

Course Outcome

Study of Lab diagnosis for Enteric infection, Respiratory tract Infection, Oral & Stomach infection, Urinary tract infections.

Study of control measures for nosocomial infection.

Student can safeguard himself & society and can work diagnostics and hospitals

Course Outline

Module -I (10 Hours)

Aerobic Culture: Scope and importance of aerobic culture, Factors affecting aerobic culture, Various media and techniques of aerobic culture. Laboratory Diagnosis of Enteric Infections: (Terminology, mechanism of infection, etiology, conventional and rapid diagnostic methods) Enteric fever / Typhoid fever, Bacterial endocarditis, Bacteraemia, Septicemia, Pyrexia of unknown origin (PUO).

Practice:

1. Isolation & identification of different groups of bacteria in laboratory
2. Antibiotic susceptibility test
3. Preparation and use of different stains in bacteriology laboratory Grams stain, ZN stain, Albert stain, Spore stain, Capsule stain, Flagella stain, Motility test

Module -II (7 Hours)

Laboratory Diagnosis of Respiratory Tract Infection (RTI): (Terminology, mechanism of infection, etiology, conventional and rapid diagnostic methods) Lower RTI, Upper RTI. Laboratory Diagnosis of Urinary Tract Infection: (Terminology, mechanism of infection, etiology, conventional and rapid diagnostic methods)

Practice:

4. Anaerobic Culture
5. Laboratory Diagnosis of Pus
6. Laboratory Diagnosis of GI Tract

Module -III (10 Hours)

Laboratory Diagnosis of Oral, Throat and Stomach Infection: (Terminology, mechanism of infection, etiology, conventional and rapid diagnostic methods) Gingivitis and anaerobic infection of oral cavity. Peptic ulcer (with emphasis in mechanism of peptic ulcer caused by *Helicobacter pylori*), Laboratory Diagnosis of Eye Infection: (Terminology, mechanism of infection, etiology, conventional and rapid diagnostic methods) Corneal ulcer, Conjunctivitis.

Practice:

7. Laboratory Diagnosis of Mycobacterium Infection
8. Laboratory Diagnosis of Venereal Diseases
9. Performance of different Tests Rapid Diagnostic Tests Molecular Tests 8 hours Interpretation of Test Results 5 hours Test reporting

Suggested Readings:

1. Textbook of Microbiology- Ananthanarayan & Paniker (10th Ed)
2. Medical Microbiology-by Fritz H. Kayser et al
3. Bailey and Scott's Diagnostic Microbiology(12th) Ed
4. Essential Medical Microbiology- by Rajesh Bhatia (4th Ed)
5. Clinical Microbiology Procedures Handbook- by Amy L. Leber (4th Ed)
6. The short text book of medical microbiology- by Satis Gupte (10th Ed)

DC-14 - CUTM1745 - Diagnostic Mycology

Subject Name	Code	Type of course	T-P-Pj	Prerequisite
Diagnostic Mycology	CUTM1745	Theory+ Practice	3-1-0	Fundamental Science

Course Objective

To confirm the suspicion of fungal disease.

To identify the etiologic agent by isolating the causative fungal pathogen.

Course Outcome

This course provides learning opportunities in the basic principles of medical microbiology and infectious fungal diseases.

The course provides the conceptual basis for understanding pathogenic fungi and the mechanisms by which they cause disease in the human body.

Student can safeguard himself & society and can work diagnostics and hospitals

Course Outline

Module-I (11

Hours)

Diagnostic Mycology: Medically important fungi, Opportunistic Fungi

Fungal Diseases: Mycoses

1. Superficial mycoses
2. Subcutaneous mycoses
3. Cutaneous mycoses: Trichophytosis, Microsporiosis, Epidermophytosis.
4. Systemic mycoses: Histoplasmosis, Blastomycosis, Cryptococcosis, Coccidioidosis, Paracoccidioidosis .

Practice:

1. Antifungal Sensitivity Test: Antibiotics.
2. Preparation of stock solution of drug

Module- II (12 Hours)

Pathogenesis and Laboratory Diagnosis of Mycotic Infections: *Aspergillus* spp, *Candida albicans*, *Fusarium* spp, *Cryptococcus neoformans*, *Histoplasma capsulatum*, *Sporothrix* spp, *Philophora* spp., *Trichophyton microsporum*, *Epidermophyton* spp. *Blastomyces dermatitidis*, *Coccidioides immitis*.

Practice:

3. Dilution technique
4. Determination of Minimal inhibitory concentration (MIC)

Module-III (17 Hours)

Isolation and Identification of Fungi (Laboratory Diagnosis): A. Selection, collection and transportation of specimens 5 hours Skin, Hair, Nail, Mucous membranes, Ear, eye, Corneal ulcer, Pus, Blood, Biopsy, Sputum, Urine, Vaginal and Cervical swab, Stool samples, Plural and peritoneal fluid, Superficial, subcutaneous and cutaneous samples. B. Smear Preparation: 2 hours KOH Preparation, 20% KOH with 20% Glycerol, KOH – DMSO (Dimethylsulphoxide) 100% Lactophenol Cotton Blue, India ink preparation.

Practice:

5. Preparation of different media, chemical and stain for fungus study
6. Isolation and identification of different fungi of medical importance

Suggested Readings:

1. Textbook of Microbiology- Ananthanarayan & Paniker (10th Ed)
2. Medical Microbiology-by Fritz H. Kayser et al
3. Fundamental medical mycology / Errol Reiss, H. Jean Shadomy, and G. Marshall Lyon III
4. Essential Medical Microbiology- by Rajesh Bhatia (4th Ed)
5. Clinical Microbiology Procedures Handbook- by Amy L. Leber (4th Ed)
6. The short text book of medical microbiology- by Satis Gupte (10th Ed)

DC-15- CUTM1743- Diagnostic Virology

Subject Name	Code	Type of course	T-P-Pj	Prerequisite
Diagnostic virology	CUTM1743	Theory +Project	3-0-1	Basic virology

Course Objective

Understanding laboratory diagnosis of virus by both conventional and molecular approach.

To produce a cadre of specialized medical virologists who would help establish clinical diagnostic services in various hospitals/centres.

Course Outcome

Organise sample collection, transportation, processing and storage in an appropriate manner.

Plan, write and implement research projects in virology, analyze their results and publish these in peer-reviewed journals.

Coordinate with concerned agencies regarding viral diseases and their outbreaks.

Plan and execute epidemiological studies and provide advice in relation to viral diseases.

Course Outline

Module I

Laboratory Organization: Guidelines on Establishment of Virology Laboratory by WHO – key elements of a virology laboratory- Room (space), Electricity, Water supply, Sterility etc.

Specimen management- Selection of specimen, specimen collection, optimal times for collection of specimen, specimen transport and storage, Biosafety- Personal protective equipment , Minimizing equipment and technique-related hazards, Management of laboratory waste, Labelling of wastes etc. Quality systems – Documentation and Standard Operating Procedure (SOP).

Module II

Clinical Virology-

Viral infections of the skin - including pediatric exanthems and enanthems, Viral respiratory infections- pharyngitis, croup, bronchiolitis, pneumonia etc , Viral CNS infections - encephalitis, meningitis, acute

flaccid paralysis, etc. Viral gastroenteritis - viruses causing diarrhea. Viral hepatitis – due to HAV, HBV, HCV, HDV, HEV etc. Viral infections in the immunocompromised persons—in transplant recipients. Congenital viral infections – Human Cytomegalovirus (HCMV), rubella virus, Varicella Zoster Virus (VZV), etc. Sexually transmitted viral infections .Oncogenic viral infections .HIV/AIDS.

Project Topic: Middle East respiratory syndrome (MERS) respiratory infection in human.

Project Topic: Severe acute respiratory syndrome (SARS) respiratory infection in human.

Module III

Virological techniques for cultivation and identification of virus- Isolation of viruses- Cell (tissue) culture; - Embryonated hen’s egg inoculation (various routes) - Animal inoculation method. Identification of virus- Direct examination of specimen: Electron microscopy (TEM and SEM), Staining and microscopy for viral inclusion bodies, Molecular techniques for direct identification of viral genomes- Nucleic acid amplification techniques (PCR, real-time PCR, etc). Indirect Examination of specimen: Cytopathic effect, Neutralization assay, Haemadsorption etc and serological assay (Immunofluorescence, Haemagglutination inhibition assay (HAI), Complement fixation tests (CFT) and ELISA. Antiviral drugs, Laboratory diagnosis of important DNA and RNA viruses.

Project topic: Molecular methods for laboratory diagnosis of corona virus (CoV).

Project topic: Comparative study of serological and molecular methods for lab diagnosis of coron a virus (CoV).

Suggested Readings:

1. Bailey & Scott’s Diagnostic Microbiology.
(e-book-<https://www.pdfdrive.com/bailey-scotts-diagnostic-microbiology-e187863782.html>)
2. Basic virology by Edward K. Wagner.
(e-book -<https://www.pdfdrive.com/basic-virology-e18900518.html>)
3. Essential in clinical microbiology by C A Kauffman and J D Sobel, 2nd Ed.
(Ebook-link- <https://www.pdfdrive.com/essentials-of-clinical-mycology-second-edition-e39564930.html>)

DC-16- CUTM1744- Diagnostic Parasitology

Subject Name	Code	Type of course	T-P-Pj	Prerequisite
Diagnostic Parasitology	CUTM1744	Theory+ Practice	3-1-0	Basic Parasitology

Course Objective

To explain the mechanisms of pathogenesis from a gross, microscopic and molecular perspective.

Recognize the diagnostic stage of the infection under the microscope and to manage the infected patient.

To examine parasites and parasitism, emphasizing the influence of parasites on the ecology and evolution of free-living species, and the role of parasites in global public health.

Course Outcome

Organise sample collection, transportation, processing and storage in an appropriate manner.

Plan, write and implement research projects in parasitology, analyze their results and publish these in peer-reviewed journals.

Coordinate with concerned agencies regarding protozoan and helminth diseases and their outbreaks.

Plan and execute epidemiological studies and provide advice in relation to protozoan diseases.

Course Outline:

Module I

Laboratory Organization (Parasitology Lab). Selection, Collection, Preservation and Transportation of Samples.

Practice: Safety measures in Parasitology lab and laboratory organization.

Module II

Laboratory Diagnosis, of the Intestinal and Vaginal Parasites:

(Terminology, mechanism of infection, etiology, conventional and rapid diagnostic methods) **Protozoa:** Entamoeba histolytica, Giardia lamblia, Trichomonas spp, Cryptosporidium, Cyclospora cayantensis, Isospora

Helminthes: Ascaries lumbricoides, Hook worm: Anacylostoma and Necator, Enterobius vermicularis, Trichuris trichuira, Strongloides spp., Taenia spp., Echinococcus spp., Hymonolepis nana. Tissue and Blood Parasites: Malaria spp, Leishmania spp (Kalaazar), Wacheria spp. Brugia, Loa loa, Oncoerca, Dracuhculus, Paragonimus westermani/hertmani.

Practice: Examination of stool for parasite identification. Examination of clinical sample for parasite identification.

Module III

Laboratory Diagnosis of Various Parasites: Direct method, Indirect method, Rapid methods, Molecular Technique -Parasite Culture. Different Stains used in Diagnostic Parasitology.

Practice: Demonstration of different rapid methods for parasite identification.

Suggested Readings:

1. Textbook of medical Parasitology.
(e-book link- <https://www.pdfdrive.com/textbook-of-medical-parasitology-textbook-of-medical-parasitology-e128716897.html>)
2. Parasitology book by K.D. Chatterjee.
(e-book link- <https://sites.google.com/site/bkthrtzapg/atahrgiwu>.
<https://www.goodreads.com/book/show/24366965-parasitology-protozoology-and-helminthology-with-two-hundred-fourteen>.)
3. Stool Examination
<https://www.youtube.com/watch?v=ePqcdDKCe0>
<https://www.youtube.com/watch?v=MRzUXg8kFi>
<https://www.youtube.com/watch?v=-iI2PxmHxuo>
4. Malaria thick smear preparation.
<https://www.youtube.com/watch?v=WPP7AjmStBg>
5. Malaria thin smear preparation.
<https://www.youtube.com/watch?v=acoALifVvb8>

DC-17- CUTM1754- Mini Project

Subject Name	Code	Type of course	T-P-Pj	Prerequisite
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Mini Project	CUTM1754	Project	0-0-2	Basic Medical science
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The student is supposed to carry out project work in assistance with a mentor. The project should be relevant to the syllabus and should be qualitatively initiated towards fetching a research publication/ case study/ clinical study/ community service/ survey on successful completion within the stipulated time.

Outcome: Research paper publication/ new idea generation/ case study/ clinical study/ community service/ survey.

DC-18- CUTM1755 - Internship

Subject Name	Code	Type of course	T-P-Pj	Prerequisite
Internship	CUTM1755	Project	0-0-12	Basic Medical science

Internship Thesis Guideline

This Guideline is designed to provide students the knowledge and practice of public health research activity, to enable them to carry out researches and solve research related problems and to help them in writing thesis and defend their work. Upon successful completion of the course, the students shall be able to:

1. Search relevant scientific literature
2. Develop a research proposal
3. Employ appropriate data collection techniques and tools
4. Manage collected data
5. Analyze data with appropriate statistical techniques
6. Write thesis
7. Defend the findings

Proposal Development:

At the ending of third year (Sixth Semester), students individually consultation with designated faculties and extensive literature survey will develop research proposal during the initial 6 months period.

Data Collection/ Thesis Writing:

Students will carry out data collection, data management, data analysis, and thesis writing during the remaining period (Six Semester).

The Dissertation should have following format:

1. Title
2. Introduction
3. Materials and Methods
4. Results
5. Discussion
6. Conclusion

7. Recommendation
8. References
9. Appendix

Internship

1. Case record
2. Lab management and ethics
3. Evaluation -Guide(internal)
 - a. -Industries guide(external)
 - b. -University-project report/ Viva

DC-19- CUTM1756 - Project

Subject Name	Code	Type of course	T-P-Pj	Prerequisite
Project	CUTM1756	Project	0-0-12	Basic Medical science

Project work:

Suggested Project title

1. Antibacterial activity of sweet orange (citrus sinesis) on *Staphylococcus aureus* and *Escherchia coli* isolated from wound infected.
2. The incidence of *Salmonella* and *Escherchia coli* in livestock (Poultry) feeds
3. Microbial evaluation of milk from a dairy farm.
4. Gastroenteritis in primary school children (6-12yr) of specific locality.
5. Comparative analysis of microbial load of the main water production and water available to CUTM campus

**CENTURION UNIVERSITY OF TECHNOLOGY AND MANAGEMENT,
ODISHA**

SCHOOL OF PARAMEDICS & ALLIED HEALTH SCIENCES



**Centurion
UNIVERSITY**

*Shaping Lives...
Empowering Communities...*

**BACHELOR OF SCIENCE IN MEDICAL LABORATORY
TECHNOLOGY**

2021

SYLLABUS

Preface: Medical Laboratory Technology helps to diagnose and prevent disease through clinical laboratory tests. It is complementary to medical science. It involves analysis of body matter such as fluid, tissue, and blood. It also covers micro-organism screening, chemical analyses, and cell count.

Medical Technologists are an integral part of the medical profession. These professionals get involved in practical and technical work to aid correct diagnosis and effective functioning of Biochemical Laboratories.

With adequate knowledge and experience, Medical Laboratory Technologists having B.Sc. MLT qualification can work in supervisory or management positions in laboratories and hospitals. They can also work as Laboratory Manager/Consultant/supervisor, health care Administrator, Hospital Outreach coordination, laboratory information system Analyst/Consultant, educational consultant/coordinator etc. Additional opportunities are available in molecular diagnostics, molecular biotechnology companies and in vitro fertilization laboratories as well as in research labs.

Programme: B. Sc. in Medical Laboratory Technology

Duration: Three years (Six semesters) full-time programme with 6 months internship in the last semester.

Eligibility: +2 Science with Physics, Chemistry & Biology or equivalent degree

Examination: Examination rules will be as per guideline of CUTM Examination hand book.

Mini Project: A candidate will have to carry out a mini project work as mentioned in the course structure. After completion of the mini project, the student has to submit the dissertation of the mini project. Internal evaluation of the same (consisting of presentation and viva-voce) will be conducted by the respective School.

Internship: A candidate will have to undergo internship for a period of six calendar months in a hospital/Diagnostics Centre equipped with modern pathology laboratory facility or in a fully equipped pathology laboratory, which fulfills the norms decided by the University.

Dissertation will be compulsory to all students. Students will carry out dissertation work individually or in the group of not more than three students. The format for dissertation/Internship report will be similar to the research thesis style; incorporating chapters on: Introduction, Materials and Methods, Results and Discussion and References / Bibliography. The dissertation will be submitted in a

typewritten and bound form.

Degree: The degree of B. Sc. in Medical Laboratory Technology course of the University shall be conferred on the candidates who have pursued the prescribed course of study for not less than three academic years and have passed examinations as prescribed under the relevant scheme and completed 6 months of compulsory internship in the last semester.

On successful completion of three years programme, with a minimum course credit of **140 credits**, the candidate will be awarded with “**Bachelor of Science in Medical Laboratory Technology (B.Sc. MLT)**” from Centurion University.

BACHELOR OF SCIENCE IN MEDICAL LABORATORY TECHNOLOGY
Programme structure

BASKET 1	BASKET 2	BASKET 3	BASKET 4	
School Core Courses	Discipline Core Courses	Ability Enhancement Compulsory Course (AECC) To be selected from University Basket	Skill Courses (To be selected from University Basket)	
SC-1	DC-1	AECC-I	SFS-1	TOTAL CREDITS
SC-2	DC-2	AECC-II	SFS-2	
SC-3	DC-3		SFS-3	
SC-4	DC-4		SFS-4	
SC-5	DC-5		SFS-5	
SC-6	DC-6			
SC-7	DC-7			
	DC-8			
	DC-9			
	DC-10			
	DC-11			
	DC-12			
	DC-13			
	DC-14			
	DC-15			
	DC-16			
	DC-17			
	DC-18			
28 Credits	86 Credits	6 Credits	20 Credits	140 Credits (Minimum Credits required)

BASKET I
School Core Courses

Sl. No.	CODE	SUBJECT	SUBJECT TYPE (T+P+Pj)	CREDITS
SC-1	CUTM1708	Human Anatomy and Physiology	2+1+0	3
SC-2	CUTM1729	Cell Biology	3+0+1	4
SC-3	CUTM1730	Medical Instrumentation and Technique	2+2+0	4
SC-4	CUTM1732	Biochemistry	3+1+0	4
SC-5	CUTM1715	Clinical Pathology	3+1+0	4
SC-6	CUTM1736	Immunology	3+2+0	5
SC-7	CUTM1737	Molecular Biology	3+0+1	4

BASKET II
Discipline Core Courses

Sl. No.	CODE	SUBJECT	SUBJECT TYPE (T+P+Pj)	CREDITS
DC-1	CUTM1731	Haematology	3+2+0	5
DC-2	CUTM1733	Microbiology	3+2+0	5
DC-3	CUTM1734	Medical Law and Ethics	2+0+1	3
DC-4	CUTM1720	Histology	3+1+0	4
DC-5	CUTM1727	Advanced Hematology	3+1+0	4
DC-6	CUTM1721	Research Methodology	2+0+1	3
DC-7	CUTM1738	Analytical Biochemistry	3+2+0	5
DC-8	CUTM1749	Applied Haematology	3+2+0	5
DC-9	CUTM1750	Immunopathology	3+0+1	4
DC-10	CUTM1748	Parasitology	3+2+0	5
DC-11	CUTM1742	Basic Computer and Information Science	0+2+0	2
DC-12	CUTM1725	Blood Banking	3+0+1	4
DC-13	CUTM1751	Medical Laboratory Management	3+0+2	5
DC-14	CUTM1753	Introduction to Quality and Patient Safety	3+0+2	5
DC-15	CUTM1752	Mycology & Virology	3+2+0	5
DC-16	CUTM1754	Mini Project	0+0+2	2
DC-17	CUTM1755	Internship	-	12

DC-18	CUTM1755	Project	-	12
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NOTE: Along with the School core and Discipline core subjects, the students need to opt for AECC Courses, Skill/ Domain/ Elective courses and value- added courses from the University Basket, as per the requirement by the University.

BASKET I

School Core Courses

SC1- CUTM1708- Human Anatomy and Physiology

Subject Name	Code	Type of course	T-P-Pj	Prerequisite
Human Anatomy and Physiology	CUTM1708	Theory+ Practice	2-1-0	Fundamental Science

Objective

To identify different types of cells and describe their functions.

To identify the organelles of a typical cell and describe their functions.

To identify the major components of the integumentary system and describe their functions.

To identify the major structures of the skin and describe their functions

To identify the major components of the skeletal system and describe their functions.

To identify the major components of the circulatory, endocrine, nervous system etc and describe their functions.

Course outcome

Use anatomical terminology to identify and describe locations of major organs of each system covered.

Explain interrelationships among molecular, cellular, tissue, and organ functions in each system.

Describe the interdependency and interactions of the systems.

Explain contributions of organs and systems to the maintenance of homeostasis.

Identify causes and effects of homeostatic imbalances.

Describe modern technology and tools used to study anatomy and physiology.

Course Outline

Module-1 (10 Hours)

Scope of Anatomy and physiology. Terms and terminology used in Anatomy. Structure of cell, function of its components with special reference to mitochondria and microsomes.

Elementary tissues: Anatomy of epithelial tissue, muscular tissue, connective tissue and nervous tissue.

Skeletal System: Skeleton system with classification, types of bone, features of long bone, ossification, blood supply, Joints – classification with examples, structure of typical synovial joints, Joint disorders.

Practice: Demonstration of individual bone from skeleton.

Identification of different organs and system from chart.

Module-2 (13 Hours)

Cardiovascular System: Composition and functions of blood. Blood groups – ABO system and Rh factor and coagulation of blood. Brief information regarding disorders of blood. lymph – origin, circulation, functions of lymph and lymph nodes. Structure and functions of various parts of the heart. Blood pressure and its recording. Brief information about cardiovascular disorders.

Respiratory system: Introduction and functional anatomy of respiratory tract, physiology of respiration.

Practice: Demonstration the morphology of different blood cells

Measurement of Blood pressure, impulses, Heart beats, respiration rate etc.

Module-3 (15 Hours)

Urinary System: Various parts of urinary system and their functions, structure and functions of kidney. Physiology of urine formation. Patho-physiology of renal diseases and edema.

Digestive System: Anatomy of digestive system and their functions. Structure and functions of liver, physiology of digestion and absorption.

Endocrine System: Endocrine glands and Hormones. Reproductive system. Structure and function of sense organs.

Practice: Demonstration of various parts of body, tissues of body, parts of digestive

system, parts of respiratory system, parts of excretory system. Identification of different organs and system from chart

Suggested Readings:

1. Text book Anatomy & Physiology for nurses by Evelyn Pearce, Publisher Faber&Faber.
2. Text book Anatomy and Physiology for nurses by Sears, Publisher EdwardArnold.

3. Anatomy & Physiology- by Ross and Wilson, PublisherElsevier.
4. Anatomy& Physiology: Understanding the human body by Clark, Publisher Jones & Bartlett.
5. Anatomy and Physiology for nurses by Pearson, Publisher Marieb&Hoehn.
6. Anatomy and Physiology by N Murgesh, PublisherSatya

SC2-CUTM1729- Cell Biology

Subject Name	Code	Type of course	T-P-Pj	Prerequisite
Cell Biology	CUTM1729	Theory+ Project	3-0-1	Fundamental Science

Objective

<p>.Determine the parts of the cell membrane and the cell wall</p> <p>Distinguish the types and mechanism of mutation</p> <p>Compare and contrast the events of cell cycle and its regulation</p> <p>Understand the dynamic character of cellular organelles</p>
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Course outcome

<p>Describe the fundamental principals cellular biology</p> <p>Develop a deeper understanding of cell structure and how it relates to cell functions.</p> <p>Understand how cells grow, divide, and die and how these important processes are regulated.</p> <p>Understand cell signaling and how it regulates cellular functions. Also how its dis- regulation leads to cancer and other diseases.</p>

Course Outline

Module -I (12 Hr)

An Overview of Cells: History, Cell theory, Structure and Function of Cell and its Organelles: Biological membranes - Nucleus - Nuclear envelope, Nucleolus, Mitochondria, Chloroplasts, Lysosomes, Gloxysomes and Peroxisomes, endoplasmic reticulum, ribosomes, Golgi complex (Structural

organization, function, marker enzymes of the above organelles), Cell types: prokaryotes vs.

eukaryotes; from single cell to multi-cellular organism; Different molecules of cell- water, salt and mineral ions etc.

Module- II (14 Hr)

Cell cycle and its regulation, Cellular communication and cell mobility: Cell cycle: G₀/G₁, S, G₂ and M phases (Cell Division: Mitosis, meiosis and cytokinesis); regulation of cell cycle; cell adhesion and roles of different adhesion molecules, gap junctions, Extra- Cellular Matrix (ECM), Cell-cell interaction and cell- ECM interaction, The cytoskeleton, Microtubule- based movement and microfilament -based movement.

Module-III (14 Hr)

Cell signaling, Programmed Cell Death (Apoptosis) and Cancer: Hormones and their receptors, cell surface receptor, signaling through G-protein coupled receptors (G-PCR), Tyrosine Kinase, signal transduction pathways, second messengers, regulation of signaling pathways, bacterial and plant two-component systems, bacterial chemotaxis, Intrinsic and Extrinsic apoptotic pathway, Caspase enzyme, Biology and elementary knowledge of development and causes of cancer; Tumor viruses, Oncogenes and tumor suppressor genes.

Suggested Readings:

1. The Cell a Molecular Approach (4th Edition) by Cooper & Hausman
<https://www.thebiomics.com/books/cell-biology/cell-molecular-approach-cooper-and-hausmn-4th-ed.html>
2. Molecular Biology by Friefelder David, Publisher Narosa www.alibris.com/Molecular-Biology-David..
3. Introduction to Cell biology by John K Young, World Scientific publishing company www.overdrive.com/.../introduction-to-cell-biology
4. Introduction to biology, 3rd tropic edition by D G Maackean www.amazon.com/Introduction-Biology-D-G-Mackean/.

SC3-CUTM1730-Basic Medical Instrumentation and Techniques

Subject Name	Code	Type of course	T-P-Pj	Prerequisite
Basic Medical Instrumentation and Techniques	CUTM1730	Theor+Practice	2-2-0	Fundamental Science

Objective

To learn the principle, instrumentation & application of Microscopy

Principle, instrumentation & application of Centrifugation

Principle of Spectroscopy

Course outcome

After completion of the course the student will be efficient in handling the microscopy equipment's.

They will also be able to have idea about handling instruments like centrifuge, spectrophotometer, chromatography, flow cytometer, Automated and semi- automated Biochemistry analyzer.

The conceptual understanding of the subject provides opportunities for skill enhancement and scopes for higher education.

Course Outline

Module -I (12 hrs)

Microscopic techniques: Principle, Instrumentation, Specimen preparation and Application: Phase-contrast microscopy, fluorescence microscopy, polarization microscopy, electron microscopy (Scanning and Transmission); Bacterial Colony Counter (Principle and working). Laminar Air Flow (Principle and working technique).

Practice: Demonstration of different Microscopes with their operation and maintain technique.

Module- II (14 hrs)

Colorimeter: Principle and Instrumentation; **Spectrophotometry:** Ultraviolet, Mass spectrophotometry; Flame photometry. **Centrifugation:** Principle; Preparative, Analytical, Density gradient centrifugation. **Cytometry:** Types, Flow cytometry and its applications.

Practice: Operation, Demonstration and Quality control of Centrifuge, UV-Vis spectrometer, Colorimeter.

Module- III (14 hrs)

Microtomy: Sectioning, Staining. Application, Principle and Application of: Fully Automated Biochemistry Analyser, Semi- automated Biochemistry Analyser, Coagulometer. Principle, working and uses of: Incubator, Hot air oven, Autoclave.

Practice: Demonstration of Auto/ Semi auto Analyzer; Working procedure of microtome, Incubator, Hot air oven, autoclave and others

Suggested Readings:

1. Wilson K and Walker J. (2010). Principles and Techniques of Biochemistry and Molecular Biology. 7th Ed., Cambridge University Press.
(e-Book link: <https://www.pdfdrive.com/principles-and-techniques-of-biochemistry-and-molecular-biology-e174866056.html>)
2. Nelson DL and Cox MM. (2008). Lehninger Principles of Biochemistry, 5th Ed., W.H. Freeman and Company.
(e-Book link: <https://www.pdfdrive.com/lehninger-principles-of-biochemistry-5th-edition-d164892141.html>)
3. Willey MJ, Sherwood LM & Woolverton C J. (2013). Prescott, Harley and Klein's Microbiology. 7thEd., McGraw Hill.
(e-Book link: <https://www.pdfdrive.com/prescott-harley-and-kleins-microbiology-7th-ed-e188166539.html>)
4. Labs for Life
(e-source link: <http://labsforlife.in/InstructionalVideo.aspx>
(e-Book link- <https://books.google.co.in/books?id=z9SzvsSCHv4C&printsec=frontcover&dq=instrumentation&hl=en&sa=X&ved=2ahUKEwjipqrO347qAhUjwzGHRomCNUQ6wEwAHoECAIQAQ#v=onepage&q=instrumentation&f=false>)

SC4-CUTM1732- Biochemistry

Subject Name	Code	Type of course	T-P-Pj	Prerequisite
Biochemistry	CUTM1732	Theory+ Practice	3-1-0	Fundamental Science

Objective

To understand the concept of metabolism of carbohydrates
To understand the significance of amino acids, proteins
Use of enzymes in enhancing metabolic reactions
Role of lipids

Course outcome

After completion of the course the student will be developed a very good understanding of various biomolecules which are required for development and functioning of cells.

Would have understood the significance of carbohydrates in energy generation and as storage food molecules for cells.

They would have understood the significance of proteins and enzymes in accelerating various metabolic activities.

The conceptual understanding of the subject provides opportunities for skill enhancement and scopes for higher education.

Course Outline

Module- I

Structure of enzyme: Apoenzyme and cofactors, prosthetic group-TPP, coenzyme NAD, metal cofactors, Classification of enzymes.

Mechanism of action of enzymes: active site, transition state complex and activation energy. Lock and key hypothesis, and Induced Fit hypothesis.

Enzyme inhibition, enzyme kinetics.

Diagnostic value of serum enzymes: Creatinine kinase, Alkaline phosphatase, Acid phosphatase, LDH, SGOT, SGPT, Amylase, Lipase, Carbonic anhydrase etc.

Practice: Study of effect of temperature on enzyme activity
Study of effect of pH on enzyme activity

Module- II

Carbohydrates: Biomedical importance & properties of Carbohydrates, Classification,

Families of monosaccharides: aldoses and ketoses, trioses, tetroses, pentoses, and hexoses. Stereo isomerism of monosaccharides, epimers, Haworth projection formulae for glucose; chair and boat forms of glucose.

Metabolism: Glycogenesis & glycogenolysis, Glycolysis, citric acid cycle & its significance, Components of respiratory chain, energy relationships during cell respiration, types of respiration. HMP shunt & Gluconeogenesis, regulation of blood glucose level.

Practice: Estimation of Glucose in urine
Estimation of Glucose in blood

Module- III

Amino acids: Classification, essential & non-essential amino acids. Chemistry of Proteins & their related metabolism, Classification, biomedical importance.

Metabolism: Ammonia formation & transport, Transamination, Decarboxylation, Urea cycle, metabolic disorders in urea cycle, catabolism of amino acids.

Practice: Estimation of Protein in urine
Estimation of Protein in blood

Module- IV

Chemistry of Lipids & their related metabolism: Classification, biomedical importance, essential fatty acids. Brief outline of metabolism: Beta oxidation of fatty acids, fatty liver, Ketogenesis, Cholesterol & its clinical significance, Lipoproteins in the blood composition & their functions in brief, Atherosclerosis.

Diabetes mellitus: its types, features, gestation diabetes mellitus, glucose tolerance test, glycosuria, Hypoglycaemia & its causes.

Practice: Estimation of Bile pigment in urine
Estimation of Bile salts in urine

Suggested Readings:

1. Victor W. Rodwell, David A. Bender, Kathleen M. Botham, Peter J. Kennelly, P. Anthony Weil (2018) Harper's Illustrated Biochemistry. Mc Graw Hill.
(e-Book link: <https://www.pdfdrive.com/harpers-illustrated-biochemistry-d176838999.html>)
2. Nelson DL and Cox MM. (2008). Lehninger Principles of Biochemistry, 5th Ed., W.H. Freeman and Company.
(e-Book link: <https://www.pdfdrive.com/lehninger-principles-of-biochemistry-5th-edition-d164892141.html>)
3. Donald Voet, Judith G. Voet (2011) Biochemistry 4th Edition. Wiley Publishers.
(e-Book link: <https://www.pdfdrive.com/biochemistry-4th-edition-e165192126.html>)
4. Jeremy M. Berg, John L. Tymoczko, Lubert Stryer. Biochemistry 7th Edition. W.H. Freeman and Company, New York.
(e-Book link: <https://www.pdfdrive.com/biochemistry-seventh-edition-e167675390.html>)

Simulation links for labs:

1. Lecturio
(e-source link: <https://app.lecturio.com/#/course/s/8014>)
2. Labs for Life

(e-source link: <http://labsforlife.in/InstructionalVideo.aspx>)

SC5-CUTM1715 -Clinical Pathology

Subject Name	Code	Type of course	T-P-Pj	Prerequisite
Clinical pathology	CUTM1715	Theory+ Practice	3-1-0	Fundamental Science

Objective

Analyze body fluid for diagnosis of disease
Analyze waste product for diagnosis of disease
Understanding DOT Policy
Understand Physiological disorder and infectious disease
Analysis of pregnancy

Course Outcome

Able to collect pathological specimen
Able to detect diabetes, ketosis, nephritis, jaundice and other physiological disorder
Able to detect infectious disease (UTI, Hematuria, Filaria, Dysentery, Ulcer, TB, etc.)
Preservation and processing of pathological sample.
Identification of Parasites
Analysis of Infertility disorder

Module-I (16 Hrs)

Introduction of clinical pathology, Composition, collection and preservation of urine, Physical examination of Urine, Chemical Examination of Urine - Sugar and Ketone bodies, Diabetes and Ketosis, Nephritis and UTI, Albumin, Phosphate, BJP, Bile Salt and Bile pigment, Chemical Examination of Urine - Multistix reagent strip, Jaundice, Microscopical Examination of Urine, Operation of Urine Analyzer, Pregnancy test, Report writing and report analysis of Urine

Practice: Operation of Urine analyzer, Benedict Test, Heat and Acid Test, Rothera's Test, Benzidine Test, Fouchet's Test

Lab:-

Urine Analysis: Collection and Physical Examination, Specific Gravity, Benedict's Qualitative test, Acetone Rothera's Test, Protein and BJP Test, Hay's Test and Fouchet's test, Benzidine test, Microscopical Examination, Pregnancy Test, Auto-mentation by Urine analyzer

Module-II (14 Hrs)

Respiratory Tract Infection: Gram Staining and ZN Staining, Basic of DOT Centre, Report writing and report analysis of sputum, Sputum for the diagnosis of Mycobacterium tuberculosis, Clinical significance and Report writing of Stool, Difference between Amoebic, Dysentery and Bacillary Dysentery, Microscopical Examination of Stool, Physical and Chemical examination of Stool, Composition, collection and preservation of stool

Practice: *Microscopic finding of stool, Morphology of stool parasite*

Lab:-

Stool Analysis: Collection and physical examination, Chemical Examination, Occult test and reducing sugar, Microscopical Examination: Protozoa, Microscopical Examination: Helminthes

Sputum Analysis: Collection and physical examination, Tuberculosis (ZN Stain), Respiratory infection (Gram Stain)

Module-III (15 Hrs)

Routine laboratory investigation of Pleural Fluid, Routine laboratory investigation of Pericardial Fluid, Routine laboratory investigation of Synovial Fluid, Synovial fluid: Collection and preservation, Examination of CSF related to Meningitis, Brain Tumour and other disorder, CSF: Composition, Collection, Preservation and physical examination, Report analysis and report writing of Semen, Semen examination for male infertility disorder, Semen: Composition, function, collection and physical examination

Practice: Gram stain, ZN Stain, General consideration on specimen collection

Lab:-

Semen Analysis: Collection and physical examination, Chemical Examination, Microscopical examination

CSF Analysis: Collection and Routine Examination

Synovial Fluid: Collection and Routine examination

Pleural Fluid: Collection and routine examination

Pericardial Fluid: Collection and routine examination

Bacteriological Examination of throat swab

Suggested Readings:

1. Textbook of Clinical laboratory methods and diagnosis by Gradwohls, Publisher Mosby
2. Medical laboratory technology Vol.1 by K. L. Mukherjee, 2007, Publisher Tata McGrawHill
3. Textbook of medical laboratory technology by Praful B Godkar, Publisher Bhalan
4. Medical laboratory science theory and practice by J Ochei and Kolhatkar, 2002, Tata McGraw-Hill, Publisher TBS

SC-6 - CUTM1736- Immunology

Subject Name	Code	Type of course	T-P-Pj	Prerequisite
Immunology	CUTM1736	Theory + Practice	3-2-0	Fundamental Science

Objective

Understanding the concept of Innate & adaptive immune system; complement system; Hypersensitivity.

Clinically relevant serological analysis for deeper understanding of antigen- antibody interaction.

Course Outcome

Application of Immunology in disease diagnosis.

The conceptual understanding of the subject provides opportunities for employability and scopes for higher education.

Course Outline

Module-I

Immunity: Classification, Measurement of immunity, Local immunity, Herd immunity. **Antigens:** Types of antigen, Epitope. Biological Classes of antigens, Superantigens.

Immunoglobulins: Antibody structure, Immunoglobulin classes.

Practice: Collection of blood sample by vein puncture

Separation and preservation of serum

Module-II

Complement System: Principal pathways of Complement activation, Quantitation of Complement (C) and its Components. Biosynthesis of complement, Complement Deficiencies.

Antigen-Antibody Reactions, Antigen-Antibody measurement, Parameters of serological tests. Serological Reactions.

Practice: Performing Serological tests: Widal test, VDRL test, ASO test, C-Reactive Protein test,

Rheumatoid factor (RF) test

Precipitation in agarose gel

Performing Ouchterlony Double diffusion test

Demonstration of SDS-PAGE

Demonstration of ELISA

Demonstration of Western

blotting

Module-III

Immune Response: Types of Immune response, Humoral immunity, Cell-mediated Immune Responses, Cytokines, Immunological tolerance.

Hypersensitivity Reactions: Classification of hypersensitivity reactions, Type I Hypersensitivity (IgE Dependent). Type II Hypersensitivity: Cytolytic and Cytotoxic. Type III Hypersensitivity-Immune Complex-mediated, Type IV Hypersensitivity-Delayed Hypersensitivity.

Suggested Readings:

1. Kuby's Immunology (7th Ed) - by J. Owen, J. Punt, S. Strandford. Macmillan Higher Education, England.
(e-book link: <https://www.pdfdrive.com/kuby-immunology-7th-edition-2013-e44842271.html>)
2. Roitt's Essential Immunology (13th Ed)- by Seamus J. Martin, Dennis R. Burton, Ivan M. Roitt. Wiley Blackwell.
(e-book link: [http://dl.mehrsys.ir/pdf-books/Roitt_s%20Essential%20Immunology%20Thirteenth%20Edition\(www.myuptodate.com\).pdf](http://dl.mehrsys.ir/pdf-books/Roitt_s%20Essential%20Immunology%20Thirteenth%20Edition(www.myuptodate.com).pdf))
3. Prescott, Harley, and Klein's Microbiology (Seventh Edition)- by Joanne M. Willey, Linda M. Sherwood, Christopher J. Woolverton. McGrawHill.
4. Microbiology An Introduction (10th Edition)- by Gerard J. Tortora, Berdell R. Funke, Christine L. Case. Pearson.
5. Text book of Microbiology (7th Edition)- by Ananthanereyan & Paniker, Publisher Universities press.
(e-book link: <https://www.pdfdrive.com/textbook-of-microbiology-e177143667.html>)
6. Practical Immunology (4th Edition)- by Frank C. Hay, Olwyn M.R. Westwood. Blackwell Science.
(e-Book link: <https://www.pdfdrive.com/practical-immunology-d34330313.html>)

Online Tutorial links:

1. Fundamentals of Immunology: Innate Immunity and B-Cell Function
(Coursera link: <https://www.coursera.org/learn/immunologyfundamentalsimmunitybcells>)

2. Fundamentals of Immunology: T Cells and Signaling

(Coursera link: <https://www.coursera.org/learn/immunologyfundamentalstcellssignaling>)

3. Fundamentals of Immunology: Death by Friendly Fire
(Coursera link: <https://www.coursera.org/learn/immunology-friendlyfire>)
4. The Immune System: New Developments in Research
(edX link: <https://www.edx.org/course/the-immune-system-new-developments-in-research-par>)

SC-7- CUTM1737- Molecular Biology

Subject Name	Code	Type of course	T-P-Pj	Prerequisite
Molecular Biology	CUTM1737	Theory + Project	3-0-1	Fundamental Science

Objective

To provide depth knowledge of biological or medicinal processes through the investigation of the underlying molecular mechanisms.

Understanding of chemical and molecular processes that occur in and between cells. Understanding will become such that , can be able to describe and explain processes and their meaning for the characteristics of living organisms.

Course Outcome

Conduct independent work in a laboratory.

Read scientific articles and gain a critical understanding of their contents.

Give a spoken and written presentation of scientific topics and research results.

Present hypotheses and select, adapt and conduct molecular and cell-based experiments to either confirm or reject the hypotheses.

Course outline

Module I

Introduction: a. Introduction to molecular biology, b. Molecular biology of cell. Evolution and Molecular structure of cell and its organelles. Types of cells. Including different kinds of Prokaryotic and eukaryotic cells, Cell growth, Cell adhesion, cell junctions and extra cellular matrix organelles, Cell cycle, Cell membrane and its structure (fluid-mosaic model). Factors influencing on membrane fluidity, asymmetry of membrane and membrane transport (active and passive)

Project Topic: Causes, types and molecular mechanism of human cancer.

Module II

Molecular Nature of the Genetic Material in Prokaryotic and Eukaryotic Cells: Molecular biology of Genes, DNA: Molecular structure, types: Primary, secondary and tertiary, Double helix, types, Transferring information from DNA to RNA, Synthesis of RNA, Translation RNA: Molecular structure, types. Evolution of DNA and RNA, Gene and genetic codes.

Project Topic: Tumor suppressor gene and oncogene.

Module III

General Concept on: a. Regulation of the Gene Expression b. Regulating the Metabolism: The Lac-Operon system, Catabolic repression, Trp Operon system: regulating the biosynthesis of the tryptophan, Gene expression in Eukaryotic cells, Plasmids: types, maintenance and functions.

Project Topic: Human Genome Project.

Module IV

DNA Replication and Gene Expression: DNA Replication: Semi conservative Nature of DNA Replication, DNA Replication in prokaryotic Cells, DNA Replication in Eukaryotic cell, Enzymes involved in DNA Replication: DNA polymerases, Proofreading, post-replication Modification of DNA. Transferring information from DNA to RNA, Synthesis of RNA (Transcription), RNA polymerase, Initiation and Termination of Transcription, Post and co- transcription modification of the RNA. Protein Biosynthesis: Translation of the genetic code, Translation of m RNA, Role of r-RNA in protein synthesis, Forming the polypeptides- elongation, Termination of the protein biosynthesis.

Project Topic: Molecular basis, types, causes and a case study of the effects of DNA mutation.

Suggested Readings:

1. Molecular Biology of the gene (7th Ed) by James D. Watson.
E-book link- <https://www.pdfdrive.com/molecular-biology-of-the-gene-e158278674.html>
2. Genes XII by Lewin's.
E-book link- <https://www.pdfdrive.com/lewins-genes-xii-e168024578.html>
3. Molecular cell biology (5th Ed) by Lodish H.

E-book link-
ed- [e15674865.html](https://www.pdfdrive.com/molecular-cell-biology-lodish-5th-ed-e15674865.html)

[https://www.pdfdrive.com/molecular-cell-biology-lodish-5th-](https://www.pdfdrive.com/molecular-cell-biology-lodish-5th-ed-e15674865.html)

BASKET II Discipline Core Courses

DC-1-CUTM1731-Haematology

Subject Name	Code	Type of course	T-P-Pj	Prerequisite
Hematology	CUTM1731	Theory+Practice	3-2-0	Basic Medical science

Objective

The overall aims are that the student should obtain advanced knowledge of the most common hematologic diseases & understanding the concept of Blood cells and other blood components.

Be able to handle an investigation of hemorrhagic disorder and laboratory abnormalities such as anaemia, polycythemia, leukopenia, leukocytosis, thrombocytopenia, thrombocytosis, elevated ESR etc within hematology.

Clinically relevant hematological analysis for deeper understanding of Evaluate normal and abnormal cell morphology with associated diseases and other blood components.

Course Outcome

Differentiate various laboratory test findings with their associated clinical conditions.

Identify the various skills necessary to perform blood counts, evaluate blood elements, and report results within the stated limits of accuracy.

Describe the various components of blood, their functions, and roles in various disease states.

To be able to demonstrate good skills in the relevant Hematology laboratory methodology.

Collection of blood for the investigations.

Be able to distinguish the developmental stages of blood cells. It will also cover Bone marrow examination.

To learn about tests carried out for hematological investigations.

To be able to carry out blood sampling.

Course Outline

Module- I (8 Hrs)

Scope & importance of Hematology, important equipment and chemicals, various test performed in Hematology laboratory, Focusing different blood cells through microscope.

Practice: Demonstration of instruments used in hematology- Microscope, Blood Cell counter, Sahali's Apparatus.

Module- II (12 Hrs)

Identify and/or confirm the composition & function of various red blood cell inclusions. Function of normal cellular components. Formation of blood, Synthesis of blood in Bone marrow- Erythropoiesis, leucopoiesis, thrombopoiesis. Anticoagulants: definition, Uses, Different types of Anticoagulants., mode of action, their merits and demerits.

Morphology of normal blood cells, abnormal morphology & diseases.

Practice: Demonstration of different blood cell, their synthesis from slide presentation or chart.
Demonstration the normal and abnormal morphology of different blood cells.

Module- III (10

Hrs) Hematological

Disorders

1. Classification of Anemia: Morphological & etiological.
2. Iron Deficiency Anemia: Distribution of body Iron, Iron Absorption, causes of iron deficiency, lab findings.
3. Megaloblastic Anemia: Causes, Lab findings.
4. Hemolytic Anemia: Definition, causes, classification & lab findings.

Bone Marrow: Cell composition of normal adult Bone marrow, Aspiration, Indication, Preparation & Staining, Special Stain for Bone Marrow -Periodic Acid Schiff, Sudan Black

Leukemia: Classification, Blood Picture, Differentiation of Blast Cells.

Practice: Collection of blood by different methods

Different normal and abnormal morphology of RBCs, WBCs, Platelet.

Module- IV (10 Hrs)

Collection of blood, Methods & Preparation of Stains and Smears

Practice:

Cleaning and drying of glass and plastic ware, Collection of venous and capillary blood, cleaning of glass-syringes and its sterilization. Preparation of buffers, Preparation of the stains and other reagents,

Preparation of peripheral blood film (PBF), To stain a peripheral blood Film by Leishman- stain, Haemoglobin estimation (Sahali's method and cyanmethaemoglobin method).

Module- V (10 Hrs)

Routine Hematological Tests:

Complete blood cell count, ESR, Differential Leukocyte count, Total leukocyte count, Bleeding time and Clotting time, Blood Grouping and Rh Typing.

Practice:

Complete Blood Counts, Determination of Haemoglobin, TRBC Count by Haemocytometers, TLC by Haemocytometer, Differential Leukocyte count, Determination of Platelet Count. Determination of ESR by wintrobes, Determination of ESR by Westergren's method, Determination of PCV by Wintrobes, Erythrocyte Indices- MCV, MCH, MCHC. Reticulocyte Count, Absolute Eosinophil Count, Bleeding time and Clotting time, Blood Grouping and Rh Typing

Suggested Readings:

1. Textbook of Medical Laboratory Technology P.B Gotkar Mumbai, Bhalani Publishing House
2. Text book of Medical Laboratory Technology by Paraful B. Godkar, Publisher Bhalani
3. Text book of Medical Laboratory Technology (2nd edition) by V.H Talib, Publisher CBS
4. Atlas of hematology (5th edition) by G.A. McDonald, Publisher Churchill Livingstone
5. Medical Laboratory Technology By K.L Mukharjee, Publisher McGraw Hill education pvtlimited
6. Text book of Medical Laboratory Technology (6th edition) by Ramnik Sood, Jaypee Publication.
7. Ebook link-<https://www.pdfdrive.com/hematology-basic-principles-and-practice-e176384006.html>
8. Ebook link-<https://www.pdfdrive.com/hematology-basic-principles-and-practice-expert-consult-online-and-print-expert-consult-title-online-print-5th-edition-e186195241.html>
9. Ebook link-
<https://books.google.co.in/books?id=6sfacydDNsUC&printsec=frontcover&dq=hematology&hl=en&sa=X&ved=2ahUKEwja9-ve3I7qAhUwzTgGHSMUDekQ6wEwAHoECAQQAQ#v=onepage&q=hematology&f=false>
10. Ebook link-
<https://books.google.co.in/books?id=QQcYAAAAYAAJ&printsec=frontcover&dq=hematology&hl=en&sa=X&ved=2ahUKEwja9-ve3I7qAhUwzTgGHSMUDekQ6wEwAnoECAIQQAQ#v=onepage&q=hematology&f=false>

DC-2- CUTM1733- Microbiology

Subject Name	Code	Type of course	T-P-Pj	Prerequisite
Microbiology	CUTM1733	Theory+ Practice	3-2-0	Fundamental Science

Objective

To know various Culture media and their applications and also understand various physical and chemical means of sterilization

To know General bacteriology and microbial techniques for isolation of pure cultures of bacteria, fungi and virus

To master aseptic techniques and be able to perform routine culture handling tasks safely and effectively

Course Outcome

This study demonstrates the theory and practical skills in microscopy and their handling techniques and staining procedures.

Understanding the details of microbial cell organelles.

Provides knowledge on growth of microorganism.

Provides knowledge Culturing microorganism.

Course Outline

Module -1(14 Hours)

Microbiology: Definition, history, host- microbe relationship, and safety measures in a microbiology laboratory. Morphology of bacterial cell wall, Bacterial anatomy (Bacterial cell structure: including spores, flagella, pili and capsules). Sporulation. Classification of bacteria according to cell wall and shape (arrangement), Classification of micro-organisms. Growth and Nutrition of Microbes: General nutritional requirements of bacteria, Bacterial growth curve

Practice:

1. Handling of Microscope
2. To learn techniques for Inoculation of bacteria on culture media.
3. To isolate specific bacteria from a mixture of organisms.

Module-2 (11 Hours)

Sterilization: Definition, sterilization by dry heat, moist heat (below, at & above 100° C), Autoclave, Hot air oven, Radiation and Filtration, preventive measures, controls and sterilization indicators. Use of laminar flow in sterilization.

Antiseptics and Disinfectants: Definition, types, properties, mode of action and use of disinfectants and antiseptics, efficiency testing of disinfectants.

Practice:

4. To demonstrate simple staining (Methylene blue)
5. Bacterial identification: To demonstrate reagent preparation and procedure for Gram stain, Z-N staining, Capsule staining, Demonstration of flagella by staining methods, Spore staining, To demonstrate spirochetes by Fontana staining procedure

Module-3 (15 Hours)

Staining techniques: Methods of smear preparation, Gram stain, AFB stain, Albert's stain and special staining for spore, capsule and flagella, Culture Media, Liquid and solid media, defined and synthetic media, routine laboratory media (basal, enriched, selective, enrichment, indicator, and transport media). Different Culture, media their preparation and uses in microbial growth.

Practice:

6. Biochemical tests for identification of bacteria
7. Preservation of stock cultures of bacteria
8. Antibiotic susceptibility test

Suggested Reading:

1. Medical Laboratory Technology by Kanai Lal Mukherjee; Tata McGraw Hill, New Delhi
2. Microbiology by Prescott
3. An Introduction to Medical Laboratory Technology by FJ Baker; Butterworth – Heinemann; Oxford
4. Practical Book of Medical Microbiology by Satish Gupta; JP Brothers, New Delhi
5. Medical Laboratory Manual for Tropical Countries Vol. I and II by Monica Cheesbrough; Cambridge University Press; UK
6. Textbook of Medical Laboratory Technology by Praful B Godkar; Bhalani Publishing House, Mumbai
7. Text book of Medical Microbiology by Gruckshiank

DC-3- CUTM1734 - Medical Law and Ethics

Subject Name	Code	Type of course	T-P-Pj	Prerequisite
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Medical Law and Ethics	CUTM1734	Theory+ Project	2-0-1	Fundamental Science
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Objective

The course provides an introduction to ethics generally and more specifically to medical ethics, examining in particular the principle of autonomy, which informs much of medical law. The course then considers the general part of medical law governing the legal relationship between medical practitioners and their patients. It considers the legal implications of the provision of medical advice, diagnosis and treatment. Selected medico-legal issues over a human life are also examined. These may include reproductive technologies, foetal rights, research on human subjects, organ donation, the rights of the dying and the legal definition of death.

Course Outcome

- The ethical underpinnings of the law as it relates to medicine,
- The law of negligence in the context of the provision of healthcare,
- Legal and ethical issues surrounding end and beginning of life
- decisions,

Course Outline

Module-1

1. The Indian medical council act, 2. Medical council of India (functions), 3. Functions of state medical councils, 4. The declaration of Geneva

Module-2

1. Duties of medical practitioners 2. Regarding red cross emblem 3. Professional secrecy 4. Privileged communication.

Module-3

1. Professional negligence 2. Medical mal occurrence 3. Contributory negligence 4. Criminal negligence

Module-4

1. Corporate negligence 2. Ethical negligence 3. Precautions against negligence 4. difference between professional negligence and infamous conduct.

Module-5

1. Malpractice litigation involving various specialities 2. Prevention of medical negligence 3. supreme court of India guidelines on medical negligence 3. The therapeutic misadventure 4. Vicarious liability

Module-6

1. Products liability 2. medical indemnity insurance 3. Medical records 4. Consent in medical practice

Module-7

1. Euthenasia 2. Deaths due to medical care 3. Malingering

Text books

1. Medical Law and Ethics by Shaun D Pattinson, 5 th edition, 2017.

DC-4 - CUTM1720- Histology

Subject Name	Code	Type of course	T-P-Pj	Prerequisite
Histology	CUTM1720	Theory+Practice	3-1-0	Basic Medical Science

Objective

Understanding the concept of histotechnology; Basic concepts about routine methods of examination of tissues Collection.

perform routine laboratory procedures encompassing all major areas of the histology laboratory.

accurately and proficiently embed tissue and understand the principles of microtomy.

Clinically relevant onchological analysis for deeper understanding of abnormal cell growth at anywhere in human body.

The conceptual understanding of the subject provides opportunities for employability and scopes for higher education.

Course Outcome

In this section students will be made aware of terminology used in

histotechnology, various instruments and their maintenance and also learn the processing of various samples for histopathological investigations.

Reception and labeling of histological specimens.

Use of antiseptics, disinfectants and insecticides in a tissue processing laboratory.

The students will learn about various staining procedures for demonstration of different substances & various cytological investigations.

The students will learn about special staining procedures & handling & testing of various cytological specimens.

Course

Outline **Module-**

I (8 Hrs)

Histotechnology, Care & Maintenance of histotechnology equipments and their parts and Safety measures of laboratory equipment used in histotechnology. Basic concepts about routine methods of examination of tissues, Collection and transportation of specimens for histological examination, fixation: Process, Various types of fixatives used in a routine histopathology laboratory- Simple fixatives, Compound fixatives, Special fixatives for demonstration of various tissue elements.

Practice: Care & maintenance of Histology equipments, Collection & transportation of specimens, Fixation

Module- II (8 Hrs)

Decalcification Criteria of a good decalcification agent, Technique of decalcification Followed with selection of tissue fixation, decalcification neutralization of acid and thorough washing. Various types of decalcifying fluids, Processing of various tissues for histological examination, Embedding, Schedule for manual or automatic Tissue processing, Components & principles of various types of a tissue processors.

Practice: -Method of Decalcification, Embedding, manual or automatic tissue processings schedule.

Module- III (10 Hrs)

Periodic Acid Schiff Staining, Impregnation and Mountains, Commonly used mountains in histotechnology lab. General Staining Procedures (routine H&E stain, PAP stain and other special stain) for Paraffin Infiltrated and Embedded tissue, To perform & practice the manual & automated

Haematoxylin and Eosin staining technique, To perform & practice the Mallory's Phosphotungstic

Acid Haematoxylin (PTAH). Introduction of FNAC and its staining tech, museum technique, post mertum technique.

Practice:

Procedure for manual Staining and Automatic Staining Technique, FNAC technique, Museum technique(Hospital Visit), Post mertum technique(Hospital Visit).

Module- IV (8 Hrs)

Demonstration of instruments used for dissection Use of antiseptics, disinfectants and insecticides in a tissue processing laboratory Reception and labeling of histological specimens Preparation of various fixatives -Helly's fluid, Zenker's fluid, Bouin's fluid, Corney's fluid, 10% Neutral formalin, Formal saline, Formal acetic acid, Pereyn's fluid, prepare 70% alcohol from absolute alcohol. To perform embedding and casting of block.

Practice:

Use of antiseptics, disinfectants and insecticides in tissue processing laboratory, Preparation of various Fixatives, Labeling of Histological specimens, Embedding and Casting of block

Module- V (8 Hrs)

Tissue Processor, Microtomy, Honing and Stropping technique, Use of tissue floating bath, Use of incubator

Practice:

Processing of tissue by manual and automated processor. method To demonstrate various part and types of microtome. To learn sharpening of microtome knife (Honing and stropping technique) To perform section cutting, learn mounting of stained smears. To practice attachment of tissue sections to glass slides To learn using tissue floatation bath drying of sections in incubator (37⁰ C)

Suggested Readings:

1. Color text book of histology by Gartner &Hiatt, publisherElsevier
2. Netter's essential histology by William Ovalle, publisherElsevier
3. Histology E-book by Barry Mitchell, publisherElsevier
4. Textbook of Histology (color atlas) by Krishna Garg, Indira Bahl, Mohini kaul, publisherCBS
5. Textbook of Histology and a Practical Guide by JP Gunasegaran, PublisherElsevier
6. Textbook of Medical Laboratory Technology by Praful B Godkar, Publisher Bhalami
7. Ebook link-
https://books.google.co.in/books?id=qWScAQAAQBAJ&printsec=frontcover&source=gbs_ge_summar_y_r&cad=0#v=onepage&q&f=false

8. Ebook link-
https://books.google.co.in/books?id=MrpEDwAAQBAJ&printsec=frontcover&source=gbs_ge_summa_r_y_r&cad=0#v=onepage&q&f=false
9. Ebook link-
https://books.google.co.in/books?id=CERPDwAAQBAJ&printsec=frontcover&source=gbs_ge_summa_r_y_r&cad=0#v=onepage&q&f=false

DC-5- CUTM1727- Advanced Hematology

Subject Name	Code	Type of course	T-P-Pj	Prerequisite
Advanced Hematology	CUTM1727	Theory+Practice	3-1-0	Fundamental Medical science

Objective

The overall aims are that the student should obtain advanced knowledge of the most common hematologic diseases & understanding the concept of Blood cells and other blood components.

Demonstrate an understanding of the components of human blood and characteristics, functions, and abnormalities and disease states of each.

Demonstrate proficiency in the skills necessary to perform blood cell counts, and evaluation of blood elements within stated limits of accuracy.

Determine suitability of hematology specimens and dispose of them in the appropriate bio-hazard containers.

Course Outcome

Differentiate various hematological procedures and the use of basic equipment essential to working in a Hematology Laboratory.

Discuss differences between Quality control, Quality Assurance, and Continuing Quality Improvement principles as used in the Hematology Laboratory.

Categorize various hematology analyses , operational principles of various hematology instruments, and troubleshooting of various

Explain the principles and theories utilized in a variety of problem-solving situations.

Compare and contrast hematology values under normal and abnormal conditions

Course Outline

Module-I (8 Hrs)

Quality assurance in hematology: Internal and external quality control including reference preparation Routine quality assurance, Protocol, Statistical analysis i.e. Standard deviation, Co-efficient variation, accuracy and precision, Safety precautions in hematology. Basic concepts of automation in hematology with special reference to: Blood cell counter, Coagulometer.

Practice: Collection of blood from different body parts. Data and record Maintain, Handling hematological equipments.

Module-II (12 Hrs)

Bone marrow examination:

1. Composition and functions, Aspiration of bone marrow (Adults and children), Processing of aspirated bone marrow (Preparation & staining of smear)
2. Brief knowledge about examination of aspirated bone marrow (differential cell counts and cellular ratios) .Special Stain for Bone Marrow -Periodic Acid Schiff, Sudan Black
3. Leukemia: Classification, Blood Picture, Differentiation of BlastCells. Laboratory diagnosis of leukaemias , Processing and staining of trephine biopsy specimens.

Practice: Method of aspiration bone marrow, method of Processing and staining of trephine biopsy.

Module-III (10 Hrs)

L.E. cell phenomenon

1. Definition of L.E. cell, Demonstration of L.E. cell by various methods , Clinicals Physiological variations in Hb, PCV, TLC and Platelets. Investigations of a case suffering from bleeding disorders.
2. Quantitative assay of coagulation factors - a. Principle b. Procedure c. Mechanism d. Tests
3. Biomedical waste management in hematology laboratory (Other than Radioactive material)

Practice-: Demonstration of functional aspect of blood cell counter Study the RBCs abnormal morphological form -**a.** Variation in size, shape and staining Character, **b.** Red cell inclusion, **c.** Identify morphologically the- Immature Erythroid series of cells **d.** Immature Myeloid ad other WBCs series of cells

Module-4 (10 Hrs)

Demonstration of various parts of centrifuge; its functioning and care, Cleaning and drying of glass and plastic ware, Cleaning of glass, syringes and its sterilization. Preparation of various anticoagulants, Preparation of buffers, Preparation of the stains and other reagents.

Practice: Use centrifuge machine to separate serum & plasma from whole blood cells, Sterilization, Buffer & stain preparation.

Suggested Readings:

1. Textbook of Medical Laboratory Technology P.B Gotkar Mumbai, Bhalani Publishing House
2. Text book of Medical Laboratory Technology by Paraful B. Godkar, Publisher Bhalani
3. Text book of Medical Laboratory Technology (2nd edition) by V.H Talib, Publisher CBS
4. Atlas of hematology (5th edition) by G.A. McDonald, Publisher Churchill Livingstone
5. Medical Laboratory Technology By K.L Mukharjee, Publisher McGraw Hill education pvtlimited
6. Text book of Medical Laboratory Technology (6th edition) by Ramnik Sood, Jaypee Publication.
7. Ebook link-<https://www.pdfdrive.com/hematology-basic-principles-and-practice-e176384006.html>
8. Ebook link-<https://www.pdfdrive.com/hematology-basic-principles-and-practice-expert-consult-online-and-print-expert-consult-title-online-print-5th-edition-e186195241.html>
9. Ebook link-
<https://books.google.co.in/books?id=6sfacydDNsUC&printsec=frontcover&dq=hematology&hl=en&sa=X&ved=2ahUKEwja9-ve3I7qAhUwzTgGHSMUDekQ6wEwAHoECAQQAQ#v=onepage&q=hematology&f=false>
10. Ebook link-
<https://books.google.co.in/books?id=QQcYAAAAAYAAJ&printsec=frontcover&dq=hematology&hl=en&sa=X&ved=2ahUKEwja9-ve3I7qAhUwzTgGHSMUDekQ6wEwAnoECAIQQAQ#v=onepage&q=hematology&f=false>

DC-6- CUTM1721- Research Methodology

Subject Name	Code	Type of course	T-P-Pj	Prerequisite
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Research Methodology	CUTM1721	Theory+ Project	2-0-1	Fundamental Science
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Objective

To equip students with a basic understanding of the underlying principles of quantitative and qualitative research methods.

Provide students with in-depth training on the conduct and management of research from inception to completion using a wide range of techniques.

Course Outcome

Students can understand the ethical and philosophical issues associated with research in education

This study provides knowledge on various modes of presenting and disseminating research findings.

Enable students to acquire expertise in the use and application of the methods of data collection and analysis.

Provide learning opportunities to critically evaluate research methodology and findings.

Enable students to be reflexive about their role and others' roles as researchers.

Course Outline

Module- I (9

Hrs)

Introduction to Research: Definition, Scope, Limitations, and Types. Objectives of Research. Research Process: Proposal Development: Basic steps involved in the health research proposal development process Literature Review: Importance and Sources, Strategies for gaining access to information, Library search, Computer search.

Research Designs: Research Title and Objectives Criteria for selecting a research title, Formulation of research objectives, Types of research objectives, Qualities of research objective

Module- II (8 Hrs)

Data Collection: Secondary Data, Primary Data, and Methods of Collection. Scaling Techniques: Concept, Types, Rating scales & Ranking Scales, Scale Construction Techniques and Multi-Dimensional Scaling. Sampling Designs: Concepts, Types and Techniques and Sample size Decision.

Module- III (14 Hrs)

Research Hypothesis: Definition, Qualities of research hypothesis Importance and types of research hypothesis. Theory of Estimation and Testing of Hypothesis Small & Large Sample Tests, Tests of Significance based on t, F, Z test and Chi-Square Test. Designing Questionnaire. Interviewing, Tabulation, Coding, Editing. Interpretation and Report Writing.

Project: Writing a review on Nosocomial urinary tract infection.

Writing a research article on antibiotic resistance patterns in wound infections.

Writing a review on Virus culture

Literature survey on Covid-19

Suggested Readings :

1. Research Methodology by C.R. Kothari (3rd Ed)
2. Research Methodology In the Medical & Biological Sciences by Petter Laake et al.
3. Essentials of Research Design and Methodology by Geoffrey Marczyk et al.
4. WHO, Health Research Methodology: A guide for training in research Methods, 2nd Edition, WHO- WIPRO
5. A Student's Guide to Methodology by Clough P and Nutbrown C. Sage Publication.
6. National Ethical Guidelines for Health Research in Nepal, Available at Nepal Health Research Council.
7. Field Trials of Health Interventions in Developing Countries by Smith PG, Morrow.

DC-7 - CUTM1738- Analytical Biochemistry

Subject Name	Code	Type of course	T-P-Pj	Prerequisite
Analytical Biochemistry	CUTM1738	Theory+ Practice	3-2-0	Fundamental Science

Objective

Understanding the concept of Biochemical analyzing instruments both automated and semi automated.

To learn about how to Care & Maintenance of Equipment & Chemicals.

To learn normal ranges of biochemical components in our body.

Clinically relevant biochemical analysis for deeper understanding of all biochemical

components i.e., Proteins, Electrolytes, Hormones etc.

Course Outcome

Understanding of instrumentation technique & principle of spectrophotometry, colometry, photometry and electrolyte analyzer.

To learn about Various tests carried out for biochemical analysis & Hormone investigations.

To learn about safety precautions and handling the equipment in biochemical laboratory.

Course Outline

Module- I (12 Hrs)

Chromatography: Paper, Thin layer, Column, Ion exchange, Affinity chromatography, Gel filtration, Gas Chromatography, HPLC, FPLC

Practice: Handling the Equipments and chemicals used in biochemical laboratory.

Module-II (12 Hrs)

Electrophoresis: Moving boundary, Zone (Paper Gel) electrophoresis, Immuno electrophoresis, Isoelectric focusing, 2-D electrophoresis. Principle, Instrumentation, Specimen preparation and Application of: X-ray diffraction, NMR, ESR

Practice: Estimate Erythrocyte sedimentation rate

Module- III (26 Hrs)

Principle and Application of: Fully Automated Biochemistry Analyser, Semi- automated Biochemistry Analyser, Coagulometer. Method of estimation and assessment for: a. Glucose tolerance test. Clearance test for renal function. Gastric analysis, LFT, KFT, Lipid profile, Qualitative test for Urobilinogens, Renal calculi, Barbiturates, T3, T4 and TSH, 17 Ketosteroids. Principles, clinical significance and procedures for estimation, of Acid phosphatase, Alkaline phosphatase, Lactate dehydrogenase, Aspartate transaminase, Alanine, transaminase and Creatine phosphokinase.

Practice: Glucose Tolerance Test, Clearance Test, Gastric juice collection, Gastric Analysis, Kidney Function Test, Liver Function Test, Lipid Profile, Renal calculi, Hormone Test

Suggested readings:

1. Handbook of Christen Medical Association, India (CMAI) Medical Laboratory Technology- Robert H.Carman. 2nd Edn. CMAI, New Delhi.
2. Text book of Medical Laboratory Technology, P.B. Godkar 2nd Edn. Bhalani Publication.
3. Handbook of Biochemistry by M. A. Siddique 8th Edn. Vijay Bhagat Scientific Book
4. Principle of Biochemistry by Lehninger
5. Biochemistry by Voet&Voet
6. Biochemistry by Stryer
7. Biochemistry of Metabolic process by Asim Kumar Roy, Kalyani Publication
8. Ebook link-
https://www.cartercenter.org/resources/pdfs/health/ephti/library/lecture_notes/health_science_students/medicalbiochemistry.pdf
9. Ebook link-
https://books.google.co.in/books?id=Je_pJfb2r0cC&printsec=frontcover&source=gbs_ge_summary_r&cad=0#v=onepage&q&f=false
10. Ebook link-
https://books.google.co.in/books?id=csPcDAAAQBAJ&printsec=frontcover&source=gbs_ge_summary_r&cad=0#v=onepage&q&f=false
11. Ebook link-
https://books.google.co.in/books?id=2FkXAwAAQBAJ&printsec=frontcover&source=gbs_ge_summary_r&cad=0#v=onepage&q&f=false

DC8-CUTM1749-Applied Hematology

Subject Name	Code	Type of course	T-P-Pj	Prerequisite
Applied Hematology	CUTM1749	Theory+Practice	3-2-0	Basic Medical science

Objective

The overall aims are that the student should obtain advanced knowledge of the most common hematologic diseases & understanding the concept of Blood cells and other blood components.

Demonstrate an understanding of the components of human blood and characteristics, functions, and abnormalities and disease states of each.

Demonstrate proficiency in the skills necessary to perform blood cell counts, and evaluation of blood elements within stated limits of accuracy.

appropriate bio-hazard containers.

Course Outcome

The students be made aware of Safety precautions, Quality assurance, biomedical waste management and automation in haematology. It will also cover Red cell abnormalities, Disorder of leukocytes, Investigations of a case suffering from bleeding disorders, To learn about tests carried out for hematological investigations.

Understanding of Haemopoietic disorders, laboratory diagnosis of leukemia, hemolytic anemia.

Collection & preservation of blood for the investigations.

Course Outline

Module-I (12 Hrs)

Laboratory diagnosis of leukaemias Definition and laboratory diagnosis of Leukamoid reactions. Cytochemical staining, procedure and their significance in various haemopoietic disorders. Laboratory diagnosis of iron deficiency anaemia, Laboratory diagnosis of megaloblastic anaemia ,Laboratory diagnosis of haemolytic anemia.

Practice: Collection of blood from different body parts. Data and record Maintain, Handling hematological equipments, Demonstrate the different abnormal morphology of RBCs in Anemia cases.

Module-II (8 Hrs)

Chromosomal studies in various hematological disorders and their significance. Mechanism of normal fibrinolysis and Laboratory diagnosis of hyperfibrinolysis. Mechanism and laboratory diagnosis of disseminated intravascular coagulation (DIC).

Practice: Laboratory diagnosis of Hyperfibrinolysis (D- dimer Method), laboratory diagnosis of disseminated intravascular coagulation (DIC)

Module-III (14 Hrs)

Laboratory diagnosis of Hemophilia and von-will brand disease. Laboratory diagnosis of Idiopathic thrombocytopenic purpura (ITP), Platelet function tests and their interpretation.

Practice: Complete Blood Count, Total Platelet Count, Bleeding time, Clotting time, Activated Partial Thromboplastin Time (APTT) Test, Prothrombin Time (PT)

Module-IV (12 Hrs)

Measurement of:

1. Blood volume, b. Determination of Red cell volume and Plasma volume, c. Red cell life span,
2. Platelet life span. Estimate serum iron, total iron, Hb-F, Plasma and urine hemoglobin. Demonstrate the presence of Hb-S by Sickling and solubility, Perform various Platelet function test.

Practice: Demonstration the sickle cells ,To estimate serum iron and total iron binding capacity. To estimate Hb-F in a given blood sample. To estimate plasma and urine. Haemoglobin in the given specimens. To demonstrate the presence of Hb-S by Sickling and solubility tests.

Suggested Readings:

1. Textbook of Medical Laboratory Technology P.B Gotkar Mumbai, Bhalani Publishing House
2. of Medical Laboratory Technology by Paraful B. Godkar, Publisher Bhalani
3. Text book of Medical Laboratory Technology (2nd edition) by V.H Talib, Publisher CBS
4. Atlas of hematology (5th edition) by G.A. McDonald, Publisher Churchill Livingstone
5. Medical Laboratory Technology By K.L Mukharjee, Publisher McGraw Hill education pvtlimited
6. Text book of Medical Laboratory Technology (6th edition) by Ramnik Sood, Jaypee Publication.
7. Ebook link-<https://www.pdfdrive.com/hematology-basic-principles-and-practice-e176384006.html>
8. Ebook link-<https://www.pdfdrive.com/hematology-basic-principles-and-practice-expert-consult-online-and-print-expert-consult-title-online-print-5th-edition-e186195241.html>
9. Ebook link-
<https://books.google.co.in/books?id=6sfacydDNsUC&printsec=frontcover&dq=hematology&hl=en&sa=X&ved=2ahUKEwja9-ve3I7qAhUwzTgGHSMUDekQ6wEwAHoECAQQAQ#v=onepage&q=hematology&f=false>
10. Ebook link-
<https://books.google.co.in/books?id=QQcYAAAAAYAAJ&printsec=frontcover&dq=hematology&hl=en&sa=X&ved=2ahUKEwja9-ve3I7qAhUwzTgGHSMUDekQ6wEwAnoECAIQQAQ#v=onepage&q=hematology&f=false>

DC-9- CUTM1750- Immunopathology

Subject Name	Code	Type of course	T-P-Pj	Prerequisite
Immunopathology	CUTM1750	Theory+ Project	3-0-1	Fundamental Science

Objective

To understand how the immune system is working, about the components of the immune system, their functioning, the defense mechanisms against different pathogens (viruses, bacteria, and parasites), the pathogenesis of immune diseases (hypersensitivity, autoimmunity, immunodeficiencies), and on the mechanisms underlying the rejection of the transplants and the antitumor immune response.

It also provides knowledge of the main immunological techniques used in research and diagnostics.

Course Outcome

To know and describe the organization and functioning of the immune system, its cells and its molecules.

To know the principles of diagnostic tests described on immunological techniques.

To know the fundamental stages of the immune system and its changes over the course of life (intrauterine life, newborn, adult, elderly)

The conceptual understanding of the subject provides opportunities for employability

Course Outline

Module I (7 Hrs)

Basic Components of the Immune System, Immunological Techniques, Immune Regulation, Immunological Aspects of Infection, Immunological Aspects of Immunodeficiency Diseases.

Module II (8 hrs)

Autoimmunity, Blood related disorder, Chronic Lymphocytic Leukemia, Immunology of HIV Infections and other viral infection, Immunological Aspects of Allergy and Anaphylaxis, Immunological Aspects of Skin and venereal Diseases.

Module III (10 hrs)

Experimental Approaches to the Study of Autoimmune Rheumatoid Arthritis Diseases, Immunological Aspects of Cardiac Disease, Immunological Aspects of Chest Diseases Pulmonary Tuberculosis

(MDRT), and XDRT, Immunological Aspects of Gastrointestinal and Liver in case of Hepatitis, Immunological Aspects of Endocrine Disease (Thyroid, diabetes, hypertension), Immunological aspects of organ transplantation.

Suggested Readings:

1. Text book of Microbiology by Ananthanereyan&Paniker, Publisher Universitiespress
2. Short text book of Medical microbiology by Satish Gupte, Publisher Jaypeebrothers
3. Medical laboratory Technology vol.I ,II, III by K L Mukherjee, Publisher McGraw Hill education
4. Medical Laboratory manual for tropical countries Vol II Microbiology by MoniaCheesbrough, publisher Butterworth Heinemannltd
5. Immunology by Ivan Roitt, JonathaanBrostoff and DavidMale.

DC-10- CUTM1748- Parasitology

Subject Name	Code	Type of course	T-P-Pj	Prerequisite
Parasitology	CUTM1748	Theory+Practice	3-2-0	Fundamental Science

Objective

Describe basic morphology, life cycle, pathogenesis, lab diagnosis and treatment of parasites (Protozoa, metazoa and Helminth)

Perform appropriate laboratory techniques used in the processing of specimens and identification of parasites.

Course Outcome

Identification of pathogenic parasite in disease diagnosis and treatment.

The conceptual understanding of the subject provides opportunities for employability and scopes for higher education.

To serve as a resource for the clinical laboratories professionals in the different region.

Course Outline

Module-I

Introduction to Medical Parasitology, General characteristics and classification of protozoa and helminthes. Collection, Transport, processing and preservation of samples for routine parasitological investigations.

Practice: Method of sample Collection, Transport, processing and preservation of samples for routine parasitological investigations.

Module II

Morphology, life cycle and lab diagnosis of *Giardia* and *Entamoeba*, *T.solium*, *T.saginata*, malaria parasite with special reference to *P. vivax* and *P. falciparum* and *Leishmania donovani* (Kala azar). Morphology, life cycle and lab diagnosis of hook worm and round worm (*Ascaris lumbricoides* and *Anchylostoma duodenale*).Most common symptoms of parasitic infection and diagnosis and treatment methods. Procedures used in microscopic examination of stool from a parasitic infected individual.

Practice: Routine Stool examination for detection of intestinal parasites. Concentration techniques for demonstration of Ova (Principles and applications). Identification of adult worms from model's or slide's method.

Module III

Laboratory Diagnosis of Various Parasites: Direct method, Indirect method. Rapid Diagnostic Tests (RDTs), Quantitative buffy coat assay (QBC), Malaria Rapid diagnostic test (MRDT), Leishmanin test.

Practice: Demonstration of some rapid diagnostic method used for parasite identification.

Suggested Readings:

1. Textbook of medical Parasitology. (e-book link-<https://www.pdfdrive.com/textbook-of-medical-parasitology-textbook-of-medical-parasitology-e128716897.html>)
2. Parasitology book by K.D. Chatterjee. (e-book link-<https://sites.google.com/site/bkthtrpazg/atahrgiwu>, <https://www.goodreads.com/book/show/24366965-parasitology-protozoology-and-helminthology-with-two-hundred-fourteen>)

DC-11- CUTM1742- Basic Computer and Information Science

Subject Name	Code	Type of course	T-P-Pj	Prerequisite
Basic Computer and Information Science	CUTM1742	Practice	0-2-0	Fundamentals of Computer

Objective

Identify the function of computer hardware components.

Identify the factors that go into an individual or organizational decision on how to purchase computer equipment.

Identify how to maintain computer equipment and solve common problems relating to computer hardware.

Identify how software and hardware work together to perform computing tasks and how software is developed and upgraded

Identify different types of software, general concepts relating to software categories, and the tasks to which each type of software is most suited or not suited.

Course Outcome

Understand the fundamental hardware components that make up a computer's hardware and the role of each of these components.

Understand the difference between an operating system and an application program, and what each is used for in a computer.

Describe some examples of computers and state the effect that the use of computer technology has had on some common products

Course Outline

Module- I

Introduction to computer: introduction, characteristics of computer, block diagram of computer, generations of computer. Types of Input output devices. Processor and memory: The Central Processing Unit (CPU), main memory. Storage Devices.

Module- II

Introduction to MS-Word: introduction, components of a word window, creating, opening and inserting files, editing a document file, page setting and formatting the text, saving the document, spell checking, printing the document file, creating and editing of table, mail merge. Introduction to Excel: introduction, about worksheet, entering information, saving workbooks and formatting, printing the worksheet, creating graphs. Introduction to power-point: introduction, creating and manipulating presentation, views, formatting and enhancing text, slide with graphs.

Module- III

Introduction to MS-DOS: History of DOS, features of MS-DOS, MS-DOS Commands (internal and external). Introduction of windows: History, features, desktop, taskbar, icons on the desktop, operation with folder, creating shortcuts, operation with windows (opening, closing, moving, resizing, minimizing and maximizing, etc.). Computer networks: introduction, types of network (LAN, MAN, WAN, Internet, Intranet), network topologies (star, ring, bus, mesh, tree, hybrid). Internet and its Applications: definition, brief history, basic services (E-Mail, File Transfer Protocol, telnet, the World Wide Web (WWW)), www browsers, use of the internet.

Suggested readings:

1. Objective Computer Awareness
2. Computer Networking (Global Edition)

DC-12 - CUTM1725- Blood Banking

Subject Name	Code	Type of course	T-P-Pj	Prerequisite
Blood Banking	CUTM1725	Theory+ Project	3-0-1	Fundamental Science

Objective

<p>Understanding blood bank method, demonstrate knowledge of testing</p> <p>Knowledge of Anticoagulant used in blood bank</p> <p>Get knowledge about blood regulation policy</p> <p>Understanding solid organ transplantation and it's policy</p> <p>Basic of transfusion reaction</p>
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Investigation related to blood bank

Course Outcome

Perform phlebotomy and related donor room activity in blood bank

Manage the blood bank

Identifies and communicate abnormal test report by alerting supervisory personal

Organize blood donation blood bank

Inventory and stock management in blood bank

Perform and maintain record of QC procedure related reagents, kits and equipments.

Course Outline

Module-I (11 Hrs)

Basic principle in blood banking, Blood bank organisation, Planning and documentation, NACO Blood bank policy, National blood policy, Equipment used in blood bank. Anticoagulant use in blood bank, Selection of blood donor, Rhesus blood group system, Human blood group system

Practice: Documentation, ABO Grouping, RH Typing, Operation of equipment.

Module-II (14 Hrs)

Auto-mentation technique used in blood bank, Techniques used for the separation of blood constituent, CBC, Blood preservation, Special investigation for processing of blood under the guide lines of NACO, Routine investigation for processing of blood, Phlebotomy in blood bank, Quality control in blood bank

Practice: Phlebotomy in blood bank, Cross matching and compatibility test, Measurement of Blood Pressure, Arrangement of blood bank lab

Module-III (20 Hrs)

Blood transfusion alternative, Prevention of diseases transmitted through blood transfusion, Transfusion reaction investigation, Transfusion reaction, Precaution taken for infusion of blood components, Pre-transfusion testing, Transfusion in solid organ transplantation, Exchange blood transfusion, Pre-surgical

blood transfusion, Blood and blood components transfusion, Selection of blood components, Apheresis and Hemapheresis

Practice: Routine hematological test, HIV, VDRL, Hbs-Ag, Other STD Test

Suggested Readings:

1. Textbook of Clinical laboratory methods and diagnosis by Gradwohls, Publisher Mosby
2. Modern Blood Banking and transfusion Practice by Denise M Harming
3. Standards of blood bank by NACO (<http://naco.gov.in/sites/default/files/Standards%20for%20Blood%20Banks%20and%20Blood%20Transfusion%20Services.pdf>)
4. Handbook of blood banking and transfusion medicine (<http://www.uomisan.edu.iq/library/admin/book/77040715888.pdf>)
5. Medical laboratory technology Vol.1 by K. L. Mukherjee, 2007, Publisher Tata McGrawHill
6. Textbook of medical laboratory technology by Praful B Godkar, Publisher Bhalan
7. Medical laboratory science theory and practice by J Ochei and Kolhatkar, 2002, Tata McGraw- Hill, Publisher TBS

DC-13- CUTM1751- Medical Laboratory Management

Subject Name	Code	Type of course	T-P-Pj	Prerequisite
Medical Laboratory Management	CUTM1751	Theory+ Project	3-0-2	Fundamental Science

Objective

<p>Explain and apply principle of effective test utilization</p> <p>Interpret, implement and complying law, regulation, accrediting standards and guidelines of Govt. and NG organizations.</p> <p>Design, implement and evaluate resources in lab</p> <p>Communicate effectively with laboratory personnel and health care professional.</p> <p>Explain and apply the major principle and tactics of laboratory administration.</p>
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Course Outcome

Become professional competent in medical laboratory
Exhibit a sense of commitment to the ethical and human aspect of patient care
Recognize the role of clinical laboratory scientist in the assurance of quality health care
Application of safety and governmental regulation and standards as applied to medical laboratory practice.

Course Outline

Module-I (16 Hrs)

Ethics of pathological clinics, Code of conduct for medical laboratory personal, Safety measure in the laboratory, Organization of Pathology laboratory under board of quality control, Clinical laboratory science, Functional components of the clinical laboratory, A Standardized clinical laboratory set up, Various types of laboratories, PPE in labs, Important instruction to minimize infection in laboratory workers

Practice: PPE Practice, Lab Setup, Sample collection and preservation.

Module-2 (16 Hrs)

Release of laboratory reports, Clinical alerts , Reporting results: Basic format of pathology reports, Transportation and preservation of lab sample, Patient management for clinical sample collection, National and international agency for clinical laboratory accreditation, Good laboratory practice, Medical legal problems, Laboratory regulation, Factors affecting productivity of laboratory, Responsibility of lab worker

Practice: Report writing, Lab record management

Module-3 (14 Hrs)

Quality management system, NABL Policy, Clinical establishment act policy, Annual maintenance contact for laboratory, General safety precautions in case of STD and drug resistant tuberculosis, Procurement and supply management, Different types of laboratory record management, Laboratory information management system (LIMS), Profit and loss analysis, WHO Policy for medical lab

Practice: Management information system, Procurement management, Profit and loss analysis

Suggested Readings:

1. Textbook of Clinical laboratory methods and diagnosis by Gradwohls, Publisher Mosby
2. Medical laboratory technology Vol.1 by K. L. Mukherjee, 2007, Publisher Tata McGrawHill
3. Textbook of medical laboratory technology by Praful B Godkar, Publisher Bhalan
4. Medical laboratory science theory and practice by J Ochei and Kolhatkar, 2002, Tata McGraw- Hill, Publisher TBS

DC-14 - CUTM1753- Introduction to Quality and Patient Safety

Subject Name	Code	Type of course	T-P-Pj	Prerequisite
Introduction to Quality and Patient Safety	CUTM1753	Theory+ Project	3-0-2	Fundamental Science

Objective

Knowing patient safety Report Distribution system Laboratory infection control Policy Bio-Medical waste management Understanding Patient rights ISO Policy for medical laboratory
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Course Outcome

Know about rights and duties of patient Know about right and duties of lab technician Understand various policy to manage lab Understand infection control procedure

Course Outline

Module-I (11

Hrs)

Human factor Engineering, Patient safety, Health literacy, Report distribution system,

Error in reporting system, responding to adverse events, Investigation of error/ Root cause analysis, Medical Error, The science of safety

Practice: Safety precaution in laboratory, Report distribution, Prescription reading

Module-II (11 Hrs)

Team work and communication, Leadership, Quality control policy, Major development and evaluation in diagnostic division, Clinical establishment act policy, National accreditation board of laboratory, ISO Policy for medical laboratory, Fire and safety policy for medical laboratory

Practice: Fire Safety in lab, Documentation for Lab establishment

Module-III (13 Hrs)

Personal protective equipment in the laboratory, AIDS and laboratory safety, Safety protection in lab in STD and other infectious disease., Biomedical waste management, Patient care in medical laboratory, Patient rights., Counselling of patient during phlebotomy, First aid in medical laboratory service.

Practice: PPE, Bio-Medical waste management, First-Aid, Patient Counseling

Suggested Readings:

1. Understanding the patient safety (LANGE clinical medicine)
2. Textbook of Clinical laboratory methods and diagnosis by Gradwohls, Publisher Mosby
3. Medical laboratory technology Vol.1 by K. L. Mukherjee, 2007, Publisher Tata McGrawHill
4. Textbook of medical laboratory technology by Praful B Godkar, Publisher Bhalan
5. Medical laboratory science theory and practice by J Ochei and Kolhatkar, 2002, Tata McGraw- Hill, Publisher TBS

DC-15 - CUTM1752- Mycology & Virology

Subject Name	Code	Type of course	T-P-Pj	Prerequisite
Mycology and virology	CUTM1752	Theory+ Practice	3-2-0	General biology

Objective

To describe the characteristics and diseases caused by pathogenic viruses and fungi.
To perform basic laboratory techniques in mycology, to isolate fungus from clinical samples.
Understanding different methods of virus cultivation.
Understanding collection, transportation and preservation methods of clinical specimen.

Course Outcome

Broad idea about structure and basic characteristics of virus and fungus.
Plan, write and implement research projects in virology and mycology analyze their results and publish these in peer-reviewed journals.
Coordinate with concerned agencies regarding viral and fungal diseases and their outbreaks.
Plan and execute epidemiological studies and provide advice in relation to viral diseases.

Course outline

Module I

Introduction to medical mycology, Basic concepts about superficial and deep Mycoses. Taxonomy and classification and general characteristics of various medically important fungi. Normal fungal flora. Morphological, cultural characteristics of common fungal laboratory contaminants, Culture media used in mycology and staining process.

Practice-: To prepare culture media used routinely in mycology. To perform all the staining techniques for identification of fungi as mentioned in theory syllabus.

Module II

Direct microscopy in Medical mycology laboratory. Processing of clinical samples for diagnosis of fungal infections i.e. Skin, nail, hair, pus, sputum, CSF and other body fluids. Techniques used for isolation and identification of medical important fungi Methods for identification of yeasts and moulds.

Practice-: To identify given yeast culture (By performing various identification techniques studied in theory). To identify given mould culture (By performing various identification techniques studied in theory). To demonstrate dimorphism in fungi. To process clinical samples for laboratory diagnosis of fungal infection that is from skin, hair and nail etc.

Module III

Introduction to medical virology, Classification of viruses. Introduction to medically important viruses (Both DNA and RNA). Collection, transportation and storage of sample for viral diagnosis .Staining techniques used in Virology. Processing of samples for viral diagnosis (Egg inoculation and tissue culture). Antiviral drugs.

Practice: Demonstration of fertilized hen egg. Demonstration of various inoculation routes in fertilized hen egg.

Suggested Readings:

1. Bailey & Scott's Diagnostic Microbiology (e-book-<https://www.pdfdrive.com/bailey-scotts-diagnostic-microbiology-e187863782.html>)
2. Basic virology by Edward K. Wagner. (e-book -<https://www.pdfdrive.com/basic-virology-e18900518.html>)
3. Essential in clinical microbiology by C A Kauffman and J D Sobel, 2nd Ed. (Ebook-link-<https://www.pdfdrive.com/essentials-of-clinical-mycology-second-edition-e39564930.html>)

DC-8- CUTM1754- Mini Project

Subject Name	Code	Type of course	T-P-Pj	Prerequisite
Mini Project	CUTM1754	Project	0-0-2	Basic Medical science

The student is supposed to carry out project work in assistance with a mentor. The project should be relevant to the syllabus and should be qualitatively initiated towards fetching a research publication/ case study/ clinical study/ community service/ survey on successful completion within the stipulated time.

Outcome: Research paper publication/ new idea generation/ case study/ clinical study/ community service/ survey.

DC-18- CUTM1756 - Project

Subject Name	Code	Type of course	T-P-Pj	Prerequisite
Project	CUTM1756	Project	0-0-12	Basic Medical science

Project work:

Suggested Project title

1. Antibacterial activity of sweet orange (citrus sinensis) on Staphylococcus aureus and Escherchia coli isolated from wound infected.
2. The incidence of Salmonella and Escherchia coli in livestock (Poultry) feeds
3. Microbial evaluation of milk from a dairy farm.
4. Gastroenteritis in primary school children (6-12yr) of specific locality.
5. Comparative analysis of microbial load of the main water production and water available to CUTM campus

DC-17- CUTM1755 - Internship

Subject Name	Code	Type of course	T-P-Pj	Prerequisite
Internship	CUTM1755	Project	0-0-12	Basic Medical science

Internship Thesis Guideline

This Guideline is designed to provide students the knowledge and practice of public health research activity, to enable them to carry out researches and solve research related problems and to help them in writing thesis and defend their work. Upon successful completion of the course, the students shall be able to:

1. Search relevant scientific literature
2. Develop a research proposal
3. Employ appropriate data collection techniques and tools
4. Manage collected data
5. Analyze data with appropriate statistical techniques
6. Write thesis
7. Defend the findings

Proposal Development:

At the ending of third year (Sixth Semester), students individually consultation with designated faculties and extensive literature survey will develop research proposal during the initial 6 months period.

Data Collection/ Thesis Writing:

Students will carry out data collection, data management, data analysis, and thesis writing during the remaining period (Six Semester).

The Dissertation should have following format:

1. Title
2. Introduction
3. Materials and Methods
4. Results
5. Discussion
6. Conclusion
7. Recommendation
8. References
9. Appendix

Internship

4. Case record
5. Lab management and ethics
6. Evaluation -Guide(internal)
 - Industries guide(external)
 - University-project report/ Viva

**CENTURION UNIVERSITY OF TECHNOLOGY AND MANAGEMENT,
ODISHA**

SCHOOL OF PARAMEDICS & ALLIED HEALTH SCIENCES



Centurion
UNIVERSITY

Shaping Lives...
Empowering Communities...

MASTEROFSCIENCEINAPPLIED&CLINICALMICROBIOLOGY

2021

SYLLABUS

M.Sc.inAppliedandClinicalMicrobiology

Preface: Medical microbiology is the branch of medical science concerned with the prevention, diagnosis and treatment of infectious diseases. In addition, this field of science studies various clinical applications of microbes for the improvement of health. There are four kinds of microorganisms that cause infectious disease: bacteria, fungi, parasites and viruses and one type of infectious protein called Prion.

A medical microbiologist studies the characteristics of pathogens, their modes of transmission, mechanism of infection and growth. Using this information, a treatment can be revised.

Medical microbiologist often serves as a consultant to a physician, providing identification of a pathogen and suggesting a treatment option.

Scope: M. Sc in Applied and Clinical Microbiology gives opportunity for specialized study in the field of medical & clinical microbiology. Candidates who successfully complete M. Sc in Applied and Clinical Microbiology course may obtain jobs as

- Specialized technologist in Microbiology or supervisor of clinical laboratories in hospitals.
- Laboratory scientists in Biomedical and research institutes.
- Teachers in training institutes of Medical Laboratory Technology/graduate & postgraduate programme of microbiology & related areas.
- Utilize or apply the concepts, theories and principles of laboratory science.
- Demonstrate the ability to plan and effect the change in laboratory practice and health care delivery system.
- Establish collaborative relationship with members of other disciplines.
- Demonstrate interest in continued learning and research for personal and professional advancement.
- Be able to interpret or guide the development of medical diagnostics in need locally and cheaply
- Be able to manage and guide appropriately equipped and staffed clinical microbiology laboratories
- Be a highly skilled human resource for the emerging pharmaceutical/medical industry
- Be able to participate in supervised or team-research in universities, industry or government
- Demonstrate advanced knowledge in the fields of Clinical Microbiology and Immunology, with excellent skills to teach and communicate this knowledge
- Demonstrate independent critical and analytical thinking, both within their field of study, and beyond, for the use of their knowledge for service to others.
- Be able to guide patient care and the public on the pathology, pathogenesis and

clinical manifestation, mode of transmission, prevention and current control methods for infections of public health importance

- Be a highly skilled human resource in the management of an increasing number of patients with tissue/Organ transplants, Cancers and immunodeficiencies

- Be able to critique and evaluate the impact of the existing national disease control programmes on the epidemiology of infectious diseases and advise on improving them
- Have acquired critical and analytical skills required for further studies in specialized areas of microbiology or related studies
- Identify and suggest possible solutions to ethical dilemmas that occur in their work and field of study, and understand the importance of professional ethics in all aspects of scientific communication and laboratory work
- Demonstrate competence in the laboratory, including application of the scientific method and appropriate use of basic and state-of-the-art laboratory tools and techniques
- Demonstrate written and oral skills necessary for communication of research, knowledge, and ideas to scientists and non-scientists alike

Programme: M.Sc. in Applied and Clinical Microbiology

Duration: Two years (Four semesters) full-time programme with 6 months internship in the last semester.

Eligibility: Bachelor's degree in any branch of Life Science / Agriculture / Pharmacy / Veterinary / Medicine (MBBS/BDS).

Examination: Examination rules will be as per guideline of CUTME Examination handbook.

Mini Project: A candidate will have to carry out a mini project work as mentioned in the course structure. After completion of the mini project, the student has to submit the dissertation of the mini project. Internal evaluation of the same (consisting of presentation and viva-voce) will be conducted by the respective School.

Internship: A candidate will have to undergo internship for a period of six calendar months in a hospital / Diagnostics Centre / Research Institution equipped with modern laboratory facility, which fulfills the norms decided by the University. Dissertation will be compulsory to all students. Students will carry out dissertation work individually or in the group of not more than three students. The format for dissertation / Internship report will be similar to the research thesis style; incorporating chapters on: Introduction, Materials and Methods, Results and Discussion and References / Bibliography. The dissertation will be submitted in a typed written and bound form.

Degree: The degree of M. Sc. in Applied and Clinical Microbiology course of the University shall be conferred on the candidates who have pursued the prescribed course of study for not less than two academic years and have passed examinations as prescribed under the relevant scheme and completed 6 months of compulsory internship in the last semester.

On successful completion of two years programme, with a minimum course credit of **96 credits**, the

candidate will be awarded with “**Master of Science in Applied and clinical microbiology (M.Sc.CMB)**” from Centurion University.

**Master of Science in Applied and Clinical Microbiology
Programme structure**

BASKET 1	BASKET 2	BASKET 3	BASKET 4	TOTAL CREDITS
School Core Courses	Discipline Core Courses	Ability Enhancement Compulsory Course (AECC) To be selected from University Basket	Skill Courses (To be selected from University Basket)	
SC-1	DC-1	AECC-I	SFS-1	
SC-2	DC-2	AECC-II	SFS-2	
SC-3	DC-3		SFS-3	
SC-4	DC-4			
SC-5	DC-5			
SC-6	DC-6			
SC-7	DC-7			
SC-8	DC-8			
	DC-9			
	DC-10			
28 Credits	50 Credits	6 Credits	12 Credits	96 Credits (Minimum Credits required)

Master of Science in Applied and Clinical Microbiology

Programme structure

SEMESTER	BASKET 1	BASKET 2	BASKET 3	BASKET 4
	School Core Courses	Discipline Core Courses	Ability Enhancement Compulsory Course (AECC) To be selected from University Basket	Skill Courses (To be selected from University Basket)
I	SC-1 SC-2 SC-3 SC-4	DC-1		SFS-1

II	SC- 5SC- 6SC- 7	DC- 2DC- 3DC- 4	AECC- IAECC- II	SFS-2
III	SC-8	DC- 5DC- 6 DC-7 DC-8	AECC-III	SFS-3
IV		DC- 9DC- 10		
Minimum Credits required (96 Credits)	28 Credits	50 Credits	6 Credits	12 Credits

BASKET I
School Core Courses

Sl.No.	CODE	SUBJECT	SUBJECT TYPE (T+P+Pj)	CREDITS
SC-1	CUTM1708	Human Anatomy and Physiology	2+1+0	3
SC-2	CUTM1709	Analytical Techniques	3+1+0	4
SC-3	CUTM1710	Biological Chemistry	2+1+0	3
SC-4	CUTM1712	Clinical Hematology	3+1+0	4
SC-5	CUTM1715	Clinical Pathology	3+1+0	4
SC-6	CUTM1714	Cell and Molecular Biology	2+0+1	3
SC-7	CUTM1718	Clinical Biochemistry	2+1+0	3
SC-8	CUTM1720	Histology	3+1+0	4

BASKET II
Discipline Core Courses

Sl.No.	CODE	SUBJECT	SUBJECT TYPE (T+P+Pj)	CREDITS
DC-1	CUTM1711	General Microbiology	3+1+0	4
DC-2	CUTM1713	Systematic Bacteriology	3+1+0	4
DC-3	CUTM1717	Applied Microbiology	2+1+0	3
DC-4	CUTM1716	Medical Parasitology and Mycology	3+2+0	5
DC-5	CUTM1719	Immunology & Virology	3+2+0	5
DC-6	CUTM1722	Clinical Bacteriology	3+1+0	4
DC-7	CUTM1721	Research Methodology	2+0+1	3
DC-8	CUTM1754	Mini Project	0+0+2	2
DC-9	CUTM1755	Internship		12
DC-10	CUTM1756	Project		12

NOTE: Along with the School core and Discipline core subjects, the students need to opt for AECC Courses, Skill/ Domain/ Elective courses and value-added courses from the University Basket, as per the requirement by the University.

BASKETI
School Core Courses
SC1-CUTM1708-Human Anatomy and Physiology

Subject Name	Code	Type of course	T-P-Pj	Prerequisite
Human Anatomy and Physiology	CUTM1708	Theory+Practice	2-1-0	Fundamental Science

Objective

- To identify different types of cells and describe their functions.
- To identify the organelles of a typical cell and describe their functions.
- To identify the major components of the integumentary system and describe their functions.
- To identify the major structures of the skin and describe their functions.
- To identify the major components of the skeletal system and describe their functions.
- To identify the major components of the circulatory, endocrine, nervous system etc and describe their functions.

Course Outcome

- Use anatomical terminology to identify and describe locations of major organs of each system covered.
- Explain interrelationships among molecular, cellular, tissue, and organ functions in each system.
- Describe the interdependency and interactions of the systems.
- Explain contributions of organs and systems to the maintenance of homeostasis.
- Identify causes and effects of homeostatic imbalances.
- Describe modern technology and tools used to study anatomy and physiology.

Course Outline

Module-I (10 Hours)

Scope of Anatomy and physiology. Terms and terminology used in Anatomy. Structure of cell, function of its components with special reference to mitochondria and microsomes.

Elementary tissues: Anatomy of epithelial tissue, muscular tissue, connective tissue and nervous tissue.

Skeletal System: Skeleton system with classification, types of bone, features of long bone, ossification, blood supply, Joints – classification with examples, structure of typical synovial joints, Joint disorders.

Practice: Demonstration of individual bone from skeleton.

Identification of different organs and system from chart.

Module-II(13Hours)

Cardiovascular System: Composition and functions of blood. Blood groups – ABO system and Rh factor and coagulation of blood. Brief information regarding disorders of blood. lymph – origin, circulation, functions of lymph and lymph nodes. Structure and functions of various parts of the heart. Blood pressure and its recording. Brief information about cardiovascular disorders.

Respiratory system: Introduction and functional anatomy of respiratory tract, physiology of respiration.

Practice: Demonstration of the morphology of different blood cells

Measurement of Blood pressure, impulses, Heartbeats, respiration rate etc.

Module-III(15Hours)

Urinary System: Various parts of urinary system and their functions, structure and function of kidney. Physiology of urine formation. Patho-physiology of renal diseases and edema.

Digestive System: Anatomy of digestive system and their functions. Structure and function of liver, physiology of digestion and absorption.

Endocrine System: Endocrine glands and Hormones. Reproductive system. Structure and function of sense organs.

Practice: Demonstration of various parts of body, tissues of body, parts of

digestive system, parts of respiratory system, parts of excretory system. Identification of different organs and system from chart

Suggested Readings:

1. Textbook Anatomy & Physiology for nurses by Evelyn Pearce, Publisher Faber & Faber.
2. Textbook Anatomy and Physiology for nurses by Sears, Publisher Edward Arnold.
3. Anatomy & Physiology- by Ross and Wilson, Publisher Elsevier.
4. Anatomy & Physiology: Understanding the human body by Clark, Publisher Jones & Bartlett.
5. Anatomy and Physiology for nurses by Pearson, Publisher Marieb & Hoehn.
6. Anatomy and Physiology by N Murgesh, Publisher Satya

SC2-CUTM1709- Analytical Techniques

Subject Name	Code	Type of course	T-P-Pj	Prerequisite
Analytical Techniques	CUTM1709	Theory+Practice	3-1-0	Fundamental Science

Objective

To learn the principle, instrumentation & application of Microscopy
Principle, instrumentation & application of Centrifugation
Chromatographic techniques
Electrophoretic techniques
Principle of Spectroscopy

Course Outcome

After completion of the course the student will be efficient in handling the microscopy equipment's.

They will also be able to have an idea about handling instruments like centrifuge, spectrophotometer, chromatography, flow cytometer, Automated and semi-automated Biochemistry analyzer.

They will gain knowledge on the principle behind and the application of NMR, X-ray diffraction, ESR.

The conceptual understanding of the subject provides opportunities for skill enhancement and scopes for higher education.

Course Outline

Module-I

Microscopic techniques: Principle, Instrumentation, Specimen preparation and Application: Phase-contrast microscopy, fluorescence microscopy, polarization microscopy, electron microscopy (Scanning and Transmission);

Bacterial Colony Counter (Principle and working).

Microtomy: Sectioning, Staining. Application.

Cytometry: Types, Flow cytometry and its applications.

Practice: Demonstration of different Microscopes with their operation.
Preparing specimens for observing under microscopes.
Demonstration of Microtome.

Module-II

Centrifugation: Principle, Preparative, Analytical, Density gradient centrifugation.

Chromatography: Principles and Applications: Paper, Thin layer, Column, Ion exchange, Affinity chromatography, Gel filtration, Gas Chromatography, HPLC, FPLC.

Electrophoresis: Immunoelectrophoresis, Isoelectric focusing, 2-D gel electrophoresis.

Practice: Demonstration of Centrifuge

Demonstration of Chromatography techniques
Demonstration of Electrophoresis

Module-III

Colorimeter: Principle and Instrumentation; **Spectrophotometry:** Ultraviolet, Mass spectrophotometry; Flame photometry;

Principle, Instrumentation, Specimen preparation and Application of: X-ray diffraction, NMR, EPR. Principle and Application of: Fully Automated Biochemistry Analyser, Semi-automated Biochemistry Analyser, Coagulometer.

Practice: Demonstration of Semi automated Analyzer
Demonstration of Fully automated Analyzer

Suggested Readings:

1. Wilson K and Walker J. (2010). Principles and Techniques of Biochemistry and Molecular Biology. 7th Ed., Cambridge University Press.
(e-Book link: <https://www.pdfdrive.com/principles-and-techniques-of-biochemistry-and-molecular-biology-e174866056.html>)
2. Nelson DL and Cox MM. (2008). Lehninger Principles of Biochemistry, 5th Ed., W.H. Freeman and Company.
(e-Book link: <https://www.pdfdrive.com/lehninger-principles-of-biochemistry-5th-edition-d164892141.html>)

3. WilleyMJ, SherwoodLM&WoolvertonCJ.(2013).Prescott,HarleyandKlein's

Microbiology. 7th Ed., McGraw Hill.

(e-Book link: <https://www.pdfdrive.com/prescott-harley-and-kleins-microbiology-7th-ed-e188166539.html>)

4. LabsforLife (e-sourcelink: <http://labsforlife.in/InstructionalVideo.aspx>)

SC3- CUTM1710-Biological Chemistry

Subject Name	Code	Type of course	T-P-Pj	Prerequisite
Biological Chemistry	CUTM1710	Theory+Practice+ Project	2-1-0	General chemistry & Biology

Objective

Work to promote good health by teaching the public and other health professionals about diet and nutrition.

To demonstrate clinical disorders, the biochemical consequences of particular disease processes and the response to therapy.

To describe the various intracellular controls that govern the rate at which the metabolic pathway functions.

To explain the ways in which hormones work in human body and alter cellular activity by binding to intracellular receptors.

Course Outcome

Students will be able to demonstrate an understanding of fundamental biochemical principles, such as the structure/function of metabolic pathways, and the regulation of biological/biochemical processes.

Able to apply and effectively communicate scientific reasoning and data analysis in both written and oral forums.

Demonstrate a thorough knowledge of the intersection between the disciplines of Biology and Chemistry.

Appreciate the way in which practitioners in the disciplines of Biology and Chemistry intersect and bring their expertise to bear in solving complex problems involving living systems.

Course Outline

Module I

Chemical aspects of Food, Nutrition and Vitamins: Energy yielding nutrients and Calorific value of carbohydrates, fats and proteins. Basal metabolic rate (BMR) and Body Mass Index (BMI). The Food Pyramid. History, Chemistry, Absorption, transport, and storage of Vitamins, Metabolic functions and Biochemical manifestations of Water soluble Vitamins-B-Complex Vitamins : Vitamin –B1, Vitamin –B2, Vitamin-B3, Vitamin –B6, Biotin, Panthothenic acid, Folic acid, Vitamin-B12. Coenzymes of B-Complex Vitamins. Fat soluble Vitamins: Vitamin-A, Vitamin-D, Vitamin-E, Vitamin-K.

Practice: Calculation of BMR and BMI.

Module II

Cellular Respiration: Aerobic and anaerobic respiration; Energy yield and regulation. Oxidation of fatty acid, Transamination and Deamination reaction, Urea formation and transport, Ketogenesis.

Practice: Solutions: Definition, use, classification, preparation and storage. Stock and working solutions. Molar and Normal solutions of compounds and acids. (NaCl, NaOH, HCl, H₂SO₄)

Module III

Biochemical aspect of Hormone: Hormone receptors and intracellular messengers, Adenylate cyclase, protein kinase and phosphodiesterase. Role of Insulin, glucagon's, epinephrine and their mechanism of action.

Practice: Diabetes and other disorder identification.

Suggested Readings:

1. Lehninger Principles of Biochemistry (<https://www.pdfdrive.com/lehninger-principles-of-biochemistry-5th-edition-e164892141.html>)
2. Fundamentals of Biochemistry: Life at the Molecular Level (<https://www.pdfdrive.com/fundamentals-of-biochemistry-life-at-the-molecular-level-e186753533.html>)

SC4-CUTM1712-Clinical Hematology

Subject Name	Code	Type of course	T-P-Pj	Prerequisite
Clinical Hematology	CUTM1712	Theory+Practice	3-1-0	Basic Medical science

Objective

The Clinical Hematology course will cover the diagnosis and management of blood cell disorders, anatomy and physiology of hematopoiesis, routine specialized hematology tests, analysis, classification, and monitoring of blood cell abnormalities.

Clinically relevant hematological analysis for deeper understanding evaluate normal and abnormal cell morphology with associated diseases and other blood components.

Be able to handle an investigation of hematological disorder and laboratory abnormalities such as anaemia, polycythemia, leukopenia, leukocytosis, thrombocytopenia, thrombocytosis, elevated ESR etc within hematology.

Course Outcome

- Differentiate various hematological procedures and the use of basic equipment essential to working in a Hematology Laboratory.
- Discuss differences between Quality control, Quality Assurance, and Continuing Quality Improvement principles as used in the Hematology Laboratory.
- Categorize various hematology analyses, operational principles of various hematology instruments, and troubleshooting of various instruments.
- Explain the principles and theories utilized in a variety of problem-solving situations.
- Define testing suitability standards for Hematology specimens.
- To be able to carry out blood sampling & Evaluate specimen acceptability.

Course Outline

Module-I(16Hrs)

Scope & importance of Haematology, important equipment and chemicals, various test performed in Haematology laboratory. Identify and/or confirm the composition of various red blood cell inclusions. Function of normal cellular components, Formation of blood, Erythropoiesis, thrombopoiesis. Anti coagulants, definition, Uses, Different types, mode of action, their merits and demerits. Morphology of normal blood cells, abnormal morphology & diseases, Hematological Disorder

Practice: Demonstration of instruments used in hematology -

Microscope, Blood Cell counter. Demonstration of different blood cell, their synthesis from slide presentation or chart. Demonstration the normal and abnormal morphology of different blood cells.

Module-II(18Hrs)

Collection and preservation of blood: different methods of collection (venous and capillary blood), preservation, changes in stored blood normal and absolute values in hematology, Preparation of peripheral blood film (PBF), To stain a peripheral blood Film by Leishman stain, Malaria thick smear preparation, Different types of stains, Romanowsky stains: principle of staining, Hemoglobin estimation (oxy Hb and cyanmethaemoglobin method), Complete Blood Cell Count: Total RBC count, Total WBC count, Platelet count, DLC value, HB, MCH, MCV, MCHC, Determination of ESR by Wintrobe's, Determination of ESR by Westergren's method, Determination of PCV by Wintrobe's, Reticulocyte Count, Absolute Eosinophil Count, Morphology of Red Blood Cells.

Practice: Different methods of collection (venous and capillary blood), Preparation of DLC, TLC, TRBC etc. Estimation of ESR, Complete blood cell count, Blood grouping, Hb and values of MCH, MCV, MCHC, PCV, Staining & Smear preparation.

Module-III(14Hrs)

Hematological Disorders

1. Classification of Anemia: Morphological & etiological.
2. Iron Deficiency Anemia: Distribution of body Iron, Iron Absorption, causes of iron deficiency, lab findings. Megaloblastic Anemia: Causes, Lab findings.
3. Hemolytic Anemia: Definition, causes, classification & lab findings.

4. Laboratory diagnosis of Hemophilia and von-willbrand disease.
5. Laboratory diagnosis of Idiopathic thrombocytopenic purpura (ITP),
6. Platelet function tests and their interpretation.

Practice: Observation about different normal and abnormal morphology of RBCs, WBCs, Platelet, Bleeding Time & Clotting Time, PT & APTT.

Suggested Readings:

1. Textbook of Medical Laboratory Technology P.B Godkar Mumbai, Bhalani Publishing House
2. Textbook of Medical Laboratory Technology by Paraful B. Godkar, Publisher Bhalani
3. Textbook of Medical Laboratory Technology (2nd edition) by V.H Talib, Publisher CBS
4. Atlas of hematology (5th edition) by G.A. McDonald, Publisher Churchill Livingstone
5. Medical Laboratory Technology By K.L Mukharjee, Publisher McGraw Hill Education Pvt Limited
6. Textbook of Medical Laboratory Technology (6th edition) by Ramnik Sood, Jaypee Publication.
7. Ebook link - <https://www.pdfdrive.com/hematology-basic-principles-and-practice-e176384006.html>
8. Ebook link - <https://www.pdfdrive.com/hematology-basic-principles-and-practice-expert-consult-online-and-print-expert-consult-title-online-print-5th-edition-e186195241.html>
9. Ebook link - <https://books.google.co.in/books?id=6sfacydDNsUC&printsec=frontcover&dq=hematology&hl=en&sa=X&ved=2ahUKEwja9-ve3I7qAhUwzTgGHSMUDekQ6wEwAHoECAQQAQ#v=onepage&q=hematology&f=false>
10. Ebook link - <https://books.google.co.in/books?id=QQcYAAAAAYAAJ&printsec=frontcover&dq=hematology&hl=en&sa=X&ved=2ahUKEwja9-ve3I7qAhUwzTgGHSMUDekQ6wEwAhoECAIQQAQ#v=onepage&q=hematology&f=false>

SC5-CUTM1715-Clinical Pathology

Subject Name	Code	Type of course	T-P-Pj	Prerequisite
Clinical pathology	CUTM1715	Theory+Practice	3-1-0	Fundamental Science

Objective

Analyze body fluid for diagnosis of disease

Analyze waste product for diagnosis of disease

Understanding DOT Policy

Understand Physiological disorder and infectious disease

Analysis of pregnancy

Course Outcome

Able to collect pathological specimen
Able to detect diabetes, ketosis, nephritis, jaundice and other physiological disorders
Able to detect infectious disease (UTI, Hematuria, Filaria, Dysentery, Ulcer, TB, etc)
Preservation and processing of pathological sample.
Identification of Parasites
Analysis of Infertility disorder

Course Outline

Module-I (16 Hrs)

Introduction of clinical pathology, Composition, collection and preservation of urine, Physical examination of Urine, Chemical Examination of Urine - Sugar and Ketone bodies, Diabetes and Ketosis, Nephritis and UTI, Albumin, Phosphate, BJP, Bile Salt and Bile pigment, Chemical Examination of Urine -

Multistix reagent strip, Jaundice, Microscopical Examination of Urine, Operation of Urine Analyzer, Pregnancy test, Report writing and report analysis of Urine

Practice: Operation of Urine analyzer, Benedict Test, Heat and Acid Test, Rothera's Test, Benzidine Test, Fouchet's Test

Lab:-

Urine Analysis: Collection and Physical Examination, Specific Gravity, Benedict's Qualitative test, Acetone Rothera's Test, Protein and BJP Test, Hay's Test and Fouchet's test, Benzidine test, Microscopical Examination, Pregnancy Test, Auto-mentation by Urine analyzer

Module-II (14 Hrs)

Respiratory Tract Infection: Gram Staining and ZN Staining, Basic of DOT Centre, Report writing and report analysis of sputum, Sputum for the diagnosis of Mycobacterium tuberculosis, Clinical significance and Report writing of Stool, Difference between Amoebic, Dysentery and Bacillary Dysentery, Microscopical Examination of Stool, Physical and Chemical examination of Stool, Composition, collection and preservation of stool

Practice: Microscopic finding of stool, Morphology of stool parasite

Lab:-

Stool Analysis: Collection and physical examination,

Chemical Examination, Occult test and reducing sugar, Microscopical Examination: Protozoa, Microscopical Examination: Helminthes

Sputum Analysis: Collection and physical examination, Tuberculosis (ZN Stain),

Respiratory infection (Gram Stain)

Module-III (15 Hrs)

Routine laboratory investigation of Pleural Fluid, Routine laboratory investigation of Pericardial Fluid, Routine laboratory investigation of Synovial Fluid, Synovial fluid: Collection and preservation, Examination of CSF related to Meningitis, Brain Tumour and other disorder, CSF: Composition, Collection, Preservation and physical examination, Report analysis and report writing of Semen, Semen examination for male infertility disorder, Semen: Composition, function, collection and physical examination

Practice: Gram stain, ZN Stain, General consideration on specimen collection

Lab:-

Semen Analysis: Collection and physical examination, Chemical Examination, Microscopical examination

CSF Analysis: Collection and Routine

Examination Synovial Fluid: Collection and Routine

examination Pleural Fluid: Collection and routine

examination Pericardial Fluid: Collection and routine

examination Bacteriological Examination of throat swab

Suggested Readings:

1. Textbook of Clinical laboratory methods and diagnosis by Gradwohl's, Publisher Mosby
2. Medical laboratory technology Vol. 1 by K. L. Mukherjee, 2007, Publisher Tata McGraw Hill
3. Textbook of medical laboratory technology by Praful B Godkar, Publisher Bhalan
4. Medical laboratory science theory and practice by J. Ochei and Kolhatkar, 2002, Tata McGraw-Hill, Publisher TBS

SC6-CUTM1714-Cell and Molecular Biology

Subject Name	Code	Type of course	T-P-Pj	Prerequisite
Cell and Molecular Biology	CUTM1714	Theory+Project	2-0-1	Fundamental Science

Objective

Understanding the central dogma of life
To understand the concept of gene regulation and its impact
The use of several molecular diagnostic techniques for disease interpretation

Course Outcome

After completion of the course the student will be gain knowledge of the significance of genes and proteins.
They will understand the mechanism of gene expression and protein synthesis,
The significance of gene expression regulation will become clear.
The students will understand the use of several molecular techniques in disease diagnosis.

Course Outline

Module-I

DNA structure. Salient features of double helix, Types of DNA. DNA topology - linking number, topoisomerases. Bidirectional and unidirectional replication, semi-conservative, semi-discontinuous replication.

Mechanism of DNA replication. Enzymes and proteins involved in DNA replication.

Module-II

RNA Structure. Transcription: Promoter, Polymerase and the transcription unit. **Transcription in Eukaryotes:** RNA polymerases, general Transcription factors. Split genes, concept of introns and exons, RNA splicing, spliceosome machinery, concept of alternative splicing, Polyadenylation and capping, Processing of rRNA, RNA interference: siRNA, miRNA and its significance.

Translational machinery: Charging of tRNA, aminoacyl tRNA synthetases. Mechanisms of initiation, elongation and termination of polypeptides in both prokaryotes and eukaryotes.

Malignant transformation of cells and role of oncogenes, Tumor virus, Proto- oncogenes, Tumorsuppressorgenes;Apoptosis,cellregeneration.

Module-III

Moleculardiagnosics: RecombinantDNA Technologyandits applications, Polymerasechainreaction andits application in diagnosis of pathogens, Site directed mutagenesis, DNA finger printing, DNaseFootPrinting, antisenseRNA technology, inheritedgeneticdisordersinmanandgenetherapy.

SuggestedReadings:

1. WatsonJD, Baker TA, BellSP, GannA, LevineMand LosickR(2008) MolecularBiologyoftheGene, 7thedition, Cold SpringHarbourLab.Press, PearsonPublication. (e-Booklink:<https://www.pdfdrive.com/molecular-biology-of-the-gene-e158278674.html>)
2. BruceAlberts, AlexanderJohnson, JulianLewis, DavidMorgan, MartinRaff, KeithRoberts, PeterWalter(2015)Molecular Biologyofthecell, 6thedition, TaylorandFrancisGroup. (e-Booklink:<https://www.pdfdrive.com/molecular-biology-of-the-cell-d184612905.html>)
3. Principles and Practice of Medicine- by Davidson, S. S., J. MacLeod and C.R.W. Edwards, 1991PublisherChurchillLivingstone. (e-Book link: <https://www.pdfdrive.com/davidsons-principles-and-practice-of-medicine-d186204495.html>)
4. SambrookJandRussellDW.(2001).Molecular Cloning:ALaboratoryManual.4thEdition, ColdSpringHarbourLaboratorypress. (e-Book link:<https://www.pdfdrive.com/search?q=Sambrook+J+and+Russell+DW.+%282001%29.+Molecular+Cloning%3A+A+Laboratory+Manual.+4th+Edition&pagecount=&pubyear=&searchin=&more=true>)
5. GeoffreyM.Cooper, RobertE. Hausman(2007). TheCell, Amolecularapproach.4thASMPress, Washington,D.C. (e-Booklink:<https://www.pdfdrive.com/the-cell-a-molecular-approach-e186369576.html>)
6. B.PrimroseandR.M.Twyman(2006) PrinciplesofGeneManipulationandGenomics7th Edition.BlackwellPublishing. (e-Book link: <https://www.pdfdrive.com/principles-of-gene-manipulation-and-genomics-e25845509.html>)

OnlineTutoriallinks:

1. DNADecoded(coursoralink:<https://www.coursera.org/learn/dna-decoded>)
2. DNAReplication(Lecturiolink:<https://app.lecturio.com/#/course/s/8020>)
3. Transcription(Lecturiolink:<https://app.lecturio.com/#/lecture/s/5990/35832>)

SC7-CUTM1718–ClinicalBiochemistry

Subject Name	Code	Typeofcourse	T-P-Pj	Prerequisite
Clinical Biochemistry	CUTM1718	Theory+Practice	2-1-0	BasicMedical science

Objective

UnderstandingtheconceptofBiochemicalanalyzinginstruments,chemicals andnormalrangesofbiochemicalcomponentsinourbody.

Clinicallyrelevantbiochemicalanalysisfordeeperunderstandingofallbiochemicalcomponentsi.e.,Proteins,Electrolytes, Hormonesetc

Course Outcome

Tolearnabouttests carriedoutfor biochemicalinvestigations.

Understanding ofprincipleofbiochemicalClinicalbiochemistrytests.

Tolearnnormalrangesand abnormalrangesofbiochemicalcomponentsandhormones.

Tostudyaboutdiseasesrelatedtobiochemicalandhormoneimbalanceinhumanbody.

Course

OutlineModule-

I(10Hrs)

LFT, KFT, Lipidprofile, EstimationofGlucose, Hormonetest: T3, T4, TSH, Prolactin, 17Kitosteroids

Practice: Demonstration the centrifuge machine, Demonstration of Colorimeter, Method of estimationand assessment for: a. Glucose tolerance test, Detection of sugar in Urine, Estimation ofProteininurine, Estimationof Liverfunctiontest, Kidneyfunctiontest, Lipidprofile, Thyroid

Module-II(10Hrs)

MetabolicdisordersandDiagnosticenzymology: Disordersofmetabolism: carbohydrate, Lipids, Amino acids and Nucleic acids. Diagnostic enzymes: Role of Enzymes in Clinical Practice: Markerenzymesin myocardium, liverand pancreas. Tumormarkers, Radioisotope techniques

Module-III(14Hrs)

Organ function tests: Liver function tests, Bile pigment metabolism, tests for liver function. Jaundice and its type, Functions of Kidney, Urine formation and renal function tests disease of kidney, Renal Calculi: Theory of formation and analysis, Gastric Analysis, Composition of gastric juice, concepts of free and bound acid, Fractional Test Meal

Practice: Operation procedure of Centrifuge machine, colorimeter etc. Estimation of Liver function test, Kidney function test, Estimation of bile pigment, bile salt, bilirubin etc.

Suggested Readings

1. Textbook of Medical Laboratory Technology by P.B. Godker, Publisher Bhalani.
2. Textbook of Medical Biochemistry by Chatterjee & Shinde, Publisher JPB
3. Medical Laboratory Technology by Mukherjee
4. Principles of Biochemistry by Lehninger, Publisher Kalyani
5. Practical Clinical Biochemistry by Harold Varley, Publisher CBS.
6. Ebook link-
https://www.cartercenter.org/resources/pdfs/health/ephti/library/lecture_notes/health_sciences_students/medicalbiochemistry.pdf
7. Ebook link-
https://books.google.co.in/books?id=Je_pJfb2r0cC&printsec=frontcover&source=gbs_ge_summary_r&cad=0#v=onepage&q&f=false
8. Ebook link-
https://books.google.co.in/books?id=csPcDAAAQBAJ&printsec=frontcover&source=gbs_ge_summary_r&cad=0#v=onepage&q&f=false
9. Ebook link-
https://books.google.co.in/books?id=2FkXAwAAQBAJ&printsec=frontcover&source=gbs_ge_summary_r&cad=0#v=onepage&q&f=false

SC-8- CUTM1720-Histology

Subject Name	Code	Type of course	T-P-Pj	Prerequisite
Histology	CUTM1720	Theory+Practice	3-1-0	Basic Medical Science

Objective

Understanding the concept of histotechnology; Basic concepts about routine methods of examination of tissues Collection.

perform routine laboratory procedures encompassing all major areas of the histology laboratory.

accurately and proficiently embed tissue and understand the principles of microtomy.

Clinically relevant onchological analysis for deeper understanding of abnormal cell growth that anywhere in human body.

The conceptual understanding of the subject provides opportunities for employability and scopes for higher education.

Course Outcome

In this section students will be made aware of terminology used in histotechnology, various instruments and their maintenance and also learn the processing of various samples for histopathological investigations.

Reception and labeling of histological specimens.

Use of antiseptics, disinfectants and insecticides in a tissue processing laboratory.

The students will learn about various staining procedures for demonstration of different substances & various cytological investigations.

The students will learn about special staining procedures & handling & testing of various cytological specimens.

Module-I(8Hrs)

Histotechnology, Care & Maintenance of histotechnology equipments and their parts and Safety measures of laboratory equipment used in histotechnology. Basic concepts about routine methods of examination of tissues, Collection and transportation of specimens for histological examination, fixation: Process, Various types of fixatives used in a routine histopathology laboratory -

Simple fixatives, Compound fixatives, Special fixatives for demonstration of various tissue elements.

Practice: Care & maintenance of Histology equipments, Collection & transportation of specimens, Fixation

Module- II(8Hrs)

Decalcification Criteria of a good decalcification agent, Technique of decalcification Followed with selection of tissue fixation, decalcification neutralization of acid and thorough washing. Various types of decalcifying fluids, Processing of various tissues for histological examination, Embedding, Schedule for manual or automatic Tissue processing, Components & principles of various types of a tissue processors.

Practice: Method of Decalcification, Embedding, manual or automatic tissue processing schedule.

Module- III(10Hrs)

Periodic Acid Schiff Staining, Impregnation and Mounting, Commonly used mounting in histotechnology lab. General Staining Procedures (routine H&E stain, PAP stain and other special stain) for Paraffin Infiltrated and Embedded tissue, To perform & practice the manual & automated Haematoxylin and Eosin staining technique, To perform & practice the Mallory's Phosphotungstic Acid Haematoxylin (PTAH). Introduction of FNAC and its staining tech, museum technique, postmortem technique.

Practice: Procedure for manual Staining and Automatic Staining Technique, FNAC technique, Museum technique (Hospital Visit), Postmortem technique (Hospital Visit).

Module- IV(8Hrs)

Demonstration of instruments used for dissection Use of antiseptics, disinfectants and insecticides in a tissue processing laboratory Reception and labeling of histological specimens Preparation of various fixatives -Helly's fluid, Zenker's fluid, Bouin's fluid, Corney's fluid, 10% Neutral formalin, Formal saline, Formal acetic acid, Pereyn's fluid, prepare 70% alcohol from absolute alcohol. To perform embedding and casting of block.

Practice: Use of antiseptics, disinfectants and insecticides in tissue processing laboratory, Preparation of various Fixatives, Labeling of Histological specimens, Embedding and Casting of block

Module- V(8Hrs)

Tissue Processor, Microtomy, Honing and Stropping technique, Use of tissue floating bath, Use of incubator

Practice: Processing of tissue by manual and automated processor method. To demonstrate various part and types of microtome. To learn sharpening of microtome knife (Honing and stropping)

technique) To perform section cutting, learn mounting of stained smears. To practice attachment of tissue sections to glass slides To learn using tissue floatation bath drying of sections in incubator (37⁰ C)

Suggested Readings:

1. Color textbook of histology by Gartner & Hiatt, publisher Elsevier
2. Netter's essential histology by William Ovalle, publisher Elsevier
3. Histology E-book by Barry Mitchell, publisher Elsevier
4. Textbook of Histology (color atlas) by Krishna Garg, Indira Bahl, Mohini Kaul, publisher CBS
5. Textbook of Histology and a Practical Guide by J P Gunasegaran, Publisher Elsevier
6. Textbook of Medical Laboratory Technology by Praful B Godkar, Publisher Bhalami
7. Ebook link-
https://books.google.co.in/books?id=qWSAQAAQBAJ&printsec=frontcover&source=gbs_ge_summary_r&cad=0#v=onepage&q&f=false
8. Ebook link-
https://books.google.co.in/books?id=MrpEDwAAQBAJ&printsec=frontcover&source=gbs_ge_summary_r&cad=0#v=onepage&q&f=false
9. Ebook link-
https://books.google.co.in/books?id=CERPDwAAQBAJ&printsec=frontcover&source=gbs_ge_summary_r&cad=0#v=onepage&q&f=false

BASKET II

Discipline Core Courses

DC-1-CUTM1711- General Microbiology

Subject Name	Code	Type of course	T-P-Pj	Prerequisite
General Microbiology	CUTM1711	Theory+Practice	3-1-0	Fundamental Science

Objective

<p>To know various culture media and their applications and also understand various physical and chemical means of sterilization</p> <p>To know General bacteriology and microbial techniques for isolation of pure cultures of bacteria, fungi and virus</p> <p>To master aseptic techniques and be able to perform routine culture handling tasks safely and effectively</p>
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Course Outcome

This study demonstrates the theory and practical skills in microscopy and their handling techniques and staining procedures.

Understanding the details of microbial cell organelles.

Provides knowledge on growth of microorganism.

Provides knowledge culturing microorganism.

Course

Outline Module-

I(12Hours)

History and scope of Microbiology, Recent trends and developments in modern microbiology. Identification, characterization and classification of microorganisms. Distinguishing characteristics between prokaryotic and eukaryotic cells. Structure and function of Cell wall of bacteria, cell membranes, flagella, pili, capsule, gas vesicles, carboxysomes, magnetosomes and phycobolosomes.

Practice:

1. Preparation of bacterial smear and staining – Gram's, Acid-fast, Staining of bacterial spores, flagella, capsule, spirochaetes
2. Demonstration of various parts of microscope and its functioning and care.

Module-II(12Hours)

Methods of sterilization: Physical methods – Dry heat, moist heat, radiation methods, filtration methods, chemical methods and their application. Concept of containment facility, sterilization at industrial level. Different staining techniques used in bacteriology.

Practice:

3. Demonstration of the different types of sterilization technique and operation of the instruments used in microbiological lab.
4. Preparation of media, cultivation of bacteria

Module-III(16Hours)

Bacterial nutrition – Nutritional requirement of bacteria. Cultivation of aerobes and anaerobes, Reproduction in bacteria and spore formation. Bacterial growth curve and bacterial nutrition Media. Culture Media, Liquid and solid media, defined and synthetic media, routine laboratory media (basal, enriched, selective, enrichment, indicator, and transport media).

Practice:

5. Biochemical tests for identification of bacteria
6. Preservation of stock cultures of bacteria

Suggested Readings:

1. Textbook of Microbiology - Ananthanarayan & Paniker (10th Ed)
2. Medical Microbiology - by Fritz H. Kayser et al
3. Medical Laboratory Technology by Kanai Lal Mukherjee, Publisher Tata McGraw Hill
4. Microbiology (7th Ed) - by Prescott
5. Practical Book of Medical Microbiology by Satish Gupta, Publisher Jaypee Brothers
6. Medical Laboratory Manual for Tropical Countries Vol. I and II by Monica Cheesbrough
7. Essential Medical Microbiology - by Rajesh Bhatia (4th Ed)
8. Clinical Laboratory Methods and Diagnosis by Gradwohl, 2000, Publisher Mosby
9. Medical Laboratory Science Theory and Practice, Jochei and Kolhatkar, 2002, Publisher TBS

DC-2- CUTM1713-Systematic Bacteriology

Subject Name	Code	Type of course	T-P-Pj	Prerequisite
Systemic Bacteriology	CUTM1713	Theory+Practice	3-1-0	Fundamental Science

Objective

To learn opportunities in the basic principles of medical microbiology and infectious disease.

To study mechanisms of infectious disease transmission, principles of aseptic practice, and the role of the human body's normal microflora.

To understand the importance of pathogenic bacteria in human disease with respect to infections of the respiratory tract, gastrointestinal tract, urinary tract, skin and soft tissue.

Course Outcome

The course provides the conceptual basis for understanding pathogenic microorganisms and the mechanisms by which they cause disease in the human body.

Recall the relationship of this infection to symptoms, relapse and the accompanying pathology.

Solve problems in the context of this understanding.

Course

Outline Module-

I(9Hrs)

Morphology, cultural characteristics, biochemical reaction, pathogenesis/disease caused & lab diagnosis, Prevention and Control of: Cocci (Gram Positive): Aerobic: Micrococcus spp., Staphylococcus spp., Streptococcus spp. Anaerobic: Peptococcus spp., Peptostreptococcus spp., *Vibrio* spp., *Acidaminococcus* spp. and others. Cocci (Gram Negative): Aerobic: *Neisseria* spp., Anaerobic Gram-negative bacteria.

Practice: Culture techniques

Culture media

Identification of *Staphylococcus* sp.

Module-II(12Hrs)

Morphology, cultural characteristics, biochemical reaction, pathogenesis/disease caused & lab diagnosis, Prevention and Control of: Aerobic non-spore forming gram positive bacilli:

Bacillus spp., *Corynebacterium* spp., *Actinomyces*, *Nocardia* spp., *Mycobacterium* spp. - pathogenic, Tubercle bacilli and MOTT bacilli (Atypical mycobacterium) and Hansen's bacilli and others. Anaerobic: *Bifidobacterium* spp., *Eubacterium* spp., *Actinomyces* spp., *Propionibacterium*, *Clostridium* spp., and others.

Practice: Preparation of media

Media used

for biochemical identification & their uses Identification of

Mycobacterium sp.

Module-III(18Hrs)

Morphology, cultural characteristics, biochemical reaction, pathogenesis/disease caused & lab diagnosis, Prevention and Control of Gram- Negative Bacilli Aerobic: Enterobacteriaceae, *Citrobacter* spp., *Edwardsiella* spp., *Enterobacter* spp., *Escherichia coli*, *Ewingella*, *Hafnia* spp., *Klebsiella* spp., *Morganella* spp., *Proteus* spp., *Providencia* spp., *Salmonella* spp., *Serratia* spp., *Shigella* spp., *Yersinia* spp., *Vibrio* spp., *Pseudomonas* spp., *Chlamydia* and *Chlamyphila*, *Brucella* spp., *Bordetella* spp., *Haemophilus* spp., *Mycoplasma* spp.

Practice: Culture methods & identification of common bacteria on media.
Antibiotic sensitivity testing.

Identification of *Escherichia*, *Klebsiella*, *Proteus* sp.

Suggested Readings:

1. Textbook of Microbiology- Ananthanarayan & Paniker (10th Ed)
2. Microbiology (7th Ed)- by Prescott
3. Medical Microbiology- by David Greenwood et al (Elsevier)
4. Essential Medical Microbiology- by Rajesh Bhatia (4th Ed)
5. Medical Microbiology- by Kayser et al
6. The short text book of medical microbiology- by Satis Gupte (10th Ed)

DC-3- CUTM1717- Applied microbiology

Subject Name	Code	Type of course	T-P-Pj	Prerequisite
Applied Microbiology	CUTM1717	Theory+Practice	2-1-0	Fundamental Science

Objective

To impart knowledge of the basic principles of bacteriology, virology, including the nature of pathogenic microorganisms, pathogenesis, laboratory diagnosis, transmission, prevention and control of diseases common in the country

Course Outcome

To know the applications of microbiology in diagnostics, hospitals and community

Course

Outline Module-

I (6 Hours)

The normal flora, collection and transport of clinical specimens, Collection and preliminary processing of specimens.

Practice:

Isolation of *Streptococcus mutans* from oral cavity
Procedure for sample collection from skin, ear.

Module-II (9 Hours)

Diagnostic microbiology- an approach to laboratory diagnosis, Rapid and automation methods in diagnostic microbiology, Molecular techniques in microbiology, Serological and skin tests

Practice: Demonstration of antigen-antibody reaction
Pus culture and sensitivity

Module-III(8Hours)

Microbiology in the service of human being, Community microbiology, Emerging and re-emerging Microbial disease, Nosocomial infections

Practice: Urine culture and sensitivity
Isolation of microorganism from spoiled fruit juice

Module-IV(6Hours)

Hospital and laboratory waste, Diagnostic virology, Emergency microbiology Bacteriology of Milk, Air and Water

Practice: Isolation of microorganism from curd Isolation of microorganism from Air

Suggested Readings:

1. Medical Parasitology by R. L. Chhpujani and Rajesh Bhatia, Jaypee publisher
2. Short textbook of medical microbiology by Satishgupt, Publisher Jaypee

DC-4-CUTM1716-Medical Parasitology and Mycology

Subject Name	Code	Type of course	T-P-Pj	Prerequisite
Medical Parasitology and Mycology	CUTM1716	Theory+Practice	3-2-0	Fundamental Science

Objective

Describe basic morphology, lifecycle, pathogenesis, lab diagnosis and treatment of parasites and fungi.

Perform appropriate laboratory techniques used in the processing of specimens and identification of parasites and fungi.

Describe basic principle and procedures of isolation of fungus and parasites from clinical samples like stool, vaginal swab etc.

Perform appropriate laboratory techniques used in the processing of specimens and identification of parasites and fungi.

Course Outcome

Identification of pathogenic parasite and fungus in disease diagnosis and treatment.

The conceptual understanding of the subject provides opportunities for employability and scopes for higher education.

To serve as a resource for the clinical laboratories professionals in the different region.

Module I

General Parasitology- Classification of medically important parasites, epidemiology of parasitic infections, immunology of human parasitic infections. Diagnostic parasitology- Systematic study of following parasites (Geographical distribution, habitat, morphology

and lifecycle, risk of infection, pathogenesis, laboratory diagnosis prophylaxis and serological diagnosis)

Practice: Collection & transport of specimens for examination of stool for parasites identification. Examination of other body fluids for parasites identification. Concentration techniques for demonstration of Ova (Principles and applications). Routine Stool examination for detection of intestinal parasites.

Module-II

Protozoa– Intestinal amoeba, free living pathogenic amoeba, giardia, trichomonas, balantidium, isospora, cryptosporidium, microspora, cyclospora Plasmodia, leishmania, trypanosoma, toxoplasma, babesia.

Helminthes– Cestodes–

Taenia, Echinococcus, Diphylobothrium, Hymenolepis, Multiceps, Trematodes–

Schistosoma, Fasciola, Fasciolepis, Paragonimus, Clonorchis, Opisthorchis. Nematodes–

Ascaris, Hookworm (Ancylostoma), Trichuris, Enterobius, Strongyloides, Filaria, Trichinella, Toxocara, Dracunculus Biological vectors.

Practice: Identification of adult worms from model's or slide's. Identification of different parasites their morphology from slide's. Culture techniques for parasites. Serological diagnostic methods.

Module-III

General Mycology – Fungus – Classification Fungal Structure & Morphology, Reproduction of fungi, Immunity to Fungal Infections. Culture Media in Mycology, Stains in Mycology. Normal fungal flora of human beings. Diagnostic Mycology - Epidemiology, Pathogenesis, Laboratory Diagnosis of Fungal Infections. Specimen collection, preservation, Transportation & Identification of Mycological Agent. Biochemical tests for fungal identification, Anti-fungal agents, invitro tests. Serological tests for mycotic infections. Use of laboratory animals in Mycology. Typing of fungi Preparation of fungal antigens & their standardization.

Practice: To prepare culture media used routinely in mycology. Diagnostic Methods in Mycotic Infections. Isolation and identification of fungus from clinical specimen. To perform all the stain in g techniques for identification of fungi.

Practice: Collection & transport of specimens Examination of stool for parasites. Examination of blood & bone marrow for parasites. Examination of other body fluids & biopsy specimens for parasites. Culture techniques for parasites. Serological diagnostic methods, skin tests.

Suggested Readings:

1. Parasitology book by K.D. Chatterjee.(e-book link- <https://sites.google.com/site/bkthrtprazg/atahrgiwu>, <https://www.goodreads.com/book/show/24366965-parasitology-protozoology-and-helminthology-with-two-hundred-fourteen>
2. Textbook of medical Parasitology.(e-book link- <https://www.pdfdrive.com/textbook-of-medical-parasitology-textbook-of-medical-parasitology-e128716897.html>
3. Bailey & Scott's Diagnostic Microbiology (e-book- <https://www.pdfdrive.com/bailey-scotts-diagnostic-microbiology-e187863782.html>)

DC-5-CUTM1719-Immunology & Virology

Subject Name	Code	Type of course	T-P-Pj	Prerequisite
Immunology and Virology	CUTM1719	Theory+Practice	3-2-0	Fundamental Science

Objective

Understanding the concept of Innate & adaptive immune system; complement system; Hypersensitivity. Clinically relevant serological analysis for deeper understanding of antigen-antibody interaction. To understand the concept of cells of immune system and organs of immune

system.

To understand the properties of virus, diagnosis of important viruses and vaccination.

Course Outcome

The student will learn the application of Immunology in disease diagnosis.

Complement system followed by the body on encountering an Antigen.

Immune Response produced on encounter with foreign body.

The students will learn the role of immunity in fighting disease, along with consequence of undesirable expression of immune system such as, hypersensitivity and autoimmune disease.

They will gather knowledge regarding the properties, diagnosis of virus and vaccination against them.

The conceptual understanding of the subject provides opportunities for employability and scopes for higher education.

Course Outline

Module-I

Immunity: Concept of Innate and Adaptive immunity.

Immune Cells and Organs: Structure, Functions and Properties of: Immune Cells – Stem cell, T cell, B cell, NK cell, Macrophage, Neutrophil, Eosinophil, Basophil, Mast cell, Dendritic cell; and Immune Organs – Bone Marrow, Thymus, Lymph Node, Spleen, GALT, MALT, CALT

Antigens: Characteristics, Hapten, Epitopes, Adjuvants;

Antibody: Structure & its classes.

Antigen-Antibody interaction, avidity & affinity.

Serological Reactions: Principles of Precipitation, Agglutination, Immunodiffusion, Immunoelectrophoresis, ELISA, ELISPOT, Western blotting, Immunofluorescence, Immunoelectron microscopy.

Practice: Performing Serological tests: Widal test, VDRL test, ASO test, C-Reactive Protein test, Rheumatoid factor (RF) test

Precipitation in agarose gel

Performing Ouchterlony Double diffusion test

Demonstration of SDS-

PAGE Demonstration of

ELISA Demonstration of Western blotting

otting

Module-II

Complement System: Role of complement system in immune response, Complement components and Activation pathways.

Immune Response: Cell mediated and humoral Immunity.

Monoclonal antibodies: Production, characterization and applications.

Types of Autoimmunity and Hypersensitivity with examples; Immunodeficiencies, SCID, DiGeorge syndrome, Chediak-Higashi syndrome, Leukocyte adhesion deficiency, CGD.

Module-III

Virus: General properties, concept of viroids, virusoids, satellite viruses and Prions.

Structure of Viruses: Capsid symmetry, enveloped and non-enveloped

viruses. Isolation, purification and cultivation of viruses.

Serological diagnosis of virus infections.

Arthropod borne and rodent borne virus diseases, Picorna viruses and diseases, Hepatitis viruses, Rabies and other neuro viruses, Orthomyxo and paramyxo viruses, Coronaviridae, Pox, Adeno, Herpes, Reo, Rotavirus, HIV Viruses, Oncogenic viruses.

Vaccines: their Preparation and their immunization schedules.

Practice: Serological diagnosis of virus borne diseases: HBsAg, HIV

Suggested Readings:

1. Kuby's Immunology (7th Ed)-
by J. Owen, J. Punt, S. Strandford. Macmillan Higher Education, England.
(e-book link: <https://www.pdfdrive.com/kuby-immunology-7th-edition-2013-e44842271.html>)
2. Roitt's Essential Immunology (13th Ed)-
by Seamus J. Martin, Dennis R. Burton, Ivan M. Roitt. Wiley Blackwell.
(e-book link: [http://dl.mehrsys.ir/pdf-books/Roitt_s%20Essential%20Immunology%20Thirteenth%20Edition\(www.myuptodate.com\).pdf](http://dl.mehrsys.ir/pdf-books/Roitt_s%20Essential%20Immunology%20Thirteenth%20Edition(www.myuptodate.com).pdf))
3. Prescott, Harley, and Klein's Microbiology (Seventh Edition)-by Joanne M. Willey,

LindaM.Sherwood,ChristopherJ.Woolverton.McGrawHill.

4. MicrobiologyAnIntroduction(10thEdition)-byGerardJ.Tortora,BerdellR.Funke,Christine

- L. Case. Pearson.
5. Textbook of Microbiology (7th Edition) - by Ananthanereyan & Paniker, Publisher Universities Press. (e-book link: <https://www.pdfdrive.com/textbook-of-microbiology-e177143667.html>)
 6. Fundamentals of Molecular Virology (2nd Edition) - by Nicholas H. Acheson, Wiley Publishers. (e-Book link: <https://www.pdfdrive.com/fundamentals-of-molecular-virology-d157673335.html>)
 7. Principles of Virology (4th Edition) - by Jane Flint, Glenn F. Rall, Vincent R. Racaniello, Anna Marie Skalka, Lynn W. Enquist. ASM Press, Washington, DC. (e-Book link: <https://www.pdfdrive.com/principles-of-virology-d158020773.html>)
 8. Virology: Principles and Applications - by John B. Carter and Venetia A. Saunders. Wiley Publishers. (e-Book link: <https://rgmaisyah.files.wordpress.com/2013/12/virology-principles-and-applications.pdf>)
 9. Practical Immunology (4th Edition) - by Frank C. Hay, Olwyn M. R. Westwood. Blackwell Science. (e-Book link: <https://www.pdfdrive.com/practical-immunology-d34330313.html>)

Online Tutorial links:

1. Fundamentals of Immunology: Innate Immunity and B-Cell Function
(Coursera link: <https://www.coursera.org/learn/immunologyfundamentalsimmunitybcells>)
2. Fundamentals of Immunology: T Cells and Signaling
(Coursera link: <https://www.coursera.org/learn/immunologyfundamentalstcellssignaling>)
3. Fundamentals of Immunology: Death by Friendly Fire
(Coursera link: <https://www.coursera.org/learn/immunology-friendlyfire>)
4. Viruses & How to Beat Them: Cells, Immunity, Vaccines
(edX link: <https://www.edx.org/course/viruses-how-to-beat-them-cells-immunity-vaccines>)
5. The Immune System: New Developments in Research
(edX link: <https://www.edx.org/course/the-immune-system-new-developments-in-research-par>)

DC-6- CUTM1722- Clinical Bacteriology

Subject Name	Code	Type of course	T-P-Pj	Prerequisite
Clinical Bacteriology	CUTM1722	Theory+Practice	3-1-0	Fundamental Science

Objective

To confirm the suspicion of infectious bacterial disease.
To identify the etiologic agent by isolating the causative bacterial pathogen.

Course Outcome

To learn the diagnosis of bacteria from infective regions of the body

Study of their sensitivity

Examination of bacteria from common samples.

Study of control measures for nosocomial infection.

Students can safeguard himself & society and can work in diagnostics and hospitals

Course

Outline **Module-**

I (12 Hours)

Laboratory strategy in the diagnosis of various Infective syndromes: Samples of choice, Collection, transportation and processing of samples for laboratory diagnosis of the following complications: a) Septicemia and bacteraemia b) Upper Respiratory tract infections, c) Lower Respiratory tract infections d) Wound, skin, and deep sepsis, e) Urinary tract infections, f) Genital Tract infections, g) Meningitis, h) Gastro intestinal infections, i) Enteric fever, j) Tuberculosis (Pulmonary and Extra-pulmonary), k) Pyrexia of unknown origin

Practice: Collection of nasal swab and its culture Isolation of microorganism from wound

Module-II (6 Hours)

Antibiotic susceptibility testing in bacteriology- a. Definition of antibiotics, b. Culture medium used for Antibiotic susceptibility testing, c. Preparation and standardization of inoculum, d. Control bacterial strains, e. Choice of antibiotics, f. MIC and MBC, g. Various methods of Antibiotic susceptibility testing with special reference to Stokes method and Kirby-Bauer method, h. Tests for production of β -lactamase

Practice: Preparation and use of different media in bacteriology laboratory Antibiotic susceptibility testing

Module-3 (10 Hours)

Bacteriological examination of water, milk, food and air-

a. Examination of water - Collection and transportation of water sample, Presumptive coliform count, Eijkman test, Introduction and importance of other bacteria considered as indicators of faecal contamination

b. Examination of Milk and milk products - Basic Concepts regarding gradation of milk,
Various tests for Bacteriological examination

c. Examination of food articles - Basic Concepts regarding classification of food like frozen food,

canned food, raw food, cooked food etc. Various tests for Bacteriological examination with special reference to food poisoning bacteria

d. Examination of Air-

Significance of air bacteriology in healthcare facilities, Collection, processing and reporting of an air sample

Practice: Isolation of microorganisms from frozen food
Isolation of microorganisms from water

Suggested Readings:

1. Practical Medical Microbiology by Mackie & MacCartney Volume 1 and 2
2. Textbook of Microbiology by Ananthanereyan
3. Medical Microbiology by Paniker & Satish Gupte
4. Medical Microbiology - by Fritz H. Kayser et al
5. Bailey and Scott's Diagnostic Microbiology (12th) Ed
6. Medical Laboratory Technology vol. I, II, III by Mukherjee
7. Medical Laboratory manual for tropical countries Vol II Microbiology by Monia Cheesbrough

DC-7-CUTM1721-Research Methodology

Subject Name	Code	Type of course	T-P-Pj	Prerequisite
Research Methodology	CUTM1721	Theory+Project	2-0-1	Fundamental Science

Objective

To equip students with a basic understanding of the underlying principles of quantitative and qualitative research methods.
Provide students with in-depth training on the conduct and

Course Outcome

Students can understand the ethical and philosophical issues associated with research in education

This study provides knowledge on various modes of presenting and disseminating research findings.

Enable students to acquire expertise in the use and application of the methods of data collection and analysis.

Provide learning opportunities to critically evaluate research methodology and findings.

Enable students to be reflexive about their role and others' roles as researchers.

Course

Outline Module-

I (9Hrs)

Introduction to Research: Definition, Scope, Limitations, and Types. Objectives of Research. Research

Process: Proposal Development: Basic steps involved in the health research proposal development process Literature Review: Importance and Sources, Strategies for gaining access to information, Library search, Computer search.

Research Designs: Research Title and Objectives Criteria for selecting a research title, Formulation of research objectives, Types of research objectives, Qualities of research objective

Module- II (8Hrs)

Data Collection: Secondary Data, Primary Data, and Methods of Collection. Scaling Techniques: Concept, Types, Rating scales & Ranking Scales, Scale Construction Techniques and Multi-Dimensional Scaling. Sampling Designs: Concepts, Types and Techniques and Sample size Decision.

Module- III (14Hrs)

Research Hypothesis: Definition, Qualities of research hypothesis Importance and types of research hypothesis. Theory of Estimation and Testing of Hypothesis Small & Large Sample Tests, Tests of Significance based on t, F, Z test and Chi-

Square Test. Designing Questionnaire. Interviewing. Tabulation, Coding, Editing, Interpretation and Report Writing.

Project: Writing a review on Nosocomial urinary tract infection.

Writing a research article on antibiotic resistance patterns in wound infections. Writi

ngareviewonVirusculture

Literature surveyonCovid-19

SuggestedReadings:

1. ResearchMethodologybyC.R.Kothari(3rdEd)
2. ResearchMethodologyIntheMedical&BiologicalSciencesbyPetterLaakeetal.
3. EssentialsofResearchDesignand MethodologybyGeoffreyMarczyketal.
4. WHO,HealthResearchMethodology:AguidefortraininginresearchMethods,2ndEdition,W
HO-WIPRO
5. AStudent’sGuidetoMethodologybyCloughPandNutbrownC.SagePublication.
6. National Ethical GuidelinesforHealth ResearchinNepal,Available atNepal
HealthResearchCouncil.
7. FieldTrialsofHealthInterventionsinDevelopingCountriesbySmithPG,Morrow.

DC-8-CUTM1754-MiniProject

Subject Name	Code	Typeofcourse	T-P-Pj	Prerequisite
MiniProject	CUTM1754	Project	0-0-2	BasicMedical science

The student is supposed to carry out project work in assistance with a mentor. The project should be relevant to the syllabus and should be qualitatively initiated towards fetching a research publication/case study/ clinical study/ community service/ survey on successful completion within the stipulated time.

Outcome: Research paper publication/ new idea generation/ case study/ clinical study/ community service/survey.

DC-10-CUTM1756-Project

Subject Name	Code	Typeofcourse	T-P-Pj	Prerequisite
Project	CUTM1756	Project	0-0-12	BasicMedical science

Projectwork:

SuggestedProjecttitle

1. Antibacterial activity of sweet orange (citrus sinensis) on Staphylococcus aureus and Escherichia coli isolated from wound infected.
2. The incidence of Salmonella and Escherichia coli in livestock (Poultry) feeds

3. Microbialevaluationofmilkfromadairyfarm.

4. Gastroenteritis in primary school children (6-12yr) of specific locality.
5. Comparative analysis of microbial load of the main water production and water available to CUTM campus

DC-9- CUTM1755–Internship

Subject Name	Code	Type of course	T-P-Pj	Prerequisite
Internship	CUTM1755	Project	0-0-12	Basic Medical science

Internship Thesis Guideline

This Guideline is designed to provide students the knowledge and practice of public health research activity, to enable them to carry out researches and solve research related problems and to help them in writing thesis and defend their work. Upon successful completion of the course, the students shall be able to:

1. Search relevant scientific literature
2. Develop a research proposal
3. Employ appropriate data collection techniques and tools
4. Manage collected data
5. Analyze data with appropriate statistical techniques
6. Write thesis
7. Defend the findings

Proposal Development:

At the ending of third year (Sixth Semester), students individually consultation with designated faculties and extensive literature survey will develop research proposal during the initial 6 months period.

Data Collection/Thesis Writing:

Students will carry out data collection, data management, data analysis, and thesis writing during the remaining period (Six Semester). The Dissertations should have following format:

1. Title
2. Introduction
3. Materials and Methods
4. Results
5. Discussion
6. Conclusion
7. Recommendation
8. References

9. Appendix

Internship

1. Case record
2. Labmanagementandethics
3. Evaluation-Guide(internal)
 - a. -Industriesguide(external)
 - b. -University-projectreport/Viva

The following colour represents the syllabus revision, skill, employability and entrepreneurship.

Green : Skill

Pink : Employability

Sky : Entrepreneurship

Centurion University of Technology and Management Odisha

Choice Based Credit System

Course Structure & Syllabus

Civil Engineering



School of Engineering & Technology

2021

CBCS Structure

Basket	Basket Category	Minimum Credits to be acquired by Regular students	Minimum Credits to be acquired by Lateral Entry students
I	Foundation Courses in Sciences	17	06
II	Foundation Courses in Humanities & Management [A: 6 credit (choice), B: 6 credit (Compulsory)]	12	6(Job readiness) + 3
III	Smart Stack	25	25
IV	Foundation and Core Engineering Courses	58*	48
V	Domain/Skill/Internship/Minor Project/MOOC	48	32
	Total Credits	160	120

Course Structure

Basket I	Foundation Courses in Sciences		
Course Code	Course Title	Credit	Type (Theory+Practice+Project)
CUTM1001	Differential Equations and Linear Algebra	3	2+0+1
CUTM1002	Laplace & Fourier Transforms	3	2+0+1
CUTM1003	Complex Analysis & Numerical Methods	3	2+0+1
CUTM1004	Discrete Mathematics	3	2+0+1
CUTM1005	Probability & Statistics	3	2+0+1
CUTM1925	Calculus	3	2+0+1
CUTM1006	Mechanics for Engineers	3	2+1+0
CUTM1007	Optics and Optical Fibres	3	2+1+0
CUTM1008	Applied Analytical Chemistry	3	2+1+0
CUTM1009	Applied Engineering Materials	3	2+0+1
CUTM1010	Environmental Studies	2	0+0+2

Basket II	Foundation Courses in Humanities & Management [A: 6 credit (choice), B: 6 credit (Compulsory)]		
Course Code	Course Title	Credit	Type (Theory+Practice+Project)
CUTM1011	Optimisation Techniques	2	0-2-0
CUTM1012	Engineering Economics and Costing	3	2-0-1
CUTM1013	Project Management	3	2-0-1
CUTM1014	Gender, Human Rights and Ethics	3	1.5-0-1.5
CUTM1015	Climate Change, Sustainability and Organisation	3	1.5-0-1.5
CUTM1016	Job Readiness	6	0-6-0

Basket III	Smart Stack		
Course Code	Course Title	Credit	Type (Theory+Practice+Project)
CUTM1017	Industrial IOT and Automation	6	3-2-1
CUTM1018	Data Analysis and Visualisation using Python	4	0-1-
CUTM1019	Machine Learning using Python	4	1-2-1
CUTM1020	Robotic automation with ROS and C++	4	1-2-1
CUTM1021	Basics of Design Thinking	2	0-0-2
CUTM1022	System Integration with DYMOLA	2	0-0-2
CUTM1023	Smart Engineering Project (G2M)	3	0-0-3

Basket IV	Core Courses _Civil Engineering		
Course Code	Course Title	Credit	Type T+P+PJ
CUTM1073	Geotechnical Engineering	3	1-1-1
CUTM1069	Construction Material Testing	2	0-2-0
CUTM1061	Structural Detailing and Drawing	2	0-2-0
CUTM1063	Quantity Estimation & Costing	3	2-1-0
CUTM1060	Geometric Modeling	3	0-3-0
CUTM1071	Hydrology and Irrigation	3	1-1-1
CUTM1067	Surveying Techniques	3	1-2-0
CUTM1068	Geospatial Survey	3	1-2-0
CUTM1066	Concrete Technology	3	1-2-0
CUTM1065	Electrical, Plumbing, and Woodwork	3	1-2-0
CUTM1074	Design of Structure	4	1-3-0
CUTM1070	Road Engineering	2	1-1-0
CUTM1064	Construction Materials	2	0-0-2
CUTM1072	Water Supply and Sanitary Engineering	2	1-1-0
CUTM1081	Computer-Aided Engineering	3	0-2-1
CUTM1090	Hydraulic Machinery	2	1-1-0
CUTM1089	Fluid Mechanics with FVM	3	2-1-0
CUTM1062	Theories of Failure analysis using FEA	4	2-2-0
CUTM1059	Database Management Systems	3	2-1-0
CUTM1058	Programming in Java	3	2-1-0
CUTM1907	Disaster Preparedness & Planning Management	2	2-0-0
	Total Credits	58	

Basket V: Domain/Skill/MOOC/Minor Project/Internship/Applied Courses

Domain:

- Construction Planning Monitoring and Project Management
- Architectural and Structural Design
- Aerial Survey and Remote Sensing Applications
- GO-TO-MARKET

Centurion University of Technology and Management Odisha

CHOICE BASED CREDIT SYSTEM

COURSE STRUCTURE & SYLLABUS

BASKET - I



Centurion
UNIVERSITY

Shaping Lives...
Empowering Communities...

School of Engineering & Technology

2021

**Course Structure
Basket - I**

Course Code	Course Title	Credits	Course Type T+P+PJ
CUTM1001	Differential Equations and Linear Algebra	3	2+0+1
CUTM1002	Laplace & Fourier Transforms	3	2+0+1
CUTM1003	Complex Analysis & Numerical Methods	3	2+0+1
CUTM1004	Discrete Mathematics	3	2+0+1
CUTM1005	Probability & Statistics	3	2+0+1
CUTM1925	Calculus	3	2+0+1
CUTM1006	Mechanics for Engineers	3	2+1+0
CUTM1007	Optics and Optical Fibres	3	2+1+0
CUTM1008	Applied Analytical Chemistry	3	2+1+0
CUTM1009	Applied Engineering Materials	3	2+0+1
CUTM1010	Environmental Studies	2	0+0+2

Syllabus

Differential Equations and Linear Algebra

Code	Course Title	Credit	T-P-PJ
CUTM1001	Differential Equations and Linear Algebra	3	2-0-1

Objective

- Introduce students to how to solve linear Differential Equations with different methods.
- To solve the system of linear equations appearing in the problems of electrical engineering, mechanical engineering etc.
- To use Eigen values and Eigen vectors in Control theory, vibration analysis, electric circuits, advanced dynamics problems.
- Introduce students how to solve first order and second order differential equations

Course outcome

- Understand the importance of linear functions in mathematics.
- Solve systems of linear equations using Gauss- elimination to reduce to echelon form.
- Learn fundamental concepts of ODE theories and where and how such equations arise in applications to scientific and engineering problems.
- Be competent in solving linear/non-linear 1st & higher order ODEs using analytical methods to obtain their exact solutions

Course content

Module-I

First order linear differential equations and its applications(Kirchhoff's law)

Project-1:Some applications of differential equations in RL electrical circuit problems

Module-II:

Second order linear homogeneous differential equations (Real roots, Real equal roots, Complex conjugate roots) and its applications.

Project-2: RLC Circuit, Pendulum

Module-III:

Second order linear non-homogeneous differential equations, Finding particular integral consisting of exponential, trigonometric functions (Sine, cosine) using inverse operator method

Project-3: Simple mass-spring system, Damped vibration system

Module IV:

Basic concepts of a matrices, solution of linear system of equations by Gauss elimination method, linearly independent and dependent of a vectors, rank of a matrix.

Project-4

Report on finding the traffic flow in the net of one-way streets

Module V:

Determinants and Cramer's Rule, Fundamental theorem of linear system of equations.

Module VI:

Eigenvalues and Eigen vectors of a matrix

Project-5

(i) Find the limit states of the Markov process model.

(ii) Find the growth rate in the Leslie model

Module VII:

Symmetric, Skew-Symmetric, Orthogonal Matrices and Properties

Project-6

To make a report to show that the product of two orthogonal matrices is orthogonal, and so is the inverse of an orthogonal matrix. What does this mean in terms of rotations?

Text Books:

1. Advanced engineering mathematics by Erwin Kreyszig, 8th edition
Chapter-6 (6.1-6.6), Chapter-7 (7.1,7.2)
2. Higher Engineering by B.V. Ramana
Chapter-8(8.1,8.2,8.21), Chapter-9 (9.2,9.3,9.5)

Reference Books:

1. J. Sinha Roy and S. Padhy, A Course of Ordinary and Partial Differential Equations, Kalyani Publishers, New Delhi.
2. G.B. Thomas, M.D. Weir, J.R. Hass, Thomas' Calculus, Pearson Publication.
3. R.G. Bartle, D.R. Sherbert, Introduction to Real Analysis, Wiley Publication

Laplace and Fourier Transform

Code	Course Title	Credit	T-P-PJ
CUTM1002	Laplace and Fourier Transform	3	2-0-1

Objective

- To describe the ideas of Fourier and Laplace Transforms and indicate their applications in the fields such as application of PDE, Digital Signal Processing, Image Processing, Theory of wave equations, Differential Equations and many others.
- To use Fourier series for solving boundary value problems appearing in scientific & engineering problems.

Course outcome

- Solve differential equations with initial conditions using Laplace transform.
- Evaluate the Fourier transform of a continuous function and be familiar with its basic properties.

Course content

Module-I (T-3-Pj-2)

Laplace Transforms, Properties of Laplace transforms, Unit step function.

Project-1

Make a short draft of properties of Laplace transform from memory. Then compare your notes with the text and write a report of 2-3 pages on these operations and their significance in applications.

Module-II (T-2-Pj-2)

Second shifting theorem, Laplace transforms of Derivatives and Integrals

Project-2

Find the Laplace transform of the following functions

Module-III (T-3-Pj-2)

Derivatives and Integrals of Transforms, Inverse Laplace transform.

Project 3:

Application of Unit step function (RC- Circuit to a single square wave).

Module- IV (T-2-Pj-2)

Solution of Differential Equation by using Laplace Transform.

Project 4: Find the solution of differential equation by using Laplace Transform.

Module-V (T-4-Pj-2)

Periodic function, Fourier series, Fourier series expansion of an arbitrary period, Half range expansions.

Project-5

Find the Fourier series expansion of a 2π periodic function.

Module-VI(T-3-Pj-2)

Complex form of Fourier series, Fourier Integrals, Different forms of Fourier Integral.

Project-6

Find the Fourier sine and cosine integral of the following functions.

Module-VII(T-3)

Fourier Transforms, Fourier sine and cosine Transforms.

Text Books:

- E. Kreyszig , Advanced Engineering Mathematics, Johnwiley& Sons Inc-8th Edition.Chapters:5(5.1 to 5.4(without Dirac's delta function) ,10(10.1,10.4 and 10.7-10.9(definitions only , no proofs))
- Higher Engineering Mathematics by B.V.Ramana, Tata McGraw-Hill Education India, Inc-8th Edition.

Reference Books:

- 1) Advanced Engineering Mathematics by P.V.O' Neil Publisher: Thomson
- 2) Mathematical Methods by Potter & Goldberg ; Publisher : PHI

Complex Analysis and Numerical Methods

Code	Course Title	Credit	T-P-PJ
CUTM1003	Complex Analysis and Numerical Methods	3	2-0-1

Objective

- To understand about Complex variables and complex functions.
- To acquire the skill of evaluating contour integrals using Cauchy's integral formula and Cauchy's integral theorem.
- To understand the limitations of analytical methods and the need for numerical methods and the ability to apply these numerical methods to obtain the approximate solutions to engineering and mathematical problems.

Course Outcome

- To get equipped with the understanding of the fundamental concepts of functions of a complex variable along with the concepts of analyticity, Cauchy-Riemann relations and harmonic functions.
- Evaluate complex contour integrals applying the Cauchy integral theorem, Cauchy integral formula.
- Derive a variety of numerical methods for finding out solutions of various mathematical problems arising in roots of linear and non-linear equations, Solving differential equations with initial conditions and Evaluating real definite integrals.

Course Outline

Module I (T-3 hrs-P-0-hrs-P-0 hrs)

Functions of a complex variable, Analytic functions, Cauchy-Riemann equations (Without Proof), Harmonic and Conjugate harmonic functions, Cauchy's Integral Theorem (Without Proof).

Project-1 : Verification of Cauchy-Riemann equations for complex functions in Cartesian form and Polar form

Module II (T-3 hrs-P-0 hrs-P-2 hrs)

Cauchy's Integral Formula (Without Proof), Cauchy's Integral Formula for higher order derivatives (Without Proof), Taylor series.

Project-2 : Evaluation of contour integrals using Cauchy's Integral Formula

Module III (T-4 hrs-P-0 hrs-P-2 hrs)

Laurent series (Without Proof), Pole, Residue, Residue Theorem (Without Proof), Evaluation of Real integral Type-I.

Module – IV (T-2 hrs-P-0 hrs-P-2 hrs)

Interpolation, Lagrange interpolation polynomial.

Project-3 : Finding out the value of a given function at an interior point on an unequal interval using Lagrange interpolation polynomial

Module – V (T-3 hrs-P-0 hrs-P-2 hrs)

Forward and backward difference operators, Newton's forward and backward difference Interpolation formulae.

Project-4 : Finding out the value of a given function at an interior point on an equal interval using Newton's forward and backward difference interpolation formulae

Module – VI (T-2 hrs-P-0 hrs-P 2 hrs)

Numerical Integration, Trapezoidal rule, Simpson's one third rule.

Project-5 : Evaluation of real definite integrals using Trapezoidal rule and Simpson's one third rule

Module – VII (T-3 hrs-P-0 hrs-P-2 hrs)

Runge-Kutta 2nd & 4th order methods.

Project-6 : Finding out Numerical solutions of differential equations using Runge-Kutta 2nd & 4th order methods

Text Book:

1) Advanced Engineering Mathematics by E. Kreyszig Publisher: John Wiley & Sons Inc-8th Edition Chapters : 12 (12.3, 12.4), 13 (13.2 to 13.4), 14.4, 15 (15.1 to 15.4 Only Type-I integral), 17 (17.3, 17.5), 19 (19.1).

Reference Books:

- 1) Advanced Engineering Mathematics by P.V. O'Neil Publisher: Thomson
- 2) Fundamentals of Complex Analysis (with Applications to Engineering and Science) by E.B. Saff & A.D. Snider Publisher: Pearson

- 3) Numerical Methods for Scientific and Engineering Computation by M. K. Jain, S. R. K. Iyengar & R.K. Jain; New Age International Publishers.
- 4) Introductory Methods of Numerical Analysis by S.S. Sastry; Third Edition, Prentice Hall India.

Discrete Mathematics

Code	Course Title	Credit	T-P-PJ
CUTM1004	Discrete Mathematics	3	2-0-1

Objective

- To understand mathematical reasoning in order to read, comprehend and construct Mathematical arguments as well as to solve problems, occurred in the development of programming languages
- To work with discrete structures such as graphs to study the structure of the world wide web, to model a computer network and to find the shortest path between two places in a transportation network

Course Outcome

- Apply the logical structure of proofs and work symbolically with connectives and quantifiers to produce logically valid, correct and clear arguments.
- Evaluate elementary mathematical arguments and identify fallacious reasoning
- Reformulate statements from common language to formal logic
- Apply truth tables and the rules of propositional and predicate calculus
- Model and solve real world problems using graphs, both quantitatively and qualitatively

Course Outline

Module -I

(4Hours)

Propositional Logic, Connectives, Truth tables of compound propositions, Propositional Equivalence.

Project 1: Given the truth values of the propositions p and q , find the truth values of the conjunction, disjunction, implication, bi-implication, converse, contrapositive and inverse.

Module -II

(3Hours)

Theory of inference, Predicates and Quantifiers, Rules of Inference.

Project 2: Build valid arguments of a given set of propositional logics and quantified statements using rules of inferences.

Module -III

(3 Hours)

Relations and its properties, Partial Ordering, POSET, Totally Ordered Set.

Project 3: Define the properties of a relation on a set using the matrix representation of that relation with examples.

Module -IV

(3Hours)

Hasse Diagram, Maximal & Minimal Elements of a Poset, Greatest & Least Elements of a Poset, Supremum & Infimum of a Poset, Lattice.

Project 4: Find a Topological Sort of a Poset.

Module -V

(3 Hours)

Introduction to Graph Theory, Graph Terminology and Special types of Graphs, Representation of Graphs.

Project 5: Describe how some special types of graphs such as bipartite, complete bipartite graphs are used in Job Assignment, Model, Local Area Networks and Parallel Processing.

Module -VI

(3 Hours)

Graph Isomorphism, Connectivity, Euler and Hamiltonian Graphs, Planar Graphs, Graph Coloring.

Project 6(i): Describe the scheduling of semester examination at a University and Frequency Assignments using Graph Colouring with examples. Find also their Chromatic numbers.

Project 6(ii): List out 10 pairs of Non-isomorphic graphs and explain the reason behind it.

Project 6(iii): List out all features of Euler and Hamiltonian Graphs. Justify whether the given set of graphs are Euler and Hamiltonian. Construct a Gray Code where the code words are bit strings of length three.

Module -VII

(4 Hours)

Trees and their Properties, Spanning Trees, Minimum Spanning Trees, Kruskal's Algorithm.

Project 7: Find a minimum spanning tree in a given weighted graph using Kruskal's Algorithm.

Text Books:

1. Discrete Mathematics and its Applications by K.H.Rosen, Publisher: TMH, Sixth Edition, 2009.
Chapters: 1(1.1 ,1.2,1.3, 1.5); 7(7.1,7.6); 8(8.1 to8.5, 8.7, 8.8);9(9.1,9.4,9.5).

Reference Books:

1. Discrete Mathematical Structures with Applications to Computer Science, J. P. Trembkay, R. Manohar, Tata MC Graw – Hill Edition 38th reprint, 2010.
2. Discrete and Combinatorial Mathematics by R.P.Grimaldi Publisher: Pearson, 5th Edition, 2003.
3. Discrete Mathematics and Applications by Thomas Koshy Publisher: Elsevier, 2004.
4. Discrete Mathematical Structures by B. Kolman, R.C. Busby & S. Ross Publisher: PHI, 5th Edition, 2003

Probability and Statistics

Code	Course Title	Credit	T-P-PJ
CUTM1005	Probability and Statistics	3	2-0-1

Objective

- To translate real-world problems into probability models.
- To motivate students in an intrinsic interest in statistical thinking.
- To recognize the role and application of probability theory, descriptive and inferential statistics in many different fields of science and engineering.
- T o apply probability and statistics in engineering and science like disease modeling, climate prediction and computer networks etc.

Course outcome

- Define and illustrate the concepts of sample space, events and compute the probability and conditional probability of events.
- Define, illustrate and apply the concepts of discrete and continuous random variables, the discrete and continuous probability distributions.
- Define, illustrate and apply the concept of the expectation to the mean, variance and covariance of random variables.

- Compute probabilities based on practical situations using the Binomial, Poisson and Normal distributions.

Course content

Module I :(3 hrs+2 hrs)

Sample spaces and events; axiomatic definition of probability; Axioms of Probabilities

Project-1

A Report on Application of probability to control the flow of traffic through a highway system, a telephone interchange, or a computer processor

Module II :(3 hrs +2 hrs)

Mutually Exclusive Events, Dependent and Independent Events. Conditional Probability

Project-2

A Report on Dependent and Independent Events with Examples

Module III:(3 hrs +2 hrs)

Discrete random variables and probability distributions, Continuous random variables and probability

distributions , Mean ,Variance and Moment Generating Function of Distributions

Project-3

Application of random variables in Engineering Field

Module IV:(3 hrs +2 hrs)

Uniform Distribution, Binomial Distribution, Poisson Distribution

Project-4

Applications of Poisson distribution

Module V:(3 hrs +2 hrs)

Normal Distribution, Working with Normal Tables, Normal Approximation to the Binomial Distributions

Project-5

Normal Distribution utilized in statistics, business settings, and government entities.

Module VI:(3 hrs)

Statistics: Random Sampling, Population and Sample, Sample Mean and Variances, Point and

Interval Estimations, Confidence Intervals

Module VII:(3 hrs +2 hrs)

Regression and Correlation Analysis: Correlation Coefficient, Co-variance independent random variables, linear regression of two variables

Project-6

Uses of Regression and Correlation Analysis in Business

Text Books:

1. Name of Author, Title, Publication, Edition

Advanced Engineering Mathematics by E. Kreyszig Publisher: John Willey & Sons Inc-8th Edition

Reference Books:

1.Statistical Methods by S.P. Gupta (31st Edition); Publisher: Sultan Chand & Sons.

2. Mathematical Statistics by S.C. Gupta & V.K. Kapur (10th Edition); Publisher: Sultan Chand & Sons.

Calculus

Code	Course Title	T-P-PJ	Prerequisite
CUTM1925	Calculus	2-0-1	

Objective

- To apply the concepts of derivative to find curvature and radius of curvature of a curve.
- To apply concepts of Vector Calculus to the problems related to models in work, circulation and flux Problems, hydrodynamics and fluid dynamics etc.

Course Outcome

- Calculate curvature and radius of curvature for a given curve.
- Determine the important quantities associated with scalar and vector fields.
- Find gradient of a scalar point function, divergence and curl of a vector point function.
- Evaluate line integral, double integral and applying these concepts to find out work done by a force, volume of regions in space, center of gravity of a mass etc.
- Transform double integral to line integrals, triple integrals to surface integrals, surface integrals to line integrals and vice versa.

Course Outline

Module-I(3hr+0hr+2hr)

Curvature and Radius of curvature in Cartesian form.

Project 1: To find radius of curvature (Parametric form)

Module-II(2hr+0hr+4hr)

Vector algebra: Algebraic operations, Scalar product, Inner product, Vector product, Scalar and vector triple product.

Project 2: Problems based on inner product, scalar and vector triple products.

Project 3: To find angle between two vectors, area of triangle and parallelogram, volume of parallelepiped and tetrahedron using vector algebra.

Module III(2hr+0hr+4hr)

Gradient of scalar point function, Directional derivatives, Divergence and curl of vector point functions, second order differential operator: the Laplacian operator.

Project 4: To prove the identities with regards to Gradient, Divergence and Curl.

Project 5: To find normal vector to a plane using Gradient of scalar point function.

Module-IV: (3hr+0hr+0hr)

Line Integrals (path dependence and path independence), double integrals.

Module-V: (3hr+0hr+0hr)

Surface Integrals, Triple Integrals

Module-VI: (4hr+0hr+2hr)

Green's and Gauss's Theorems (without proof) and their applications to evaluate the integrals.

Project 6: To find center of gravity and moments of inertia of a mass density

Module-VII: (3hr+0hr+0hr)

Stokes' Theorem (without proof) and its applications to evaluate the integrals.

Text Books:

1. A Text book of Calculus Part – II by Shanti Narayan, Publisher: S. Chand & Company Ltd. Chapters: 8 (Art. 24, 25 (only for Cartesian and parametric curves)).
2. Advanced Engineering Mathematics by E. Kreyszig, Publisher: John Willey & Sons Inc.- 8th Edition

Chapters: 8 (8.1 to 8.3, 8.9 to 8.11), 9 (9.1 to 9.7, 9.9).

Mechanics for Engineers

Code	Course Title	Credit	T-P-PJ
CUTM1006	Mechanics for Engineers	3	2-1-0

Objective

- To provide the students with a clear and thorough understanding on fundamentals of mechanics as applied to solve real-world problems.

Course outcome

- Use scalar and vector analytical techniques for analyzing forces in statically determinate structures.
- Analyze the frictional forces involved in planes, ladder friction and belt friction.
- Determine the centroid and moment of inertia of composite shapes.
- Apply fundamental concepts of kinematics and kinetics of particles to the analysis of simple, practical problems.

- Apply basic knowledge of mathematics and physics to solve real-world problems.

Course content

Module I: Force and Moment (4 Hrs. + 2 Hrs. practices)

Law of Transmissibility of a Force, Composition and Resolution of Forces, Resultant and Equilibrant, Resultant of Two and Several Forces, Moment of a Force and a Couple, Varignon's Principle of Moment

Practice-1: Verification of laws of parallelogram law of forces

Module II: Equilibrium (3 Hrs. + 2 Hrs. practice)

System Isolation and Free Body Diagram, Particle Equilibrium, Lami's theorem, General Conditions of Equilibrium, Types of Supports and Support Reactions, Rigid Body Equilibrium.

Practice-2: To verify the condition of equilibrium by finding reactions at the support of a beam

Module III: Friction (2 Hrs. + 2 Hrs. practice)

Basic Terms used in Dry Friction, Laws of Coulomb Friction, Equilibrium of Bodies on a Inclined Plane, Ladder Friction, Belt Friction

Practice-3: Determination of Angle of Repose

Module IV: Centroid**(2 Hrs.)**

Axis of Symmetry, Centroid of Lines, Areas and Volumes, Centroid of Composite Section.

Module V: Moment of Inertia**(3 Hrs. + 2 Hrs. practice)**

Rectangular and Polar Moment of Inertia, Radius of Gyration, Parallel Axis Theorem and Perpendicular Axis Theorem, Moment of Inertia of Composite Section

Practice-4: Determination of Moment of Inertia of a fly wheel.

Module VI: Kinematics of Linear Motion**(3 Hrs.)**

Kinematics of a Particle, Uniform and Variable Acceleration, Motion under Gravity

Module VII: Kinetics of Linear Motion**(3 Hrs. + 4 Hrs. Practice)**

Principles of Dynamics such as Newton's Second Law, Work-Energy Principle, Impulse-Momentum Principle, Law of Conservation Law of Momentum and Energy

Practice-5: Verification of Newton's second law of motion.

Practice-6: Verification of conservation of momentum in collision.

Text Books:

Engineering Mechanics; Statics and Dynamics by A. K. Tayal, Umesh Publications

Reference Books:

Engineering Mechanics by S. Timoshenko, D.H. Young and J.V. Rao, Tata McGraw Hill
Engineering Mechanics by D.S. Kumar, S.K. Kataria and Sons.

Optics and Optical Fibres

Code	Course Title	Credit	T-P-PJ
CUTM1007	Optics and Optical Fibres	3	2-1-0

Objective

- To train the students for the applications of the solar cell, laser and optical fiber in the field of engineering and technology.
- To learn and practice the techniques used by optical phenomenon so that these can be applied to actual field studies.

Course outcome

- Students should understand optical phenomena.
- Students should learn about different light sources and their use
- After completion of the course the students shall be able to understand the basic knowledge of solar cell, laser and optical fiber and instrumentation involved.
- Students should be able to understand optical fiber principle, operations and its applications.

Course outline

Module I: Reflection and Refraction (Derivation is not required) (3hours +2hours)

Reflection at plane surface, reflection at spherical mirrors, Paraxial rays and approximation. Sign convention, Location of the image formation, Spherical mirror equation, Refraction, Total internal reflection, Dispersion by a prism, Refraction through a prism.

Practice: 1

To determine the refractive index of glass slab using travelling microscope.

Module II: Lenses (Derivation is not required) (2hours+2hours)

Definition, Types of Lenses, Terminology associated with the Lens, Sign Convention Location of the image formation by graphical method for Lenses, Lens formula.

Practice: 2

To determine the dispersive power and Cauchy constants of the material of a prism using mercury source.

Module III: Interference (Derivation is not required) (2hours+2hours)

Superposition principle, definition of Interference, Coherence, Young's double slit experiment, Newton's rings theory- Determination of wave length of light.

Practice: 3

Newton's Rings-Refractive index of liquid

Module IV: Diffraction and Polarization (Derivation is not required) (3hours+2hours)

Types of diffraction, Fraunhofer diffraction at a single slit, Diffraction at N-parallel slits (plane diffraction grating) Polarisation, Types of polarized light and their representation, Brewster Law, Malus Law, polarization by double refraction, polarimeter, Applications of polarized light.

Practice: 4

To find grating element of a plan transmission diffraction grating.

Module V: Optical Properties and Laser (3hours+2hours)

Scattering, refraction, reflection, absorption & transmission, Introduction to optoelectronics, Concept of Light Emitting Diode, Stimulated and spontaneous emission, Basic principle of Lasers, Population inversion, Laser Pumping, Different levels of laser system, Ruby Laser, Applications of Lasers (Medicine, Metrology, Defenses, Nuclear energy, in communication, in consumer electronics industry)

Practice: 5

Wave length of LASER source by diffraction grating method

Module VI: Optical Fibers (3hours+1hours)

Introduction to fiber optics, structure of optical fibers, classification of optical fibers on the variation of refractive index, Classification of optical fibers on the variation of mode of transmission/core diameter, Numerical Aperture, Acceptance angle. Principle of optical fibers communication, optical communication (block diagram only),

Practice: 6

To find the numerical aperture of a given optic fiber and hence to find its acceptance angle.

Module VII: Optical Fibers (4hours+1hours)

Attenuation in optical fibers (Qualitative only-Scattering losses, Absorption losses, bending losses) Fiber Materials-Glass fibers, Plastic fibers, Light sources for fiber optics
V-number of an optical fiber, optical fiber cables design, optical fiber connection, fiber splices, fiber connectors. Application of optical fibers- Cable TV, Networking, Power companies, Imaging, Sensors, Medical (Dental surgery, Endoscopy, Surgery)

Practice: 7

Measurement of bending loss.

Text Books:

1. A Text Book of Optics by M.N. Avadhanulu, BrijLal, N. Subrahmanyam, S Chand; 23rd Rev. Edn. [Module I&II]
2. Engineering Physics, by D.Thirupathi Naidu, M.Veeranjaneyulu, V.G.S Book links, 2017. [Module-III, IV]

3. Principles of Engineering Physics-2 by Md.Khan, S.Panigrahi, Cambridge University Press 2016. [module-V,VI&VII]

Reference Books:

1. Optics by AjoyGhatak, McGraw Hill Education; 6 edition, 2017.
2. Physics-I for engineering degree students by B.B. Swain and P.K.Jena.
3. Concepts in Engineering Physics by I Md. N. Kha, 2016.

Applied Analytical Chemistry

Code	Course Title	Credit	T-P-PJ
CUTM1008	Applied Analytical Chemistry	3	2-1-0

Course Objective

- Explain fundamental principles for environmental analytical methods (titration, electrochemistry, instrumentation and basic parameters of water, soil, fuel, etc)
- Point out suitable analytical techniques for analyzing a specific compounds in an environmental matrix

Course Outcome

- Apply quality control on chemical analysis and laboratory work and explain its importance
- Plan and carry out laboratory experiments, including data analysis and conclusions
- Point out suitable techniques for sampling and handling of environmental samples

Module-I(4Hrs)

Water analysis:

Water softening processes: Lime-Soda, Zeolite and Ion exchange methods. Removal of DO and dissolved CO₂ from water by De-aeration method, Desalination of Brackish water by Reverse osmosis and electro dialysis process. Numericals on calculation of hardness of water, Lime-Soda calculation, Alkalinity of water.

1. Determination of hardness of water by EDTA method. (V. lab)
2. Determination of alkalinity of water. (V. lab)
3. [Determination of Dissolved Oxygen in water.](#) (V. lab)

4. [Determination of Biological Oxygen Demand.](#) (V. lab)
5. [Determination of Chemical Oxygen Demand.](#) (V. lab)

Module-II(2Hrs)

Soil Analysis:

Soil profile, Structure, and properties, Determination of soil properties, Fertility of the soil.

6. Determination of specific gravity of the soil by using pycnometer. (V.lab)
7. Determination of pH and electrical conductivity of soil sample.
8. Determination of moisture content in soil by oven drying method. (V. lab)

Module-III (4Hrs)

Fuel Chemistry-I:

Classification, combustion and chemical principles involved in fuel, calorific value: gross and net calorific values and their determination by bomb calorimeter. Proximate and ultimate analysis of coal and their importance. LPG, Water gas, producer gas, CNG.

9. Determination of calorific value of a fuel sample by using Bomb calorimeter. (V. lab)
10. Analysis of flue gases by Orsat's apparatus.

Module-IV (3Hrs)

Fuel Chemistry-II

Petroleum: its chemical composition and fractional distillation, cracking of heavy oil residues – thermal and catalytic cracking, knocking and chemical structure, octane number, synthesis and applications of bio-fuels, Photovoltaic cell.

11. Synthesis of biodiesel by transesterification process

Module-V(3Hrs)

Corrosion-Mechanisms, Factors affecting Corrosion; Protection from corrosion.

12. Estimation of ferrous ion in the given solution using standard potassium dichromate.

Module-VI (2Hrs)

Electrochemical Phenomenon

Electrochemical cell, Electrode potential, Determination of pH of a solution Using Clomel/Quinhydrone Electrode.

Module-VII(2Hrs)

Error in Chemical analysis

Types of errors, Accuracy and precision, Absolute and relative uncertainty, mean and standard deviation.

Applied Engineering Material

Code	Course Title	Credit	T-P-PJ
CUTM1009	Applied Engineering Material	3	2-0-1

Objective

- To give an introduction to materials, ceramics, polymers, and electronic materials in the context of a molecular level understanding and their application in various field

Course outcome

- Students will understand the physical/chemical behaviors of materials.
- Students will be able to select materials, based on their properties and behaviors, for a given application.
- Students will understand how molecular interactions to the behavior of material give rise to macroscopic properties.

Course content

Module I: New Materials/Nanomaterials (5hrs)

Nanostructures and Nanomaterials: classification (Dimensionality, Morphology/ shape/structure of nano-entities, New Effect/ Phenomena). Hybrid nanomaterials. Effect of size, structure, mechanism, and property on material performance. Applications of nanomaterials in catalysis, telecommunication and medicine.

Project

Synthesis of TiO₂ and ZnO nanoparticles by Sol Gel ,Sonication and Precipitaion method and study their application .

Module II: Carbon Nanomaterials (5hrs)

Carbon nanomaterials, such as graphene, carbon nanotubes (CNTs), crystalline diamond, and diamond-like carbon , Properties and application of fullerenes,

Project

Synthesis and Fabrication of Graphene and Graphene Oxide by sol-gel techniques

Module III: Polymer (5hrs)

Mechanism of polymerization and synthesis of polymers, Copolymerization, Viscoelasticity. Elastomers-structure, Conducting polymers and applications, Fabrication and moulding of polymers, Synthesis, properties and uses PMMA, formaldehyde resins, melamine-formaldehyde-urea resins

Project

Preparation of polystyrene by anionic/cationic/emulsion polymerization method

Module IV: Composites (5hrs)

Composites: characteristics, types and applications, Nanocomposites , Polymer/ Metal oxide nanocomposites and its application

Project

Fabrication of Ceramic matrix particulate composite by powder metallurgy route.

Module V: Adhesives Lubricants (4hrs)

Adhesives, adhesive mechanism and applications, Lubricants-physical and chemical properties, types and mechanism of lubrication. Additives of lubricants and freezing points of lubricants

Module VI: Energy Storages material-I (4Hrs)

Fundamental aspects related to energy storage and conversion, lithium ion batteries, Lead acid batteries; Nickel Cadmium batteries; advanced batteries

Module VII: Energy Storages material-II(4Hrs.)

Super capacitors, fuel cells and Photovoltaic, Future of battery technology

Project

Fabrication of Fuel cell and its application

Text Books:

1. A Textbook of Engineering Chemistry, by Shashi Chawla
2. Engineering Chemistry, by P. C Jain and M. Jain
3. Advanced Polymer Chemistry, by M. Chanda

Reference Books:

4. Surfactants and Polymers in Aqueous Solution, by K. Holmberg, B. Jonsson, B. Kronberg and B. Lindman
5. Energy Scenario beyond 2100, by S. Muthukrishna Iyer

Environmental Studies

Code	Course Title	Credit	T-P-PJ
CUTM1010	Environmental Studies	2	0-0-2

Objective

- To introduces the environmental consequences of Industries on the human health and methods for minimizing their impact through technology and legal system to the undergraduate students.

Course outcome

- After learning this course one should be able to control pollution at individual level and also gains an idea about conservation of natural resources and its management.

Course content

Module-I: Fundamentals of Environmental Sciences

Assignment-1: Multidisciplinary nature of Environmental science

Assignment-2: Components of Environment

Assignment-3: scope and importance of environmental science

Module: II Ecology and Ecosystem

Assignment-1: Structure and function of ecosystem

Assignment-2: Types of ecosystem

Assignment-3: Ecological Succession

Module III- Biodiversity and its conservation

Assignment-1: Concepts of Biodiversity

Assignment-2:Biodiversity at local level, global level and National level

Assignment-3: Conservation of Biodiversity

Module IV- Natural resources and its conservation

Assignment-1: Land resources and its conservation

Assignment-2: Forest resources and its conservation

Assignment-3:Water resources and its conservation

Assignment-4:Energy resources and its conservation

Module V Environmental pollutions and its control measure

Assignment-1: Soil pollution

Assignment-2: Water pollution

Assignment-3: Air pollution

Assignment-4: Noise pollution

Module VI Natural Hazards and Disaster management

Assignment-1: Concepts of natural hazards

Assignment-2: Different types of natural hazards: cyclone, earthquake, volcanic eruption etc.

Assignment-3: Process of disaster preparedness and its management

Assignment-4: Solid waste management

Module VII Environmental issues and laws

Assignment-1: Major environmental issues like climate change, global warming, green house effects, Ozone layer depletion, Acid rain

Assignment-2: Water Act, 1974

Assignment-3: Air Act, 1981

Assignment-4:Environmental protection act, 1986

Reference Books:

1. Environmental Studies by U.N. Dash & H. D. Kumar, India Tech Publication, New Delhi
2. Environmental Studies by R. Rajagopalan Oxford University Press
3. Environmental Science and Engineering, 2E, by Aloka Debi, University Press

Centurion University of Technology and Management Odisha

CHOICE BASED CREDIT SYSTEM

COURSE STRUCTURE & SYLLABUS

BASKET - II



Centurion
UNIVERSITY
Shaping Lives...
Empowering Communities...

School of Engineering & Technology

2020

Course Structure

Basket - II

Course Code	Course Title	Credits	Course Type T+P+PJ
CUTM1011	Optimisation Techniques	2	0-2-0
CUTM1012	Engineering Economics and Costing	3	2-0-1
CUTM1013	Project Management	3	2-0-1
CUTM1014	Gender, Human Rights and Ethics	3	1.5-0-1.5
CUTM1015	Climate Change, Sustainability and Organisation	3	1.5-0-1.5
CUTM1016	Job Readiness	6	0-6-0

Syllabus

Optimization Techniques

Code	Course Title	Credit	T-P-PJ
CUTM1011	Optimization Techniques	2	0-2-0

Course Rationale:

Operations research (OR) have many applications in science, engineering, economics, and industry and thus the ability to solve OR problems are crucial for both researchers and practitioners. Being able to solve the real life problems and obtaining the right solution requires understanding and modelling the problem correctly and applying appropriate optimization tools and skills to solve the mathematical model. The goal of this course is to teach you to formulate, analyse, and solve mathematical models that represent real-world problems. We will also discuss how to use EXCEL for solving optimization problems

Course Objectives:

To learn about the operations research techniques, model formulation and applications used to solve business decisions by using computer software

Course Outcomes: After completion of the course students

LO1. Ability to apply the theory of optimization methods and algorithms to develop and for solving various types of optimization problems

LO2. Ability to go in research by applying optimization techniques in problems of Engineering and Technology

LO3. Ability to solve the mathematical results and numerical techniques of optimization theory to concrete Engineering problems by using computer software

Course contents

Module-I: Linear Programming: Graphical Method, Simplex method, Penalty Method,

Module-II: Transportation Models, Assignment Models, Sequencing and Scheduling Models by Johnson's Algorithm

References Recommended:

Books

- Harvey M. Wagner, *Principles of Operations Research*, Englewood Cliffs, Prentice-Hall, 1969
- S D Sharma and Himansu Sharma, *Operations Research: Theory, Methods and Applications*, 15 Edition, Kedarnath Ramnath & Co

External Links:

<https://www.informs.org/Resource-Center/INFORMS-Student-Union/Consider-an-Analytics-OR-Career>

<https://www.informs.org/>

https://en.wikipedia.org/wiki/Operations_research

Google and YouTube

Journals:

- International Journal of operations Research
- European Journal of Operations Research
- **International Journal of Operations Research and Optimization**

Engineering Economics and Costing

Code	Course Title	Credit	T-P-PJ
CUTM1012	Engineering Economics and Costing	3	2-0-1

Course Rationale:

This course aims at providing the student with advanced concepts of engineering economic analysis and its role in engineering decision making.

Course Objectives:

CO1. Facilitate students to understand the basics of Economics and its application in the field of engineering

CO1.Enable students to understand the concepts of the time value of money and techniques for evaluation of engineering project

CO1.Equip students with the skills required to understand cost statements/records of the product and its effect on decision making

Course Outcomes: After completion of the course students

LO1. Apply the microeconomics concepts related to business and its impact on enterprise

LO1.Develop an awareness and understanding time value of money and techniques for evaluation of engineering project

LO1.Apply cost concepts to analyse common business management decisions such as pricing a product and services.

Course contents

Module: I: Engineering Economics – Nature and scope

General concepts on Micro & Macro Economics. The Theory of demand, Demand function, Law of demand and its exceptions, Elasticity of demand, Law of supply and elasticity of supply.

Theory of production, Law of variable proportion, Law of returns to scale.

Module-II: Time value of money:

Simple and compound interest, Cash flow diagram, Principle of economic equivalence. Evaluation of engineering projects: Present worth method, Future worth method,

Net present value method, internal rate of return method, Cost-benefit analysis in public projects.

Depreciation: Meaning Causes, Factors affecting depreciation, Methods of providing depreciation, Straight Line Method & Diminishing Balance Method

Module-III

Cost concepts, Elements of costs, Preparation of cost sheet, Segregation of costs into fixed and variable costs. Break-even analysis (Simple numerical problems to be solved)

Indian Banking System: Banks: Meaning, nature, characteristic of the Indian banking system, functions of commercial banks, functions of Reserve Bank of India, Overview of Indian Financial System.

Books

- Riggs, Bedworth and Randhwa, “Engineering Economics”, McGraw Hill Education India.
- Mithani, D.M., Principles of Economics. Himalaya Publishing House
- Mishra,S. “Engineering Economics & Costing “, PHI
- Sullivan and Wicks, “ Engineering Economics”, Pearson
- Paneer Seelvan,R., “ Engineering Economics”, PHI
- Gupta, G.S., “ Managerial Economics”, TMH
- Lal and Srivastav, “ Cost Accounting”, TMH

Links to websites:

- <http://courseware.cutm.ac.in/>

Project Management

Code	Course Title	Credit	T-P-PJ
CUTM1013	Project Management	3	2-0-1

Course Objective:

- The successful development and implementation of all project's procedures.
- Learn project management methodology to initiate and manage projects efficiently and effectively
- Acquire key project management skills and strategies for Productive guidance, efficient communication and supervision of the project's team
- The achievement of the project's main goal within the given constraints

Course outcome:

- Develop a Project Charter document for any project
- Develop Project Management Plan document
- Acquire 10 knowledge area identified by PMI and its application while delivering a projects
- Implement the Project and Prepare a project document that they have undertaken as a learning tool
- Qualify CAPM/PMP certification offered by PMI

Course Content:

Unit: I

Project Management framework; Introduction to Project Management; Project Life Cycle and Organisation, Project vs. Operational work, Stakeholders, Organisational Influences

Project Management Process for a Project, groups, Initiating, planning, executing, monitoring &controlling and closing process groups.

Project management Knowledge area;

Project Integration Management; Develop project charter, develop project management plan, direct and manage project execution, monitor and control project work, perform integrated change control, close project or phase.

Unit: II

Project Scope Management; collect requirements, define scope, create WBS, verify scope, control scope

Project Time Management; Define activities, sequence activities, estimate, develop and schedule

Project Cost Management; Estimate costs, determine budget, control costs

Unit: III

Project Quality Management; Plan quality, perform quality assurance, perform quality control

Project HR Management; Develop HR plan, acquire project team, develop and manage project team

Project Communications Management; Identify stakeholders, plan communication, distribute information, manage expectation of stake holders, report performance

Unit: IV

Project Risk Management; Plan risks; identify risks, perform quality and quantitative risk analysis, plan risk responses, monitor and control risks

Project Procurement Management; Plan procurements, conduct procurements, administer procurements, close procurements

Project Stakeholders Management;Identifying stakeholders, stakeholder analysis, engagement

Note: Students can use any of these software for their project; MS. Excel/ Bitrix 24/Primavera/ Microsoft Projects

Books Recommended:

- 1) Project Management: A Managerial Process, Clifford F Gray & Eric W Larson, Tata McGrawHill
[Text book]
- 2) A Guide to the Project Management Body of Knowledge, 6th Edition, PMI
- 3) Project Management- A system Approach to Planning, Scheduling and Controlling (Harold Kerzner). CBS Publishers and Distributers, New Delhi.
- 4) Projects, Preparation, Appraisal and Implementation (Prasanna Chandra), 3rd Edition, Tata McGraw Hill, New Delhi.
- 5) Project Management (Nagarajan, K), New Age Publishers, New Delhi.
- 6) Project Management. A Managerial Approach (Meredith, R.J and Mantel, S.J), Wiley (India).

Gender, Human Rights and Ethics

Code	Course Title	Credit	T-P-PJ
CUTM1014	Gender, Human Rights and Ethics	3	1.5-0-1.5

Course Objectives

This course is about gender, human rights and ethics in which the student will be sensitized and exposed to related issues in the context of business and organisations in India. The specific objectives are:

- To develop an understanding of gender, human rights and ethics in an unequal society like India
- Sensitisation of how gender, human rights and ethics are significant in organisations.
- Integrating concerns related to gender, human rights and ethics in organisations.

Course Outcomes

- Understanding the complexity of issues and challenges relating to gender, human rights and ethics
- Be sensitive to gender, human rights and ethics within an organizational context,
- To integrate concerns related to gender, human rights and ethics into the policies, processes and systems in an organization.

Course Syllabus

Module 1

- Difference between sex and gender; social construction of gender and its outcomes in the form of behavior, roles, gender based division of labour, hierarchy; gender relations.
- Gender issues in organisations - significance of relations between structures, practices, context, interactions and power for construction of gender at organisational level
- Gender implications at workplace, management and leadership, Laws and Acts
- Comparing different types of organisations; how to create a gender sensitive organisation.

Module 2

- Introduction to human rights, Meaning and Definition, Types
- Human Rights Law: Protection, violation and the legal framework for their protection - International Human Rights Law, Universal Declaration of Human Rights
- Conflicts of Rights and its Significance to Organisations: Challenges of the past and challenges for the future. Persistence of social discrimination and inequality; efforts in the search for justice for past violations, continued struggle for human rights and accountability in an organisational context.

Module 3

- Introduction to and study of ethics; Indian and Western ethics
- Different ethical systems and perspectives; ethical relativism and its implications, utilitarianism, duty ethics and virtue ethics in organisations
- Critique of various ethical positions and develop their own position in an organizational context.

Session Plan

Session 1

Basic concepts on sex and gender; social construction of gender; constitutional provisions for gender equality.

PPT 1 - [Introduction to Gender](#)

1.5 mins video on Gender Equality and Poverty

<https://www.youtube.com/watch?v=4viXOGvvu0Y>

Session 2

Gender issues in different sectors – Health, Education, Governance, Livelihoods

PPT 2 - [Gender issues in health](#)

PPT 3 - [Gender issues in education](#)

PPT 4 - [Gender issues in Governance](#)

1.3 mins video on gender stereotypes and education

<https://www.youtube.com/watch?v=nrZ21nD9I-0>

Session 3

Approaches to address gender inequality – WID, WAD and GAD

PPT 5 - [WID WAD GAD](#)

TED talk by Deepa Bhardwaj - True equality is when both women and men have a voice - 13 mins

https://www.youtube.com/watch?v=BSRTZ_q4RX8

Session 4 & 5

Gender and organizational issues

PPT 6 - [Gender and Organisations](#)

PPT 7 - [Gender Equality in Organisations](#)

PPT 8 - [Gender Mainstreaming and Attitude in Workplace](#)

PPT 9 - [Gender Sensitisation](#)

3.22 mins on The Future of Gender Equality in Work by ILO

https://www.ilo.org/global/about-the-ilo/multimedia/video/institutional-videos/WCMS_558508/lang--en/index.htm

4.22 mins video on Gender Based Analysis

<https://www.youtube.com/watch?v=p6w-d1mmjFU>

Free Readings

Gender and Development - Concepts and Definitions

Gender and Organisational Change Training

Project

-Gender Responsive Governance in times of COVID 19

<https://in.one.un.org/gender-responsive-governance-in-the-times-of-covid-19/>

- SDG - Gender Equality Goal 5

<https://in.one.un.org/page/sustainable-development-goals/sdg-5/>

- Gender, Sustainability and Environment

Women Environment and Sustainable Development A Ca

- Good Practices of Gender Mainstreaming in India

Good Practices for Gender Mainstreaming

- Gender Equality Case Study

Gender Equality - Kerala Case Study

Session 6

Basic concepts on human rights; history of human rights; current significance

Videos on Basic concepts of human rights

<https://www.youtube.com/watch?v=ew993Wdc0zo>

<https://www.youtube.com/watch?v=JpY9s1Agbsw>

Videos on History of Human Rights

<https://www.youtube.com/watch?v=nDgIVseTkuE>

https://www.youtube.com/watch?v=6XXGF_V8_7M

Session 7

Violation and legal framework for the protection of human rights

Video on the Paris Principles

https://www.youtube.com/watch?v=ZEgD7pdXt_c

Video on Protection of Human Rights Act 1993 (for reference, bilingual)

<https://www.youtube.com/watch?v=qAiiOyL5WAw>

Session 8

Human rights and sustainability framework

Video on Human Rights and Sustainable Development

<https://www.youtube.com/watch?v=mHHy1gDn4x8>

Session 9 & 10

Human rights in the organizational context

Video on Why should your company care about human rights

<https://www.youtube.com/watch?v=mCtNx3hHZ08>

Video on UN Reporting Framework: Salient Human Rights Issues

<https://www.youtube.com/watch?v=LswDupgiZug>

Books:

1. Arihants UGC NET Human Rights and Duties

2. Kapoor, S. K. Central Law Agency's Human Rights under International Law and National Law

Ciapham Andrew, 2015, Human Rights: A Very Short Introduction, Oxford University Press

Smith Rhona, 2015, Textbook on International Human Rights, Oxford University Press

Free Online Sources:

<https://www.humanrightscareers.com/.../10-human-rights-study-books-you-can-download>

<https://www.humanrightscareers.com/courses/>

Session 11

Basic concepts in ethics

PPT - [Introduction to Ethics](#)

Video on Ethics defined

<https://www.youtube.com/watch?v=4vWXpzlL7Mo>

Session 12

Theoretical perspectives – utilitarianism, virtue ethics, duty ethics

PPTs - [Duty Ethics](#)

[Utilitarianism](#)

[Virtue Ethics](#)

Video on Utilitarianism

https://www.youtube.com/watch?v=-FrZl22_79Q

Video on virtue ethics

<https://www.youtube.com/watch?v=NMblKpkKYao>

Video on deontology (duty) ethics

<https://www.youtube.com/watch?v=wWZi-8Wji7M>

Project (self exploration through case studies)

[Fraudulent Books 1](#)

[Gifts from the Boss's Friend 1](#)

[Gifts from the Sales Representative 1](#)

Session 13

Ethical relativism

PPT - [Ethical Relativism](#)

Video on Moral relativism

<https://www.youtube.com/watch?v=5RU7M6JSVtk>

Project (self-exploration through case studies)

[Mining Data docx 1](#)

[Office Affair 2](#)

[On-time Delivery](#)

Session 14 & 15

Ethics in organisations

Video on ethics in the workplace

<https://www.youtube.com/watch?v=0mUxMpMTT28>

Project (self-exploration through case studies)

Falsifying Attendance_1

Family Loyalty vs. Meritocracy_1

Rumors_1

The Supervisor's Choice_1

Books

Frankena, WK, 1973, Ethics (2nd Edition), Pearson.

Singer, P. 2011, Practical Ethics (3rd ed), Cambridge University Press.

Smart, JJC and Williams, B. 1973, Utilitarianism: For and Against, Cambridge University Press.

Climate Change, Sustainability and Organisations

Code	Course Title	Credit	T-P-PJ
CUTM1015	Climate Change, Sustainability and Organisations	3	1.5-0-1.5

Course Rationale:

This course is about climate change, sustainability and its implications for organisations. Climate change and sustainability are closely interlinked. Students will be exposed to related issues, challenges and debates on the subjects. They will develop an understanding of how organizational performance gets affected by climate change today. As organisations grow and diversify in India, there is a need to sensitise Management students to the significance of climate change and its impact on humanity and environment; Sustainable Development Goals (SDGs) and integrated reporting framework for sustainability of organisations.

Module 1: Climate Change and Organisations

Course Objectives:

- CO1. To develop an understanding about climate change in general, responses and debates
- CO2. To create awareness about the impact of climate change on organisations in performance, growth and sustainability
- CO3. To facilitate in developing reference points to factor in aspects of climate change in organizational planning and development

Course Outcomes:

- LO1. Students will be exposed to current climate change issues, challenges and debates
- LO2. They will be sensitive to its implications for organisations in different sectors
- LO3. The course will equip the students of Management to develop strategies for perspective planning of organisations

Course Contents:

1. Basics of climate change; impacts on various sectors; responses and mitigation efforts by the state and non-state agencies; debates and critiques
2. Sectoral implications of climate change – Agriculture and Forestry; Transportation; Buildings; Energy; Industry and Manufacturing
3. Climate change – specific impacts (Migration, Disasters and Pandemics)
4. Mitigation and adaptation keeping the sustainability of business organisations

Projects: Case study, videos, small group workshops, book reviews

Session Plan for Module 1 – Climate Change and Organisations (10 one hour sessions)

Session 1: Basic concepts of climate change, impacts, issues and challenges

Session 2: Responses and mitigation efforts by state and non-state agencies

Session 3: Debates and critiques on climate change

Session 4: Climate change and ecosystem

Session 5: Climate change and social sector – health, education and livelihood/food security

Session 6: Climate change and infrastructure and services – buildings, transportation, communication, electricity/energy

Session 7: Mitigation and adaptation of climate change impacts on business organisations

Session 8 and 9: Climate change impacts of migration, disasters and pandemics – societal and organisational implication

Session 10: Develop reference points to factor into perspective planning and development of organisations

Module 2 – Sustainability in Organisations

Course Objectives:

CO1. To develop an understanding of sustainable development, SDGs and their relevance for sustainability of organisations

CO2. To comprehend the application of the Integrated Reporting Framework for Sustainability in business.

Course Outcomes:

LO1. The student will develop an understanding of perspectives on SDGs, sustainability and development in the context of organisations

LO2. Argue the business case for sustainability informed by an understanding of the impact of current global and local economic, social and environmental pressures (including pandemics)

LO3. Develop an Action Plan through a Case Study for integrating sustainability across an organisation's value chain

LO4. Develop and apply the Integrated Reporting Framework for Sustainability through a case.

Course Contents:

1. Sustainable development, debates, SDGs, challenges and opportunities; The business case and leadership for action
2. Regulatory environment and International policy; Integrated Reporting Framework for Sustainability
3. Production and consumption; Design, technology, and planning for sustainability
4. Communication and marketing; Collaboration and partnerships

Projects: Small group exercises, case analysis, video and book reviews

Session Plan for Module 2 – Sustainability in Organisations (10 one hour sessions)

Session 1: Sustainable development basics and introduction to SDGs (rationale, issues and challenges for India)

Session 2 to 6: Discussion on the 17 SDGs

Session 7: SDGs and its relevance for organisations

Session 8 to 10: Integrated framework for reporting sustainability in organisations; factoring aspects of SD into performance of organisations

The 17 sustainable development goals (SDGs) to transform our world:

GOAL 1: No Poverty

GOAL 2: Zero Hunger

GOAL 3: Good Health and Well-being

GOAL 4: Quality Education

GOAL 5: Gender Equality

GOAL 6: Clean Water and Sanitation

GOAL 7: Affordable and Clean Energy

GOAL 8: Decent Work and Economic Growth

GOAL 9: Industry, Innovation and Infrastructure

GOAL 10: Reduced Inequality

GOAL 11: Sustainable Cities and Communities

GOAL 12: Responsible Consumption and Production

GOAL 13: Climate Action

GOAL 14: Life Below Water

GOAL 15: Life on Land

GOAL 16: Peace and Justice Strong Institutions

GOAL 17: Partnerships to achieve the Goal

Videos – Climate Change

1. CSE Climate Change Analysis - <https://www.youtube.com/watch?v=5fyT3-9kxU4> (7.5 mins)
2. Climate Change is having Massive Impact on Indian Farmers - <https://www.youtube.com/watch?v=A8gcGalzqlw> (8.5 mins)
3. Climate Change in India: The Risks we face (NDTV) - <https://www.youtube.com/watch?v=AT1yi1tDenM> (20.28 mins)

Videos – Sustainable Development

1. Short Videos (5) on Sustainable Development Goals and one TED Talk
<https://developmenteducation.ie/blog/2017/09/5-videos-sustainable-development-goals-worth-view-useful-ted-talk/>

2. Overview of Sustainable Development Goals -
<https://www.youtube.com/watch?v=s190sjqYRdg> (7.43 mins)

Projects:

1. Climate change impacts on agriculture and policy responses – what is the current practice and its implications for the sector and people; give your own recommendations based on your understanding of issues, challenges, debates, critiques.
2. Marine fishing – fisherfolk
3. Forest dwellers
4. Business organisations – MSMEs, manufacturing, service industries; application of the integrated framework for sustainability reporting

Job

Readiness

Code	Course Title	Credit	T-P-PJ
CUTM1016	Job Readiness	6	0-6-0

Course Objectives

Develop additional skills (verbal, logical, quantitative and reasoning) required to enhance employability as well as the entrepreneurial ability of the students

Course Outcomes

Achieve the following scores as a minimum:

IELTS 6.5

Verbal: 60% (average of 10 exams)

Quantitative: 60% (average of 10 exams)

Logical Reasoning: 60% (average of 10 exams)

Note: A student will be awarded the credits and grades as outlined in the attached presentation:

<https://drive.google.com/file/d/1Wst-jdAJuHHVtYC4F-p3SKuw1PHWOI1U/view?usp=sharing>

Course Syllabus

Course Division

Course I: IELTS - Reading, Listening, Speaking and Writing

Course II: IELTS Verbal

Course III: Quantitative Aptitude

Course IV: Logical Reasoning

Course I: IELTS - Reading, Listening, Speaking and Writing

Module I: IELTS Reading (18hrs)

- Skimming and Scanning
- Sentence Completion
- Choose the Correct options (A, B, C, D)
- Locating the Specific Information
- Assessment on Reading Skill

Module II: IELTS Listening (6hrs)

- Notes/ Form/Table completion
- Label the Map/Passage, Multiple Choice Questions
- Complete the Sentences, Listening to Find Information
- Assessment on Listening Skills

Module III: IELTS Speaking (18hrs)

- Speaking about yourself, your family, your work and your interests
- Introduction & Interview
- Topic Discussion (e.g, Environment, Covid 19, Job)

- Assessment on Speaking Skills

Module IV: IELTS Writing (6 hrs)

- Summarising the chart, table or graph
- Comparing and contrasting graphs and tables
- Describing maps & diagrams
- Agreeing & disagreeing
- Expressing a personal view & opinion
- Assessment on Writing Skill
- CV Writing (2nd year)
- Letter Writing
- Email Writing(2nd year)
- Getting Started –writing an introduction

Course II: IELTS Verbal

Module I: Grammar (4 Hrs)

- Articles
- Prepositions
- Subject-Verb
- Spotting Errors
- Sentence Correction

Module II: Vocabulary (5 Hrs)

- Synonyms
- Antonyms
- Contextual Vocabulary

Module III: Reading Comprehension (3 Hrs)

- Paragraph/ Sentence Completion
- Jumbled Sentences/ Jumbled Paragraph
- Reading Comprehension

Module IV: Verbal Analogies (3 Hrs)

Course III: Quantitative Aptitude

Module I: Number System & Operation (14 Hrs)

- Speed Math-1 : Multiplication tricks, Square, cube, square root, Cube root tricks
- Speed Math-2 : Speed Calculations
- Number System-01 : Operation on Numbers, Classification of Numbers, Tests of Divisibility, Unit Digit Calculation
- Number System-02 : Arithmetic Progression, Geometric Progression, Factors & Factorials, Trailing Zeroes, Remainder Theorem
- HCF & LCM : Concepts, short tricks, question discussion
- Average : Concepts, short tricks, question discussion
- Assessments

Module II: Basic Arithmetic (16 Hrs)

- Percentage-01 : Basics of Percentage, Effective percentage, shortcuts
- Percentage-02 : Advanced questions and discussions
- Profit & Loss-01 : Basics and advanced questions of Profit & Loss and shortcuts
- Profit & Loss-02 : MRP, Discount, Successive discount
- Ratio & Proportion : Types of ratios, Basics & Advanced Question
- Age : Concepts & Shortcuts
- Partnership : Concepts & Shortcuts
- Mixture & Alligation : Rule of Alligation, Basics & Advanced question, Short tricks
- Assessments

Module III: Time & Analysis (17 Hrs)

- Time, Speed, Distance : Concepts, Problems based on relations, Average speed, Stoppage time
- Trains : Relative Speed & All types of train problems
- Boats & Streams : Basics, Upstream, Downstream & Shortcuts
- Race : All concepts & Shortcuts
- Time & Work : Efficiency, wages, alternative day, chain rule

- Pipes & Cistern : Positive & Negative work
- Simple Interest : Concepts & Shortcuts on Simple Interest & Installments
- Compound Interest : Concepts & Shortcuts on Simple Interest & Installments
- Logarithm : All Formulae, concepts & Shortcuts
- Assessments

Module IV: Advanced Arithmetic (16 Hrs)

- Equation : Linear & Quadratic
- Permutation : All concepts & Shortcuts on factorial, fundamental principles of counting
- Combination : All concepts & Shortcuts on Selection (Groups/teams)
- Probability : Terms related to Probability, Event, Theorems related Probability, Conditional Probability. Shortcuts on coins, dices, balls, cards, etc
- Data Interpretation : (Bar/Pi-Chart /Line) graph
- Mensuration : Area & Volume
- Height & Distance : Lines of Sight, Horizontal line, Angle of Elevation, Angle of Depression
- Assessments

Course IV: Logical Reasoning

Module I: Verbal Reasoning-I (14 Hrs)

- Series-1 : Number series (Missing & Wrong)
- Series-2 : Letter, Alpha numeric, Miscellaneous series
- Coding & Decoding : Letter Coding, Number coding, Message coding, Substitution coding, Conditional coding
- Word Problem : Analogy, Odd man out, word formation, letter pair
- Logical Thinking : Brain Riddles
- Assessments

Module II : Verbal Reasoning-II (14 Hrs)

- Order & Ranking : Ranking & Sequence
- Direction Sense Test : Shortest Distance, Angular movement concept and Dusk & Dawn
- Clock : Concepts of Angle, Reflex angle, Right angle Opposite, Coincide and Incorrect clock
- Calendar : All concepts & Shortcuts
- Blood Relation : Jumbled-up descriptions, coded relations, Relation Puzzles
- Assessments

Module III : Non Verbal Reasoning (14 Hrs)

- Cubes & Dices
- Cubes & Cuboids
- Embedded Figure & Figure series
- Figure Puzzle & Figure grouping
- Figure Counting
- Mirror & Water Image
- Paper Cutting & Paper folding
- Assessments

Module IV: Advanced Reasoning (16 Hrs)

- Sitting Arrangement : Circular, Square, Rectangular, Linear, Triangular

- Puzzle : Box, Floor, Month, Day
- Advanced Puzzle : 3 variable
- Logical Venn Diagram
- Syllogism
- Statement & Conclusion
- Data Sufficiency
- Assessments

Centurion University of Technology and Management Odisha

CHOICE BASED CREDIT SYSTEM

COURSE STRUCTURE & SYLLABUS

BASKET - III



School of Engineering & Technology

2020

**Course Structure
Basket - III**

Course Code	Course Title	Credits	Course Type T+P+PJ
CUTM1017	Industrial IOT and Automation	6	3-2-1
CUTM1018	Data Analysis and Visualisation using Python	4	0-1-3
CUTM1019	Machine Learning using Python	4	1-2-1
CUTM1020	Robotic automation with ROS and C++	4	1-2-1
CUTM1021	Basics of Design Thinking	2	0-0-2
CUTM1022	System Integration with DYMOLA	2	0-0-2
CUTM1023	Smart Engineering Project (G2M)	3	0-0-3

Industrial IoT and Automation

Code	Course Title	Credit	T-P-PJ
CUTM1017	Industrial IoT and Automation	6	3-2-1

Objective

- Students will learn the new evolution in hardware, software, and data.
- While the promise of the Industrial Internet of Things (IIoT) brings many new business prospects, it also presents significant challenges ranging from technology architectural choices to security concerns.
- Students acquire upcoming Industrial Internet of Things: Roadmap to the Connected World Course offers important insights on how to overcome these challenges and thrive in this exciting space.

Course outcome

- Discover key IIoT concepts including identification, sensors, localization, wireless protocols, data storage and security
- Explore IoT technologies, architectures, standards, and regulation
- Realize the value created by collecting, communicating, coordinating, and leveraging the data from connected devices
- Examine technological developments that will likely shape the industrial landscape in the future
- Understand how to develop and implement own IoT technologies, solutions, and applications
- At the end of the program, students will be able to understand how to develop and implement their own IoT technologies, solutions, and applications.

Course content

MODULE 1: Introduction & Architecture

Theory

What is IIoT and connected world? The difference between IoT and IIoT, Architecture of IIoT, IOT node.

Challenges of IIOT

Hands-On

1. Introduction to Arduino, ES8266, Introduction to raspberry Pi.

MODULE2: IIOT Components

Theory:

Fundamentals of Control System, introductions, components, closed loop & open loop system.

Introduction to Sensors (Description and Working principle): What is sensor? Types of sensors, working principle of basic

Sensors -Ultrasonic Sensor, IR sensor, MQ2, Temperature and Humidity Sensors (DHT-11).Digital switch, Electro

Mechanical switches.

Practice:

2. Measurement of temperature & pressure values of the process using raspberry pi/node mcu.
3. Modules and Sensors Interfacing (IR sensor, ultrasonic sensors ,Soil moisture sensor) using raspberry pi/node mcu.
4. Modules and Actuators Interfacing (Relay, Motor, Buzzer) using raspberry pi/node mcu.

MODULE 3: Communication Technologies of IIoT

Theory:

Communication Protocols: IEEE 802.15.4, ZigBee, Z Wave, Bluetooth, BLE, NFC, RFID

Industry standards communication technology (LoRAWAN, OPC UA, MQTT), connecting into existing Modbus and Profibus

Technology, wireless network communication.

Practice:

5. Demonstration of MQTT communication
6. Demonstration of LoRa communication.

MODULE 4: Visualization and Data Types of IIoT

Theory:

Front end EDGE devices, enterprise data for IIoT, emerging descriptive data standards for IIoT, cloud data base, cloud

Computing, fog or edge computing,

Connecting an Arduino /raspberry pi to the Web: Introduction, setting up the Arduino/raspberry pi development

Environment, Options for Internet connectivity with Arduino, configuring your Arduino/raspberry pi board for the IoT.

Practice:

7. Visualization of diverse sensor data using dashboard (part of IoT's 'control panel')
8. Sending alert message to the user.

MODULE 5:

Theory

Extraction from Web: Grabbing the content from a web page, Sending data on the web, troubleshooting basic Arduino

issues, types of IoT interaction , Machine to Machine interaction (M2M).

Practice

9. Device control using mobile Apps or through Web pages.
10. Machine to Machine communication

MODULE 6: Control & Supervisory Level of Automation

Theory

Programmable logic controller (PLC), real-time control system, Supervisory Control & Data Acquisition (SCADA).

HMI in an automation process, ERP &MES

Practice

11. Digital logic gates programming using ladder diagram
12. Implementation of Boolean expression using ladder diagram
13. Simulation of PLC to understand the process control concept.

Module 7: Application of IIOT

Case study: Health monitoring, Iot smart city, Smart irrigation, Robot surveillance

Text Books:

1. Industrial IoT Challenges, Design Principles, Applications, and Security by Ismail Butun (editor)
2. Internet of Things with Arduino Cookbook, Marco Schwartz, ISBN 978-1-78528-658-2 2.

Reference Books:

1. The Internet of Things in the Industrial Sector, Mahmood, Zaigham (Ed.) (Springer Publication)
2. Industrial Internet of Things: Cybermanufacturing System, Sabina Jeschke, Christian Brecher, Houbing Song, Danda B. Rawat (Springer Publication)
3. Internet of Things- A Hands on Approach, Arshdeep Bahga and Vijay Madiseti , Universities Press , 2015.

Data Analysis and Visualization Using Python

Code	Course Title	Credit	T-P-PJ
CUTM1018	Data Analysis and Visualisation Using Python	4	0-1-3

Objective

- How to tell a story from data
- How to marshal the data for storyline
- The ability to develop visualisation to tell the story
- The focus is on analysis of data using visualisation as a tool

Course outcome

- To create impactful visualization with good story line.

Course content

Module-I

STORY BOARD DEVELOPMENT

The objective and flow of the story to be understood through cases

Module-II

DATA READING USING PYTHON FUNCTIONS

Python libraries: Pandas, NumPy, Plotly, Matplotlib, Seaborn, Dash

Data collection from online data sources, Web scrap, and data formats such as HTML, CSV,

MS Excel, data compilation, arranging and reading data, data munging

Module-III

DATA VISUALSATION USING PYTHON LIBRARIES

Different graphs such as Scatterplot, Line chart, Histogram, Bar chart, Bubble chart, Heatmaps etc.

Dashboard Basics – Layout, Reporting, Infographics, Interactive components, live updating

Projects List

1. COVID 19
2. World Development Indicators
3. ERP dashboarding
4. Details of Social/ Empowerment schemes of Govt. etc.

References:

<https://www.programmer-books.com/wp-content/uploads/2019/04/Python-for-Data-Analysis-2nd-Edition.pdf>

<https://towardsdatascience.com/data-visualization/home>

Reading materials and videos available on internet on how to use ANACONDA, JUPYTER NOTEBOOK and Python Libraries

Machine Learning using Python

Code	Course Title	Credit	T-P-PJ
CUTM1019	Machine Learning using Python	4	1-2-1

Objective

- Understand the meaning, purpose, scope, stages, applications, and effects of ML.
- Explore important packages of python, such as numpy, scipy, OpenCV and scikit-learn.

Course outcome

- Students will able to Create and incorporate ML solutions in their respective fields of study.

Course content

Module 1 – Application and Environmental-setup (12 hrs)

- Applications of Machine Learning In different fields (Medical science, Agriculture, Automobile, mining and many more).
- Supervised vs Unsupervised Learning based on problem Definition.
- Understanding the problem and its possible solutions using IRIS datasets.
- Python libraries suitable for Machine Learning(numpy, scipy, scikit-learn, opencv)
- Environmental setup and Installation of important libraries.

Module 2 - Regression (8 hrs)

- Linear Regression
- Non-linear Regression
- Model Evaluation in Regression
- Evaluation Metrics in Regression Models
- Multiple Linear Regression
- Feature Reduction using PCA
- Implementation of regression model on IRIS datasets.

Module 3 - Classification (24 hrs)

- Defining Classification Problem with IRIS datasets.
- Mathematical formulation of K-Nearest Neighbour Algorithm for binary classification.

- Implementation of K-Nearest Neighbour Algorithm using sci-kit learn.
- Classification using Decision tree.
- Construction of decision trees based on entropy.
- Implementation of Decision Trees for Iris datasets .
- Classification using Support Vector Machines.
- SVM for Binary classification
- Regulating different functional parameters of SVM using sci-kit learn.
- SVM for multi class classification.
- Implementation of SVM using Iris datasets .
- Implementation of Model Evaluation Metrics using sci-kit learn and IRIS datasets.

Module 4 - Unsupervised Learning (12 hrs)

- Defining clustering and its application in ML .
- Mathematical formulation of K-Means Clustering.
- Defining K value and its importance in K-Means Clustering.
- Finding appropriate K value using elbow technique for a particular problem.
- Implementation of K-Means clustering for IRIS datasets

Projects

- To be defined based on respective study area of student.

References:

Text Book:

1. EthemAlpaydin, Introduction to Machine Learning, Second Edition,
<http://mitpress.mit.edu/catalog/item/default.asp?ttype=2&tid=12012>.

Web Resource:

1. <https://towardsdatascience.com/beginners-guide-to-machine-learning-with-python-b9ff35bc9c51>

Robotic automation with ROS and C++

Code	Course Title	Credit	T-P-PJ
CUTM1020	Robotic automation with ROS and C++	4	1-2-1

Course Content:

1. Robotic Automation Introduction
2. Sensors & Controllers
3. Sequential robot control
4. ROS & C++
5. Project

Course Objectives

- To upgrade knowledge levels of robotic application in modern industries
- Project based training

Course Outcomes

- Advanced knowledge on robotic automation
- Understand different types of devices to which robotic modules are connected
- Provide the knowledge about understand various types of robotic applications.
- Industry based project & advanced learning.

Course Syllabus

Module – 1

Robotic Automation Introduction

- 1.1 Basic's of automation
- 1.2 Use of robots in industry.

Module - 2

Sensor's requirement in robots.

- 2.1 Selecting sensors as per the project.

- 2.2 Specification checking of sensors.
- 2.3 Interfacing of sensor to controllers.

Practice

- P2.1 TILT, PROXIMITY, TEMPERATURE, HUMIDITY, SMOKE, FINGERPRINT
- P2.2 BLUETOOTH, ESP8266, GPS, GSM

Module - 3

Controllers and output port handling.

- 3.1 Concept of 8951 controller
- 3.2 Concept of Arduino and concept of Raspberry Pi.

Practice

- P3.1 Port handling of 8951
- P3.2 Port handling of Arduino
- P3.3 Port handling of Raspberry Pi

Module- 4

Sequential robot control

- 4.1 Designing of sequential robot control system.
- 4.2 Writing of programs in different programming languages.
- 4.3 Controlling of input/output devices.

Practice

- P4.1 Programming of controllers with different programming languages
- P4.2 Designing of sequential control robot.

Module- 5

ROS & C++

- 5.1 What is Ubuntu & ROS?
- 5.2 Requirement and application of ROS.
- 5.3 ROS based simulation of Turtlbot.
- 5.4 Adding of robot with wheel & sensor. Placing robot inside Gazebo.

Practice:

- P5.1 Ubuntu basic command.
- P5.2 Installation of Ubuntu, ROS & Gazebo
- P5.3 Turtlbot control application
- P5.4 Gazebo based robot control and simulation.
- P5.5 Python and C++ based programming to control robot.

Virtual LAB : Using ROBOMASTER (AWS)

Projects

1. Mobile controlled robot

2. Autonomous operated robot.
3. 3. Location targeted robot

Basics of Design Thinking

Code	Course Title	Credit	T-P-PJ
CUTM1021	Basics of Design Thinking	2	0-0-2

Course Rationale:

Steve Jobs famously said “Design is just not what it looks or feels like. Design it how it works”. Design Thinking is described as a discipline where designer’s sensibility and methods match with the needs of users. It draws on logic, imagination, intuition and systemic reasoning to explore the possibilities of a solution to a challenge and to create desired outcomes that benefit the end user. So, if you are among the one who is constantly thinking of solving a problem of business or society, it is ideal for you. This course will help you with the basics of design thinking and through an action centric learning approach, lead to creatively explore the challenges and by using the design thinking tool propose innovative solutions.

Course Objectives: The course aims to

- To orient the participants with the basics of the design thinking process
- To familiarize participants with the elements of Design thinking

Course Outcome: After completion of the course the students

- will be able to apply the design thinking process to innovative problem solving

Course contents:

Module: I

Basics of Design Thinking, Why Design Thinking, Design Thinking Mindset (Inspiration, Ideation and Implementation) Design thinking process, (Empathy, Define, Ideate, Prototype, Test). Cases of application of Design thinking approach (Intuit, IDEO, Infosys, IBM, Google, Apple, Jubilant Foods)

Module: II

Executing a Design Thinking Project- Apply Interviewing and empathy building technique, Drawing inferences from the observations, Defining a point of view, Ideation process, developing and testing prototypes and writing a story of a minimum viable solution.

Projects-

- Develop a customer friendly insulin pump design
- Develop a new customer experience for buying a diamond ring online
- Develop a new disease monitoring device for health workers working in remote areas.
- Designing an integrated machinery for end to end farm activities for small and marginal farmers.
- Design a Fund raising campaign

Recommended References:

Books: Tom Kelly & Jonathan Littman (2001). “The Art of Innovation” Broadway Publication.

System Integration with DYMOLA

Code	Course Title	Credit	T-P-PJ
CUTM1022	System Integration with DYMOLA	2	0-0-2

Course Objectives

- To provide powerful multi-disciplinary systems engineering through compatible model libraries for a large number of engineering domains.
- To design high-fidelity modeling of complex integrated systems.
- To design intuitive modeling i.e. advanced, formally defined object-oriented modeling language.
- To enable users to easily build their own components or adapt existing ones to match their unique needs.
- To provide hardware-in-the-loop simulations (HILS) i.e. real-time simulation with AurdinoUno, Python, Matlab, 3D real-time animation, CAD files import capability.
- To increase the ability to integrate with complex 3D geometry for integrated simulation.
- To increase powerful model management, calibration & optimization capabilities.

Course Outcomes

- The use of open standards such as DYMOLA (Modelica and FMI) is a key enabler to better understand the behavior of systems and to work and communicate accurately with partners and suppliers.
- DYMOLA is not only capable to support an ad-hoc modeling level, such as functional behavior or detailed design, but is also able to convert these predictive models into real-time models.
- The user can able to create new elements in an easy and intuitive way, to answer to its own modeling requirements.
- Future Centurions are ready for operating in many industries including automotive, aerospace, architecture, Motorsport, energy, and high tech.

Course Syllabus

Module 1 - Introduction Dymola and Modelica library

Package Browser, Component Browser, Parameter and Variable Editor Simulation

Window,

Modeling, and Simulation.

The Modeling window is used to compose models and model components.

The Simulation experiment on the model, plot results and animate the behavior.

Creating user-defined models and scripting using Modelica language.

Role Play – Explore the pre-defined libraries and Models, Creating a Package

Practice Project - Preparation of animated projects

<https://www.youtube.com/watch?v=39xyI0k>

<https://www.youtube.com/watch?v=FN8LlnTwzVE&t=314s>

Module 2 – Physical Modeling using DYMOLA

Import of user-defined libraries and packages, interfacing with physical models using ArduinoUno.

The Simulation experiment on the model using multi-domain libraries such as mechanical, electrical, control, thermal, pneumatic, hydraulic, powertrain, thermodynamics, vehicle dynamics, air-conditioning domains

Dymola interface that is stored in the Python package

Role Play – Explore the pre-defined libraries and Models, Creating a Package

Practice Project - Preparation of projects using user-defined packages, Systems Physics with Modelica/Dymola

<https://www.youtube.com/watch?v=xlpHwX-W3Ns>

Module 3 – Animation and 3D view Using DYMOLA

MultiBody Frame Connector, Building a Mechanical Model, Concept of Furuta

Role Play - Practical session by students for students

Practice Project - Modeling of animated projects using the MultiBody library.

<https://www.youtube.com/watch?v=c9Ar2b4X5rQ>

<https://www.youtube.com/watch?v=k7ILBASaEJg>

Session Plan

Session 1

Project 1

Simulating a model – Modeling of Integrated circuits

Description: Use of Electrical and Electronics components.

Workbench Use: Behavior Modelling, Functional and Logical Design.

Session 2

Project 2

Simulating a model -Creating a model for Electric DC Motor

Description: Design a DC Motor Model, Test, and Simulation, Creating a library for components, Creating a model for motor drive, Scripting.

Workbench Use: Behavior Modelling, Modelica Standard Library.

Session 3

Project 3

Simulating a model -Simple Pendulum with Frictionless joint Using Multi-Body Library

Description: Design the Simple pendulum and the Furuta joint using Dymola and Modelica language. Friction joint for the Mechanical equipment.

Workbench Use: Behavior Modelling.

Session 4

Project 4

Simulating a model – Pick and Place Robot

Description: 5 Axis Pick and Place Robot Design, Validation, and Optimization in the 3DS platform.

Workbench Use: Behavior Modelling, Functional and Logical Design. Part design and Assembly Design.

<https://www.youtube.com/watch?v=9RgdZUvEjPw>

Session 5

Project 5

Simulating a model – 3D Printer Design

Description: Design All System and Sub System of the 3D Printer, Validation and Simulation using 3Ds Platform.

Workbench Use: Behavior Modelling, Functional and Logical Design. Part design and Assembly Design.

Session 6

Project 6

Simulating a model – Bicycle Behavior Modeling

Description: Design Power Train, Driving Cycle, part design, and Simulation.

Workbench Use: Behavior Modelling, Functional and Logical Design. Part design and Assembly Design.

Session 7

Project 7

Simulating a model – Refrigerator Compartment Door Design using Thermal Library

Description: This component model the airflow through the door of a refrigerator or freezer compartment.

Workbench Use: Behavior Modelling, Functional and Logical Design. Part design and Assembly Design.

Session 8

Project 8

Simulating a Model – Engine Analytic Using MultBody Library.

Description: Engine analytic, an engine with 6 cylinders, 6 planar loops, 1 degree of freedom, and analytic handling of kinematic loops.

Workbench Use: Behavior Modeling.

Session 9

Project 9

Simulating a model – Control the real and Digital servo motor ArduinoUno Library

Description: Control the Real and Digital Servo motor with simulation.

Workbench Use: Behavior Modelling, Arduino based System Design, and Functional and logical design.

Session 10

Project 10

Simulating a model – Virtual Universes with Poppy Humanoid Using ArduinoUno Library

Description: Virtual universes with a human assistant robot with simulation.

Workbench Use: Behavior Modelling, Arduino based System Design, Functional, and logical design.

Session 11

Project 11

Simulating a model – Implementation of Model using Python Library

Description: Modeling using python library, validation and optimization in the 3Ds platform.

Workbench Use: Behavior Modelling, Functional and Logical Design. Part design and Assembly Design.

Session 12

Project 12

Simulating a model – Industrial Robot Design

Description: 6 Axis industrial robot design, validation, and optimization in the 3Ds platform.

Workbench Use: Behavior Modelling, Functional and Logical Design. Part design and Assembly Design.

Session 13

Project 13

simulating a model – Temperature Control System Using State Graph

Description: The model contains an electric circuit with a heating resistor and a switch.

Workbench Use: Behavior Modelling.

https://www.youtube.com/watch?v=zz-_crJOG0&t=26s

<https://www.youtube.com/watch?v=Zl592ARjnpU>

Session 14

Project 14

Simulating a model – Magnetic Ball System using Magnetic Library

Description: The electronic circuit consists of a voltage source, a resistor, and an inductor in the form of a tightly wound coil. An iron ball beneath the inductor experiences a gravitational force as well as an induced magnetic force (from the inductor) that opposes the gravitational force.

Workbench Use: Behavior Modelling.

Session 15

Project 15

Simulating a Model – Design of Water to Steam Converter Using Fluid Library

Description: Create a package under Fluid_Package called Water_To_Steam using temperature sensors.

Workbench Use: Behavior Modelling.

Session 16

Project 16

Simulating a Model – Design of Liquid Valve Control Using Fluid Library

Description: Building a simple circuit with two valves and a volume block.

Workbench Use: Behavior Modelling.

https://www.youtube.com/watch?v=P_YI3RiTI14

Syllabus

Geotechnical Engineering

Code	Course Title	Credit	T-P-PJ
CUTM1073	Geotechnical Engineering	3	1-1-1

Objective

- Perform Moisture content, Specific gravity, Atterberg limits tests.
- Perform Grain size distribution, Proctor tests.
- Perform Unconfined compression, Triaxial tests.
- Perform California Bearing Ratio, Vane Shear tests.
- Perform Sand replacement, Core cutter, Permeability tests.

Course Outcome

- To obtain knowledge about soil properties and methods of soil properties determination in the laboratory, using field tests and considering comparable experience. Basic stability and deformation problems. Principle of spread and deep foundation design. To understand fundamental knowledge of geotechnical works for soil improvement, interaction of structure and subsoil. Basic design methods for excavation and foundation pits with dewatering and sealing systems.
- Design and analyse Shallow foundations manually as well as using STAAD Pro
- Design and analyse Deep foundations manually as well as using STAAD Pro
- Carry out Moisture content, Specific gravity, Atterberg limits tests.
- Carry out Grain size distribution, Proctor tests.
- Carry out Unconfined compression, Triaxial tests.
- Carry out California Bearing Ratio, Vane Shear tests
- Carry out Sand replacement, Core cutter, Permeability tests.

Course content

Module I:(5hrs)

Theory :(2hrs)

- (a) INTRODUCTION: Soil formation - soil structure and clay mineralogy - Adsorbed water - Mass- volume relationship - Relative density.
- (b) INDEX PROPERTIES OF SOILS: Grain size analysis - Sieve and Hydrometer

methods - Consistency Limits and Indices - I.S. Classification of soils

- (c) PERMEABILITY: Soil water - capillary rise - flow of water through soils - Darcy's law- permeability - Factors affecting - Determination of coefficient of permeability - Permeability of layered systems
- (d) SEEPAGE THROUGH SOILS: Total, neutral and effective stresses - quick sand condition - Seepage through soils - Flow nets: Characteristics and Uses (Basic appraisal only) .

Practice:(3hrs)

1. Determination of water content of soil (1hrs)
2. Determination of specific gravity of soil(1hrs)
3. Grain size analysis by sieving (Dry sieve analysis) (1hrs)

Module II: (5hrs)

Theory :(1.5hrs)

- (e) BCOMPACTION: Mechanism of compaction - factors affecting - effects of compaction on soil properties. Field compaction Equipment - compaction control.
- (f) CONSOLIDATION: Stress history of clay; e-p and e-log p curves - magnitude and rate of 1-D consolidation- Terzaghi's Theory.

Practice:(3:30hrs)

4. Determination of field density by sand replacement method.(1hrs)
5. Determination of consolidation properties of soils.(1:15mins)
6. Determination of unconfined compressive strength of soil(1:15mins)

Module III: (6hrs)

Theory :(1.5hrs)

- (g) SHEAR STRENGTH OF SOILS: Mohr - Coulomb Failure theories
- (h) STRESS DISTRIBUTION IN SOILS: Normal and shear stresses on a plane, Boussinesq's solution.

Practice:(1hrs)

7. Determination of shrinkage limit; Determination of permeability by constant head method (1hrs)

Project :(3:30 hrs)

Types of shear strength test to be delivered as project mode, rest of the topics to be dealt in classroom teaching mode, Mathematical Derivations to be limited to classroom activity. They should not be a part of External Evaluation.

Module IV: (7hrs):

Theory:(1hrs)

(i)DESIGN OF SHALLOW FOUNDATIONS: Introduction, Different types of shallow foundations, (j)DESIGN OF DEEP FOUNDATIONS: Introduction, Different types of deep foundations, Design methodology for piles.

Practice: (1hrs)

8. California bearing ratio test (1hrs)

Project :(5hrs)

Design calculation of shallow foundation to be done in project mode using STAAD Pro software.

design calculation of pile capacity, Analysis of pile group, Settlement of pile group, Concept of negative skin friction, Piles subjected to lateral loads, Pile load test, Design and construction of well foundation. Design of cantilever sheet piles and anchor sheet piles to be done in practice mode as well as project mode using STAAD Pro software.

Module V: (4:30 hrs):

Theory:(2hrs)

(k) FOUNDATIONS IN DIFFICULT GROUNDS: Introduction, Techniques of ground improvement, Foundations in swelling soil, Foundations in collapsible soil, Use of soil reinforcement.

(l) MACHINE FOUNDATIONS: Introduction, Free and forced vibration, Lysmer's method, dynamically loaded foundations, Dynamic soil properties, Vibration isolation .
BASIC APPRAISAL ONLY.NO NUMERICAL PROBLEMS)

Practice:(2:30hrs)

9. Determination of shear parameters by Direct shear test(1:30hrs)

10. Determination of compaction properties by standard proctor test. (1hrs)

Module VI: (5 hrs)

Practice: (1 hrs)

11. Determination of shear parameters by Tri-axial test. (1hrs)

Project :(4 hrs)

STABILITY OF SLOPES: soil stabilization measures. Slope stability solutions to done using software Stability analysis of rigid walls, (MATLAB)

Module VII:(2hrs)

- (0) EARTH PRESSURE: Types of Earth pressure. Rankine's Active and passive earth pressure, Smooth Vertical wall with horizontal backfill. Extension to Soil, Coulombs wedge theory.
- (p) DESIGN OF RETAINING STRUCTURES: Introduction, Different types of retaining structures

E Books: Jain A K and Jain A K. 2005. Soil Mechanics and Foundations. Laxmi Publications (P) Ltd. New Delhi.

Ranjan Gopal and Rao A S R. 1993. Basic and Applied Soil Mechanics. Welley Easters Ltd., New Delhi.

Singh Alam. 1994. Soil Engineering Vol. I. CBS Publishers and Distributions, Delhi.

Construction Material Testing

Code	Course Title	Credit	T-P-PJ
CUTM1069	Construction Material Testing	2	0-2-0

Objective

- Understand the range of various materials for Civil Engineering projects.
- Understand relevant properties of common construction materials.
- Perform measuring, testing and evaluating the results.

Course Outcome

- Test, measure, and evaluate the best use of building and construction materials.
- Gain knowledge about how to determine the standard quality of construction materials.

Course Content

MODULE I : PROPERTIES OF CEMENT (3 Hrs)

Chemical composition test (01 Hr)

Fineness test of cement (comparison study) (01 Hr)

Soundness test of cement (comparison study) (01 Hr)

MODULE II: PROPERTIES OF STEEL (3 Hrs)

1. Ultimate Tensile strength test (01 Hr)

2. % of Elongation test (01 Hr)

3. Bend & rebend test (01 Hr)

Module III: PROPERTIES OF CEMENT CONCRETE (5 Hrs)

1. Gradation of Coarse Aggregates (01 Hr)

2. Flakiness Indes & Elongation Index (01 Hr)

3. Silt Content (01 Hr)

4. Preparation of cube mould for durability test (02 Hr)

Module IV : PROPERTIES OF BRICKS (2 Hrs)

1. Compression test on Bricks. (01 Hr)

2. Absorption test of brick. (01 Hr)

Module V : PROPERTIES OF TILES AND MARBLES (3 Hrs)

3. Test on tiles breaking strength. (01 Hr)
4. Water absorption test for marbles. (01 Hr)
5. Hardness test for marbles. (01 Hr)

Module VI : PROPERTIES OF TIMBER MATERIALS(5 Hrs)

1. Test on moisture content on timber. (02 Hr)
2. Air permeability, water tightness and wind resistance test for window and doors. (03 Hr)

Module VII : PROPERTIES OF BUILDING STRUCTURE(5 Hrs)

1. Slip Resistance Checking. (01 Hr)
2. Weather resistance and durability test. (02 Hr)
3. Test on durability of recycled concrete aggregates. (02 Hr)

Text Books

1. B.N Dutta 'Estimating and Costing in Civil Engineering', UBS Publishers & Distributors (P) Ltd, 2010.
2. M.S Shety, S. CHAND Publication, 2006.
3. Building and Construction Materials: Testing and Quality Control (Lab Manual Series) Paperback – 1 July 2017 by M.L. Gambhir (Author), Neha Jamwal (Author).
4. Building Construction and Materials (SI Units) Paperback – 1 January 2017 by Gurcharan Singh (Author)

References

1. Indian standards for tests on concrete materials and mix design.
2. Standard Data Book for Analysis and Rates, IRC, New Delhi, 2003

Structural Detailing and Drawing

Code	Course Title	Credit	T-P-PJ
CUTM1061	Structural Detailing and Drawing	2	0+2+0

Objective

- To introduce the students to basic theory and concepts of Structural Drawing, STAAD Pro and the classical methods for the analysis of building drawings.
- On completion of this course the students will be able to know the process of making sketches, types of projections, designing of beam, columns and shear walls.

Course Outcome

- Perform free hand sketching of basic geometrical constructions and multiple views of objects. Concept of projection, Types of section, PEB structure & Steel structure work.
- Demonstrate STAAD- PRO, & its uses. Do frame structure, steel structure & applying properties, loads, shear force and bending moment. Do design of steel, /concrete structure & bridge design.

Course Content

MODULE 1 – INTRODUCTION OF ENGINEERING DRAWING

(02 hrs)

Setting of paper size, drawing of title block with border line - Drawing of Types of line, their properties, and arrow head - Types of scale, dimensioning rules & their uses.

MODULE 2 – ORTHOGRAPHIC AND ISOMETRIC PROJECTION

(04 hrs)

Concept of projection - Types of projection and applying symbol of projection - Isometric scale - Isometric view.

MODULE 3 – SECTIONING

(04 hrs)

Types of section – Application - View positioning - steel structure - PEB structure & Steel structure work - Syphon , culvert & bridge design - Stair ,door & ventilator design and calculation.

MODULE 4 – INTRODUCTION OF STAAD Pro

(02 hrs)

Introduction to structural design & analysis, brief introduction about RCC structure - Doing frame structure - Calculating coordinate points, properties of building.

MODULE 5 – PLANE & SPACE FRAME STRUCTURE

(03 hrs)

Load, types & uses of load, calculation of dead load, live load & floor load - Working with design and analysis of building &, steel structure, preparation of RCC report - Applying load (wind load, seismic load, floor load, live load, dead load) using by water tank, tower, truss & multi stored building.

MODULE 6 – DESIGN OF BEAM AND COLUMN

(02 hrs)

Design of beam and column, file transfer, concrete design, steel design, slab design, shear force /bending moment, solve some error - Using I.S code to define concrete design, steel & transfer to file from AutoCAD to STAAD PRO through DXF file.

MODULE 7 – SHEAR WALL DESIGN

(03 hrs)

Describe about Shear wall design, & foundation - Using surface panel models to design shear wall (RC walls) & lift rooms, using STAAD -foundation to design, pile, mat, and isolated, combined footings - bridge deck design & stair case design - Response spectrum & foundation design foundation design.

Text Books:

1. Bhatt N.D. and Panchal V.M., “Engineering Drawing”, Charotar Publishing House, 50th Edition, 2010.
2. Luzzader, Warren.J. and Duff,John M., “Fundamentals of Engineering Drawing with an introduction to Interactive Computer Graphics for Design and Production, Eastern Economy Edition, Prentice Hall of India Pvt. Ltd, New Delhi, 2005.
3. Basant Agarwal and Agarwal C.M., “Engineering Drawing”, Tata McGraw Hill Publishing Company Limited, New Delhi, 2008

References:

1. Gopalakrishna K.R., “Engineering Drawing” (Vol. I&II combined), Subhas Stores, Bangalore, 2007.
3. Shah M.B., and Rana B.C., “Engineering Drawing”, Pearson, 2nd Edition, 2009.
4. Venugopal K. and Prabhu Raja V., “Engineering Graphics”, New Age International (P) Limited, 2008.

Publication of Bureau of Indian Standards:

1. IS 10711 – 2001: Technical products Documentation – Size and layout of drawing sheets.
2. IS 9609 (Parts 0 & 1) – 2001: Technical products Documentation – Lettering.
3. IS 10714 (Part 20) – 2001 & SP 46 – 2003: Lines for technical drawings.
4. IS 11669 – 1986 & SP 46 – 2003: Dimensioning of Technical Drawings.
5. IS 15021 (Parts 1 to 4) – 2001: Technical drawings – Projection Methods.

Quantity Estimation & Costing

Code	Course Title	Credit	T-P-PJ
CUTM1063	Quantity Estimation & Costing	3	2+1+0

Objective

- To make familiar with calculation of quantities for different item of works & provide knowledge about estimation of buildings through Estimator-2.0 software
- On completion of this course the students will be able to know the process of making animation of buildings, Sketch up of building plans and building models.

Course Outcome

- Estimating, brick calculations & cost for different materials, foundation & footing calculations.
- Gain knowledge about how to schedule & estimate different construction works both manually and using software.

Course Content

Module - I: BUILDING (2 Hrs)

Reading of Plans, Sections and detailed Drawings Related to buildings; preparation of Quantities and Units. Introduction of estimating & different types of estimate - Requirements for building estimate purpose of estimate - Plinth area estimate, cube rate estimate, annual estimate & maintenance estimate - Brick calculation & cost for different material - No. of brick required for area, weight of bricks, different bricks densities.

Practice Sessions:

1. Study of construction drawings and preparation of WBS. (01 Hr)
2. Detailed estimates for a Shopping Complex using Estimator-2.0 software. (01 Hr)
3. Detailed estimates for a hostel Building using Estimator-2.0 software. (01 Hr)
4. Detailed estimates for a hospital using Estimator-2.0 software. (01 Hr)

Module -II : CULVERT (2 Hrs)

Estimations and Quantity Surveying: Reading of Plans, Sections and detailed Drawings Related to irrigation structures; preparation of Quantities and Units.

1. Detailed estimates (Manual) for a Slab culvert with right angled/ Splayed wing wall. (01 Hr)

2. Detailed estimates (Manual) for a box culvert. (01 Hr)
3. Detailed estimates (Manual) for a Hume pipe Culvert. (01 Hr)

Module –III: ROAD (2 Hrs)

Estimations and Quantity Surveying: Reading of Plans, Sections and detailed Drawings Related to Roads structures; preparation of Quantities and Units.

1. Detailed estimates (Manual) for a road. (01 Hr)

Module - IV: SLOPED ROOF (2 Hrs)

Estimations and Quantity Surveying: Reading of Plans, Sections and detailed Drawings Related to Sloping roof/Roof truss structures; preparation of Quantities and Units.

1. Detailed estimate (Manual) for a timber roof truss. (01 Hr)
2. Detailed estimate (Manual) for a roof cover of GI sheets. (01 Hr)

Module –V: QUANTITY SURVEY (2 hrs)

Estimations and Quantity Surveying; Preparation of Quantity of materials per unit rate of work; Estimating labor.

Quantity of materials required for different items of works in buildings (Manual). (01 Hr)
Quantity of different types of labor required for different items of works (Manual). (01 Hr)

Module-VI: RATE ANALYSIS OF BUILDING

Specifications; Rate Analysis as per State Govt. and CPWD Standards.

1. Development of Excel Sheet for Rates, Specifications and Cost Estimates. (01 Hr)
2. Rate Analysis and Cost Estimates for a Shopping Complex using Estimator-2.0 software. (01 Hr)
3. Rate Analysis and Cost Estimates for a hostel Building and a hospital. (01 Hr)

Module-VII: RATE ANALYSIS OF CULVERT & ROAD

Specifications; Rate Analysis as per State Govt. and CPWD Standards

1. Rate Analysis and Cost Estimates for a Slab culvert with right angled wing wall using Estimator-2.0 software. (01 Hr)
2. Rate Analysis and Cost Estimates for an arch culvert. (01 Hr)
3. Rate Analysis and Cost Estimates for a road. (01 Hr)

MODULE VIII – PROJECT PREPARATION

1. Road section C & L-section. (01 Hr)
2. Report of detailed estimation with hard copy. (01 Hr)

Text Books

1. B.N Dutta ‘Estimating and Costing in Civil Engineering’, UBS Publishers & Distributors (P) Ltd, 2010.
2. B.S.Patil, ‘Civil Engineering Contracts and Estimates’, University Press, 2006.
3. D.N. Banerjee, ‘Principles and Practices of Valuation’, V Edition, Eastern Law House, 1998.

References

1. Arbitration and Conciliation Act, 1996
2. Standard Bid Evaluation Form, Procurement of Good or Works, The World Bank, April 1996
3. Standard Data Book for Analysis and Rates, IRC, New Delhi, 2003.

Geometric Modeling

Code	Course Title	Credit	T-P-PJ
CUTM1060	Geometric Modeling	3	0+3+0

Objective

- To introduce the students to basic theory and concepts of AutoCad, Revit and the classical methods for the analysis of building drawings.
- On completion of this course the students will be able to know the process of making sketches, dimensions, 3D Modeling and rendering.

Course Outcome

- Demonstrate use of CAD in Civil Construction, basic knowledge of operating software & commands, and benefit of civil developments in the construction industry. Do 2d & 3d drafting /design with AUTO CAD software.
- Architectural modeling set up units & element properties, annotating, detailing, presentation tools, printing, export/import with Revit Architecture Software.

Course content

MODULE 1 - 2D SKETCHES AND DIMENSIONING

1. Study for Drafting and Modeling – Coordinate systems (absolute, relative, polar). (1 Hr)
2. Drawing of a Section for a duplex building. (1 Hr)
3. Drawing of an elevation for a duplex building with dimensions. (2 Hrs)

MODULE 2 - 3D SKETCHES AND PROJECTION OF DUPLEX

1. Drawing of front view and top view of simple solids like prism, pyramid, cylinder, cone, etc, and dimensioning. (1 Hr)
2. Drawing front view, top view and side view of objects and projection of duplex building (2 Hrs)

MODULE 3 – BUILDING PLAN AND TRUSS

1. Drawing of a plan of residential building (Two bed rooms, kitchen, hall, etc.) (2 Hrs)
2. Drawing of a simple steel truss. (1 Hr)
3. Drawing sectional views of prism, pyramid, cylinder, cone, etc, (1 Hr)

MODULE 4 – INTRODUCTION OF REVIT ARCHITECTURE (02hrs)

1. Installing Autodesk Revit architecture and understanding the user interface. (1 Hr)
2. Creation of plan for a project by using level and sketching elements. (2 Hrs)

MODULE 5 - 3D MODELING WITH RIVET

1. Drawing isometric projection of simple objects. (1 Hr)
2. Creation of 3-D models of simple objects and obtaining 2-D multiview drawings from 3-D model. (2 Hrs)
3. Creation of 3d syphon, 3d canal fall, 3d water tank, 3d of trusts & 3d of foot over bridge. (2 Hrs)
4. Assembly drawing & attribute text - Annotation, block & w-block & leader. (2 Hrs)

MODULE 6 – WORKING WITH PROJECT AND WORK PLANES (04hrs)

1. Working with basic building components, site design and massing studies. (2 Hrs)
2. Setting color for wall, about sectioning libraries, basic knowledge of building. (2 Hrs)

MODULE 7 – ANNOTATION AND DETAILING AND RENDERING (04 hrs)

17. Creating text notes, grids, and levels. (1 Hr)
18. Working with label and detailing. (1 Hr)
19. Understanding the rendering workflow, using lights, and creating a lighting fixture. (1 Hr)
20. Displaying a light source in a view, controlling the position of a spotlight in a building model & adding plants and entourage. (2 Hr)

Text Books:

1. Groover M.P. and Zimmers E.W. Jr., “CAD/CAM, Computer Aided Design and Manufacturing”, Prentice Hall of India Ltd, New Delhi, 1993.
2. Krishnamoorthy C.S.Rajeev S., “Computer Aided Design”, Narosa Publishing House, New Delhi, 1993.
3. Sikka V. B., A Course in Civil Engineering Drawing, 4th Edition, S.K. Kataria and Sons, 1998.
4. George Omura, "Mastering in AUTOCAD 2002", BPB Publications, 2002.

Reference Books:

1. Shah.M.G., Kale. C.M. and Patki. S.Y., "Building Drawing with an Integrated Approach to Built.
2. Verma.B.P., "Civil Engineering Drawing and House Planning", Khanna Publishers, 1989.
3. Marimuthu V.M., Murugesan R. and Padmini S., "Civil Engineering Drawing-I", Pratheeba Publishers, 2008.
4. A Guide to building information modeling for Owners, Managers, Designers, Engineers, and Contractors, John Wiley and Sons. Inc., 200.

Hydrology and Irrigation

Code	Course Title	Credit	T-P-PJ
CUTM1071	Hydrology and Irrigation	3	1-1-1

Course objective

- To study the basic principles and movement of groundwater and properties of ground water flow.
- To study the watershed characters and applications.
- To study the ground water resources mapping and surface water resources mapping.
- To study the hydrological disaster and role of earth observation technology.

Course outcome

- An ability to manipulate hydrological data and undertake widely used data analysis.
- An ability to use the techniques, skills, and modern engineering tools related to groundwater modelling.
- Project oriented skills shall be gained by students to work efficiently in survey, planning, design and construction in the irrigation sector.

Module I: Theory 2 hr

Hydrological cycle, Types of Rainfall, Precipitation - measurement - average precipitation over a basin, evaporation, transpiration, infiltration - Infiltration indices. Runoff -Overland flow, Types of aquifers.

Practice: 2hr

1. Determination of infiltration capacity using double ring infiltrometer.

Module II: Hydrograph 3hr

Direct runoff, Base flow, separation of base flow- Hydrograph, Unit hydrograph - Assumptions of Unit hydrograph, derivation of unit hydrograph from direct runoff hydrograph, Computation of direct runoff hydrograph for different storms using unit hydrograph theory. 1hr

Practice:

2. Construction of double mass curve using Python hr
3. Hydrograph analysis using Python. 1h

Module III: Flood Management and Rainwater Harvesting 4hr

Indian rivers and floods, Causes of floods, Flood damage analysis. Design flood, Flood estimation, Frequency analysis, Flood routing through reservoirs and open channels. 1hr

Necessity of Rainwater harvesting, Importance of Rain water harvesting, Rainwater harvesting methods, Conservation and Harvesting of rain. Types and design of water harvesting structures; traditional rain water harvesting structures. 1hr

Practice:

4. Mapping of Drainage order from toposheets 1hr
5. Calculation of area and length of drainage. 1hr

Module IV: Groundwater Pollution & Quality Analysis 3hr

Sources of pollution; Potential evaluation of groundwater pollution; Physical, Chemical, Biological analysis, Surface and subsurface investigations of groundwater. 1hr

Practice:

6. Physio-chemical analysis of groundwater in laboratory 2hr

Module V: Reservoir 2hr

Types, Investigations, Site selection, Zones of storage, Safe yield, Reservoir capacity, Reservoir sedimentation and control. Introduction to Dams, types of dams, spillways and ancillary works, Site assessment and selection of type of dam, Information about major dams and reservoirs of India.

Module VI: Hydropower Engineering: 2hr

Dams and their causes of failure, planning of water resources projects, single and multipurpose projects, Reservoir Planning: Storage capacity of reservoirs, Yield from reservoir, Mass curve, Reservoir losses, reservoir sedimentation.

Module VII: Irrigation 6hr

Irrigation Engineering: Water requirements of crops, consumptive use, quality of water for irrigation, duty and delta, irrigation methods and their efficiencies. 1hr

Canals: Distribution systems for canal irrigation, canal capacity, canal losses, alignment of main and distributary canals, most efficient section, lined canals, their design, regime theory - Kennedys and Lacey's theories. Lined canals, Water logging - causes and control. 1hr

Practice :

7. Design of irrigation canal using Kennedy's and Lacey's theory. 1hr
8. Design of lined canal. 1hr
9. Design of tank surplus and vertical drop weir. 1hr
10. Design of head regulators and cross regulators. 1hr

Seminars:

1. Interlinking of River
2. Estimation of Evapotranspiration over land surface
3. Groundwater identification and estimation
4. Runoff computations
5. Attribution of Hydrologic Changes in a Tropical River Basin to Rainfall Variability.

Students take up group projects and deal with the following activities during the project. The project Report should contain the below gate process.

E Books:

1. Todd D.K., (2000) Ground Water Hydrology , John Wiley and Sons,
2. K., subramanya (2008) Engineering Hydrology, Tata McGraw-Hill Publishing Company Limited.
3. Ahmadi, A., Akhbari., M., and Karamouz, M (2011) Groundwater Hydrology: Engineering, Planning and Management, CRC Press.
4. Saeid Eslamian (2014) Handbook of Engineering Hydrology: Environmental hydrology and water management, CRC Press.
5. Malcolm. G. Anderson and Jeffrey J Mc Donnell (2005) Encyclopedia of hydrological Science, J Wiley.

Surveying Techniques

Code	Course Title	Credit	T-P-PJ
CUTM1067	Surveying Techniques	3	1-2-0

Objective:

To study the temporary adjustment of survey instruments by standard methods ,levelling and cross sectioning survey and setting out works.

To do various field works with the help of Total station.

To Carry out topographic survey

Course Outcome:

- Carry out temporary adjustment of survey instruments by standard methods ,levelling and cross sectioning survey and setting out works
- Carry out topographic survey
- Doing centering, leveling & measuring coordinate points of area and calculation, transfer to data from Total station to software spectrum link
- Doing field work using of simple machine parts such as Total –Station, Auto- level

Course outline:

Module-1(2Th) HRS

Historical survey practice: Introduction to surveying: Classification, Basic Principle, List of Instruments used in surveying.

Module-II (2Th+4Pr) HRS

Leveling: Concept and principles of levelling, different types of levelling, their application ,selection of station points, staff measurement locations, ideal location for etc. ,computation of Reduced levels through rise and fall method and height of collimation method, standard procedure for conducting leveling works , Identification of errors, understanding their source and rectifying the same ,different causes of errors in the leveling works, their impact on the project, procedure for laying slopes and gradients for roads, bridges, pipelines, canals etc ,errors in slope alignment and their implications, identification & rectifications ,procedures for making entries in the field book and make necessary calculations

Practices:

1. Calculation of RL using HI and Rise and fall method.
2. Longitudinal and cross sectional Leveling
3. Check Leveling

Module-III (2+5)HRS

Total station: Parts of the instrument, operational panel, guide light, basic key operation, display functions, setting up the instrument, focusing and target sighting, angle measurement, setting the horizontal, distance and angle measurement, REM measurement, coordinate measurement ,to view the data/ points collected, area calculation, data download.

Practices:

4. Distance, angle and slope Measurements
5. Traverse adjustment (With help of software)
6. Area calculation using Total station

Module-IV (1Th+5 Pr)HRS

Applications of total station :Detail survey i.e., data collection., Height measurement (Remove elevation measurement- REM,Fixing of missing pillars (or) Setting out (or) Stake out, Resection. etc. Remote distance measurement (RDM) or Missing line measurement (MLM).

Practices:

7. Height measurement (Remote elevation measurement- REM).
8. Fixing of missing pillars (or) Setting out (or) Stake out.

Module-V (1Th+3Pra) HRS

Concept of topographic survey, its importance and different methods of conducting topographic survey using modern and conventional instruments, calculations required for plotting contours, Interpretation and importance of contours. Knowledge of scale and key while plotting a contour map, represent topography of the area in required scale, different methods of computing levels.

Practice:

9. Preparation of contour maps using total station and surfer software.

Module-VI (2Th+4Pra) Hrs

Curves: Types of curves, Properties– simple, compound, reverse and transition curve. of works

Practices:

10. Setting out of different curves (simple, compound, reverse and transition) using Total Station

Module-- VII (4 hours)

Setting out of works

11. Setting out of Building
12. Setting out of culvert

Text Books:

1. Surveying Vol I & II, III B C Purnima, Laxmi Publication.
2. Surveying, volume 1&2 BY S.K.Duggal, TMH publisher.

Reference Books:

1. Surveying & Levelling by T.P Kanitkar& V S Kulkarni

E Books:

1. Source of reference; NSQF

Online Source: NPTEL Videos (www.nptel.ac.in)

Geospatial Survey

Code	Course Title	Credit	T-P-PJ
CUTM1068	Geospatial Survey	3	1-2-0

Objective:

- To teach the basic concept of Geospatial Technology and to do various field works with the help of digital surveying instruments.
- To provide basics of digital surveying and mapping of earth surface using GPS, DGPS, GPR

Course Outcome:

- Gain knowledge about the structure of spatial data including file associations, attribute tables, metadata, coordinate systems, and projections
- Carryout measurements Differential Global Positioning System (DGPS)/ Global Navigation Satellite System (GNSS) in the field.
- Preparation & digitization of different topography map with the help of Arc-GIS software
- Utility mapping using GPR

Module I: GIS(1Th+4Pra)Hrs

Geographic Information System: Introduction, Definition of GIS, Components of GIS, Geographical concepts, Input data for GIS Types of output products, Application of GIS Practice:

1. Introduction to GIS (Overview, Features, About the software, Main user interface, Main menu Project menu; Layer menu; View menu; Bookmarks menu; Plug-ins menu; Help menu, Toolbar, Legend window, Preview map, add data to the map area, Opening and saving projects)
2. Building a catalog of geographic data (Arc Catalog, folder connection, inside the catalog, folder location, create a working copy of the data, connect directly to your copy of the data, and remove folders that do not need)

Module II: GIS Data types (2Th+4Pra)Hrs

Introduction: GIS data types: Data representation: Data sources: Typical GIS data sets Data acquisition, Data verification and editing, Dereferencing of GIS data, Spatial data errors Spatial data models, Spatial data structures, Modelling surfaces , Modelling networks , GIS database and database management system

1. Introduction to Google Earth, Convert Shape file to KML Format, Extract data From Google Earth, Extract Point Data, Extract Polygon data, Extract line data, Convert KML File to shape file, overlaying an image into google earth

2. Exploring data and adding it to a map (The Contents tab, The Metadata tab, add a layer to a map, import metadata, Search for items, map compose)
3. Managing a dataset (Define a shape file's coordinate system, modify attributes in database tables, calculate attribute values in ArcMap, Update the table's metadata, create a layer using the related attributes, Add the vegetation type layer to the map)
4. ArcGIS Graphics language (generalization, symbology, and colour effect, change symbology and use transparency in creative ways)

Module III: Spatial Data Analysis (1Th+5Pra)Hrs

Spatial Data Analysis: Introduction, Data analysis terminology, Measurement of length, perimeter and area. Queries. Reclassification. Buffering and neighborhood functions. Data integration-map overlay. Spatial interpolation. Surface analysis. Network analysis. Digital terrain visualization

Practice:

1. Topology (Concept of topology, topology in different GIS format, Coverage, shapefile, DXF-Drawing Exchange File, Geodatabase, Topology principle, Topological Error and Correction process, creating personal Geodatabase, creating a features dataset)
2. Buffering and Editing tools: (Buffering in ArcGIS, add the data layer, create the buffer, conflation, extend the line, Erase point, Flip line, Snap, trim line, Densify, create a polygon, create point, Create polygon)
3. Creation DEM , DSM,TIN from SRTM/Cartosat Data

Module IV: Global Positioning System (2Th+3Pra)Hrs

Introduction of Global Positioning System, Satellite constellation, GPS signals and data, Geo-Positioning-Basic Concepts. Discussion on NAVSTAR, GLONASS, GALLILEO, COMPASS. Basic geodesy, Geoid /datum/ Ellipsoid-definition and basic concepts, Coordinate Systems, Special Referencing system, Map Scale, Scale factors, Indian geodetic System Segments of GPS:Control Segment, Space Segments, User Segment-operations of GPS, accuracy, error sources and analysis, methodology for collection of data, adjustment computations and analysis. Selection of datum, units and scale; GPS measurement. GPS Positioning Types-Absolute Positioning

Practice:

10. Setting of instrument, Observation, Data downloading and processing, Plotting of points, Georeferencing, Error calculation.

Module V: Differential Global Positioning System(2Th+3Pra)Hrs

Differential positioning Methods-Static & Rapid static, Kinematic-Real time kinematic Survey. DGPS-GPS data processing and Accuracy. Selection of Reference Station, Reference Station Equipment: GPS receiver, GPS antenna. Radio and its types, Radio Antenna GP. Application of GPS in Surveying and Mapping, Navigation, Military, Location Based Services, Vehicle tracking, etc. Limitation of GPS & DGPS

Practice:

11.Instrument Setup (Base station and Rover), Post-Processed Kinematic (PPK); Single point observation, Double point with baseline processing methods, Triangulation method, Real-Time Kinematic (RTK);Navigation system, Collection of Ground Control Point (GCP), Data export to GIS software.

Module VI: Ground Penetrating Radar(1Th+3Pra)Hrs

GPR Explain working principle of ground penetrating radar (GPR), Describe the type of antennas used with GPR for different type of underground material detection, Use ground penetrating radar until a predefined depth from sub-surface based on the conductivity of material. Explain use of sketch/single line diagram (SLD).Describe the use of GPS/DGP in sync with GPR to get all data populated on map. Describe the use of other Utility locator like electromagnetic locator and other utility locators

Practice:

12.Instrument setup, Utility mapping (Waterline, electric line, etc.), Processing of data

Module VII: (1Th+3Pra)Hrs

Explain GPR screen reading for the data being recorded, Describe the use of Roadometer with GPR to measure distance, Explain all the connecting cables used with GPR, Describe the power source and running capacity of GPR batteries, Explain handling the GPR and it's components, Describe how to transport GPR instrument, Use appropriate GPR antenna for described type of survey, Demonstrate the assembly of GPR equipment, Demonstrate the GPR data collection using cross section .

Text Books:

- 1.Remote sensing and GIS 2nd Edition, Basudeb Bhatt, Oxford Publication
2. Anji Reddy, M. Remote sensing and Geographical information system, B.S. Publications, 20011.

Concrete Technology

Code	Course Title	Credit	T-P-PJ
CUTM1066	Concrete Technology	3	1-2-0

Course Objective:

- To study properties of cement, sand and aggregate.
- To determine the correct proportion of cement, sand and aggregate ratio for the concrete.
- To perform tests for cement, sand and aggregate
- To perform tests for concrete.
- To supervise and monitor concrete casing and casting for building construction.

Course Outcome:

- Demonstrate test and analysis of cement, aggregate, sand, effect of water cement ratio.
- Prepare concrete, carry out simple formwork and reinforcement with the application of modern Power Tools.
- Prepare reinforcement of different R.C.C. members i.e, Foundation, beams, columns, slabs, Retaining Wall, etc.
- Erect scaffolding and make the intricate formwork at different locations.
- Prepare a bar bending schedule and demonstrate bar bending and calculate the estimated quantity of materials.
- Make different types of arches and lintels with chajja.
- Layout different types of vertical movement according to shape, location, materials by using stair, lift, ramp and escalator.

Course Syllabus

Module I : Aggregate/Sand (5hrs)

Theory:

Aggregate, classification (IS : 383), Grading, Characteristics (grading, fineness modulus), Bulking of fine aggregate, Deleterious substances, factors affecting the strength of concrete. Water, water quality, water requirement for hydration & workability, the effect of impurities present in water, Admixture, the meaning of terms, functions, classification, waterproofing and permeability reducing admixture. Construction Chemicals, Interpretation of specifications manufactures, Meaning of terms, functions, Classification (IS : 4082), waterproofing and permeability reducing admixture. (1hrs)

Practice:

1. Perform sieve analysis on aggregate and determine to grade. (01 hrs)
2. Determine the presence of silt and clay and Perform a test to determine bulking of sand. (01 hrs)
3. Specific Gravity, Water Absorption And Natural Course Of Fine & Coarse Aggregate. (1hr)
4. Aggregate Impact Test, Aggregate Crushing Test (1hr)

Module II: Preparation of Cement Concrete (3hrs)

Theory:-

Preparation of concrete Methods used, merits and demerits of methods, tools and equipment used and precautions to be taken for the following processes, batching, mixing, transportation, placing, compaction, curing, finishing, strength & durability requirements (IS : 456 - 2000), stripping of formwork, application of modern power tools, classification & specifications of concrete, classification of concrete according to grade, weight & methods of mixing ready mixed concrete, self-levelling concrete. (1hr)

Practice:-

Prepare concrete and lay at required places using power tools, (2hrs)

Module III: Workability of Concrete (3.5hrs)

Theory: Introduction to concrete, properties, workability of concrete (0.5hr)

Practice:

1. Workability of Fresh Concrete by (3hr)
 - (a) Slump cone method
 - (b) Compaction factor
 - (c) Flow table methods.

Module IV: Strength of concrete (7hrs)

Theory:

Nominal mixed and design mixed concrete, properties of concrete- workability & consistency, segregation, bleeding, strength, durability, impermeability, volume, stability, R.C.C. members for foundation, beams, columns, slabs, retaining wall etc. Scaffolding & formwork - Definitions of common technical terms used in Scaffolding, formwork. Types & applications Different materials used in formwork. Methods and tools used for formwork. Safety precautions to be observed in scaffolding and formwork Defects in formwork Shuttering /removal of formwork. Maintenance & repair of formwork Plain cement concrete (PCC) & Reinforced cement concrete. Properties of PCC & RCC in the green state and hardened state Importance of formwork and reinforcement in construction. (3hrs)

Practice:

1. Compressive strength of concrete (2hr)
 - (a) Cube Specimen
 - (b) Cylinder Specimen
2. Splitting tensile strength of cylinder. (2hr)

Module V : Design-mix concrete(5 hrs)

Principles of mix proportioning, probabilistic parameters, factors governing selection of mix. Road note - 4, DOE, ACI and IS method of concrete mix design, Variability of test results, acceptance criteria, various IS code provisions. (1hr)

Practice:

1. Preparation of design-mix concrete (2hr)

2. Concrete shotcreting (1hr)
3. Pressure grouting of concrete (1hr)

Module VI: Reinforcement in Concrete (5 hrs)

Theory:

Structural elements & characteristics (simply supported, continuous, fixed, cantilever, overhang), the importance of the use of reinforcement in concrete, tools used in bar bending correct use of tools, different operation in bar bending (straightening of bars, cutting of bars, bending of bars, placing of bars, binding of bars, fixing of cover blocks). (1hr)

Practice:

Making of shuttering & supports with uprights and wedges for Arches, Lintels and Lintels with Chajjahs. (2hrs)

Cutting, bending & placing of reinforcement. (2hrs)

Module VII: Special concreting techniques (7hr):

Theory:

Review of behavior and characteristics of high strength concrete, high performance concrete, fiber reinforced concrete, mass concrete, lightweight and heavyweight concrete, Precast concrete. Pumped concrete, concrete, underwater concrete, pre-placed concrete, vacuum dewatered concrete, hot and cold weather concreting, Ready mixed concrete. (3hr)

Practice:

1. Preparation of Lightweight concrete mix. (1hr)
2. Preparation of Fibre reinforced concrete. (1hr)
3. Preparation of concrete with solid wastes.(1hr)
4. Reactive Powder Concrete design. (1hr)

Reference: NSQF level 6

Electrical, Plumbing and Wood Works

Code	Course Title	Credit	T-P-PJ
CUTM1065	Electrical, Plumbing and Wood Works	3	1-2-0

Course Objectives

- To understand the installation for electrical systems in a building. To study carpentry work in the building, installation of doors, windows, etc. To understand and demonstrate installation of plumbing systems in the building.

Course Outcomes

- Identify timber and perform sawing and planing using hand and power tools. Demonstrate surface finish with exact sizing by planing operation. Prepare different wooden Joints. (Range of skill - framing joint, Housing joints, broadening joints, Lengthening joints) Make small wooden job as per drawing with schedule sizes of timber or alternatives of timber i.e. FRP, MDF, FOAM using various hardware. Make different types of doors and windows with fixing of components. Demonstrate joining of electrical wire and carry out soldering, crimping observing related safety precautions. Demonstrate Electrical wiring with fixing of accessories conforming ISI rules (Range of skills - different types of Electrical wiring, joining of Fuses, fixing of MCB, a connection of lamp with switch and different fitting, etc.) Demonstrate installation of electrical appliances, Earthing and estimate costing of wiring Prepare a Simple pipe connection demonstrating cutting, joining of pipes with different methods using different types of fittings. Prepare layout of soil pipe and waste pipe with different types of sanitary fittings

Course Syllabus

Module I: Carpentry Tools (5 hrs)

Theory:

Defects in timber, diseases of timber, knots, shakes, grains, etc. Carpentry hand tools, measuring tools and uses. Work holding devices, power tools, viz. saws, drills, etc. Description of Carpentry Joinery, Planing, Moulding, Rebating, Chamfering, Sawing, Etc. Type of different planes and their proper uses in woodwork. Description, function and its size setting, knowledge of sharpening and uses, etc. knowledge of using marking gauges. Important instruments are necessary for checking flatness and twistness of the surface. Sharpening and grinding angle of the cutter. (2hr)

Practice:-

Identify different wooden sample pieces i.e.- softwood & hardwood, wooden grains, etc. & their applications Annual ring, knots, shakes & chinks, etc.). Demonstrate the application of hand tools, measuring tools, and work holding devices. Demonstrate the use of different power tools, viz. saws, drills, etc. Perform sawing, planing, Moulding, Rebating, Chamfering, etc. using different types of saws, and planes. Sharpen and set different type saw blades and planer blades/ cutters. (---2hrs)

Planing face, face edge, etc. Demonstrate the use of marking, mortise gauge, etc. Test the accuracy of flatness and twist-ness of the surface by using a try square. Demonstrate the use of winding strips, cross planing, edge planing. Demonstrate a portable power planer machine and its function. (---2 hrs)

Module II: Woodwork (5 hrs)

Theory:

Portable power planer - useful in modern woodwork and new technology design. Description of different types of joints. Uses of joint:- Framing joint angle joint and lengthening joint, housing joint, broadening joint, etc. Wood products - Industrial forms of timber - Veneer - Laminated sheet - Fibreboard - Hardboard - Plywood, Calculation of timber required for Wall Bracket. List the sequence of operations of the job. Doors –Parts, Location, standard sizes, types. Windows-types. Ventilators-purpose-types. (2hr)

Practice:

Make framing joint - Mortise and tenon Joint (Single and double, Plain hunched Mitre corner,) Make Housing joints - Full housing, Bridle, Stopped housing. Make broadening joints - Simple butt joint, Riveted butt joint, etc. Lengthening joints: End half-lap joint, End overlap joint, End bends lap joint, slopping scarf, racking scared, half lapping scarf, table scarf joint, etc. (---2hrs)

Make a joint on the hardwood to make a small frame. Stopped the Tenon & Mortise joint on the hardwood in the frame to set themselves. Make shelves by six pieces of hardwood with a single lapped half-lap dovetail joint with frame (two nos. of selves). (---2hrs)

Module III: Electrical Tools and Wiring (7hr)

Theory:-

Electrical Wiring:- Safety precaution and elementary first aid. Artificial respiration and treatment of electrical shock. Elementary electricity and its units. General ideas of the supply system. Wireman's tools kit. Wiring materials. Electrical fittings. System of wirings. Wiring installation for domestic lightings. Conductor, insulator, semiconductor, cable joints, measurement of cable. Types of Fuses, MCB soldering, ELCB, RCCB, ABCB, MCCB AC and DC, AC fundamentals, polyphase types of electrical wiring Different Electrical wiring accessories, ISI rules of wiring Illumination. Earthing, types of earthing Earthing Pit. (1hr)

Practice:-

Prepare terminations of cable ends. Practice on skinning, twisting, and crimping. Identify various types of cables and measure conductor size using SWG and micrometer. (---1hrs)

Make a simple twist, married, Tee, and western union joints. Make Britannia straight, Britannia Tee, and rat tail joints. Practice in Soldering of joints/lugs. (---1hrs)

Demonstrate different electrical wiring systems with fixing of different accessories. Make electrical Fuse joints, fixing MCB.(---2hrs)

Module IV: Electrical Appliances (7hrs)

Theory

Different electrical appliances, accessories, Voltmeter. Estimation and costing of wiring. Explanation and working of different types of transformers and their classification. (1hr)

Practice:

Connect lamps with switches. Staircase circuit wiring. (---1hrs)

Install earthing in different positions. Install and connect electrical appliances and take a reading with Voltmeter. Prepare materials list and cost of wiring. (---1 hrs)

Identify transformer, test and use. (--1hrs)

Module V: Plumbing Tools (7hrs)

Theory:- Plumbing tools, materials used in plumbing, Different types of pipes, fittings and Joints - GI, PVC, AC, SW, CI, lead, steel - Properties and use in plumbing work. Method of cutting and joining of pipes. Drills - types and uses. Tap and Dies - types and uses, calculation of Tap drill size. (2hr)

Practice:-

Perform a Simple pipe connection using G.I. Pipes, socket, elbow, tee, reducing elbow, G.I. union, cap plug, reducer, Three face elbow, reducing socket, plug, G.I. nipple, etc. (2hrs).

Perform Joining of pipe with – thread joint, lead joint, flange joint, cement joint, D. Joint, etc. (---1 hrs)

Module VI Plumbing pipe fitting (7hrs)

Theory:

Sanitary Technical terms - sewer, sewage, sullage, etc. -Soil pipe and waste pipe fitting Different types of water closets Different types of urinal port Kitchen sinks, Bathtub, Washbasin. Water meter, installation of the water meter. Removal of airlock Purification of water Mineral matter, Hardness, Causes of Scale formation & their Removal. (1hr)

Practice:

Perform Joining of pipe with Elbow joint, socket joint, Tee joint, reducing elbow joint, floor trap joint, etc. (---1 hrs)

The layout of soil pipe and waste pipe to the sanitary fitting using different types of fitting viz. Door junction, door Bend, H.R. bend, Plain Bend, Double door junction, inverter junction, cowel , floor trap, Gully trap, P-trap etc. (---2 hrs)

Fitting of I.W.C with a high-level cistern. Fitting of the washbasin. Fitting of E.W.C. with a low-level cistern. Fitting a kitchen sink. Fitting of the bathtub. Fitting a urinal pot with an auto cistern. (---2hrs)

Module VII: Installations (5 hrs)

Theory:

Water Purification: Treatment plants for different groundwater contaminants, Treatment plants for surface water. Types of damages in taps, valves, water meter, and tanks - Method of rectification Water supply - Sources of water Storage of water Distribution of water Different types of valves used in Plumbing, Types of tanks R.C.C., P.V.C. Iron tanks etc. (1 hrs)

Practice:

Install a water meter. Remove the airlock. Determination of pH by pH meter. (----1 hrs)

Recondition taps, valves & flushing tank, test for correct functioning. Prepare a water supply pipeline system in residential buildings using different types of valves, fittings, and appliances. (---1 hrs)

Reference NSQF Level 5

Design of Structures

Code	Course Title	Credit	T-P-PJ
CUTM1074	Design of Structures	4	1-3-0

Course Objectives

To teach the basic theoretical aspects and contemporary issues in the design and fabrication of reinforced concrete members

To teach the basic fundamental behavior of different sections, bolts, members of steel structure used in construction.

To analyze and Design of Concrete Structures and Pre-Engineered Building(PEB) by using Software ETABS

Course Outcomes

To gain the knowledge of RCC design calculation with relevant Indian Standards.

After completion of the courses the students will gain knowledge of Pre-Engineered design calculation with relevant Indian Standards

Students will develop the skill of converting client's requirements to structural drawing by using ETABS.

Course Syllabus

Course content (50 Hours)

Module I: Building Structural Frame (9 Hours):

Introduction to Reinforced Concrete, Mechanical Properties of Concrete, Flexural Analysis, Combined Flexure and Axial Load, Shear analysis. Limit State Method using Indian Standard Codes.

Practice:

1. Draw grids, Reference planes and joints, create new project models and introduction of the layout. (2hr)
2. Draw building structural frame and define material properties (4hrs)

Module II: Load definition to Building frame (5 Hours):

Modeling of Building, Load Calculations, Seismic weight, Base shear, Storey shear, Mass source, diaphragm, Meshing of Slab.

Practice:

3. Building structural frame- Define Properties, Material, Section, Mass source, Load pattern, load combinations

- Define Section Properties + Section Property Modifiers (1hr)
- Load Pattern (Gravity Loads + Earthquake (seismic) Loads (0.5hr)
- Wind Loads, Dead loads, super dead loads and live loads introductory(0.5hr)
- Define Load combination (Manual + Auto)(0.5hr)
- Meshing for Slabs, Walls, beams and Columns (0.5 hr)
- Assign Loads to structure as per IS Codes(0.5)
- Define Mass Source (For Lateral analysis)(0.5 hr)
- Pier Labels and Spandrel Labels for shell members such as shear walls and retaining RCC walls (1hr)

Module III: Analysis and check for Safety (10 Hours):

Analysis checks, Post design checks, Pushover analysis, response spectrum analysis, time history analysis.

Practice:

4. P Delta Analysis Check (How to include P-delta effects) (2hr)
5. Center of Mass and Center of Rigidity (and Building Eccentricity Check)(1hr)
6. Mass (Weight) Irregularity check as per the code (1hr)
7. Story Displacement, Story Drift checks as per code (1hr)
8. Torsional Irregularity check(1hr)
9. Modal Analysis Case [Eigen or Ritz Vectors], Time period (1hr)
10. Time History Analysis (2hrs)

Module IV: Reinforcement Detailing and scheduling (6 Hours):

- Reference of IS codes IS SP 34-1987 (Theory) (1hr)
- IS 13920-1993 Ductile Detailing of RC structures (Theory) (1 hr)

Practice:

11. Detailing of Beams, Columns and slabs using Autocad (4hr)

Module V: Design of Foundations using SAFE foundation (6 Hours):

Introduction to SAFE foundation, familiarizing tools used in SAFE foundation. Types of foundations introduction, isolated footing design, combined footing design and mat foundation design.

Practice:

12. Importing ETABS model file into the SAFE foundation software (0.5 hr)
13. design of isolated footing (1 hr)
14. design of combined footing (1 hr)
15. design of mat foundation (1 hr)

Module VI: Materials and Specifications of Steel/ Pre-Engineered Building (PEB) Structures (06 Hours):

PRE-ENGINEERED BUILDING COMPONENTS: Primary System: Main frames, Gable End Frame - Secondary frame system: Sizes and Properties of Purlins & Girts – Bracing System: Rod, angle, Portal, Pipe bracing – Sheeting and Cladding: Roof Sheeting and Wall sheeting – Accessories: Turbo Ventilators, Ridge vents, Sky Lights, Louvers, Insulation, Stair cases.

Practice:

16. DESIGN LOADS ON PRE-ENGINEERED BUILDINGS. Design of PEB frame under the influence of Dead, Live, Collateral, Wind, Seismic and Other applicable Loads. Serviceability Limits as per code IS:800. (4hrs)

Module VII: PEB DESIGN METHODOLOGY (8 Hours):

Practice:

17. Design Parameters of PEB Frames - Depth of the section, Depth to Flange width ratios, Thickness of Flange to thickness of Web ratio. d/t_w , b_f/t_f ratios of sections as per IS code. Section Sizes as per Manufacturing Limitations. Analysis and Design of Rigid Frames. Rigid Frame Moment Connection, Shear Connection- Anchor bolt and base plate design (Pinned and Fixed). (8hrs)

Text Books:

1. Reinforced Concrete design-S. N. Sinha. Tata McGraw-Hill, New Delhi
2. S K Duggal, " Design of steel structures",2012.
3. S. Ramamurtham and R. Narayan, " Design of steel structures" ,2014

Reference:

1. PEB design using ETABS
2. Etabs Full - Video

Road Engineering

Code	Course Title	Credit	T-P-PJ
CUTM1070	Road Engineering	3	1-1-1

Course Objectives

- To introduce transportation engineering principles with emphasis on designing principal element of highways along with the safe and efficient operation of highways.

Course Outcomes

- Students will gain knowledge on planning, material selection for construction, Economics and finance and designing of elements on highway.
- Acquire the skill of designing the geometric elements of highway using CIVIL 3D software.

Course Syllabus

THE CLASSES WILL BE DELIVERED IN FLIP CLASS MOD

Module I: Highway introduction planning and development (1 hr)

Highway planning in India, development, rural and urban roads, road departments in India, road classification, road authorities i.e. IRC, NHAI, CRRI, NHDP etc.

Module II: Materials Characteristics and construction (6 hrs)

Introduction, physical and engineering properties of materials of pavement surfaces: Pavement quality concrete (PQC), Plain cement concrete(PCC), Hot Mix Asphalt (HMA), wearing courses, base, sub-base treated layers, types of bitumen, cutback bitumen, bitumen emulsion, tar, types of tar, bituminous mix design.

Practice Sessions:

Test on aggregate

Los angeles abrasion test.
Aggregate crushing test
Aggregate Impact value test
Specific gravity, water absorption, and bulk density

Test on bitumen

Penetration test of bitumen
Ductility value test of bitumen
Softening point test of bitumen
Flash and Fire point test of bitumen
Specific gravity of bitumen

Flakiness index and elongation index test of Aggregate

Test on mix design

Marshall Stability Test of bitumen

Test on subgrade

California bearing ratio test

Module III: Geometric design of roads (12 hrs)

Theory

Introduction to geometry design: Objective of geometric design, Design speed, cross-section elements, pavement surface characteristics-skid resistance, traffic volume, number of lanes, level of services, sight distance, horizontal alignment, vertical alignment, Superelevation, camber, cross-section, lane width.

Practice Sessions:

Design of Horizontal Alignment using CIVIL 3D software.

Design of Vertical Alignment using CIVIL 3D software.

Design of Superelevation using CIVIL 3D software.

Create a profile using CIVIL 3D software.

Module IV: Pavement Engineering (8 hrs)

Design of Flexible pavements and Rigid pavements according to standards.

Practice Sessions:

Design of flexible pavements

Design of rigid pavement

Module V: Traffic Engineering (4 hrs)

Introduction to traffic engineering, road user characteristics, vehicular characteristics, various traffic studies and their application (field study), traffic signals, traffic signs and road marking, parking studies, traffic operations-accident prevention and safety methods, rotary intersection, ITS (intelligent transportation system) Various types of intersection and their design concept

Practice Sessions:

Junction design using civil 3d software

Vehicle volume counts (field study)

Module VI: Construction methodologies (3 hrs)

Cement Concrete Roads: Joints in pavements, Arrangement of joints, joint filler and sealer, Introduction, Components, I-Girder, Box culvert, VUP (Vehicle underpasses), PUP (Pedestrian underpasses), Road construction equipment, Machines used, Estimate a road project, PPP model.

Practice Sessions:

Estimate a road project

Module VII: Pavement evaluation and rehabilitation (1 hr)

Pavement failures, quality control causing deterioration and environmental factors, types of maintenance, maintenance of bituminous and concrete surfaces, roughness measurement, special repairs in pavements, strengthening and widening of an existing road.

Text Books:

k.khanna and C.E.G JUSTO, Highway engineering.

R Kadiyali, Traffic engineering and N B Lal, Principles and practice of highway engineering, Khanna Publications, 2005

Construction Materials

Code	Course Title	Credit	T-P-PJ
CUTM1064	Construction Materials	2	0-0-2

Course Objectives

- To introduce students to various materials commonly used in civil engineering construction and their properties.

Course Outcomes

- **Knowledge:** Able to learn basic theory about main building- and construction materials.
- **Skills:** Able to make the right and well-founded choice of materials.
- **General competence:** Understand how properties of materials that are important in engineering can be related to the characteristics of the material.

Course Syllabus

THE CLASSES WILL BE DELIVERED IN FLIPCLASS MODE.

MODULE I: STRUCTURAL AND NONSTRUCTURAL

MATERIALS (3 hrs)

Overview of Materials and Building/Structural Types, Factors Affecting Choice of Materials and Structural Form, Mechanical Properties, Non-Mechanical Properties (physical properties, durability), Individual Building Materials Manufacturing, Properties, Comparative Behavior, Structural Steel, Composition, Material Properties, and Behaviour, Non-ferrous metals.

MODULE II: STONES, BRICKS, CONCRETE BLOCKS (3 hrs)

Stone as a building material, Criteria for selection, Refractory bricks, Concrete blocks, Lightweight concrete blocks, Air Cleaning Bricks, Passive Cooling Ceramics or hydro ceramic bricks, Fly ash bricks, AAC, ECA, CLC blocks, EPS Building.

MODULE III: TIMBER, ROOF & FLOORING MATERIALS (4 hrs)

Timber, Market forms, Industrial Timber, Plywood, Mass timber, laminated timber and glue, laminated timber, Veneer, thermocol, Panels of laminates, Steel, Aluminum and Other Metallic Materials, Composition, Aluminium composite panel, Market forms, Mechanical treatment, Granite, Tile flooring, Cladding of tiles, materials according to types of roof, Elements of a pitched roof, Trussed roof, Steel Truss, Different roofing materials, R.C.C. Roof.

MODULE IV: NONSTRUCTURAL MATERIALS, ACCESSORIES, AND FINISHES (5 hrs)

Materials for doors and windows, Paneled door, Flush door, Collapsible door, Rolling shutter, PVC Door, Review of Nonstructural Materials and Criteria for Selection, Polymer Floor Finishes, Paints, varnishes, enamel, distemper, Tiles, Acoustic Treatment, Drywalls, Anchors, plumbing and sanitary fittings.

MODULE V: EXTERIOR WALL MATERIALS (4 hrs)

Gypsum Area Separation Walls, Insulated Vinyl Siding, Tilt, Up Walls, OVE Framing, ICF Walls, House Wrap Installation Tips, Common Cladding Alternatives, Insulated Wall Panels, WPC sheets, Cinder Block Walls, GFRG panels, Alusion panels, 3D, printed bioplastics.

MODULE VI: NEW GENERATION CONSTRUCTION MATERIALS (4 hrs)

Glass, Ceramics, Sealants for joints, Fibre glass-reinforced plastic, Clay products, Refractories, Composite materials, Types, Applications of laminar composites, Fibre textiles, Geomembranes and Geotextiles for earth reinforcement, Illuminating Cement, Prefabricated panels, Bubble deck slab, Terracotta hollow brick, Cigarette Butts, Recycled cardboard, Sensitile, electrified wood, flexicombo, Richlite, liquid granite, carbon fibre, bendable concrete, concrete canvas, low e glass, transparent aluminum, paper insulation, Concrete, Masonry, Programmable Cement, Strand Rods, Concrete: Admixture, translucent concrete, FRP, Shotcrete, Epoxy resin, and grouting.

MODULE VII: GREEN AND SUSTAINABLE CONSTRUCTION MATERIALS (2 hrs)

Bamboo, Reclaimed wood, cork, mycelium, recycled steel, straw bales, rammed earth, hempcrete, grasscrete, GGBFS, CSF, geopolymer, Silica fume, Fly ash, Red Mud, copper slag, construction demolition waste, waste plastic.

Text Books:

1. Varghese.P.C, "Building Materials", PHI Learning Pvt Ltd, New Delhi, 2012.
2. Rajput. R.K., "Engineering Materials", S. Chand and company Ltd., 2008.

Water supply and Sanitary Engineering

Code	Course Title	Credit	T-P-PJ
CUTM1072	Water supply and Sanitary Engineering	3	1-1-1

Course Objectives

- To enable the students understand about the drinking water, sources, quality, demand, conveyance, water treatment, design of treatment units, Waste water treatment, STP and solid waste collection, treatment along with house plumbing and different sanitary fittings

Course Outcomes

- To understand the principles of treatment units and their design units of drinking water, solid and liquid waste water treatment units; its recycle, reuse or disposal methods along with hands on practice of house plumbing and sanitary fittings

.Course Syllabus

Module 1: Sources, Quality and Demand of water (Three hours)

Importance and necessity of water supply Engineering; Sources of water; Suitability of water; Choice of source; Types of demand Population forecast; Computation of quantity of water; Fluctuation in demand; Factors affecting demand; Impurities in water; Collection of water sample; Physical Chemical and Biological tests; Standards of quality of water

Module 2 Treatment of water (Three hours)

Objectives of water treatment; Location of water treatment plant; Layout of water treatment plant; Basic principles of working of treatment plant; Various stages of treatment of influent water; ; Functioning of Coagulation treatment plant; Sedimentation; Filtration; Disinfection

Practice session (2Hours)

Practice 1: Predict Population from given field data by various methods

Practice II: Calculation of hardness of water from the observed field data

Module 3: Conveyance of Water (Three Hours)

Pumps and selection (out line only); Types of pipes used for conveyance; Pipe joints; Laying of Pipes; Distribution system; Types of valves; Types of Meters; Pipe fittings and fixtures of different materials their advantages and disadvantages; Necessity; Methods to prevent leaks; Measures for conservation of water

Practice session (2hours)

Practice III: Design lay out of pipe system from the overhead tank to different supply terminals.

Practice IV: **Laboratory works:** Determination of pH value, Turbidity and hardness of water sample

Module 4: Sanitation system (Four Hours)

Objective of sewage disposal; Methods of sewage collection; Conservancy system; Water carriage system; Classification of Drains; Sewer section; Sewer joint; Manhole; Flushing tank; Catch basin; Laying of sewer; Appurtenances and its locations; Maintenance of sewer; Procedure for maintenance of sewerage system; Causes of trouble and odor; Sewer cleaning operations; Requirements of maintenance; Functions of each maintenance equipment and tool; Safety measures for sewer-men

Practice session (2hours)

Practice V: Preparation of AUTOCAD layout plans/ sketches of different Water treatment plant, Sewage treatment plant, sedimentation tank, filters, Manholes, Flushing tanks etc.

Practice VI: Design of Septic tank using HEC software

Module 5: Sewage Treatment and Disposal (Two Hours)

Characteristics of sewage; Sampling of sewage; Treatment of sewage; B.O.D. Test, C.O.D. test; Methods of sewage disposal (STP)

Practice Session (2hours)

Practice VII: Design of Manhole from given field data

Practice VIII: Determination of B.O.D. and C.O.D. of waste water sample

Module 6: Plumbing gadgets and Sanitary fittings (Two Hours)

Plumbing tools; Pipes and pipe fittings; Fixing and jointing pipes and accessories; Traps; House drainage plant; Plumbing practice and operations; Safety and precautions; Sanitary fittings

Field Visit: Four hours

Water treatment plant and a sewage treatment plant must be followed by a field Visit report

Module 7: Recycling and disposal of Waste Water and Solid Waste (Three Hours)

Sewage Treatment plant; Different recycling method with respect to quality of waste water; Utilization and management of solid waste;

Seminar: (Two hours)

The students are made groups and topics related to water supply, Municipal/rural waste disposal system, storm water disposal and Sewerage disposal systems

Suggested Reading

1. Text Book of water supply and sanitary Engineering ; S K Hussain : Oxford and IBH
2. Water supply & Sanitary Engg; : Vazirani & Chandola :Khanna Publishers
3. Municipal and Rural Sanitation :Ehlers & Steel :Mc Graw hill book
4. Elements of Public Health Engineering. :K.N.Duggal :S.Chand & Co.

Computer Aided Engineering

Code	Course Title	Credit	T-P-PJ
CUTM1081	Computer Aided Engineering	3	0-2-1

Objective

- This course will help student to use structural scenario, thermal scenario and to do Structural analysis and Thermal analysis of various problems.

Course Outcome

- Create complete finite element models
- Submit and monitor analysis jobs
- View and evaluate simulation results

Course content

Module I: Material and Selection Properties

(6 Hrs)

Property Module, Material Definitions, Linear Elasticity, Large Strain Elasticity, Metal Plasticity, Material Calibration, Material Databases, Section Properties

Practice:

1. Analysis of crack in pressure vessel
2. Cable stayed bridge simulation

Module II: Element Selection Criteria

(6 Hrs)

Solid Element Selection, Structural vs. Continuum Elements, Modeling Bending Using Continuum Elements, Stress Concentrations

Practice:

3. Stress analysis of rail road with wheel.
4. Bike frame structural analysis

Module III: Meshing

(8 Hrs)

Mesh Module, Mesh Elements Mesh Generation Workflow, Local Fine-tuning Quality Checks, Mesh Compatibility, Mesh Convergence, Dependent and Independent Part Instances

Practice:

5. Airplane bracket structural analysis
6. Structural analysis of wind turbine blade

Module IV: Boundary Condition

(6 Hrs)

Step Module, Analysis Steps and Procedures, Output Requests, Output Files
Load Module, Loads and Boundary Conditions, Initial Conditions

Practice:

7. Generative structural analysis applied for design optimization
8. Stress analysis on a backhoe

Module V: Contact

(6 Hrs)

Mechanical Contact Properties, Contact Domain, Contact Formulation and Controls, Handling
Initial Over closures, Contact Output

Practice:

9. Analysis of Economizer.
10. Analysis of Screw Jack

Module VI: Analysis Procedures

(6 Hrs)

Model and Analysis Steps, Analysis Procedures, The static, general analysis procedure, Finding
a converged solution, The Static, Linear Perturbation procedure, Buckle procedure, Frequency
Procedure, The dynamic, explicit analysis procedure, Stability Limit, Analysis Continuation
Techniques

Practice:

11. Steady state analysis of a composite bar.

Module VII: Thermal Analysis

(8 Hrs)

Steady State Heat Transfer, Transient Heat Transfer, Thermal Interfaces, Thermal Stress
Analysis

Practice:

12. Temperature distribution in radiators used in automobiles
13. Oven radiation simulation
14. Steady state thermal analysis of tungsten coil with internal heat generation
15. Thermal analysis of disc brake

Projects

1. Thermal Analysis of PV Solar Pannel
2. Structural and thermal analysis of Green House
3. Structural analysis of Quadcopter.
4. Structural analysis of landing gear.
5. Numerical study on different types of fins.
6. Overhead tank failure analysis.
7. Analysis of Rocket Nozzle
8. Analysis of BAJA SAE
9. Structural and Thermal Analysis of Downdraft Gasifier
10. Structural and Thermal Analysis of Stirling Engine
11. Structural Analysis of Hydraulic Press
12. Structural Analysis of Elevating Conveyor

Text Books/ Reference Books/ Reference Material

1. SIMULIA: 3DS Learning Space

Source of reference: 3DS peer learning

Hydraulic Machinery

Code	Course Title	Credit	T-P-PJ
CUTM1090	Hydraulic Machinery	2	1-1-0

Objective

- To emphasize Principle of operation of hydraulic machines and their system design
- To familiarize their huge applications in different industries

Course Outcome

- After completion of the course, the students will have a strong foundation on the pertinent equations to engineering design of the machines for required applications.
- Students will learn to determine performance characteristics of fluid machinery by using various simulation tools

Course content

Module I: Principle of Operation of Hydraulic Machinery

(2 hrs)

Introduction to hydraulic machines: Classification and operation principle, Euler equation for turbo machines: net head developed by pump and Turbines

Module II: Radial and Axial flow pumps

(8 hrs)

Velocity triangle of pumps, effect of inlet swirl on velocity triangles, Constructional features of Centrifugal Pump, design aspect, working principle and efficiencies, work done by the impeller, priming, specific speed, NPSH, effect of swirl on the cavitations, working principle and design aspect of gear oil pump.

Practice:

1. Flow analysis of fluid of Centrifugal pump through Simulia software
2. Flow analysis of gear oil pump through Simulia software
3. Performance Characteristics of Centrifugal Pump through Virtual lab

Module III: Positive displacement Pumps

(3 hrs)

Working principle of Reciprocating Pump, discharge, work done and power requirement, ideal indicator diagram, and slip, characteristic H-Q curve of positive displacement pump

Practice:

4. Performance Characteristics of Double Acting Reciprocating Pump through Virtual lab.

Module IV: Hydraulic Turbine: Impulse Turbine**(6 hrs)**

Classification, definitions of heads and efficiencies, Pelton Wheel - Construction and working principle, work done and hydraulic efficiency, design aspects.

Practice:

5. Simulation of Pelton Turbine through simulia software
6. Performance Characteristics of Pelton Turbine through Virtual lab.

Module V: Hydraulic Turbine: Reaction Turbine**(6 hrs)**

Reaction turbine (Francis, Kaplan) -Components, working principle, work done and efficiency, draft tube, specific speed, cavitations

Practice:

7. Performance Characteristics of Francis Turbine Simulia software.
8. Simulation of Kaplan turbine through Virtual lab.

Text Books:

1. R.K. Bansal, Fluid Mechanics and Hydraulic Machines, Laxmi Publications, ninth edition

Reference Books:

1. P.N. Modi & S.N. Seth, Hydraulics & Fluid Mechanics, Rajsons Publications Pvt. Ltd, Twentieth Edition

Source of reference;

1. <https://nptel.ac.in/course.html>
2. www.vlabs.ac.in

Fluid Mechanics with Finite Volume Method

Code	Course Title	Credit	T-P-PJ
CUTM1089	Fluid Mechanics with Finite Volume Method	3	2-1-0

Objective

- To learn To learn fundamentals of computational methods like FVM for solving linear and non-linear partial differential equations related to fluid dynamics
- To emphasizes the basic underlying fluid mechanical principles governing energy transfer in a fluid flow systems with their performances in different field of engineering applications

Course Outcome

- After completion of the course, the students will able to evaluate finite difference/volume schemes on model problems of computational fluid dynamics.
- Students will learn to develop steady state mechanical energy balance equation for fluid flow systems, estimate pressure drop in fluid flow systems

Course content

Module I: Introduction to Finite volume Method

(6 hrs)

Fundamentals of Finite volume methods, different types of finite volume grids, approximation of surface and volume integrals; interpolation methods, Review of governing equations, Classification of governing equations , Staggered and co-located formulation

Practice:

1. 2D mapped Mesh for rectangular pipe
2. 2D mapped Meshing for Aerofoil.

Module II: Grid generation

(6 hrs)

Grid generation, creating, updating and managing meshes, Steady diffusion equation on structured meshes, Unsteady diffusion equation on structured meshes, Linear system solvers, finite volume discretization of steady and unsteady diffusion equation, Finite volume discretization of convection-diffusion problem

Practice:

3. 3D structure mesh of Circular Cylinder
4. 3D unstructured mesh with primes layers for Aerofoil
5. 3D coarse/ medium/ fine sweep mesh for pipe

Module III: Incompressible flow field calculation with finite volume method (5 hrs)

Navier-stokes equation, Discretization of the Momentum Equation: Stream Function-Vorticity approach and Primitive variable approach, Staggered grid and Collocated grid solutions of Navier-stokes equation with finite volume method, boundary condition, Reynolds averaged Navier-Stokes equations.

Module IV: Fluid kinematics

(2 hrs)

Types of flow, Continuity equation (in one, two & three dimension steady state fluid flow analysis with finite volume method, velocity and acceleration fields, streamline, streak line, path line, velocity potential function and stream function, Rotation and vorticity.

Module V: Fluid Dynamics with Finite volume method

(4 hrs)

Lagrangian and Eulerian Approach, Euler's equation of motion along a stream line for ideal flow, Principle of conservation of energy with finite volume method, Integration of Euler's equation along a stream line, Bernoulli's equation

Practice:

6. Fluid Analysis of Bernoulli's equation: Flow in a contracting pipe through CFD simulation

Module VI: Flow through Pipes

(5 hrs)

Reynolds's Experiment, Laws of Laminar and Turbulent Friction, Introduction Turbulence modeling through Finite volume method, Hagen Poiseuille Equation for laminar flow through pipe, Darcy-Weisbach Equation for Turbulent flow through pipe.

Practice:

7. Fluid Analysis of Laminar flow in 3D Circular Pipe through CFD simulation

8. CFD Simulation of the Water Flow Passing Through a Converging Pipe.

9. CFD Analysis to determine the frictional losses in the pipe.

Module VII: Flow Measurement

(5 hrs)

Flow through small orifice meter, Mouthpiece, Velocity Measurement using Pitot tube, Prandtl tube, Flow measurement in pipes-Flow, Venturi Meter, Flow rate Measurement in channel-Weir and Notches

Practice:

10. CFD Analysis of Fluid flow through Orifice meter

11. CFD Analysis of Fluid flow through adjustable channel

12. CFD Analysis of Fluid flow simulation through Venturi Meter

Text Books:

1. R.K. Bansal, Fluid Mechanics and Hydraulic Machines, Laxmi Publications, ninth edition

Reference Books:

2. P.N. Modi & S.N. Seth, Hydraulics & Fluid Mechanics, Rajsons Publications Pvt. Ltd, Twentieth Edition

Source of reference;

3. <https://nptel.ac.in/course.html>
4. <https://nptel.ac.in/courses/112/105/112105218/>
5. <https://nptel.ac.in/courses/112/105/112105183/>
6. <https://nptel.ac.in/courses/112/105/112105182/>

Theories of Failure Using Finite Element Analysis

Code	Course Title	Credit	T-P-PJ
CUTM1062	Theories of Failure Using Finite Element Analysis	4	2-2-0

Objective

- To educate the students on basic theories behind mechanics of solids.
- To educate the students on Finite Element Analysis concept applicable to Practical conditions.
- To educate the students on Failure Criterion which will be useful for designing Practical problems.
- To educate the students on using 3D Experience Tools for analysis of various mechanical structures and load transmitting elements.

Course Outcome

- Students will have knowledge and practical engineering skills in analysis of mechanical strength of structures and load transmission elements and will be able to design them based on input data.
- Students will be able to deploy 3D Experience Platform to develop design solutions.
- Students will be able to apply the Concept of Meshing and Failure Criteria to Practical Problems which will lead Economical and safe in Design Aspect.

Course content

Module I Introduction to Finite Element Analysis (FEA) and 3D Experience Platform - (4(T)+5(P)) (9 Hours)

Introduction to FEA: Need for Studying FEA; Types of Analysis; Discretization of a Structure; Element Shapes, Nodes and Degrees of Freedom; Mesh Refining, Element Aspect Ratio, Use of Symmetry, Principle of Convergence; General Procedure of FEA.

Material failure Behaviour: Stress–Strain Diagrams for Ductile and Brittle Materials.

Equivalent stresses for varying orientations, Principal stresses, maximum shear stress, Mohr's circles.

Practice:

1. Introduction to 3D Experience Platform: About the Apps and their Applications from Engineering Point of View.
2. Analysis of Steel Bridge – Simulation using 3D Experience Tool.
3. Tensile Test using Simulation 3D Experience Tool.
4. Stress Strain Curve of a Ductile Material (Mild Steel) using Universal Testing Machine

Module II Mesh Generation and Modeling of Truss Structure (1(T)+ 4(P) (5 Hours)

Mesh Generation and Methods of Meshing and Types of Meshing. Procedure for selecting the

method of meshing and type of meshing. Importance and application of Stiffness Matrix for different types of elements and the procedure for getting the results.

Practice:

5. 3D Experience Simulia – Modelling and Meshing of Transmission line tower.

Module III Stresses and Deflection Criteria: (5(T)+ 4(P)) (9 Hours)

Procedure for Drawing Shear Force and Bending Moment Diagrams, Point of Contra Flexure.

Stresses (No Derivation): Simple or Pure Bending, Flexure Formula, Section Modulus, Neutral Axis, Determination of Bending Stresses, Shear Stress Distribution for Different Sections.

Deflection : Equation of Elastic Curve, Direct Integration Method

Practice:

6. 3D Experience Simulia – Modelling and Finite Element Analysis of Framed Structure subjected Earthquake Loads.

Module IV: Theories of Failure: (2(T)+ 4(P)) (6 Hours)

Theories of Failure: Failure Under Biaxial Loading, Rankine's Theory, Guest's or Tresca's Theory, Von Mises Theory, Graphical Representation of Failure, Safety Factors, Prevention of Failure in Design Stage, Diagnosis of Failure In Post-Manufacturing Stage.

Practice:

7. 3D Experience Simulia: Bicycle Frame Structural Analysis

Module V: Torsion: (3(T)+ 4(P)) (7 Hours)

Torsion: Torsion Equation, Design of Shafts, Power Transmitted by Shafts, Composite Shafts, Combined Bending and Torsion, Closed-Coiled Helical Springs, Spring Connected in Series and Parallel.

Dynamic Analysis: Fundamentals of Vibration; Evaluation of Natural Frequencies and Mode Shapes (Eigen values and Eigenvectors); Non-linear Analysis, Fatigue Analysis. Structures Subjected to Blast Loads.

Practice:

8. Simulation: Static and Dynamic Analysis of Shaft

Module VI Pressure Vessels (1(T)+ 2(P)) (3 Hours)

Longitudinal and Hoop Stress in Thin-walled Pressure Vessels Subjected to Internal Pressure.

Practice:

9. Simulation: Crack Analysis of Thin walled Pressure Vessels.

Module VII Fatigue and Fracture: (3(T)+ 4(P)) (7 Hours)

Fatigue: Failure Under Cyclic Loading, Endurance Limit. S-N Curve, Stress Concentration, Goodman and Soderberg Criteria.

Fracture: Types of Failure, Brittle and Ductile Fracture, Basic Modes of Fracture. Griffith's Analysis, Crack Growth and Stress Intensity Factor.

10. Fatigue Analysis of Crankshaft of Two-Wheeler

Text Books:

1. Strength of Materials, S.S. Rattan, Tata Mc-Graw Hill Publication.
2. Advanced Mechanics of Materials, A.P. Boresi and R.J. Schmidt, Willey India

Reference Books:

1. Elements of Fracture mechanics, Prashant Kumar, McGraw Hill Education (India)
2. Engineering Mechanics of Solids, Egor P. Popov, Pearson publication
3. Strength of Materials, R.K.Bansal, Laxmi Publications.

Disaster Preparedness & Planning Management

Code	Course Title	Credit	T-P-PJ
CUTM1907	Disaster Preparedness & Planning Management	2	2-0-0

The overall aim of this course is to provide broad understanding about the basic concepts of Disaster Management with preparedness as a Civil Engineer. Further, the course introduces the various natural hazards that can pose risk to property, lives, and livestock, etc. and understanding of the social responsibility as an engineer towards preparedness as well as mitigating the damages.

Course objectives of the course are i) To Understand basic concepts in Disaster Management ii) To Understand Definitions and Terminologies used in Disaster Management iii) To Understand Types and Categories of Disasters iv). To Understand the Challenges posed by Disasters vi) To understand Impacts of Disasters Key Skills

Outcomes: The student will develop competencies in → the application of Disaster Concepts to Management → Analyzing Relationship between Development and Disasters. → Ability to understand Categories of Disasters and → realization of the responsibilities to society

Syllabus

Module 1: Introduction - Concepts and definitions: disaster, hazard, vulnerability, risks severity, frequency and details, capacity, impact, prevention, mitigation).

Module 2: Disasters - Disasters classification; natural disasters (floods, draught, cyclones, volcanoes, earthquakes, tsunami, landslides, coastal erosion, soil erosion, forest fires etc.); manmade disasters (industrial pollution, artificial flooding in urban areas, nuclear radiation, chemical spills, transportation accidents, terrorist strikes, etc.); hazard and vulnerability profile of India, mountain and coastal areas, ecological fragility.

Module 3: Disaster Impacts - Disaster impacts (environmental, physical, social, ecological, economic, political, etc.); health, psycho-social issues; demographic aspects (gender, age,

special needs); hazard locations; global and national disaster trends; climate change and urban disasters.

Module 4: Disaster Risk Reduction (DRR) - Disaster management cycle – its phases; prevention, mitigation, preparedness, relief and recovery; structural and non-structural measures; risk analysis, vulnerability and capacity assessment; early warning systems, Postdisaster environmental response (water, sanitation, food safety, waste management, disease control, security, communications); Roles and responsibilities of government, community, local institutions, NGOs and other stakeholders; Policies and legislation for disaster risk reduction, DRR programmes in India and the activities of National Disaster Management Authority.

Module 5: Disasters, Environment and Development - Factors affecting vulnerability such as impact of developmental projects and environmental modifications (including of dams, landuse changes, urbanization etc.), sustainable and environmental friendly recovery; reconstruction and development methods.

Text/Reference Books:

1. <http://ndma.gov.in/> (Home page of National Disaster Management Authority)
2. <http://www.ndmindia.nic.in/> (National Disaster management in India, Ministry of Home Affairs).
3. Pradeep Sahni, 2004, Disaster Risk Reduction in South Asia, Prentice Hall.
4. Singh B.K., 2008, Handbook of Disaster Management: Techniques & Guidelines, Rajat Publication.
5. Ghosh G.K., 2006, Disaster Management, APH Publishing Corporation
6. Disaster Medical Systems Guidelines. Emergency Medical Services Authority, State of California, EMSA no.214, June 2003
7. Inter Agency Standing Committee (IASC) (Feb. 2007). IASC Guidelines on Mental Health and Psychosocial Support in Emergency Settings. Geneva: IASC

DOMAIN				
Sl. No.	Code	Subject Name	T-P-P	Credits
Domain	ASCU2020	Aerial Surveying and Remote Sensing Applications		4-10-4
1.	CUAS2020	REMOTE SENSING & DIGITAL IMAGE PROCESSING	2-2-0	4
2.	CUAS2021	GEOSPATIAL TECHNOLOGY AND ITS APPLICATION	2-2-0	4
3.	CUAS2022	PHOTOGRAMMETRY AND ITS APPLICATION	0-2-0	2
4.	CUAS2023	LIDAR REMOTE SENSING AND ITS APPLICATIONS	0-2-0	2
5.	CUAS2024	HYPER-SPECTRAL REMOTE SENSING AND ITS APPLICATION	0-2-0	2
6.	CUAS2025	PROJECT	0-0-4	4
Total				18

DOMAIN

Aerial Surveying and Remote Sensing Applications

Course Title	Code	Type of course	T-P-PJ	Prerequisite
Aerial Surveying and Remote Sensing Applications	ASCU2020	Theory + Practice + Project	4 - 10 - 4	Nil

Courses Division:

- | | |
|--|-----------------|
| 1. Remote Sensing & Digital Image Processing | (2-2-0) 45Hours |
| 2. Geospatial Technology and its Application | (2-2-0)45Hours |
| 3. Photogrammetry and its Application | (0-2-0) 25Hours |
| 4. Lidar Remote sensing and its Applications | (0-2-0) 25Hours |
| 5. Hyper-spectral Remote Sensing and its Application | (0-2-0) 25Hours |
| 6. Project | (0-0-4) 54Hours |

Objective:

- Apply the principles of Remote Sensing and GIS to collect, map and retrieve spatial information.
- Plan, assess and evaluate natural and manmade systems using geospatial models and methods.
- Use geospatial tools and techniques for natural resources planning and management.

Course Outcome:

- Identify specific data and methodologies for effective mapping and evaluation of natural resources.
- Develop geospatial models and tools to address the social and engineering problems
- Design multi-criteria geospatial systems for decision-making process
- Work in a team using geospatial tools and environment to achieve project objectives.
- Pursue lifelong learning for professional advancement

Evaluation System: As per university norms

Remote Sensing and Digital Image Processing

Subject Name	Code	Type of course	Credit	T-P-P	Prerequisite
Remote Sensing and Digital Image Processing	CUAS2020	T+P	4	2-2-0	NIL

Module: I Basic Concept of Remote Sensing (4+6) Hours

Introduction of Remote Sensing: Principles of RS and its Type; Energy sources and Radiation principles, Pixel, DN value, Energy equation; EMR and Spectrum; EMR interaction with Atmosphere; scattering, Absorption, Atmospheric window, Black body radiation; EMR interaction with earth surface features, reflection, absorption, emission and transmission, Spectral signature; Interaction with vegetation, soil, water bodies; Advantage of RS over conventional method, Limitation, Ideal remote sensing.

Practice:

1. Installation of Image Processing software's
2. Download satellite data from GLOVIS / Earth Explorer / Bhuvan etc.
3. Layer stacking
4. LUT and Image Subset
5. Spectral Signature mapping (soil, vegetation, water)

Module: II Digital Image (2+3) Hours

Data acquisition: Procedure, Reflectance and Digital numbers; Intensity, Reference data, Ground truth, Analog to digital conversion, FCCs, TCC, Platforms and sensors; orbits ,types, Resolutions; Image Interpretation; visual- Interpretation keys.

Practice:

1. FCCs and TCC
2. Resolution
3. Image Interpretation

Module: III Satellite Information and Principles (2+3) Hours

Land observation satellites, characters and applications; PSLV, GSLV, Satellite, Platform Types; LANDSAT series; IRS series; IKONOS Series; QUICKBIRD series; Weather/Meteorological satellites; INSAT series, NOAA, Applications, Marine observation satellites; OCEANSAT

Practice:

1. Image filtering and Band ratioing
2. Mosaicking

Module: IV Image Acquisition and Format (2+4) Hours

Digital Image Processing; Export and import, Data formats; BSQ, BIL, BIP, Run length encoding, Image Compression Data products.

Practice:

1. Export and Import
2. Histogram
3. Subset using AOI

Module: V Image Processing (3+4) Hours

IMAGE RECTIFICATION; Pre-processing and Post processing Geometric distortion; sources and causes for distortion, rectification, GCP, Resampling, Image registration; Radiometric distortion; sources and causes, atmospheric correction.

Practice: (Spectral Python and ENVI)

1. Geometric correction
2. Radiometric correction
3. Atmospheric correction

Module: VI Image Classification (4+4) Hours

IMAGE CLASSIFICATION; Classification techniques, types, Supervised and Un-supervised; Principal Component Analysis (PCA); Image Enhancement; Accuracy assessment.

Practice:

1. PCA analysis (spectral Python and ENVI)
2. NDVI, DVI, NDWI calculation
3. Image classification in Spectral angel Mapper
4. MNF Ratoing
5. Supervised Classification(spectral Python and ENVI)
6. Un-supervised Classification(spectral Python and ENVI)
7. Image Enhancement(ENVI)
8. Accuracy Assessment(ENVI)

Module: VI Remote Sensing and Its application (3+4) Hours

Microwave RS and its application; Thermal RS and its application; Optical RS and its application; Sensor and its types.

Practice: Using Spectral Python

1. Application of microwave remote sensing (Structural Trend line mapping)
2. Application of thermal remote sensing and case study(Land surface Temp. estimation)
3. Application of optical remote sensing and case study

Module I: GIS & Cartography (2+4) Hours

Components of GIS, Types of Data in GIS, Scale Application of GIS, Advantage and limitation of GIS. History and development of Cartography; Definition, scope and concepts of cartography, Characteristics of Map; Categories of maps, Methods of mapping, relief maps, thematic maps.

Practice:

1. **Symbology** (generalization, symbology, and colour effect, change symbology and use transparency in creative ways) using GRASS and QGIS

Subject Name	Code	Type of course	Credit	T-P-P	Prerequisite
Geospatial Technology and its Application	CUAS2021	T+P	4	2-2-0	NIL

Geo-referencing (Map to Image and Image to Image), Projection, Data base creation: Digitization using Point, line and polygon, Edit, Clip, Intersect, Union, Merge, Join and subset. Attribute table editing

2. **Google Earth** (Convert Shape file to KML Format and KML File to shape file, Import data into Google earth, Bhuvan view, Extract data From Google Earth, Extract Point Data, Extract Polygon data, Extract line data, overlaying an image into Google earth)

Module: II Data analysis tools(2+4) Hours

Raster data spatial analysis, Network analysis, Vector operations and analysis, Data editing, Primary and secondary data. Data model and data structure, Geodatabase and metadata, GIS data model, Overlay analysis, Network modeling, Data Structure Models, Spatial interpolation; measurement and analysis methods, Advantage and disadvantage

Practice:

1. Linking of spatial and Non-spatial data and queries, Joining tabular data with the feature attribute data, Non-spatial query, Spatial query, Spatial join, Vector based spatial analysis, Raster based spatial data analysis
2. Buffering and Creation of Contour
3. Network Analysis

Module: III Multi-criteria analysis and decision making (3+4) Hours

Principles and elements of multiple-criteria decision making, Classification of Multiple-criteria Decision Problem: Multi-objective Vs Multi-attribute, Decision Alternatives and constraints, Criterion weighting, Decision rules, Multiple-criteria decision making in spatial data analysis.

Introduction to AHP, Basic Principles of AHP, Effect Table, Pair Wise comparison, Consistency, Weightage, performance score, Case studies involving AHP

Practice:

1. Mapping accident locations using Linear Referencing technique.
2. Preparation of raster layers for Multicriteria Analysis
3. Solving a spatial problem using Multicriteria Analysis (Spatial AHP)

Module: IV Digital Elevation Model (DEM) (2+4) Hours

Concept of DEM, Various techniques to generate DEM, Importance of spatial resolution to DEM, Integration of DEM to satellite data, Common derivatives of DEM, Slope, Aspects, TIN, Sources of DEM, Laminations and future of DEM.

Practice:

1. Google earth to DEM, 3D Map preparation, Contour to DEM, TIN and Aspect
2. DEM based surface Hydrology modeling,
3. LiDAR classification, DEM from LiDAR

Module: V Geospatial Technology for Water resources Engineering (3+4) Hours

Watershed, types, divide catchment, command area, stream types, Drainage network, different pattern; morphometric analysis, Bifurcation ratio analysis; Assessment of **Groundwater potential zones** and Groundwater mapping; Site selection for recharge structures, Hydrogeological Mapping GIS applications to ground water studies.

Practice:

1. Mapping of catchment, command area
2. Drainage network analysis
3. Morphometric analysis
4. Mapping of Groundwater potential zones

Module: VI Geospatial Technology for Environmental Engineering (3+4) Hours

Monitoring atmosphere constituents; air pollution, industrial activity, modeling using GIS, Resource development in remote areas, Impacts of anthropogenic activity, Solid Waste management; Water Pollution, Shortest path Identification, Network analysis.

Practice:

1. Air pollution mapping
2. Solid waste management
3. Water pollution

Photogrammetry and Application

Practice Experiments:

3.1 Scale determination from aerial photo

3.2 Aerial photo Interpretation

3.3 Use of Parallax bar and determination of Height from stereo pair

3.4 Satellite DEM and ortho Image generation

3.5 Primary and additive colour creation

3.6 Stereo test

3.7 Mosaic

Subject Name	Code	Type of course	Credit	T-P-P	Prerequisite
Photogrammetry and Application	CUAS2022	T+P	2	0-2-0 25Hours	NIL

3.8 Stereoscopic vision

3.9 Relief displacement

3.10 Analog to digital conversion, Orientation of stereo model and Determination of Height

3.11 Aerial mapping using DRONE

3.12 Mosaicking of aerial Photo

3.13 Correction and rectification

3.14 DTM generation Image correction, Link between GIS and Digital Photogrammetry and Ortho Image generation

LIDAR Remote Sensing and Application

Practice Experiments:

4.1 Download of LIDAR data

4.2 Layer stacking

4.3 Data Validation

4.4 Georeferencing Technology

4.5 Boresight Calibration - Lidar Data Pre-processing

Subject Name	Code	Type of course	Credit	T-P-P	Prerequisite
LIDAR Remote Sensing and Application	CUAS2023	T+P	2	0-2-0 25Hours	NIL
Subject Name	Code	Type of course	Credit	T-P-P	Prerequisite

4.6 Project Coverage Verification - Review Lidar Data against Field Control

4.7 Lidar data errors and rectifications, - processes calibration of Lidar data - artifacts and anomalies - Lidar Error Budget.

4.8 Noise Removal and other sensor-related artifacts - Layer Extraction - Automated Filtering

4.9 Manual Editing and Product Generation – Surface Editing - Hydrologic Enforcement

4.10 Breaklines, Contours, and Accuracy Assessment

4.11 Topographic Mapping, flood inundation analysis, line-of-sight analysis

4.12 Forestry, various types of LIDAR sensors-, vegetation metric calculations - specific application software.

4.13 Corridor mapping system, data processing and quality control procedures.

4.14 Modelling

Hyperspectral Remote Sensing and Application

Hyperspectral Remote Sensing and Application	CUAS2024	T+P	2	0-2-0 25Hours	NIL
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Practice Experiments:

5.1 Introduction to ENVI, Python and Downloading, Displaying, and Analyzing

Subject Name	Code	Type of course	Credit	T-P-P	Prerequisite
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Hyperspectral Imagery

5.2 Atmospheric Correction of Hyperspectral Imagery.

5.3 MNF rationing from Hyperspectral(EO1)

5.4 Hyperspectral Image Classification Using Spectral Angle Mapper (SAM) & Spectral Feature Fitting (SFF).

5.5 Hyperspectral Imagery Classification Using an Unsupervised Neuron fuzzy System.

5.6 Application of Hyperspectral Imagery in Geological Studies.

5.7 Hyperspectral Signatures & Feature Fitting.

5.8 Hyperspectral Remote Sensing for Agriculture and soil Studies.

5.9 Hyperspectral Remote Sensing for Forestry Applications.

5.10 Hyperspectral Remote Sensing for Urban Studies.

5.11 Mineral identification from Hyperspectral imagery

5.12 Python Programming for Hyperspectral data analysis.

Project

Project	CUAS2025	Project	4	0-0-4	NIL
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List of Projects :

1. Flood inundation mapping and Risk Evaluation using Geospatial Technology.
2. Landslide Hazard mapping using GIS and RS.
3. Land use and Land cover Dynamics using Earth observation Technology.
4. Mangrove change detection study using Multi-Temporal satellite data.
5. Solid waste management and shortest path identification using GIS Technology.
6. Watershed management using GIS Technology.
7. Identification Mineral mapping using GIS and RS.
8. Crop Health Monitoring using Geospatial Technology.
9. Identification of Hydrocarbon Locales using space inputs and Geospatial Technology.
10. Ground water exploration using GIS and RS Techniques.
11. Interlinking of River using GIS Technology.
12. Biomass estimation using Space Technology.
13. Land surface Temperature mapping using RS Technology.
14. Climate Change study using Earth Observation Technology.
15. Erosion and Accretion study of Shorelines and its impact in coastal habitats.

Students take up group projects and deal the following activities during the project. The project Report should contain below gate process.

Step 1: Functional Planning of the project and Objective Identification

Step 2: Literature Review

Step 3: Preparation of Flow chart for Methodology

Step 4: Layer creation and GIS analysis

Step 5: Identifying the possible Risks involved (specific to the project)

Step 6: Report writing

Each student is expected to do an individual project. At the completion of a project the student will submit a project report, which will be evaluated (end semester assessment) by duly appointed examiner(s). This evaluation will be based on the project report and a viva voce examination on the project. Student will be allowed to appear in the final viva voce examination only if he / she has submitted his / her project work in the form of paper for presentation / publication in a conference / journal and produced the proof of acknowledgement of receipt of paper from the organizers / publishers.

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Domain Track Title: CONSTRUCTION PLANNING, MONITORING AND PROJECTMANAGEMENT

Track Total Credits =Theory + Practice + Project = 16 (4- 6 - 6)

Courses Division (list all divisions):

PHASE I.	Study of Drawings and Plan Hours	(0+2+0)	25
PHASE II.	Project Scheduling & Management Hours	(2+1+0)	30
PHASE III.	Quantity Estimation and Equipment Management Hours	(0+1+1)	25
PHASE IV	Site Study and Study on Contract Laws Hours	(2+1+0)	30
PHASE V.	Concepts of Quality Control and Checking Hours	(0+1+1)	25
PHASE VI.	Site Supervision Project Hours	(0+0+4)	54

Domain Track Objectives:

- Students will be able to work with the latest trend of the construction industry

needs.

- Understand different methods of project delivery and the roles and responsibilities of all constituents involved in the design and constant process.
- Give the students experience, supervision and direction in recognizing and applying the concepts of project management and construeplanning.

Domain Track Course Outcomes:

- Students will plan various projects relating to advanced building technology with trust.
- Students will be churned as Construction Manager, Project Engineer, Site Supervisor and Project Consultant.
- Maintain and develop the pupils' ability to put their knowledge of theory into practice using forms of construction.

Domain Syllabus:

PHASE I- STUDY OF DRAWINGS 2+2+0

Inputs required completing the project

1. To ensure the student to read about the technical terms in various building drawings.
2. To give hands on practice to the students in preparing blue prints of a proposed construction.

To fulfill the requirement of the INPUTS the candidate has to learn the following steps:

<u>TYPES OF INPUT</u>	<u>TYPE OF STUDY</u>
Preparation of Site Map Practice	Theory + Drawing
Preparation of Electrical and Plumbingdrawing Practice	Theory + Drawing
Preparation of Bar Bending Schedule and Carpentry drawing Practice	Theory + Drawing
Structural Detailing of building components Preparation of Building layouts Practice	Theory + Drawing

Report Preparation Review
Practice

Theory + Drawing

Field Work Report Presentation
Practice

Theory + Drawing

Phase II: PROJECT SCHEDULING & MANAGEMENT 0+2+0

1. WBS
2. Equipment Scheduling
3. Labour Scheduling
4. Material Scheduling
5. Financial Resource allocation.

To fulfill the requirement of the INPUTS the candidate has to learn the following steps:

TYPES OF INPUT

TYPE OF STUDY

Preparation of Functional Planning	Practice
Detail analysis report about the information of an equipment	Practice
Preparation of datasheet of construction labors	Practice
Preparation of materials list required for the project	Project
Scheduling the resources of the project	Project
Report Preparation	Report
Review	Presentation

PHASE III QUANTITY ESTIMATION AND EQUIPMENT MANAGEMENT

- 1 Identify the particular equipment to be used in the construction project they will undertake.
- 2 Prepare plans for economic management by estimating the costs of the total construction works.

To appraise the student with the aspects related to functioning, operation and maintenance of various construction equipment.

To fulfill the requirement of the INPUTS the candidate has to learn the following steps:

TYPES OF INPUT

TYPE OF STUDY

Planning & Selection of Equipment Learning }	Practice (Self-
Economics of Equipment and procurement techniques. Learning }	Practice (Self-
Estimation for total construction cost. Learning }	Practice (Self-

Estimation for total labor and material Learning }	Practice (Self-
Preparation of BOQ. (Lab)	Estimator 2.0
Review	Presentation

PHASE IV SITE STUDY AND STUDY ON CONTRACT LAWS
2+2+0

To learn about the methods of marking layouts and pre construction process.
To study the various types of construction contracts and their legal aspects and provisions.
To fulfill the requirement of the INPUTS the candidate has to learn the following steps:

<u>TYPES OF INPUT</u>	<u>TYPE OF STUDY</u>
Marking Layouts of proposed plan.	Field work
Preparation of Site Map Practice	Surveying
Design of contract documents Tenders Prequalification-Bidding- Accepting- Evaluation of Tender from Technical Class Room Practice	Theory+
Contractual and Commercial Points of View. Legal Requirements, Insurance and Bonding, Laws Governing Sale, Purchase and Use of Urban and Rural Land-Land Revenue Codes-Tax Laws Class Room Practice	Theory+
Assessment (Lab) Examination	

PHASE-V 0+1+1 CONCEPTS OF QUALITY CONTROL AND CHECKING

Inputs required completing the project

- To enlighten the student with the tools of total quality management process.
- To give hands on practice to the students in preparing quality assessment schedules and inspection check list
- Carryout the field and laboratory tests for quality assessment in construction industry.

To fulfill the requirement of the INPUTS the candidate has to learn the following steps:

TYPES OF INPUT

TYPE OF STUDY

Generation of sample QC inspection Check list for Practice (Self- Learning) Industrial building.	
Generation of sample QC inspection Check list for Institutional building. (Self- Learning)	Practice
Generation of sample QC inspection Check list for Apartment building. (Self-Learning)	Practice
Generation of sample QC inspection Check list (Self- Learning) Road Structures.	Practice
Report Preparation.	Report
Review.	Presentation

PHASE VI SITE SUPERVISION PRACTICES 0+0+2

To demonstrate supervision of concreting task such as form finish concrete structure, complex structure, slip fc concreting and concreting in extreme weather condition.
Supervise, monitor and evaluate performance of subordinates at workplace.
To study about the processes of various stages of construction on the field.
To fulfill the requirement of the INPUTS the candidate has to Learn the following steps:

TYPES OF INPUT

TYPE OF STUDY

Supervise and monitor the execution of System/shuttering Carpentry works. Learning)	Practice (Self-
Supervise and monitor the execution of concreting works. Learning	Practice (Self-
Supervise and monitor the execution of bar bending works Learning	Practice (Self-
Supervise and monitor the execution of scaffolding works. Learning	Practice (Self-
Supervise and monitor the daily- Labour works (DPR). Learning	Practice (Self-
Assessment (Review)	Presentation

REPORT WRITING

Students take up group projects and deal the following activities during the course of their project.

- Functional Planning of the project
- Identification of Objects
- Literature Review
- Preparation of Flow chart for Methodology
- Sequences of construction process
- Identifying the possible Risks involved (specific to the project)
- Result and Discussion
- Conclusion
- Recommendation
- **References**

Software Handling

- 1 Auto CAD
2. Revit Architecture
- 3 M. S. Project
- 4 Primavera
- s Estimator 2.0

Domain Track Title : **Architectural and Structural Design**

Track Total Credits (0-15-5)

Courses Divisions:

1. Critical thinking and presenting it with digital platform (AutoCAD leads to 3D base) (0-3-0)
2. Scope to enrich by exposing them to BIM modelling (0-5-0)
3. Design and failure analysis of structure (0-5-0)
4. Amalgamation of architecture and civil requirements using Generative Apps (0-2-0)
5. Project(0-0-5)

Domain Track Objectives:

1. To teach the Principles of architectural building design.
2. To familiarise the student with practicing life in construction industry and orient their learnings towards practical application in the field
3. Make a difference with cutting edge technology

Domain Track Course Outcomes:

1. Strong understanding of architectural design and scope for innovative ideas
2. Case study based practical solution with actual site visits/live buildings
3. Modelling of structural elements and failure analysis
4. Time saving estimations/structural calculations using digital tool

Domain Syllabus:

1. Critical thinking and presenting it with digital platform (37.5 Hrs) (AutoCAD leads to 3D base)

- 1.1 Introduction to Architectural Design
- 1.2 The need and scope of with basics of Design Principles
- 1.3 Ergonomic data and its application
- 1.4 Hands-on experience with designing their own house or hostel
- 1.5 The need of digital drive for 2D design expressions
- 1.6 Basics of AutoCAD, Conceptualization of Design: Own House drafting/Hostel
- 1.7 Addition of Creativity and modifying the design
- 1.8 Study the impact of Geological data, climatological data on design
- 1.9 Modification of design based on hydrology, soil, site conditions
- 1.10 Carving out a meaningful design in terms of architecture and structure both

- 1.11 Application of 2D design/ welcoming them in the world of 3D design
- 1.12 Basics of 3D concepts and commands
- 1.13 Practical techniques for saving area/cost
- 1.14 Presenting a wholesome idea before moving to BIM

2. Scope to enrich by exposing them to BIM modelling (62.5 Hrs)

- 2.1 Introduction to BIM modelling
- 2.2 The need and scope of with live examples
- 2.3 Ergonomic data and its application
- 2.4 Applying learnings to a bigger scale hotel/flat scheme/hostels
- 2.5 Incorporation of site factors
- 2.6 Realistic approach road and building bye-laws
- 2.7 The magic of *Importing previous plans & reorient them to achieve larger scale in no time*
- 2.8 Prepare specifications in BIM
- 2.9 Estimating all the quantities in a very short time
- 2.10 Concepts of CATIA
- 2.11 Layer wise calculation for pipelines, electrical ducts, AC units etc
- 2.12 Introducing structural layers for design
- 2.13 Cross check with grid formation, foundation calculation & column orientation
- 2.14 Data and record for 3D design of individual aspects for the next level

3. Design and Failure Analysis of Structure (62.5 Hrs)

- 3.1 Introduction to steel structures. Modeling, Analysis and design of steel truss in as per AISC 360
- 3.2 Linear buckling analysis of structures
- 3.3 Introduction to PEB, Modelling PEB and assigning properties, load cases, design parameters, Analysis and extracting results.

- 3.4 Introduction to lattice steel structures. Modelling, Analysis and design of lattice steel structures.
- 3.5 Reading design results and optimising the steel structure.
- 3.6 Modelling, Analysis and design of portal frame as per AISC 360 and ASCE 07-16
- 3.7 Introduction to nonlinear static analysis. Perform pushover analysis.
- 3.8 Introduction and modelling of composite deck platform
- 3.9 Modelling of deck slab and assigning section properties with releases
- 3.10 Assigning specifications and diaphragm to the structures
- 3.11 Define and calculate seismic and wind loads as per ASCE 07 and ATC hazards
- 3.12 Define load cases and load combinations, Deflection check concept, floor vibration analysis.
- 3.13 Analyse composite structure and extract results.
- 3.14 How to import CAD MODEL, Design and analysis of multi storey residential building based on different loading criteria (based Code on IS456:2000),Creating plate elements and shear walls.
- 3.15 Design and analysis of frame structures based on different loading criteria (based Code on IS456:2000)
- 3.16 Design, analysis of Foundations (Isolated footing and Combined footing based on code IS456:2000)
- 3.17 Design, analysis of structural elements e.g. Beam, column, Slab (one way and Two way) (based Code on IS456:2000 and BS8007)
- 3.18 Error and warning analysis, Report generation

4. Amalgamation of Architecture and Civil Requirements using Generative Apps or Derivatives of Parametric Design (25 Hrs)

- 4.1 Optimisation of steel cost- using permutation & combination of steel/foundation type or small changes in architectural design
- 4.2 Segregated services
- 4.3 Revising PERT/CPM paths
- 4.4 Addition of storage spaces
- 4.5 Façade treatment/modification
- 4.6 Inclusion of basement/parking areas/bunkers
- 4.7 Reduction of construction cost
- 4.8 Site development and slope calculation (in brief)
- 4.9 Mitigating hydrological impacts on difficult sites

Session Plan for the Entire Domain:

1. Critical thinking and presenting it with digital platform (37.5 Hrs)

Session 1: Architectural Design Basics

<https://www.youtube.com/watch?v=k4dVgbuxBAw>

Session 2: Stages of Architectural Design

<https://www.youtube.com/watch?v=pv-O5VdVjdM>

Session 3: Fundamentals of Building Planning

<https://www.youtube.com/watch?v=LIY7f6kK3Jk>

Session 4: Visualisation of plans

Session 5: Basics of AutoCAD

<https://www.youtube.com/watch?v=hO865EIE0p0>

Session 6: Making a simple floor plan in AutoCAD

<https://www.youtube.com/watch?v=-iX-ZyvOiQA>

Session 7: Creative Design

<https://www.youtube.com/watch?v=YHNYaQzsRf8>

Session 8: Creativity in building design (sample/live case analysis)

<https://www.youtube.com/watch?v=MDtlcrDApFk>

Session 9: Design is a thinking process

<https://www.youtube.com/watch?v=vmHoGicPQQQ>

Session 10: Modification and correction

Session 11: Adding variables like: Climatology, soil data and hydrology

Session 12: Arriving at a creative and unique solution

Session 13: Printing the ideas in brain

Session 14: Basics of 3D design

https://www.youtube.com/watch?v=MZ89_ozNWiA

Session 15: Exploring various platforms to express the idea in VR

https://www.youtube.com/watch?v=il7m1Ta7_eQ

Session 16: Detailing in 3D

Session 17: Practical techniques for saving area/cost

Session 18: Hands on practice for optimisation of design

2. Scope to enrich by exposing them to BIM modelling (62.5 Hrs)

Session 1: A thorough introduction to BIM

<https://hmcarchitects.com/news/building-information-modeling-benefits-for-architecture-and-construction-2019-06-05/>

Session 2: BIM's extent and various applications

Session 3: Case study and live applications/examples

<https://www.linkedin.com/pulse/200612engineeringtemplateexample-mansu-kim/?trackingId=tW9ftWdlwLMES034UU2meg%3D%3D>

Session 4: Introduction to bigger scale problems based on previous sample design

Session 5: Time saving factor using 3D skills

<https://www.linkedin.com/pulse/200612engineeringtemplateexample-mansu-kim/?trackingId=tW9ftWdlwLMES034UU2meg%3D%3D>

Session 6: Specification generation in BIM

<https://www.cadcr.com/bim-and-specifications-writing-the-great-disconnect/>

Session 7: Estimation of quantities

<https://estimationqs.com/bim-vs-bills-of-quantities-3d-model-quantity-takeoff/>

Session 8: 5D estimation and BIM/adding another dimension to BIM

<http://biblus.accasoftware.com/en/perspectives-on-5d-bim-the-fifth-dimension-of-bim-linked-to-construction-estimate/>

Session 9: Layer of services: water supply and Sanitation

Session 10: Calculation and Fitting nitty-gritty

Session 11: Electrical Layout and BIM

https://www.youtube.com/watch?v=SSkl_vT7cCQ

Session 12: Electrical Layout: drawing and estimation

<https://www.youtube.com/watch?v=r5p3LOqPMiM>

Session 13: AC layout ducting (only introduction)

Session 14: Centreline plan and Cross check with grid formation

<https://www.youtube.com/watch?v=dPHYi-fYcnk>

Session 15: Reorientation of columns and beams to form a strong frame

<https://www.youtube.com/watch?v=nKZy4MB-0zY>

Session 16: Cross check in 3D-Quick Revit analysis/SAP

<https://www.youtube.com/watch?v=pIRqWvD0Wqw>

Session 17: Basics of foundation calculation & column

<https://www.youtube.com/watch?v=SUF5h2ulf2U>

Session 18: Report generation

Session 19: Presentation with achievements in project

3. Design and Failure Analysis of the Structure

Session 1: Introduction to Steel Structures, Various types of trusses, Purlins, girders and Sag Rods.

<https://youtu.be/dZctrAnZeI>

Session 2: Modelling of Steel Truss in STAAD as per AISC 360

Session 3: Analysis and Design of Steel Truss in STAAD as per AISC 360

Session 4: Introduction to Linear Buckling Analysis

Session 5: Perform Buckling Analysis for I Shape Column

Session 6: Perform Buckling Analysis for I Shaped Steel Girder

Session 7: Introduction to Pre-Engineered Buildings (PEB)

<https://youtu.be/N024hmp2PYU>

Session 8: Modelling of PEB Shed and Assigning Properties

<https://youtu.be/T2AafFV-KS0>

Session 9: Define Load Cases and Combinations

Session 10: Calculation and Assignment of Dead and Live Loads as per IS 875 and NBC 2016

Session 11: Assignment of Wind Loads on PEB Shed as per the Indian Standards

Session 12: Assigning Analysis and Design Parameters with Extracting Design Results

Session 13: Introduction to Lattice Steel Truss Structures

Session 14: Practical Reference for a Lattice Steel Truss Structure

Session 15: Modelling of Lattice Steel Truss Structure

Session 16: Analysis and Design of Lattice Steel Truss Structure

Session 17: Reading Design Results and Optimizing the Steel Structure

Session 18: Detailed Explanation of Wind Loads as per ASCE07-16

Session 19: Modelling of Portal Frame as per AISC 360 and ASCE07-16

Session 20: Analysis and Design of Portal Frame as per AISC 360 and ASCE07-16

Session 21: Introduction to Non Linear Static Analysis i.e. Pushover Analysis

Session 22: Perform Pushover Analysis for a Steel Frame in STAAD Pro.

Session 23: Introduction to Steel and Composite Buildings

Session 24: Introduction to Cold Formed Steel Structures, Introduction and Modelling of Composite Deck Platform

Session 25: Modelling of Deck Slab and Assigning Section properties with Releases

Session 26: Assigning Specifications, Releases and Diaphragm to the Structure

Session 27: Define and Calculate Seismic and Wind Loads as per ASCE 07 and ATC Hazards

<https://youtu.be/tV3I7SDmiwk>

Session 28: Define Load Cases and Load Combinations

Session 29: Define Analysis and Composite Structure Design Commands

Session 30: Analyzing and Designing the Structure as per AISC 360 for Composite beams

Session 31: Floor Vibration Analysis and Generation of Design Report

Session 32: Deflection Check Concept i.e. DJ1 and DJ2 Design Command

Session 33: Introduction to Plate Girders

Session 34: Design of Plate Girders as per AISC 360

Session 35: Introduction to Linear Cable Analysis and Cable Supported Structures

Session 36: Linear Cable Analysis of a Guyed Tower in STAAD Pro.

Session 37: Introduction to Lifting Arrangement and Basic Modelling of Suspended Arrangement

Session 38: Advanced Cable Analysis and Extraction of the Results

Session 39: Modelling of Steel Structure Platform and defining Load Cases, Combination

<https://youtu.be/YBWPn5jmMGs>

Session 40: Defining Properties, Analysis and Design Parameters

Session 41-42: How to import CAD MODEL, Design and analysis of multi storey residential building based on different loading criteria (based Code on IS456:2000)

<https://youtu.be/xb2I5-89O28>

<https://youtu.be/uGZjESwS6z0>

Session 43: Creating plate elements and shear walls.

<https://youtu.be/YKNfjEmN5O4>

Session 44-45: Design and analysis of frame structures based on different loading criteria (based Code on IS456:2000)

https://youtu.be/_I1qYBIspbk

Session 46-47: Design, analysis of Foundations (Isolated footing and Combined footing based on code IS456:2000)

<https://youtu.be/be20IIMaRS4>

Session 48-49: Design, analysis of structural elements e.g. Beam, column, Slab (one way and Two way) (based Code on IS456:2000 and BS8007)

<https://youtu.be/NXP2cmL8fmY>

<https://youtu.be/-17O4ZSZ9VY>

<https://youtu.be/XueRfUsznhI>

<https://youtu.be/8BX8wDuuVFk>

<https://youtu.be/7hguBoqCajE>

<https://youtu.be/GTDCjEtXI60>

Session 50-51: Error and warning analysis, Report generation

4. Amalgamation of Architecture and Civil Requirements using Generative Apps or Derivatives of Parametric Design (25 Hrs)

Session 1: Variable analysis using BIM: plan, grid, column numbers and even reinforcement detailing

Session 2: Revising estimations in no time

Session 3: Achieving cost effectiveness

Session 4: Checking services' paths-Layering of services

Session 5: Addressing the coinciding issues with services

Ex: AC duct and electrical conduits

Session 6: Visual realisation of reinforcement in all the elements

Session 7: Arriving on shortest timeline-Revising PERT/CPM

Session 8: Exploring possibilities for additional spaces in design

Ex: storage, intermediate water tank, parking area

Session 9: Façade treatment

<https://study.com/academy/lesson/facade-in-architecture-definition-design.html>

Session 10: Dynamic façade design

<https://www.homedit.com/cool-building-facades/>

Session 11: Site development –Phase wise

Session 12: Site development – After completion year wise

Session 13: Scope for future addition/intervention by developer

Session 14: Estimation of effective saving- in terms of time/money/gain

List of Projects:

1. Small scale (initial) with interior
 - 1.a. Hostel room
 - 1.b. Individual home
 - 1.c. Duplex bungalow
 - 1.d. Shop
 2. Live/ ongoing Project/Turn key basis
 - 2.a. Multi storey building
 - 2.b. Hospital
 - 2c. Hostel
 - 2.d. Office Building
 3. Highway geometry design
 4. Design and analysis industrial ware house
 5. Design and analysis of auditorium with proper load calculation, load cases, load combination based on code (IS 456:2000 and BS 8007).
 6. Design of bridge deck slab
-
1. Gate Process for Project
 1. Gate 0: Project Identification
 2. Gate 1: Planning
 3. Gate 2: Modelling
 4. Gate 3: Design and simulation
 5. Gate 4: Documentation

The following colour represents the syllabus revision, skill, employability and entrepreneurship.

Green : Skill

Pink : Employability

Sky : Entrepreneurship



Centurion University of Technology and Management Odisha

Choice Based Credit System

Course Structure & Syllabus

Mechanical Engineering



CENTURION UNIVERSITY OF TECHNOLOGY AND MANAGEMENT

School of Engineering & Technology

2020

CBCS Structure

Basket	Basket Category	Minimum Credits to be acquired by Regular students	Minimum Credits to be acquired by Lateral Entry students
I	Foundation Courses in Sciences	17	06
II	Foundation Courses in Humanities & Management [A: 6 credit (choice), B: 6 credit (Compulsory)]	12	6(Job readiness) + 3
III	Smart Stack	25	25
IV	Foundation and Core Engineering Courses	58*	48
V	Domain/Skill/Internship/Minor Project/MOOC	48	32
	Total Credits	160	120

Course Structure

Basket I	Foundation Courses in Sciences		
Course Code	Course Title	Credit	Type (Theory+Practice+Project)
CUTM1001	Differential Equations and Linear Algebra	3	2+0+1
CUTM1002	Laplace & Fourier Transforms	3	2+0+1
CUTM1003	Complex Analysis & Numerical Methods	3	2+0+1
CUTM1004	Discrete Mathematics	3	2+0+1
CUTM1005	Probability & Statistics	3	2+0+1
CUTM1925	Calculus	3	2+0+1
CUTM1006	Mechanics for Engineers	3	2+1+0
CUTM1007	Optics and Optical Fibres	3	2+1+0
CUTM1008	Applied Analytical Chemistry	3	2+1+0
CUTM1009	Applied Engineering Materials	3	2+0+1
CUTM1010	Environmental Studies	2	0+0+2

Basket II	Foundation Courses in Humanities & Management [A: 6 credit (choice), B: 6 credit (Compulsory)]		
Course Code	Course Title	Credit	Type (Theory+Practice+Project)
CUTM1011	Optimisation Techniques	2	0-2-0
CUTM1012	Engineering Economics and Costing	3	2-0-1
CUTM1013	Project Management	3	2-0-1
CUTM1014	Gender, Human Rights and Ethics	3	1.5-0-1.5
CUTM1015	Climate Change, Sustainability and Organization	3	1.5-0-1.5
CUTM1016	Job Readiness	6	0-6-0

Basket III	Smart Stack		
Course Code	Course Title	Credit	Type (Theory+Practice+Project)
CUTM1017	Industrial IOT and Automation	6	3-2-1
CUTM1018	Data Analysis and Visualisation using Python	4	0-1-
CUTM1019	Machine Learning using Python	4	1-2-1
CUTM1020	Robotic automation with ROS and C++	4	1-2-1
CUTM1021	Basics of Design Thinking	2	0-0-2
CUTM1022	System Integration with DYMOLA	2	0-0-2
CUTM1023	Smart Engineering Project (G2M)	3	0-0-3

Basket IV	Core Courses_ Mechanical Engineering			
Course Code	Course Title	Credits	Type T+P+PJ	Prerequisite
CUTM1075	Computer Aided Drafting	3	0-2-1	
CUTM1076	Product Design and Development	2	1-1-0	
CUTM1077	Reverse Engineering and Rapid Prototype	4	1-2-1	
CUTM1078	Product Life Cycle Management	2	0-1-1	
CUTM1079	Manufacturing Process-process planning and Heat Treatment	3	2-1-0	
CUTM1080	Material in product design and development	2	1-10	
CUTM1081	Computer Aided Engineering	3	0-2-1	
CUTM1082	Quality Assurance	2	1-1-0	
CUTM1083	Applied Ergonomics	2	0-1-1	
CUTM1084	Computer Aided Manufacturing	2	0-2-0	
CUTM1085	CNC Programming & CNC Machining	2	0-2-0	
CUTM1086	Design of Tools, Jigs and Fixtures	3	2-1-0	
CUTM1087	Advance Metrology	2	1-1-0	
CUTM1088	Thermodynamics	3	2-1-0	
CUTM1089	Fluid Mechanics with Finite Volume Method	3	2-1-0	
CUTM1090	Hydraulic Machinery	2	1-1-0	
CUTM1091	Theory of Machines	3	2-1-0	
CUTM1092	Heat Transfer with FDM/FVM	3	2-1-0	
CUTM1062	Theories of Failure Using Finite Element Analysis	4	2-2-0	
CUTM1079	Optimisation Techniques	2	0-2-0	
CUTM1058	Programming in Java(Same as Java Technologies)	3	2-1-0	
CUTM1059	Database Management Systems	3	2-1-0	
	Total Credits	58		



Basket V: Domain/Skill/MOOC/Minor Project/Internship/Applied Courses

Domain:

- Manufacturing (Conventional, CNC and Additive)
- Welding and Inspection
- Automobile Engineering
- Computational Fluid Dynamics
- Composite Design and Manufacturing
- GO-TO-MARKET (Digital Manufacturing)



Centurion University of Technology and Management Odisha

CHOICE BASED CREDIT SYSTEM

COURSE STRUCTURE & SYLLABUS

BASKET - I



**Centurion
UNIVERSITY**

*Shaping Lives...
Empowering Communities...*

School of Engineering & Technology

2021



**Course Structure
Basket - I**

Course Code	Course Title	Credits	Course Type T+P+PJ
CUTM1001	Differential Equations and Linear Algebra	3	2+0+1
CUTM1002	Laplace & Fourier Transforms	3	2+0+1
CUTM1003	Complex Analysis & Numerical Methods	3	2+0+1
CUTM1004	Discrete Mathematics	3	2+0+1
CUTM1005	Probability & Statistics	3	2+0+1
CUTM1925	Calculus	3	2+0+1
CUTM1006	Mechanics for Engineers	3	2+1+0
CUTM1007	Optics and Optical Fibres	3	2+1+0
CUTM1008	Applied Analytical Chemistry	3	2+1+0
CUTM1009	Applied Engineering Materials	3	2+0+1
CUTM1010	Environmental Studies	2	0+0+2



Syllabus

Differential Equations and Linear Algebra

Code	Course Title	Credit	T-P-PJ
CUTM1001	Differential Equations and Linear Algebra	3	2-0-1

Objective

- Introduce students to how to solve linear Differential Equations with different methods.
- To solve the system of linear equations appearing in the problems of electrical engineering, mechanical engineering etc.
- To use Eigen values and Eigen vectors in Control theory, vibration analysis, electric circuits, advanced dynamics problems.
- Introduce students how to solve first order and second order differential equations

Course outcome

- Understand the importance of linear functions in mathematics.
- Solve systems of linear equations using Gauss- elimination to reduce to echelon form.
- Learn fundamental concepts of ODE theories and where and how such equations arise in applications to scientific and engineering problems.
- Be competent in solving linear/non-linear 1st & higher order ODEs using analytical methods to obtain their exact solutions

Course content

Module-I

First order linear differential equations and its applications(Kirchhoff's law)

Project-1:Some applications of differential equations in RL electrical circuit problems

Module-II:

Second order linear homogeneous differential equations (Real roots, Real equal roots, Complex conjugate roots) and its applications.

Project-2: RLC Circuit, Pendulum

Module-III:

Second order linear non-homogeneous differential equations, Finding particular integral consisting of exponential, trigonometric functions (Sine, cosine) using inverse operator method

Project-3: Simple mass-spring system, Damped vibration system

Module IV:

Basic concepts of a matrices, solution of linear system of equations by Gauss elimination method, linearly independent and dependent of a vectors, rank of a matrix.

Project-4

Report on finding the traffic flow in the net of one-way streets

Module V:

Determinants and Cramer's Rule, Fundamental theorem of linear system of equations.

Module VI:

Eigenvalues and Eigen vectors of a matrix

Project-5

(i) Find the limit states of the Markov process model.

(ii) Find the growth rate in the Leslie model

Module VII:

Symmetric, Skew-Symmetric, Orthogonal Matrices and Properties

Project-6

To make a report to show that the product of two orthogonal matrices is orthogonal, and so is the inverse of an orthogonal matrix. What does this mean in terms of rotations?

Text Books:

1. Advanced engineering mathematics by Erwin Kreyszig, 8th edition
Chapter-6 (6.1-6.6), Chapter-7 (7.1,7.2)
2. Higher Engineering by B.V. Ramana
Chapter-8(8.1,8.2,8.21), Chapter-9 (9.2,9.3,9.5)

Reference Books:

1. J. Sinha Roy and S. Padhy, A Course of Ordinary and Partial Differential Equations, Kalyani Publishers, New Delhi.
2. G.B. Thomas, M.D. Weir, J.R. Hass, Thomas' Calculus, Pearson Publication.
3. R.G. Bartle, D.R. Sherbert, Introduction to Real Analysis, Wiley Publication



Laplace and Fourier Transform

Code	Course Title	Credit	T-P-PJ
CUTM1002	Laplace and Fourier Transform	3	2-0-1

Objective

- To describe the ideas of Fourier and Laplace Transforms and indicate their applications in the fields such as application of PDE, Digital Signal Processing, Image Processing, Theory of wave equations, Differential Equations and many others.
- To use Fourier series for solving boundary value problems appearing in scientific & engineering problems.

Course outcome

- Solve differential equations with initial conditions using Laplace transform.
- Evaluate the Fourier transform of a continuous function and be familiar with its basic properties.

Course content

Module-I (T-3-Pj-2)

Laplace Transforms, Properties of Laplace transforms, Unit step function.

Project-1

Make a short draft of properties of Laplace transform from memory. Then compare your notes with the text and write a report of 2-3 pages on these operations and their significance in applications.

Module-II (T-2-Pj-2)

Second shifting theorem, Laplace transforms of Derivatives and Integrals

Project-2

Find the Laplace transform of the following functions

Module-III (T-3-Pj-2)



Derivatives and Integrals of Transforms, Inverse Laplace transform.

Project 3:

Application of Unit step function (RC- Circuit to a single square wave).

Module- IV (T-2-Pj-2)

Solution of Differential Equation by using Laplace Transform.

Project 4: Find the solution of differential equation by using Laplace Transform.

Module-V (T-4-Pj-2)

Periodic function, Fourier series, Fourier series expansion of an arbitrary period, Half range expansions.

Project-5

Find the Fourier series expansion of a 2π periodic function.

Module-VI(T-3-Pj-2)

Complex form of Fourier series, Fourier Integrals, Different forms of Fourier Integral.

Project-6

Find the Fourier sine and cosine integral of the following functions.

Module-VII(T-3)

Fourier Transforms, Fourier sine and cosine Transforms.

Text Books:

- E. Kreyszig , Advanced Engineering Mathematics, Johnwiley& Sons Inc-8th Edition.Chapters:5(5.1 to 5.4(without Dirac's delta function)),10(10.1,10.4 and 10.7-10.9(definitions only , no proofs))
- Highjer Engineering Mathematics by B.V.Ramana, Tata McGraw-Hill Education India, Inc-8th Edition.

Reference Books:

- 1) Advanced Engineering Mathematics by P.V.O' Neil Publisher: Thomson
- 2) Mathematical Methods by Potter & Goldberg ; Publisher : PHI



Complex Analysis and Numerical Methods

Code	Course Title	Credit	T-P-PJ
CUTM1003	Complex Analysis and Numerical Methods	3	2-0-1

Objective

- To understand about Complex variables and complex functions.
- To acquire the skill of evaluating contour integrals using Cauchy's integral formula and Cauchy's integral theorem.
- To understand the limitations of analytical methods and the need for numerical methods and the ability to apply these numerical methods to obtain the approximate solutions to engineering and mathematical problems.

Course Outcome

- To get equipped with the understanding of the fundamental concepts of functions of a complex variable along with the concepts of analyticity, Cauchy-Riemann relations and harmonic functions.
- Evaluate complex contour integrals applying the Cauchy integral theorem, Cauchy integral formula.
- Derive a variety of numerical methods for finding out solutions of various mathematical problems arising in roots of linear and non-linear equations, Solving differential equations with initial conditions and Evaluating real definite integrals.

Course Outline

Module I (T-3 hrs-P-0-hrs-P-0 hrs)

Functions of a complex variable, Analytic functions, Cauchy-Riemann equations (Without Proof), Harmonic and Conjugate harmonic functions, Cauchy's Integral Theorem (Without Proof).

Project-1 : Verification of Cauchy-Riemann equations for complex functions in Cartesian form and Polar form

Module II (T-3 hrs-P-0 hrs-P-2 hrs)



Cauchy's Integral Formula (Without Proof), Cauchy's Integral Formula for higher order derivatives (Without Proof), Taylor series.

Project-2 : Evaluation of contour integrals using Cauchy's Integral Formula

Module III (T-4 hrs-P-0 hrs-P-2 hrs)

Laurent series (Without Proof), Pole, Residue, Residue Theorem (Without Proof), Evaluation of Real integral Type-I.

Module – IV (T-2 hrs-P-0 hrs-P-2 hrs)

Interpolation, Lagrange interpolation polynomial.

Project-3 : Finding out the value of a given function at an interior point on an unequal interval using Lagrange interpolation polynomial

Module – V (T-3 hrs-P-0 hrs-P-2 hrs)

Forward and backward difference operators, Newton's forward and backward difference Interpolation formulae.

Project-4 : Finding out the value of a given function at an interior point on an equal interval using Newton's forward and backward difference interpolation formulae

Module – VI (T-2 hrs-P-0 hrs-P 2 hrs)

Numerical Integration, Trapezoidal rule, Simpson's one third rule.

Project-5 : Evaluation of real definite integrals using Trapezoidal rule and Simpson's one third rule

Module – VII (T-3 hrs-P-0 hrs-P-2 hrs)

Runge-Kutta 2nd & 4th order methods.

Project-6 : Finding out Numerical solutions of differential equations using Runge-Kutta 2nd & 4th order methods

Text Book:

1) Advanced Engineering Mathematics by E. Kreyszig Publisher: Johnwiley& Sons Inc-8th Edition Chapters : 12 (12.3, 12.4), 13 (13.2 to 13.4), 14.4, 15 (15.1 to 15.4 Only Type-I integral), 17 (17.3, 17.5), 19 (19.1).

Reference Books:

1) Advanced Engineering Mathematics by P.V. O'Neil Publisher: Thomson



- 2) Fundamentals of Complex Analysis (with Applications to Engineering and Science) by E.B. Saff & A.D. Snider Publisher: Pearson
- 3) Numerical Methods for Scientific and Engineering Computation by M. K. Jain, S. R. K. Iyengar & R.K. Jain; New Age International Publishers.
- 4) Introductory Methods of Numerical Analysis by S.S. Sastry; Third Edition, Prentice Hall India.

Discrete Mathematics

Code	Course Title	Credit	T-P-PJ
CUTM1004	Discrete Mathematics	3	2-0-1

Objective

- To understand mathematical reasoning in order to read, comprehend and construct Mathematical arguments as well as to solve problems, occurred in the development of programming languages
- To work with discrete structures such as graphs to study the structure of the world wide web, to model a computer network and to find the shortest path between two places in a transportation network

Course Outcome

- Apply the logical structure of proofs and work symbolically with connectives and quantifiers to produce logically valid, correct and clear arguments.
- Evaluate elementary mathematical arguments and identify fallacious reasoning
- Reformulate statements from common language to formal logic
- Apply truth tables and the rules of propositional and predicate calculus
- Model and solve real world problems using graphs, both quantitatively and qualitatively

Course Outline

Module -I

(4Hours)

Propositional Logic, Connectives, Truth tables of compound propositions, Propositional Equivalence.

Project 1: Given the truth values of the propositions p and q , find the truth values of the conjunction, disjunction, implication, bi-implication, converse, contrapositive and inverse.

Module -II (3Hours)

Theory of inference, Predicates and Quantifiers, Rules of Inference.

Project 2: Build valid arguments of a given set of propositional logics and quantified statements using rules of inferences.

Module -III (3 Hours)

Relations and its properties, Partial Ordering, POSET, Totally Ordered Set.

Project 3: Define the properties of a relation on a set using the matrix representation of that relation with examples.

Module -IV (3Hours)

Hasse Diagram, Maximal & Minimal Elements of a Poset, Greatest & Least Elements of a Poset, Supremum & Infimum of a Poset, Lattice.

Project 4: Find a Topological Sort of a Poset.

Module -V (3 Hours)

Introduction to Graph Theory, Graph Terminology and Special types of Graphs, Representation of Graphs.

Project 5: Describe how some special types of graphs such as bipartite, complete bipartite graphs are used in Job Assignment, Model, Local Area Networks and Parallel Processing.

Module -VI (3 Hours)

Graph Isomorphism, Connectivity, Euler and Hamiltonian Graphs, Planar Graphs, Graph Coloring.

Project 6(i): Describe the scheduling of semester examination at a University and Frequency Assignments using Graph Colouring with examples. Find also their Chromatic numbers.

Project 6(ii): List out 10 pairs of Non-isomorphic graphs and explain the reason behind it.

Project 6(iii): List out all features of Euler and Hamiltonian Graphs. Justify whether the given set of graphs are Euler and Hamiltonian. Construct a Gray Code where the code words are bit strings of length three.

Module -VII (4 Hours)

Trees and their Properties, Spanning Trees, Minimum Spanning Trees, Kruskal's Algorithm.



Project 7: Find a minimum spanning tree in a given weighted graph using Kruskal's Algorithm.

Text Books:

1. Discrete Mathematics and its Applications by K.H.Rosen, Publisher: TMH, Sixth Edition, 2009.
Chapters: 1(1.1 ,1.2,1.3, 1.5); 7(7.1,7.6); 8(8.1 to8.5, 8.7, 8.8);9(9.1,9.4,9.5).

Reference Books:

1. Discrete Mathematical Structures with Applications to Computer Science, J. P. Trembkay, R. Manohar, Tata MC Graw – Hill Edition 38th reprint, 2010.
2. Discrete and Combinatorial Mathematics by R.P.Grimaldi Publisher: Pearson, 5th Edition, 2003.
3. Discrete Mathematics and Applications by Thomas Koshy Publisher: Elsevier, 2004.
4. Discrete Mathematical Structures by B. Kolman, R.C. Busby & S. Ross Publisher: PHI, 5th Edition, 2003

Probability and Statistics

Code	Course Title	Credit	T-P-PJ
CUTM1005	Probability and Statistics	3	2-0-1

Objective

- To translate real-world problems into probability models.
- To motivate students in an intrinsic interest in statistical thinking.
- To recognize the role and application of probability theory, descriptive and inferential statistics in many different fields of science and engineering.
- To apply probability and statistics in engineering and science like disease modeling, climate prediction and computer networks etc.

Course outcome

- Define and illustrate the concepts of sample space, events and compute the probability

and conditional probability of events.

- Define, illustrate and apply the concepts of discrete and continuous random variables, the discrete and continuous probability distributions.
- Define, illustrate and apply the concept of the expectation to the mean, variance and covariance of random variables.
- Compute probabilities based on practical situations using the Binomial, Poisson and Normal distributions.

Course content

Module I :(3 hrs+2 hrs)

Sample spaces and events; axiomatic definition of probability; Axioms of Probabilities

Project-1

A Report on Application of probability to control the flow of traffic through a highway system, a telephone interchange, or a computer processor

Module II :(3 hrs +2 hrs)

Mutually Exclusive Events, Dependent and Independent Events. Conditional Probability

Project-2

A Report on Dependent and Independent Events with Examples

Module III:(3 hrs +2 hrs)

Discrete random variables and probability distributions, Continuous random variables and probability

distributions , Mean ,Variance and Moment Generating Function of Distributions

Project-3

Application of random variables in Engineering Field

Module IV:(3 hrs +2 hrs)

Uniform Distribution, Binomial Distribution, Poisson Distribution

Project-4

Applications of Poisson distribution



Module V:(3 hrs +2 hrs)

Normal Distribution, Working with Normal Tables, Normal Approximation to the Binomial Distributions

Project-5

Normal Distribution utilized in statistics, business settings, and government entities.

Module VI:(3 hrs)

Statistics: Random Sampling, Population and Sample, Sample Mean and Variances, Point and Interval Estimations, Confidence Intervals

Module VII:(3 hrs +2 hrs)

Regression and Correlation Analysis: Correlation Coefficient, Co-variance independent random variables, linear regression of two variables

Project-6

Uses of Regression and Correlation Analysis in Business

Text Books:

1. Name of Author, Title, Publication, Edition

Advanced Engineering Mathematics by E. Kreyszig Publisher: John Willey & Sons Inc-8th Edition

Reference Books:

1.Statistical Methods by S.P. Gupta (31st Edition); Publisher: Sultan Chand & Sons.

2. Mathematical Statistics by S.C. Gupta & V.K. Kapur (10th Edition); Publisher: Sultan Chand & Sons.

Calculus

Code	Course Title	T-P-PJ	Prerequisite
CUTM1925	Calculus	2-0-1	

Objective

- To apply the concepts of derivative to find curvature and radius of curvature of a curve.
- To apply concepts of Vector Calculus to the problems related to models in work,

circulation and flux Problems, hydrodynamics and fluid dynamics etc.

Course Outcome

- Calculate curvature and radius of curvature for a given curve.
- Determine the important quantities associated with scalar and vector fields.
- Find gradient of a scalar point function, divergence and curl of a vector point function.
- Evaluate line integral, double integral and applying these concepts to find out work done by a force, volume of regions in space, center of gravity of a mass etc.
- Transform double integral to line integrals, triple integrals to surface integrals, surface integrals to line integrals and vice versa.

Course Outline

Module-I(3hr+0hr+2hr)

Curvature and Radius of curvature in Cartesian form.

Project 1: To find radius of curvature (Parametric form)

Module-II(2hr+0hr+4hr)

Vector algebra: Algebraic operations, Scalar product, Inner product, Vector product, Scalar and vector triple product.

Project 2: Problems based on inner product, scalar and vector triple products.

Project 3: To find angle between two vectors, area of triangle and parallelogram, volume of parallelepiped and tetrahedron using vector algebra.

Module III(2hr+0hr+4hr)

Gradient of scalar point function, Directional derivatives, Divergence and curl of vector point functions, second order differential operator: the Laplacian operator.

Project 4: To prove the identities with regards to Gradient, Divergence and Curl.

Project 5: To find normal vector to a plane using Gradient of scalar point function.

Module-IV: (3hr+0hr+0hr)

Line Integrals (path dependence and path independence), double integrals.

Module-V: (3hr+0hr+0hr)



Surface Integrals, Triple Integrals

Module-VI: (4hr+0hr+2hr)

Green's and Gauss's Theorems (without proof) and their applications to evaluate the integrals.

Project 6: To find center of gravity and moments of inertia of a mass density

Module-VII: (3hr+0hr+0hr)

Stokes' Theorem (without proof) and its applications to evaluate the integrals.

Text Books:

1. A Text book of Calculus Part – II by Shanti Narayan, Publisher: S. Chand & Company Ltd.
Chapters: 8 (Art. 24, 25 (only for Cartesian and parametric curves)).
2. Advanced Engineering Mathematics by E. Kreyszig, Publisher: John Willey & Sons Inc.- 8th Edition
Chapters: 8 (8.1 to 8.3, 8.9 to 8.11), 9 (9.1 to 9.7, 9.9).

Mechanics for Engineers

Code	Course Title	Credit	T-P-PJ
CUTM1006	Mechanics for Engineers	3	2-1-0

Objective

- To provide the students with a clear and thorough understanding on fundamentals of mechanics as applied to solve real-world problems.

Course outcome

- Use scalar and vector analytical techniques for analyzing forces in statically determinate structures.
- Analyze the frictional forces involved in planes, ladder friction and belt friction.
- Determine the centroid and moment of inertia of composite shapes.
- Apply fundamental concepts of kinematics and kinetics of particles to the analysis of simple, practical problems.
- Apply basic knowledge of mathematics and physics to solve real-world problems.

Course content

Module I: Force and Moment (4 Hrs. + 2 Hrs. practices)

Law of Transmissibility of a Force, Composition and Resolution of Forces, Resultant and Equilibrant, Resultant of Two and Several Forces, Moment of a Force and a Couple, Varignon's Principle of Moment

Practice-1: Verification of laws of parallelogram law of forces

Module II: Equilibrium

(3 Hrs. + 2 Hrs. practice)

System Isolation and Free Body Diagram, Particle Equilibrium, Lami's theorem, General Conditions of Equilibrium, Types of Supports and Support Reactions, Rigid Body Equilibrium.

Practice-2: To verify the condition of equilibrium by finding reactions at the support of a beam

Module III: Friction

(2 Hrs. + 2 Hrs. practice)

Basic Terms used in Dry Friction, Laws of Coulomb Friction, Equilibrium of Bodies on a Inclined Plane, Ladder Friction, Belt Friction

Practice-3: Determination of Angle of Repose



Module IV: Centroid

(2 Hrs.)

Axis of Symmetry, Centroid of Lines, Areas and Volumes, Centroid of Composite Section.

Module V: Moment of Inertia

(3 Hrs. + 2 Hrs. practice)

Rectangular and Polar Moment of Inertia, Radius of Gyration, Parallel Axis Theorem and Perpendicular Axis Theorem, Moment of Inertia of Composite Section

Practice-4: Determination of Moment of Inertia of a fly wheel.

Module VI: Kinematics of Linear Motion

(3 Hrs.)

Kinematics of a Particle, Uniform and Variable Acceleration, Motion under Gravity

Module VII: Kinetics of Linear Motion

(3 Hrs. + 4 Hrs. Practice)

Principles of Dynamics such as Newton's Second Law, Work-Energy Principle, Impulse-Momentum Principle, Law of Conservation Law of Momentum and Energy

Practice-5: Verification of Newton's second law of motion.

Practice-6: Verification of conservation of momentum in collision.

Text Books:

Engineering Mechanics; Statics and Dynamics by A. K. Tayal, Umesh Publications

Reference Books:

Engineering Mechanics by S. Timoshenko, D.H. Young and J.V. Rao, Tata McGraw Hill

Engineering Mechanics by D.S. Kumar, S.K. Kataria and Sons.

Optics and Optical Fibres

Code	Course Title	Credit	T-P-PJ
CUTM1007	Optics and Optical Fibres	3	2-1-0

Objective

- To train the students for the applications of the solar cell, laser and optical fiber in the field of engineering and technology.
- To learn and practice the techniques used by optical phenomenon so that these can be applied to actual field studies.

Course outcome

- Students should understand optical phenomena.
- Students should learn about different light sources and their use
- After completion of the course the students shall be able to understand the basic knowledge of solar cell, laser and optical fiber and instrumentation involved.
- Students should be able to understand optical fiber principle, operations and its applications.

Course outline

Module I: Reflection and Refraction (Derivation is not required) (3hours +2hours)

Reflection at plane surface, reflection at spherical mirrors, Paraxial rays and approximation. Sign convention, Location of the image formation, Spherical mirror equation, Refraction, Total internal reflection, Dispersion by a prism, Refraction through a prism.

Practice: 1

To determine the refractive index of glass slab using travelling microscope.

Module II: Lenses (Derivation is not required) (2hours+2hours)

Definition, Types of Lenses, Terminology associated with the Lens, Sign Convention Location of the image formation by graphical method for Lenses, Lens formula.

Practice: 2

To determine the dispersive power and Cauchy constants of the material of a prism using mercury source.

Module III: Interference (Derivation is not required) (2hours+2hours)

Superposition principle, definition of Interference, Coherence, Young's double slit experiment, Newton's rings theory- Determination of wave length of light.

Practice: 3

Newton's Rings-Refractive index of liquid

Module IV: Diffraction and Polarization (Derivation is not required) (3hours+2hours)

Types of diffraction, Fraunhofer diffraction at a single slit, Diffraction at N-parallel slits (plane diffraction grating) Polarisation, Types of polarized light and their representation, Brewster Law .Malus Law, polarization by double refraction, polarimeter, Applications of polarized light.

Practice: 4

To find grating element of a plan transmission diffraction grating.

Module V: Optical Properties and Laser (3hours+2hours)

Scattering, refraction, reflection, absorption & transmission, Introduction to optoelectronics, Concept of Light Emitting Diode, Stimulated and spontaneous emission, Basic principle of Lasers, Population inversion, Laser Pumping, Different levels of laser system, Ruby Laser, Applications of Lasers (Medicine, Metrology, Defenses, Nuclear energy, in communication, in consumer electronics industry)

Practice: 5

Wave length of LASER source by diffraction grating method

Module VI: Optical Fibers (3hours+1hours)

Introduction to fiber optics, structure of optical fibers, classification of optical fibers on the variation of refractive index, Classification of optical fibers on the variation of mode of transmission/core diameter, Numerical Aperture, Acceptance angle. Principle of optical fibers communication, optical communication (block diagram only),

Practice: 6

To find the numerical aperture of a given optic fiber and hence to find its acceptance angle.

Module VII: Optical Fibers (4hours+1hours)

Attenuation in optical fibers (Qualitative only-Scattering losses, Absorption losses, bending losses) Fiber Materials-Glass fibers, Plastic fibers, Light sources for fiber optics
V-number of an optical fiber, optical fiber cables design, optical fiber connection, fiber splices, fiber connectors. Application of optical fibers- Cable TV, Networking, Power companies, Imaging, Sensors, Medical (Dental surgery, Endoscopy, Surgery)

Practice: 7

Measurement of bending loss.

Text Books:

1. A Text Book of Optics by M.N. Avadhanulu, BrijLal, N. Subrahmanyam, S Chand; 23rd Rev. Edn. [Module I&II]
2. Engineering Physics, by D.Thirupathi Naidu, M.Veeranjaneyulu, V.G.S Book links,2017.[Module-III,IV]
3. Principles of Engineering Physics-2 by Md.Khan, S.Panigrahi, Cambridge University Press 2016. [module-V,VI&VII]

Reference Books:

1. Optics by AjoyGhatak, McGraw Hill Education; 6 edition, 2017.
2. Physics-I for engineering degree students by B.B. Swain and P.K.Jena.
3. Concepts in Engineering Physics by I Md. N. Kha, 2016.

Applied Analytical Chemistry

Code	Course Title	Credit	T-P-PJ
CUTM1008	Applied Analytical Chemistry	3	2-1-0

Course Objective

- Explain fundamental principles for environmental analytical methods (titration, electrochemistry, instrumentation and basic parameters of water, soil, fuel, etc)
- Point out suitable analytical techniques for analyzing a specific compounds in an environmental matrix

Course Outcome

- Apply quality control on chemical analysis and laboratory work and explain its importance
- Plan and carry out laboratory experiments, including data analysis and conclusions
- Point out suitable techniques for sampling and handling of environmental samples

Module-I(4Hrs)

Water analysis:

Water softening processes: Lime-Soda, Zeolite and Ion exchange methods. Removal of DO and dissolved CO₂ from water by De-aeration method, Desalination of Brackish water by Reverse osmosis and electro dialysis process. Numericals on calculation of hardness of water, Lime-Soda calculation, Alkalinity of water.

1. Determination of hardness of water by EDTA method. (V. lab)
2. Determination of alkalinity of water. (V. lab)
3. [Determination of Dissolved Oxygen in water.](#) (V. lab)
4. [Determination of Biological Oxygen Demand.](#) (V. lab)
5. [Determination of Chemical Oxygen Demand.](#) (V. lab)

Module-II(2Hrs)

Soil Analysis:

Soil profile, Structure, and properties, Determination of soil properties, Fertility of the soil.

6. Determination of specific gravity of the soil by using piknometer. (V.lab)
7. Determination of pH and electrical conductivity of soil sample.
8. Determination of moisture content in soil by oven drying method. (V. lab)

Module-III (4Hrs)

Fuel Chemistry-I:

Classification, combustion and chemical principles involved in fuel, calorific value: gross and net calorific values and their determination by bomb calorimeter. Proximate and ultimate analysis of coal and their importance. LPG, Water gas, producer gas, CNG.

9. Determination of calorific value of a fuel sample by using Bomb calorimeter. (V. lab)
10. Analysis of flue gases by Orsat's apparatus.

Module-IV (3Hrs)

Fuel Chemistry-II

Petroleum: its chemical composition and fractional distillation, cracking of heavy oil residues – thermal and catalytic cracking, knocking and chemical structure, octane number, synthesis and applications of bio-fuels, Photovoltaic cell.

11. Synthesis of biodiesel by transesterification process

Module-V(3Hrs)

Corrosion-Mechanisms,Factors affecting Corrosion;Protection from corrosion.

12. Estimation of ferrous ion in the given solution using standard potassium dichromate.

Module-VI (2Hrs)

Electrochemical Phenomenon

Electrochemical cell, Electrode potential, Determination of pH of a solution Using Clomel/ Quin Hydron Electrode.

Module-VII(2Hrs)

Error in Chemical analysis

Types of errors, Accuracy and precision, Absolute and relative uncertainty, mean and standard deviation.

Applied Engineering Material

Code	Course Title	Credit	T-P-PJ
CUTM1009	Applied Engineering Material	3	2-0-1

Objective

- To give an introduction to materials, ceramics, polymers, and electronic materials in the context of a molecular level understanding and their application in various field

Course outcome

- Students will understand the physical/chemical behaviors of materials.
- Students will be able to select materials, based on their properties and behaviors, for a given application.
- Students will understand how molecular interactions to the behavior of material give rise to macroscopic properties.

Course content

Module I: New Materials/Nanomaterials (5hrs)

Nanostructures and Nanomaterials: classification (Dimensionality, Morphology/ shape/structure of nano-entities, New Effect/ Phenomena). Hybrid nanomaterials. Effect of size, structure, mechanism, and property on material performance. Applications of nanomaterials in catalysis, telecommunication and medicine.

Project

Synthesis of TiO₂ and ZnO nanoparticles by Sol Gel ,Sonication and Precipitaion method and study their application .

Module II: Carbon Nanomaterials (5hrs)

Carbon nanomaterials, such as graphene, carbon nanotubes (CNTs), crystalline diamond, and diamond-like carbon , Properties and application of fullerenes,

Project

Synthesis and Fabrication of Graphene and Graphene Oxide by sol-gel techniques

Module III: Polymer (5hrs)

Mechanism of polymerization and synthesis of polymers, Copolymerization, Viscoelasticity. Elastomers-structure, Conducting polymers and applications, Fabrication and moulding of

polymers, Synthesis, properties and uses PMMA, formaldehyde resins, melamine-formaldehyde-urea resins

Project

Preparation of polystyrene by anionic/cationic/emulsion polymerization method

Module IV: Composites (5hrs)

Composites: characteristics, types and applications, Nanocomposites , Polymer/ Metal oxide nanocomposites and its application

Project

Fabrication of Ceramic matrix particulate composite by powder metallurgy route.

Module V: Adhesives Lubricants (4hrs)

Adhesives, adhesive mechanism and applications, Lubricants-physical and chemical properties, types and mechanism of lubrication. Additives of lubricants and freezing points of lubricants

Module VI: Energy Storages material-I (4Hrs)

Fundamental aspects related to energy storage and conversion, lithium ion batteries, Lead acid batteries; Nickel Cadmium batteries; advanced batteries

Module VII: Energy Storages material-II(4Hrs.)

Super capacitors, fuel cells and Photovoltaic, Future of battery technology

Project

Fabrication of Fuel cell and its application

Text Books:

1. A Textbook of Engineering Chemistry, by Shashi Chawla
2. Engineering Chemistry, by P. C Jain and M. Jain
3. Advanced Polymer Chemistry, by M. Chanda

Reference Books:

4. Surfactants and Polymers in Aqueous Solution, by K. Holmberg, B. Jonsson, B. Kronberg and B. Lindman
5. Energy Scenario beyond 2100, by S. Muthukrishna Iyer

Environmental Studies

Code	Course Title	Credit	T-P-PJ
CUTM1010	Environmental Studies	2	0-0-2

Objective

- To introduces the environmental consequences of Industries on the human health and methods for minimizing their impact through technology and legal system to the undergraduate students.

Course outcome

- After learning this course one should be able to control pollution at individual level and also gains an idea about conservation of natural resources and its management.

Course content

Module-I: Fundamentals of Environmental Sciences

Assignment-1: Multidisciplinary nature of Environmental science

Assignment-2: Components of Environment

Assignment-3: scope and importance of environmental science

Module: II Ecology and Ecosystem

Assignment-1: Structure and function of ecosystem

Assignment-2: Types of ecosystem

Assignment-3: Ecological Succession

Module III- Biodiversity and its conservation

Assignment-1: Concepts of Biodiversity

Assignment-2:Biodiversity at local level, global level and National level

Assignment-3: Conservation of Biodiversity

Module IV- Natural resources and its conservation

Assignment-1: Land resources and its conservation



Assignment-2: Forest resources and its conservation

Assignment-3: Water resources and its conservation

Assignment-4: Energy resources and its conservation

Module V Environmental pollutions and its control measure

Assignment-1: Soil pollution

Assignment-2: Water pollution

Assignment-3: Air pollution

Assignment-4: Noise pollution

Module VI Natural Hazards and Disaster management

Assignment-1: Concepts of natural hazards

Assignment-2: Different types of natural hazards: cyclone, earthquake, volcanic eruption etc.

Assignment-3: Process of disaster preparedness and its management

Assignment-4: Solid waste management

Module VII Environmental issues and laws

Assignment-1: Major environmental issues like climate change, global warming, green house effects, Ozone layer depletion, Acid rain

Assignment-2: Water Act, 1974

Assignment-3: Air Act, 1981

Assignment-4: Environmental protection act, 1986

Reference Books:

1. Environmental Studies by U.N. Dash & H. D. Kumar, India Tech Publication, New Delhi
2. Environmental Studies by R. Rajagopalan Oxford University Press
3. Environmental Science and Engineering, 2E, by Aloka Debi, University Press



Centurion University of Technology and Management Odisha

CHOICE BASED CREDIT SYSTEM

COURSE STRUCTURE & SYLLABUS

BASKET - II



Centurion
UNIVERSITY

Shaping Lives...
Empowering Communities...

School of Engineering & Technology

2020

Course Structure

Basket - II

Course Code	Course Title	Credits	Course Type T+P+PJ
CUTM1011	Optimisation Techniques	2	0-2-0
CUTM1012	Engineering Economics and Costing	3	2-0-1
CUTM1013	Project Management	3	2-0-1
CUTM1014	Gender, Human Rights and Ethics	3	1.5-0-1.5
CUTM1015	Climate Change, Sustainability and Organisation	3	1.5-0-1.5
CUTM1016	Job Readiness	6	0-6-0



Syllabus

Optimization Techniques

Code	Course Title	Credit	T-P-PJ
CUTM1011	Optimization Techniques	2	0-2-0

Course Rationale:

Operations research (OR) have many applications in science, engineering, economics, and industry and thus the ability to solve OR problems are crucial for both researchers and practitioners. Being able to solve the real life problems and obtaining the right solution requires understanding and modelling the problem correctly and applying appropriate optimization tools and skills to solve the mathematical model. The goal of this course is to teach you to formulate, analyse, and solve mathematical models that represent real-world problems. We will also discuss how to use EXCEL for solving optimization problems

Course Objectives:

To learn about the operations research techniques, model formulation and applications used to solve business decisions by using computer software

Course Outcomes: After completion of the course students

LO1. Ability to apply the theory of optimization methods and algorithms to develop and for solving various types of optimization problems

LO2. Ability to go in research by applying optimization techniques in problems of Engineering and Technology

LO3. Ability to solve the mathematical results and numerical techniques of optimization theory to concrete Engineering problems by using computer software

Course contents

Module-I: Linear Programming: Graphical Method, Simplex method, Penalty Method,

Module-II: Transportation Models, Assignment Models, Sequencing



and Scheduling Models by Johnson's Algorithm

References Recommended:

Books

- Harvey M. Wagner, *Principles of Operations Research*, Englewood Cliffs, Prentice-Hall, 1969
- S D Sharma and Himansu Sharma, *Operations Research: Theory, Methods and Applications*, 15 Edition, Kedarnath Ramnath & Co



External Links:

<https://www.informs.org/Resource-Center/INFORMS-Student-Union/Consider-an-Analytics-OR-Career>

<https://www.informs.org/>

https://en.wikipedia.org/wiki/Operations_research

Google and YouTube

Journals:

- International Journal of operations Research
- European Journal of Operations Research
- International Journal of Operations Research and Optimization

Engineering Economics and Costing

Code	Course Title	Credit	T-P-PJ
CUTM1012	Engineering Economics and Costing	3	2-0-1

Course Rationale:

This course aims at providing the student with advanced concepts of engineering economic analysis and its role in engineering decision making.

Course Objectives:

CO1. Facilitate students to understand the basics of Economics and its application in the field of engineering

CO1.Enable students to understand the concepts of the time value of money and techniques for evaluation of engineering project

CO1.Equip students with the skills required to understand cost statements/records of the product and its effect on decision making

Course Outcomes: After completion of the course students

LO1. Apply the microeconomics concepts related to business and its impact on enterprise

LO1.Develop an awareness and understanding time value of money and techniques for evaluation of engineering project

LO1.Apply cost concepts to analyse common business management decisions such as pricing a product and services.

Course contents

Module: I: Engineering Economics – Nature and scope

General concepts on Micro & Macro Economics. The Theory of demand, Demand function, Law of demand and its exceptions, Elasticity of demand, Law of supply and elasticity of supply. Theory of production, Law of variable proportion, Law of returns to scale.

Module-II: Time value of money:

Simple and compound interest, Cash flow diagram, Principle of economic equivalence. Evaluation of engineering projects: Present worth method, Future worth method, Net present value method, internal rate of return method, Cost-benefit analysis in public projects. Depreciation: Meaning Causes, Factors affecting depreciation, Methods of providing depreciation, Straight Line Method & Diminishing Balance Method

Module-III

Cost concepts, Elements of costs, Preparation of cost sheet, Segregation of costs into fixed and variable costs. Break-even analysis (Simple numerical problems to be solved)

Indian Banking System: Banks: Meaning, nature, characteristic of the Indian banking system, functions of commercial banks, functions of Reserve Bank of India, Overview of Indian Financial System.

Books

- Riggs, Bedworth and Randhwa, “Engineering Economics”, McGraw Hill Education India.
- Mithani, D.M., Principles of Economics. Himalaya Publishing House
- Mishra, S. “Engineering Economics & Costing”, PHI
- Sullivan and Wicks, “Engineering Economics”, Pearson
- Paneer Seelvan, R., “Engineering Economics”, PHI
- Gupta, G.S., “Managerial Economics”, TMH
- Lal and Srivastav, “Cost Accounting”, TMH

Links to websites:

- <http://courseware.cutm.ac.in/>

Project Management

Code	Course Title	Credit	T-P-PJ
CUTM1013	Project Management	3	2-0-1

Course Objective:

- The successful development and implementation of all project's procedures.
- Learn project management methodology to initiate and manage projects efficiently and effectively
- Acquire key project management skills and strategies for Productive guidance, efficient communication and supervision of the project's team
- The achievement of the project's main goal within the given constraints

Course outcome:

- Develop a Project Charter document for any project
- Develop Project Management Plan document
- Acquire 10 knowledge area identified by PMI and its application while delivering a projects
- Implement the Project and Prepare a project document that they have undertaken as a learning tool
- Qualify CAPM/PMP certification offered by PMI

Course Content:

Unit: I

Project Management framework; Introduction to Project Management; Project Life Cycle and Organisation, Project vs. Operational work, Stakeholders, Organisational Influences

Project Management Process for a Project, groups, Initiating, planning, executing, monitoring &controlling and closing process groups.

Project management Knowledge area;

Project Integration Management; Develop project charter, develop project management plan, direct and manage project execution, monitor and control project work, perform integrated change control, close project or phase.

Unit: II

Project Scope Management; collect requirements, define scope, create WBS, verify scope, control scope

Project Time Management; Define activities, sequence activities, estimate, develop and schedule

Project Cost Management; Estimate costs, determine budget, control costs

Unit: III

Project Quality Management; Plan quality, perform quality assurance, perform quality control

Project HR Management; Develop HR plan, acquire project team, develop and manage project team

Project Communications Management; Identify stakeholders, plan communication, distribute information, manage expectation of stake holders, report performance

Unit: IV

Project Risk Management; Plan risks; identify risks, perform quality and quantitative risk analysis, plan risk responses, monitor and control risks

Project Procurement Management; Plan procurements, conduct procurements, administer procurements, close procurements

Project Stakeholders Management; Identifying stakeholders, stakeholder analysis, engagement

Note: Students can use any of these software for their project; MS. Excel/ Bitrix 24/Primavera/ Microsoft Projects

Books Recommended:

- 1) Project Management: A Managerial Process, Clifford F Gray & Eric W Larson, Tata McGrawHill
[Text book]
- 2) A Guide to the Project Management Body of Knowledge, 6th Edition, PMI
- 3) Project Management- A system Approach to Planning, Scheduling and Controlling (Harold Kerzner). CBS Publishers and Distributors, New Delhi.
- 4) Projects, Preparation, Appraisal and Implementation (Prasanna Chandra), 3rd Edition, Tata McGraw Hill, New Delhi.
- 5) Project Management (Nagarajan, K), New Age Publishers, New Delhi.
- 6) Project Management. A Managerial Approach (Meredith, R.J and Mantel, S.J), Wiley (India).

Gender, Human Rights and Ethics

Code	Course Title	Credit	T-P-PJ
CUTM1014	Gender, Human Rights and Ethics	3	1.5-0-1.5

Course Objectives

This course is about gender, human rights and ethics in which the student will be sensitized and exposed to related issues in the context of business and organisations in India. The specific objectives are:

- To develop an understanding of gender, human rights and ethics in an unequal society like

India

- Sensitisation of how gender, human rights and ethics are significant in organisations.
- Integrating concerns related to gender, human rights and ethics in organisations.

Course Outcomes

- Understanding the complexity of issues and challenges relating to gender, human rights and ethics
- Be sensitive to gender, human rights and ethics within an organizational context,
- To integrate concerns related to gender, human rights and ethics into the policies, processes and systems in an organization.

Course Syllabus

Module 1

- Difference between sex and gender; social construction of gender and its outcomes in the form of behavior, roles, gender based division of labour, hierarchy; gender relations.
- Gender issues in organisations - significance of relations between structures, practices, context, interactions and power for construction of gender at organisational level
- Gender implications at workplace, management and leadership, Laws and Acts
- Comparing different types of organisations; how to create a gender sensitive organisation.

Module 2

- Introduction to human rights, Meaning and Definition, Types
- Human Rights Law: Protection, violation and the legal framework for their protection - International Human Rights Law, Universal Declaration of Human Rights
- Conflicts of Rights and its Significance to Organisations: Challenges of the past and challenges for the future. Persistence of social discrimination and inequality; efforts in the search for justice for past violations, continued struggle for human rights and accountability in an organisational context.

Module 3

- Introduction to and study of ethics; Indian and Western ethics
- Different ethical systems and perspectives; ethical relativism and its implications, utilitarianism, duty ethics and virtue ethics in organisations
- Critique of various ethical positions and develop their own position in an organizational context.

Session Plan

Session 1

Basic concepts on sex and gender; social construction of gender; constitutional provisions for gender equality.

PPT 1 - Introduction to Gender

1.5 mins video on Gender Equality and Poverty

<https://www.youtube.com/watch?v=4viXOGvvu0Y>

Session 2

Gender issues in different sectors – Health, Education, Governance, Livelihoods

PPT 2 - Gender issues in health

PPT 3 - Gender issues in education

PPT 4 - Gender issues in Governance

1.3 mins video on gender stereotypes and education

<https://www.youtube.com/watch?v=nrZ21nD9I-0>

Session 3

Approaches to address gender inequality – WID, WAD and GAD

PPT 5 - WID WAD GAD

TED talk by Deepa Bhardwaj - True equality is when both women and men have a voice - 13 mins

https://www.youtube.com/watch?v=BSRTZ_q4RX8

Session 4 & 5

Gender and organizational issues

PPT 6 - Gender and Organisations

PPT 7 - Gender Equality in Organisations

PPT 8 - Gender Mainstreaming and Attitude in Workplace

PPT 9 - Gender Sensitisation

3.22 mins on The Future of Gender Equality in Work by ILO

https://www.ilo.org/global/about-the-ilo/multimedia/video/institutional-videos/WCMS_558508/lang--en/index.htm

4.22 mins video on Gender Based Analysis

<https://www.youtube.com/watch?v=p6w-d1mmjFU>

Free Readings

Gender and Development - Concepts and Definitions

Gender and Organisational Change Training

Project

-Gender Responsive Governance in times of COVID 19

<https://in.one.un.org/gender-responsive-governance-in-the-times-of-covid-19/>

- SDG - Gender Equality Goal 5

<https://in.one.un.org/page/sustainable-development-goals/sdg-5/>

- Gender, Sustainability and Environment

Women Environment and Sustainable Development A Ca

- Good Practices of Gender Mainstreaming in India

Good Practices for Gender Mainstreaming

- Gender Equality Case Study

Gender Equality - Kerala Case Study

Session 6

Basic concepts on human rights; history of human rights; current significance

Videos on Basic concepts of human rights

<https://www.youtube.com/watch?v=ew993Wdc0zo>

<https://www.youtube.com/watch?v=JpY9s1Agbsw>

Videos on History of Human Rights

<https://www.youtube.com/watch?v=nDgIVseTkuE>

https://www.youtube.com/watch?v=6XXGF_V8_7M

Session 7

Violation and legal framework for the protection of human rights

Video on the Paris Principles

https://www.youtube.com/watch?v=ZEgD7pdXt_c

Video on Protection of Human Rights Act 1993 (for reference, bilingual)

<https://www.youtube.com/watch?v=qAiiOyL5WAw>

Session 8

Human rights and sustainability framework

Video on Human Rights and Sustainable Development

<https://www.youtube.com/watch?v=mHHy1gDn4x8>

Session 9 & 10

Human rights in the organizational context

Video on Why should your company care about human rights

<https://www.youtube.com/watch?v=mCtNx3hHZ08>

Video on UN Reporting Framework: Salient Human Rights Issues

<https://www.youtube.com/watch?v=LswDupgiZug>

Books:

1. Arihants UGC NET Human Rights and Duties

2. Kapoor, S. K. Central Law Agency's Human Rights under International Law and National Law

Ciapham Andrew, 2015, Human Rights: A Very Short Introduction, Oxford University Press

Smith Rhona, 2015, Textbook on International Human Rights, Oxford University Press

Free Online Sources:

<https://www.humanrightscareers.com/.../10-human-rights-study-books-you-can-download>

<https://www.humanrightscareers.com/courses/>

Session 11

Basic concepts in ethics

PPT - [Introduction to Ethics](#)

Video on Ethics defined

<https://www.youtube.com/watch?v=4vWXpziL7Mo>

Session 12

Theoretical perspectives – utilitarianism, virtue ethics, duty ethics

PPTs - [Duty Ethics](#)

[Utilitarianism](#)

[Virtue Ethics](#)

Video on Utilitarianism

https://www.youtube.com/watch?v=-FrZl22_79Q

Video on virtue ethics

<https://www.youtube.com/watch?v=NMblKpkKYao>

Video on deontology (duty) ethics

<https://www.youtube.com/watch?v=wWZi-8Wji7M>

Project (self exploration through case studies)

Fraudulent Books_1

Gifts from the Boss's Friend_1

Gifts from the Sales Representative_1

Session 13

Ethical relativism

PPT - Ethical Relativism

Video on Moral relativism

<https://www.youtube.com/watch?v=5RU7M6JSVtk>

Project (self-exploration through case studies)

Mining Data docx_1

Office Affair_2

On-time Delivery

Session 14 & 15

Ethics in organisations

Video on ethics in the workplace

<https://www.youtube.com/watch?v=0mUxMpMTT28>

Project (self-exploration through case studies)

Falsifying Attendance_1

Family Loyalty vs. Meritocracy_1

Rumors_1

The Supervisor's Choice_1

Books

Frankena, WK, 1973, Ethics (2nd Edition), Pearson.

Singer, P. 2011, Practical Ethics (3rd ed), Cambridge University Press.

Smart, JJC and Williams, B. 1973, Utilitarianism: For and Against, Cambridge University Press.

Climate Change, Sustainability and Organisations

Code	Course Title	Credit	T-P-PJ
CUTM1015	Climate Change, Sustainability and Organisations	3	1.5-0-1.5

Course Rationale:

This course is about climate change, sustainability and its implications for organisations. Climate change and sustainability are closely interlinked. Students will be exposed to related issues, challenges and debates on the subjects. They will develop an understanding of how organizational performance gets affected by climate change today. As organisations grow and diversify in India, there is a need to sensitise Management students to the significance of climate change and its impact on humanity and environment; Sustainable Development Goals (SDGs) and integrated reporting framework for sustainability of organisations.

Module 1: Climate Change and Organisations

Course Objectives:

- CO1. To develop an understanding about climate change in general, responses and debates
- CO2. To create awareness about the impact of climate change on organisations in performance, growth and sustainability
- CO3. To facilitate in developing reference points to factor in aspects of climate change in organizational planning and development

Course Outcomes:

- LO1. Students will be exposed to current climate change issues, challenges and debates
- LO2. They will be sensitive to its implications for organisations in different sectors
- LO3. The course will equip the students of Management to develop strategies for perspective planning of organisations

Course Contents:

1. Basics of climate change; impacts on various sectors; responses and mitigation efforts by the state and non-state agencies; debates and critiques
2. Sectoral implications of climate change – Agriculture and Forestry; Transportation; Buildings; Energy; Industry and Manufacturing
3. Climate change – specific impacts (Migration, Disasters and Pandemics)

4. Mitigation and adaptation keeping the sustainability of business organisations

Projects: Case study, videos, small group workshops, book reviews

Session Plan for Module 1 – Climate Change and Organisations (10 one hour sessions)

Session 1: Basic concepts of climate change, impacts, issues and challenges

Session 2: Responses and mitigation efforts by state and non-state agencies

Session 3: Debates and critiques on climate change

Session 4: Climate change and ecosystem

Session 5: Climate change and social sector – health, education and livelihood/food security

Session 6: Climate change and infrastructure and services – buildings, transportation, communication, electricity/energy

Session 7: Mitigation and adaptation of climate change impacts on business organisations

Session 8 and 9: Climate change impacts of migration, disasters and pandemics – societal and organisational implication

Session 10: Develop reference points to factor into perspective planning and development of organisations

Module 2 – Sustainability in Organisations

Course Objectives:

CO1. To develop an understanding of sustainable development, SDGs and their relevance for sustainability of organisations

CO2. To comprehend the application of the Integrated Reporting Framework for Sustainability in business.

Course Outcomes:

- LO1. The student will develop an understanding of perspectives on SDGs, sustainability and development in the context of organisations
- LO2. Argue the business case for sustainability informed by an understanding of the impact of current global and local economic, social and environmental pressures (including pandemics)
- LO3. Develop an Action Plan through a Case Study for integrating sustainability across an organisation's value chain
- LO4. Develop and apply the Integrated Reporting Framework for Sustainability through a case.

Course Contents:

1. Sustainable development, debates, SDGs, challenges and opportunities; The business case and leadership for action
2. Regulatory environment and International policy; Integrated Reporting Framework for Sustainability
3. Production and consumption; Design, technology, and planning for sustainability
4. Communication and marketing; Collaboration and partnerships

Projects: Small group exercises, case analysis, video and book reviews

Session Plan for Module 2 – Sustainability in Organisations (10 one hour sessions)

Session 1: Sustainable development basics and introduction to SDGs (rationale, issues and challenges for India)

Session 2 to 6: Discussion on the 17 SDGs

Session 7: SDGs and its relevance for organisations

Session 8 to 10: Integrated framework for reporting sustainability in organisations; factoring aspects of SD into performance of organisations

The 17 sustainable development goals (SDGs) to transform our world:

GOAL 1: No Poverty

GOAL 2: Zero Hunger

GOAL 3: Good Health and Well-being

GOAL 4: Quality Education

GOAL 5: Gender Equality

GOAL 6: Clean Water and Sanitation

GOAL 7: Affordable and Clean Energy

GOAL 8: Decent Work and Economic Growth

GOAL 9: Industry, Innovation and Infrastructure

GOAL 10: Reduced Inequality

GOAL 11: Sustainable Cities and Communities

GOAL 12: Responsible Consumption and Production

GOAL 13: Climate Action

GOAL 14: Life Below Water

GOAL 15: Life on Land

GOAL 16: Peace and Justice Strong Institutions

GOAL 17: Partnerships to achieve the Goal

Videos – Climate Change

1. CSE Climate Change Analysis - <https://www.youtube.com/watch?v=5fyT3-9kxU4> (7.5 mins)
2. Climate Change is having Massive Impact on Indian Farmers - <https://www.youtube.com/watch?v=A8gcGaIzqIw> (8.5 mins)
3. Climate Change in India: The Risks we face (NDTV) - <https://www.youtube.com/watch?v=AT1yi1tDenM> (20.28 mins)

Videos – Sustainable Development

1. Short Videos (5) on Sustainable Development Goals and one TED Talk <https://developmenteducation.ie/blog/2017/09/5-videos-sustainable-development-goals-worth-view-useful-ted-talk/>



2. Overview of Sustainable Development Goals -
<https://www.youtube.com/watch?v=s190sjqYRdg> (7.43 mins)

Projects:

1. Climate change impacts on agriculture and policy responses – what is the current practice and its implications for the sector and people; give your own recommendations based on your understanding of issues, challenges, debates, critiques.
2. Marine fishing – fisherfolk
3. Forest dwellers
4. Business organisations – MSMEs, manufacturing, service industries; application of the integrated framework for sustainability reporting

Job

Readiness

Code	Course Title	Credit	T-P-PJ
CUTM1016	Job Readiness	6	0-6-0

Course Objectives

Develop additional skills (verbal, logical, quantitative and reasoning) required to enhance employability as well as the entrepreneurial ability of the students

Course Outcomes

Achieve the following scores as a minimum:

IELTS 6.5

Verbal: 60% (average of 10 exams)

Quantitative: 60% (average of 10 exams)

Logical Reasoning: 60% (average of 10 exams)



Note: A student will be awarded the credits and grades as outlined in the attached presentation:
<https://drive.google.com/file/d/1Wst-jdAJuHHvtYC4F-p3SKuw1PHWOI1U/view?usp=sharing>

Course Syllabus

Course Division

Course I: IELTS - Reading, Listening, Speaking and Writing

Course II: IELTS Verbal

Course III: Quantitative Aptitude

Course IV: Logical Reasoning

Course I: IELTS - Reading, Listening, Speaking and Writing

Module I: IELTS Reading (18hrs)

- Skimming and Scanning
- Sentence Completion
- Choose the Correct options (A, B, C, D)
- Locating the Specific Information
- Assessment on Reading Skill

Module II: IELTS Listening (6hrs)

- Notes/ Form/Table completion
- Label the Map/Passage, Multiple Choice Questions
- Complete the Sentences, Listening to Find Information
- Assessment on Listening Skills

Module III: IELTS Speaking (18hrs)

- Speaking about yourself, your family, your work and your interests
- Introduction & Interview
- Topic Discussion (e.g, Environment, Covid 19, Job)
- Assessment on Speaking Skills

Module IV: IELTS Writing (6 hrs)

- Summarising the chart, table or graph
- Comparing and contrasting graphs and tables

- Describing maps & diagrams
- Agreeing & disagreeing
- Expressing a personal view & opinion
- Assessment on Writing Skill
- CV Writing (2nd year)
- Letter Writing
- Email Writing(2nd year)
- Getting Started –writing an introduction

Course II: IELTS Verbal

Module I: Grammar (4 Hrs)

- Articles
- Prepositions
- Subject-Verb
- Spotting Errors
- Sentence Correction

Module II: Vocabulary (5 Hrs)

- Synonyms
- Antonyms
- Contextual Vocabulary

Module III: Reading Comprehension (3 Hrs)

- Paragraph/ Sentence Completion
- Jumbled Sentences/ Jumbled Paragraph
- Reading Comprehension

Module IV: Verbal Analogies (3 Hrs)

Course III: Quantitative Aptitude

Module I: Number System & Operation (14 Hrs)

- Speed Math-1 : Multiplication tricks, Square, cube, square root, Cube root tricks

- Speed Math-2 : Speed Calculations
- Number System-01 : Operation on Numbers, Classification of Numbers, Tests of Divisibility, Unit Digit Calculation
- Number System-02 : Arithmetic Progression, Geometric Progression, Factors & Factorials, Trailing Zeroes, Remainder Theorem
- HCF & LCM : Concepts, short tricks, question discussion
- Average : Concepts, short tricks, question discussion
- Assessments

Module II: Basic Arithmetic (16 Hrs)

- Percentage-01 : Basics of Percentage, Effective percentage, shortcuts
- Percentage-02 : Advanced questions and discussions
- Profit & Loss-01 : Basics and advanced questions of Profit & Loss and shortcuts
- Profit & Loss-02 : MRP, Discount, Successive discount
- Ratio & Proportion : Types of ratios, Basics & Advanced Question
- Age : Concepts & Shortcuts
- Partnership : Concepts & Shortcuts
- Mixture & Alligation : Rule of Alligation, Basics & Advanced question, Short tricks
- Assessments

Module III: Time & Analysis (17 Hrs)

- Time, Speed, Distance : Concepts, Problems based on relations, Average speed, Stoppage time
- Trains : Relative Speed & All types of train problems
- Boats & Streams : Basics, Upstream, Downstream & Shortcuts
- Race : All concepts & Shortcuts
- Time & Work : Efficiency, wages, alternative day, chain rule
- Pipes & Cistern : Positive & Negative work
- Simple Interest : Concepts & Shortcuts on Simple Interest & Installments

- Compound Interest : Concepts & Shortcuts on Simple Interest & Installments
- Logarithm : All Formulae, concepts & Shortcuts
- Assessments

Module IV: Advanced Arithmetic (16 Hrs)

- Equation : Linear & Quadratic
- Permutation : All concepts & Shortcuts on factorial, fundamental principles of counting
- Combination : All concepts & Shortcuts on Selection (Groups/teams)
- Probability : Terms related to Probability, Event, Theorems related Probability, Conditional Probability. Shortcuts on coins, dices, balls, cards, etc
- Data Interpretation : (Bar/Pi-Chart /Line) graph
- Mensuration : Area & Volume
- Height & Distance : Lines of Sight, Horizontal line, Angle of Elevation, Angle of Depression
- Assessments

Course IV: Logical Reasoning

Module I: Verbal Reasoning-I (14 Hrs)

- Series-1 : Number series (Missing & Wrong)
- Series-2 : Letter, Alpha numeric, Miscellaneous series
- Coding & Decoding : Letter Coding, Number coding, Message coding, Substitution coding, Conditional coding
- Word Problem : Analogy, Odd man out, word formation, letter pair
- Logical Thinking : Brain Riddles
- Assessments

Module II : Verbal Reasoning-II (14 Hrs)

- Order & Ranking : Ranking & Sequence
- Direction Sense Test : Shortest Distance, Angular movement concept and Dusk & Dawn
- Clock : Concepts of Angle, Reflex angle, Right angle Opposite, Coincide and Incorrect clock
- Calendar : All concepts & Shortcuts
- Blood Relation : Jumbled-up descriptions, coded relations, Relation Puzzles
- Assessments

Module III : Non Verbal Reasoning (14 Hrs)

- Cubes & Dices
- Cubes & Cuboids
- Embedded Figure & Figure series
- Figure Puzzle & Figure grouping
- Figure Counting
- Mirror & Water Image
- Paper Cutting & Paper folding
- Assessments

Module IV: Advanced Reasoning (16 Hrs)

- Sitting Arrangement : Circular, Square, Rectangular, Linear, Triangular
- Puzzle : Box, Floor, Month, Day
- Advanced Puzzle : 3 variable
- Logical Venn Diagram
- Syllogism
- Statement & Conclusion
- Data Sufficiency
- Assessments



Centurion University of Technology and Management Odisha

CHOICE BASED CREDIT SYSTEM

COURSE STRUCTURE & SYLLABUS

BASKET - III



Centurion
UNIVERSITY

Shaping Lives...
Empowering Communities...

School of Engineering & Technology

2020

**Course Structure
Basket - III**

Course Code	Course Title	Credits	Course Type T+P+PJ
CUTM1017	Industrial IOT and Automation	6	3-2-1
CUTM1018	Data Analysis and Visualisation using Python	4	0-1-3
CUTM1019	Machine Learning using Python	4	1-2-1
CUTM1020	Robotic automation with ROS and C++	4	1-2-1
CUTM1021	Basics of Design Thinking	2	0-0-2
CUTM1022	System Integration with DYMOLA	2	0-0-2
CUTM1023	Smart Engineering Project (G2M)	3	0-0-3

Industrial IoT and Automation

Code	Course Title	Credit	T-P-PJ
CUTM1017	Industrial IoT and Automation	6	3-2-1

Objective

- Students will learn the new evolution in hardware, software, and data.
- While the promise of the Industrial Internet of Things (IIoT) brings many new business prospects, it also presents significant challenges ranging from technology architectural choices to security concerns.
- Students acquire upcoming Industrial Internet of Things: Roadmap to the Connected World Course offers important insights on how to overcome these challenges and thrive in this exciting space.

Course outcome

- Discover key IIoT concepts including identification, sensors, localization, wireless protocols, data storage and security
- Explore IoT technologies, architectures, standards, and regulation
- Realize the value created by collecting, communicating, coordinating, and leveraging the data from connected devices
- Examine technological developments that will likely shape the industrial landscape in the future
- Understand how to develop and implement own IoT technologies, solutions, and applications
- At the end of the program, students will be able to understand how to develop and implement their own IoT technologies, solutions, and applications.

Course content

MODULE 1: Introduction & Architecture

Theory

What is IIoT and connected world? The difference between IoT and IIoT, Architecture of IIoT, IOT node.

Challenges of IIOT

Hands-On

1. Introduction to Arduino, ES8266, Introduction to raspberry Pi.

MODULE2: IIOT Components

Theory:

Fundamentals of Control System, introductions, components, closed loop & open loop system.

Introduction to Sensors (Description and Working principle): What is sensor? Types of sensors, working principle of basic

Sensors -Ultrasonic Sensor, IR sensor, MQ2, Temperature and Humidity Sensors (DHT-11).Digital switch, Electro

Mechanical switches.

Practice:

2. Measurement of temperature & pressure values of the process using raspberry pi/node mcu.
3. Modules and Sensors Interfacing (IR sensor, ultrasonic sensors ,Soil moisture sensor) using raspberry pi/node mcu.
4. Modules and Actuators Interfacing (Relay, Motor, Buzzer) using raspberry pi/node mcu.

MODULE 3: Communication Technologies of IIoT

Theory:

Communication Protocols: IEEE 802.15.4, ZigBee, Z Wave, Bluetooth, BLE, NFC, RFID

Industry standards communication technology (LoRAWAN, OPC UA, MQTT), connecting into existing Modbus and Profibus

Technology, wireless network communication.

Practice:

5. Demonstration of MQTT communication
6. Demonstration of LoRa communication.

MODULE 4: Visualization and Data Types of IIoT

Theory:

Front end EDGE devices, enterprise data for IIoT, emerging descriptive data standards for IIoT, cloud data base, cloud

Computing, fog or edge computing,

Connecting an Arduino /raspberry pi to the Web: Introduction, setting up the Arduino/raspberry pi development

Environment, Options for Internet connectivity with Arduino, configuring your Arduino/raspberry pi board for the IoT.

Practice:

7. Visualization of diverse sensor data using dashboard (part of IoT's 'control panel')
8. Sending alert message to the user.

MODULE 5:

Theory

Extraction from Web: Grabbing the content from a web page, Sending data on the web, troubleshooting basic Arduino issues, types of IoT interaction , Machine to Machine interaction (M2M).

Practice

9. Device control using mobile Apps or through Web pages.
10. Machine to Machine communication

MODULE 6: Control & Supervisory Level of Automation

Theory

Programmable logic controller (PLC), real-time control system, Supervisory Control & Data Acquisition (SCADA).

HMI in an automation process, ERP &MES

Practice

11. Digital logic gates programming using ladder diagram
12. Implementation of Boolean expression using ladder diagram
13. Simulation of PLC to understand the process control concept.

Module 7: Application of IIOT

Case study: Health monitoring, Iot smart city, Smart irrigation, Robot surveillance

Text Books:

1. Industrial IoT Challenges, Design Principles, Applications, and Security by Ismail Butun (editor)
2. Internet of Things with Arduino Cookbook, Marco Schwartz, ISBN 978-1-78528-658-2

Reference Books:

1. The Internet of Things in the Industrial Sector, Mahmood, Zaigham (Ed.) (Springer Publication)
2. Industrial Internet of Things: Cybermanufacturing System, Sabina Jeschke, Christian Brecher, Houbing Song, Danda B. Rawat (Springer Publication)
3. Internet of Things- A Hands on Approach, Arshdeep Bahga and Vijay Madiseti , Universities Press , 2015.



Data Analysis and Visualization Using Python

Code	Course Title	Credit	T-P-PJ
CUTM1018	Data Analysis and Visualisation Using Python	4	0-1-3

Objective

- How to tell a story from data
- How to marshal the data for storyline
- The ability to develop visualisation to tell the story
- The focus is on analysis of data using visualisation as a tool

Course outcome

- To create impactful visualization with good story line.

Course content

Module-I

STORY BOARD DEVELOPMENT

The objective and flow of the story to be understood through cases

Module-II

DATA READING USING PYTHON FUNCTIONS

Python libraries: Pandas, NumPy, Plotly, Matplotlib, Seaborn, Dash

Data collection from online data sources, Web scrap, and data formats such as HTML, CSV, MS

Excel, data compilation, arranging and reading data, data munging

Module-III

DATA VISUALISATION USING PYTHON LIBRARIES



Different graphs such as Scatterplot, Line chart, Histogram, Bar chart, Bubble chart, Heatmaps etc.

Dashboard Basics – Layout, Reporting, Infographics, Interactive components, live updating

Projects List

1. COVID 19
2. World Development Indicators
3. ERP dashboarding
4. Details of Social/ Empowerment schemes of Govt. etc.

References:

<https://www.programmer-books.com/wp-content/uploads/2019/04/Python-for-Data-Analysis-2nd-Edition.pdf>

<https://towardsdatascience.com/data-visualization/home>

Reading materials and videos available on internet on how to use ANACONDA, JUPYTER NOTEBOOK and Python Libraries

Machine Learning using Python

Code	Course Title	Credit	T-P-PJ
CUTM1019	Machine Learning using Python	4	1-2-1

Objective

- Understand the meaning, purpose, scope, stages, applications, and effects of ML.
- Explore important packages of python, such as numpy, scipy, OpenCV and scikit-learn.

Course outcome

- Students will able to Create and incorporate ML solutions in their respective fields of study.

Course content

Module 1 – Application and Environmental-setup (12 hrs)

- Applications of Machine Learning In different fields (Medical science, Agriculture, Automobile, mining and many more).
- Supervised vs Unsupervised Learning based on problem Definition.

- Understanding the problem and its possible solutions using IRIS datasets.
- Python libraries suitable for Machine Learning(numpy, scipy, scikit-learn, opencv)
- Environmental setup and Installation of important libraries.

Module 2 - Regression (8 hrs)

- Linear Regression
- Non-linear Regression
- Model Evaluation in Regression
- Evaluation Metrics in Regression Models
- Multiple Linear Regression
- Feature Reduction using PCA
- Implementation of regression model on IRIS datasets.

Module 3 - Classification (24 hrs)

- Defining Classification Problem with IRIS datasets.
- Mathematical formulation of K-Nearest Neighbour Algorithm for binary classification.
- Implementation of K-Nearest Neighbour Algorithm using sci-kit learn.
- Classification using Decision tree.
- Construction of decision trees based on entropy.
- Implementation of Decision Trees for Iris datasets .
- Classification using Support Vector Machines.
- SVM for Binary classification
- Regulating different functional parameters of SVM using sci-kit learn.
- SVM for multi class classification.
- Implementation of SVM using Iris datasets .
- Implementation of Model Evaluation Metrics using sci-kit learn and IRIS datasets.

Module 4 - Unsupervised Learning (12 hrs)

- Defining clustering and its application in ML .
- Mathematical formulation of K-Means Clustering.
- Defining K value and its importance in K-Means Clustering.
- Finding appropriate K value using elbow technique for a particular problem.
- Implementation of K-Means clustering for IRIS datasets

Projects

- To be defined based on respective study area of student.

References:

Text Book:

1. EthemAlpaydin, Introduction to Machine Learning, Second Edition,
<http://mitpress.mit.edu/catalog/item/default.asp?ttype=2&tid=12012>.

Web Resource:

1. <https://towardsdatascience.com/beginners-guide-to-machine-learning-with-python-b9ff35bc9c51>

Robotic automation with ROS and C++

Code	Course Title	Credit	T-P-PJ
CUTM1020	Robotic automation with ROS and C++	4	1-2-1

Course Content:

1. Robotic Automation Introduction
2. Sensors & Controllers
3. Sequential robot control
4. ROS & C++
5. Project

Course Objectives

- To upgrade knowledge levels of robotic application in modern industries
- Project based training

Course Outcomes

- Advanced knowledge on robotic automation
- Understand different types of devices to which robotic modules are connected
- Provide the knowledge about understand various types of robotic applications.
- Industry based project & advanced learning.

Course Syllabus

Module – 1

Robotic Automation Introduction

- 1.1 Basic's of automation
- 1.2 Use of robots in industry.

Module - 2

Sensor's requirement in robots.

- 2.1 Selecting sensors as per the project.
- 2.2 Specification checking of sensors.
- 2.3 Interfacing of sensor to controllers.

Practice

- P2.1 TILT, PROXIMITY, TEMPERATURE, HUMIDITY, SMOKE, FINGERPRINT
- P2.2 BLUETOOTH, ESP8266, GPS, GSM

Module - 3

Controllers and output port handling.

- 3.1 Concept of 8951 controller
- 3.2 Concept of Arduino and concept of Raspberry Pi.

Practice

- P3.1 Port handling of 8951
- P3.2 Port handling of Arduino
- P3.3 Port handling of Raspberry Pi

Module- 4

Sequential robot control

- 4.1 Designing of sequential robot control system.
- 4.2 Writing of programs in different programming languages.
- 4.3 Controlling of input/output devices.

Practice

P4.1 Programming of controllers with different programming languages

P4.2 Designing of sequential control robot.

Module- 5

ROS & C++

5.1 What is Ubuntu & ROS?

5.2 Requirement and application of ROS.

5.3 ROS based simulation of Turtlbot.

5.4 Adding of robot with wheel & sensor. Placing robot inside Gazebo.

Practice:

P5.1 Ubuntu basic command.

P5.2 Installation of Ubuntu, ROS & Gazebo

P5.3 Turtlbot control application

P5.4 Gazebo based robot control and simulation.

P5.5 Python and C++ based programming to control robot.

Virtual LAB : Using ROBOMASTER (AWS)

Projects

1. Mobile controlled robot
2. Autonomous operated robot.
3. Location targeted robot

Basics of Design Thinking

Code	Course Title	Credit	T-P-PJ
CUTM1021	Basics of Design Thinking	2	0-0-2

Course Rationale:

Steve Jobs famously said “Design is just not what it looks or feels like. Design it how it works”. Design Thinking is described as a discipline where designer’s sensibility and methods match with the needs of users. It draws on logic, imagination, intuition and systemic reasoning to explore the possibilities of a solution to a challenge and to create desired outcomes that benefit the end user. So, if you are among the one who is constantly thinking of solving a problem of business or society, it is ideal for you. This course will help you with the basics of design thinking and through an action centric learning approach, lead to creatively explore the challenges and by using the design thinking tool propose innovative solutions.

Course Objectives: The course aims to

- To orient the participants with the basics of the design thinking process
- To familiarize participants with the elements of Design thinking

Course Outcome: After completion of the course the students

- will be able to apply the design thinking process to innovative problem solving

Course contents:

Module: I

Basics of Design Thinking, Why Design Thinking, Design Thinking Mindset (Inspiration, Ideation and Implementation) Design thinking process, (Empathy, Define, Ideate, Prototype, Test). Cases of application of Design thinking approach (Intuit, IDEO, Infosys, IBM, Google, Apple, Jubilant Foods)

Module: II

Executing a Design Thinking Project- Apply Interviewing and empathy building technique, Drawing inferences from the observations, Defining a point of view, Ideation process, developing and testing prototypes and writing a story of a minimum viable solution.



Projects-

- Develop a customer friendly insulin pump design
- Develop a new customer experience for buying a diamond ring online
- Develop a new disease monitoring device for health workers working in remote areas.
- Designing an integrated machinery for end to end farm activities for small and marginal farmers.
- Design a Fund raising campaign

Recommended References:

Books: Tom Kelly & Jonathan Littman (2001). “The Art of Innovation” Broadway Publication.

System Integration with DYMOLA

Code	Course Title	Credit	T-P-PJ
CUTM1022	System Integration with DYMOLA	2	0-0-2

Course Objectives

- To provide powerful multi-disciplinary systems engineering through compatible model libraries for a large number of engineering domains.
- To design high-fidelity modeling of complex integrated systems.
- To design intuitive modeling i.e. advanced, formally defined object-oriented modeling language.
- To enable users to easily build their own components or adapt existing ones to match their unique needs.
- To provide hardware-in-the-loop simulations (HILS) i.e. real-time simulation with AurdinoUno, Python, Matlab, 3D real-time animation, CAD files import capability.
- To increase the ability to integrate with complex 3D geometry for integrated simulation.
- To increase powerful model management, calibration & optimization capabilities.

Course Outcomes

- The use of open standards such as DYMOLA (Modelica and FMI) is a key enabler to better understand the behavior of systems and to work and communicate accurately with partners and suppliers.
- DYMOLA is not only capable to support an ad-hoc modeling level, such as functional behavior or detailed design, but is also able to convert these predictive models into real-time models.
- The user can able to create new elements in an easy and intuitive way, to answer to its own modeling requirements.
- Future Centurions are ready for operating in many industries including automotive, aerospace, architecture, Motorsport, energy, and high tech.

Course Syllabus

Module 1 - Introduction Dymola and Modelica library

Package Browser, Component Browser, Parameter and Variable Editor Simulation Window, Modeling, and Simulation.

The Modeling window is used to compose models and model components.

The Simulation experiment on the model, plot results and animate the behavior.

Creating user-defined models and scripting using Modelica language.

Role Play – Explore the pre-defined libraries and Models, Creating a Package

Practice Project - Preparation of animated projects

<https://www.youtube.com/watch?v=39xyI0k>

<https://www.youtube.com/watch?v=FN8LlnTwzVE&t=314s>

Module 2 – Physical Modeling using DYMOLA

Import of user-defined libraries and packages, interfacing with physical models using ArduinoUno.

The Simulation experiment on the model using multi-domain libraries such as mechanical, electrical, control, thermal, pneumatic, hydraulic, powertrain, thermodynamics, vehicle dynamics, air-conditioning domains

Dymola interface that is stored in the Python package

Role Play – Explore the pre-defined libraries and Models, Creating a Package

Practice Project - Preparation of projects using user-defined packages,

Systems Physics with Modelica/Dymola

<https://www.youtube.com/watch?v=xlpHwX-W3Ns>

Module 3 – Animation and 3D view Using DYMOLA

MultiBody Frame Connector, Building a Mechanical Model, Concept of Furuta

Role Play - Practical session by students for students

Practice Project - Modeling of animated projects using the MultiBody library.

<https://www.youtube.com/watch?v=c9Ar2b4X5rQ>

<https://www.youtube.com/watch?v=k7ILBASaEJg>

Session Plan

Session 1

Project 1

Simulating a model – Modeling of Integrated circuits

Description: Use of Electrical and Electronics components.

Workbench Use: Behavior Modelling, Functional and Logical Design.

Session 2

Project 2

Simulating a model -Creating a model for Electric DC Motor

Description: Design a DC Motor Model, Test, and Simulation, Creating a library for components, Creating a model for motor drive, Scripting.

Workbench Use: Behavior Modelling, Modelica Standard Library.

Session 3

Project 3

Simulating a model -Simple Pendulum with Frictionless joint Using Multi-Body Library

Description: Design the Simple pendulum and the Furuta joint using Dymola and Modelica language. Friction joint for the Mechanical equipment.

Workbench Use: Behavior Modelling.

Session 4

Project 4

Simulating a model – Pick and Place Robot

Description: 5 Axis Pick and Place Robot Design, Validation, and Optimization in the 3DS platform.

Workbench Use: Behavior Modelling, Functional and Logical Design. Part design and Assembly Design.

<https://www.youtube.com/watch?v=9RgdZUvEjPw>

Session 5

Project 5

Simulating a model – 3D Printer Design

Description: Design All System and Sub System of the 3D Printer, Validation and Simulation using 3Ds Platform.

Workbench Use: Behavior Modelling, Functional and Logical Design. Part design and Assembly Design.

Session 6

Project 6

Simulating a model – Bicycle Behavior Modeling

Description: Design Power Train, Driving Cycle, part design, and Simulation.

Workbench Use: Behavior Modelling, Functional and Logical Design. Part design and Assembly Design.

Session 7

Project 7

Simulating a model – Refrigerator Compartment Door Design using Thermal Library

Description: This component model the airflow through the door of a refrigerator or freezer compartment.

Workbench Use: Behavior Modelling, Functional and Logical Design. Part design and Assembly Design.

Session 8

Project 8

Simulating a Model – Engine Analytic Using MultBody Library.

Description: Engine analytic, an engine with 6 cylinders, 6 planar loops, 1 degree of freedom, and analytic handling of kinematic loops.

Workbench Use: Behavior Modeling.

Session 9

Project 9

Simulating a model – Control the real and Digital servo motor ArduinoUno Library

Description: Control the Real and Digital Servo motor with simulation.

Workbench Use: Behavior Modelling, Arduino based System Design, and Functional and logical design.

Session 10

Project 10

Simulating a model – Virtual Universes with Poppy Humanoid Using ArduinoUno Library

Description: Virtual universes with a human assistant robot with simulation.

Workbench Use: Behavior Modelling, Arduino based System Design, Functional, and logical design.

Session 11

Project 11

Simulating a model – Implementation of Model using Python Library

Description: Modeling using python library, validation and optimization in the 3Ds platform.

Workbench Use: Behavior Modelling, Functional and Logical Design. Part design and Assembly Design.

Session 12

Project 12

Simulating a model – Industrial Robot Design

Description: 6 Axis industrial robot design, validation, and optimization in the 3Ds platform.

Workbench Use: Behavior Modelling, Functional and Logical Design. Part design and Assembly Design.

Session 13

Project 13

simulating a model – Temperature Control System Using State Graph

Description: The model contains an electric circuit with a heating resistor and a switch.

Workbench Use: Behavior Modelling.

<https://www.youtube.com/watch?v=zz-crJOG0&t=26s>

<https://www.youtube.com/watch?v=Zl592ARjnpU>

Session 14

Project 14

Simulating a model – Magnetic Ball System using Magnetic Library

Description: The electronic circuit consists of a voltage source, a resistor, and an inductor in the form of a tightly wound coil. An iron ball beneath the inductor experiences a gravitational force as well as an induced magnetic force (from the inductor) that opposes the gravitational force.

Workbench Use: Behavior Modelling.

Session 15

Project 15

Simulating a Model – Design of Water to Steam Converter Using Fluid Library

Description: Create a package under Fluid_Package called Water_To_Steam using temperature sensors.

Workbench Use: Behavior Modelling.

Session 16

Project 16

Simulating a Model – Design of Liquid Valve Control Using Fluid Library

Description: Building a simple circuit with two valves and a volume block.

Workbench Use: Behavior Modelling.

https://www.youtube.com/watch?v=P_YI3RiTI14

Basket IV Core Courses Syllabus

Computer Aided Drafting

Code	Course Title	Credit	T-P-PJ
CUTM1075	Computer Aided Drafting	3	0-2-1

Objective

- How to create simple parts, assemblies and drawings.
- How to use different feature-based tools to build, review and modify a model.
- How to create and analyze assemblies and how to produce a drawing with different views.
- How to dimension the drawing and annotate the views.

Course outcomes

- Students will be able to use CATIA for creation of 3D models, Assembly Designs and Drawings

Course content

Module I: Sketcher - Creating Profiles 2 (hrs)

PLM Objects, Sketch Support, Simple elements, constraining sketches, simple and complex profiles, transforming sketches, saving documents

Practice-1 : Hands on Session on Sketcher Workbench

Module II: Part Design -Creating Basic Features 5 (hrs)

Extruded Features, revolved features, holes, threads, taps, drafts, fillets, chamfers, shelling and stiffeners, relational dimensions,

Practice-2 : Hands on Session on Sketch Based Features & Dress Up Features

Practice-3: Hands on Session on Transformation Features

Module III: Reviewing & Modifying 2 (hrs)

Measuring the model, re using the data, editing features

Practice-4: Hands on Session on Measuring Tools & Editing Features

Module IV: Finalizing Design 5 (hrs)

Adding parameters, reusing features, rendering, weight calculation,



Practice-5: Hands on Session on Parametric Design

Practice-6: Hands on Session on Rendering, Material Addition

Module V: Creating & Managing Products **6 (hrs)**

Positioning Components, constraining Components, Analyzing weight distribution, replacing and revising parts

Practice-7: Hands on Session on Assembly Design

Practice-8 : Hands on Session on Digital Mock Up

Module VI: Creating Drawings **4 (hrs)**

Creating Drawing, Modifying, dimensioning, Annotations, Finalizing & Printing

Practice-9: Hands on Session on Drawing Conventions

Practice-10: Hands on Session on Creating Drawings

Module VII: Master Exercise **(5 hrs)**

Heat Sink , PC Card Slide

Practice-11: Modeling of Heat Sink

Practice-12: Modeling and Assembly of PC card Slide

Text Books:

3. Mechanical Design Fundamentals : Dassault Systemes Companion Learning Space Material

Reference Books:

Note: 1 credit theory=10 hrs lecture, 1 credit practice/project=12.5 hrs lab/workshop/field work in a semester

Product Design & Development

Code	Course Title	Credit	T-P-PJ
CUTM1076	Product Design & Development	2	1-1-0

Objective

- Understand modern product development processes.
- Understand and explain the concept of Industrial design and robust design concepts.
- Understand the concept of Design for manufacture and assembly.
- Understand the legal factors, social issues, engineering ethics related to product design

Course outcomes

- Prepare primary designs taking into consideration all relevant ergonomics and aesthetic aspects of the product.

Course content

Module I: Introduction

2 (hrs)

Introduction to product design, Morphology of design, Modern product development process, Innovative thinking

Module II: Conceptual

3 (hrs)

Generation, Selection and embodiment of concept, Product Architecture

Practice 1: Concept Design using 3D Experience Platform

Module III: Industrial

5 (hrs)

Process and need, Robust design concepts: Taguchi Design and DOE, case studies on various robust design concepts

Practice 2: Failure Analysis through Simulia - Structural Analysis,

Practice 3: Thermal Analysis using Simulia

Module IV:

3 (hrs)

Optimization Optimization using 3D Experience- Function Generative Design

Practice 4: Shape Optimization using 3D Experience

Module V: Design for Manufacturing & Assembly 3 (hrs)

Methods, Design for Maintainability, Designs for Environment, Product costing

Practice 5: Assembly Design Review using 3D Experience

Module VI: Value Engineering & Analysis 3 (hrs)

Definition, Methodology & Case Studies, Economic analysis: Qualitative & Quantitative

Module VII: Ergonomics & Aesthetics 3 (hrs)

Gross human autonomy, Anthropometry, Man-Machine interaction, Concepts of size and texture, color, Comfort criteria, Psychological & Physiological Considerations

Practice 6 : Human Ergonomics using 3D Experience

Text Books:

4. Engineering Design , George E.Dieter, Fourth Edition, McGraw Hill
5. Chitale, A K, Product Design & Manufacturing, 2013, 6th Edition, PHI publication, India

Reference Books:

6. DassaultSystemes Companion Learning Space Material on Product Design
7. DassaultSystemes Companion Learning Space Material on Function Generative Design
8. DassaultSystemes Companion Learning Space Material on Virtual Ergonomics Simulation
Fundamentals- Delmia Ergonomics at Work

Reverse Engineering & Rapid Prototype

Code	Course Title	Credit	T-P-PJ
CUTM1077	Reverse Engineering & Rapid Prototype	4	1-2-1

Objective

- Understand concept of reverse engineering
- Understand principles of imaging, cross-sectional scanning, digital data, computational graphics
- Understand legality of reverse engineering concept

Course outcomes

- Use the Digitized Shape Editor (DSE) workbench
- Import and process the digitized data (scans or clouds of points),
- Quick Surface Reconstruction (QSR) from the digitized data.
- Create a mesh and extract characteristic curves to create surfaces using point cloud data

Course content

Module I: Introduction to Reverse Engineering

2 (hrs)

Historical Background & Industrial Evolution, Reverse Engineering in Modern Industries, Motivation and Challenge, Analysis and Verification, Applications of Reverse Engineering & 3D scanning.

Practice :1 Generate a Model from a Product

Module II: Processing the Point data & Creating Tessellated Mesh

2 (hrs)

Stages in the Process, Introduction to Digitized shape editor, Importing the Point data, editing the cloud, Creating & Correcting the mesh, editing the mesh, creating tessellated mesh

Practice:2 Cloud Point Generation

Practice :3 Mesh Generation from Cloud Point data

Module III: Curve Creation & Processing

2 (hrs)

Stages in the Process, creating and editing scans, creating curves, Additional tools, Introduction to quick surface reconstruction, creating scans by segmentation, processing curves



Practice : 4 Curve Generation

Module IV: Creating Surface

2 (hrs)

Stages in the Process, creating surface, using automatic processes, checking deviations

Practice :5 Surface Generation & Optimization

Module V : Additive Manufacturing

2 (hrs)

Additive Manufacturing Technology in product development-Materials for Additive Manufacturing Technology, Classification – Stereo lithography Apparatus (SLA)- Principle, process, advantages –Fused Deposition Modeling – Principle, process, advantages. Selective Laser Sintering – Principle, Process, advantages, Three Dimensional Printing – Principle, process, advantages - Laser Engineered Net Shaping (LENS)

Module VI : Delmia Additive Part Preparation Essentials

Preparing Infrastructure, Preparing Parts, Managing Rules, Generating the Slicing Path,

Practice : 6 Prepare a part for 3D Printing

Module VII: Master Project

2 (hrs)

Reverse Engineering of the Car Fender and 3D Printing

Text Books:

1. DassaultSystemes Companion Learning Space : Catia Reverse Engineering Essentials

Reference Books:



Product Life Cycle Management

Code	Course Title	Credit	T-P-PJ
CUTM1078	Product Life Cycle Management	2	0-1-1

Objective

- Use ENOVIA Engineering BOM Management
- Create parts and specifications
- Create Change Orders

Course outcomes

- Manage the engineering change process
- Raise Change Requests for the parts and specifications
- Generate various types of reports.

Course content

Module I: Introduction

3 (hrs)

Product Lifecycle Management (PLM), Need for PLM, Product Lifecycle Phases, Opportunities of Globalization, Pre-PLM Environment, PLM Paradigm, Importance & Benefits of PLM, Widespread Impact of PLM, Focus and Application

Module II: ENOVIA

2(hrs)

Getting Started, Working with Parts, Creating & Attaching Specifications

Module III: EBOM

2 (hrs)

Creating Engineering Bill of Materials

Module IV: ECM

2 (hrs)

Releasing parts using Enterprise Change Management, Reports

Module V: Collaborative Life Cycle Management

4 (hrs)

Getting Started, Creating a Product Structure, Managing the Structure

Module VI: 3D Tolerancing & Annotation 3 (hrs)

Dimensions & Tolerances, Assembly Specifications, Validate Annotations, Generate Drawings, Review through 3D Play.



Module VII: Master Project

3(hrs)

Master Project on ENOVIA EBOM Management

Text Books:

1. DassaultSystemes Companion Learning Space- ENOVIA EBOM Management
2. DassaultSystemes Companion Learning Space- Collaborative Lifecycle Management
3. DassaultSystemes Companion Learning Space- 3D Tolerancing& Annotation

Manufacturing Process-Process Planning and Heat Treatment

Code	Course Title	Credit	T-P-PJ
CUTM1079	Manufacturing Process-Process Planning and Heat Treatment	3	2-1-0

Objective

- To Understand the Importance of Materials, Manufacturing Processes, Process Planning & Design in Product Manufacturing

Course outcomes

- Select Engineering Material for a Required Purpose
- Identify Various Manufacturing Processes
- Implement Modern Approaches to Process Planning, Product Design & Development

Course content

Module I: Classification of Materials(5hrs)

Common Engineering Materials; Crystal Geometry (Crystal Types, Crystal Structures, Crystal Defects, Recrystallization, Crystal Growth, Methods of Determining Crystal Structure, Scanning Electron Microscope); **Mechanical Properties, Mechanical Tests and Deformation of Materials** (Mechanism of Strengthening in Metals. Grain Size and its relation to Mechanical Properties, Review and Brief Discussion on Stress Strain Diagram of Steel and the Parameters for Ductility, Percentage of Elongation, Toughness, Strain Hardening, and Tensile Strength, etc., Fracture Toughness and Crack Growth Measurement, Failure Analysis), Fatigue and Creep Testing, Testing for Residual Stresses.

Module II: Tool Materials (4hrs)

Engineering Alloys (Selection and Specification of Carbon and Alloy Steels for General Engineering Purpose, Specification of Materials as per Various Standards- IS, BS, AISI, APS etc.); **Steels** (Case Hardening Steels, Cold Work Tool Steels, Hot Work Tool Steels, High Speed Tool Steels; **Modern Cutting Tool Materials** (Carbide, Coated carbides, Ceramics, CBN, Diamond, SiALON, Impregnated tools); **Introduction to Plastics** (Properties of Plastics, Thermo Plastics-Thermo Setting Plastics, Methods of Processing of Plastics); **Cast Iron** (Grey

Iron Casting IS: 210 SG Cast Iron IS: 865, Malleable Iron Castings IS: 2108 and IS: 2640); **Non-Ferrous Alloys** (Zn & Al Alloys); **Powder Metallurgy** (Methods for Production of Powders, Powder Metallurgy Steps).

Module III: Heat Treatment (4hrs)

Heat Treatment of Steel (Hardenability Concepts and its Role in Steel Specification, Hardening and Annealing of Tool Steels, Case Hardening and Local Hardening, Isothermal Transformation Diagrams, Austempering, Martempering and Isothermal Annealing for Tool Steels,. Major Defects in Metals or Alloys due to Faulty Heat Treatment, ION Nitrating, Vacuum Carburizing, Chemical Vapour Depositing); **Heat Treatment of Non-ferrous Materials** (Classification of Heat Treatment Processes for Aluminium Alloys, Heat Treatment of Wrought & Cast Aluminium Alloys).

Module IV: Manufacturing Processes(7 hrs)

Forming Processes (Cold & Hot Working, Rolling, Forging, Drawing, Bending & Extrusion); **Joining Processes** (Arc Welding, Gas Welding, Resistance Welding, Thermit Welding, TIG & MIG Welding, LBW, EBW, Adhesive Bonding, Soldering & Brazing,); **Casting Process**(Sand Casting, Die Casting, Investment Casting, Centrifugal Casting, Vacuum Casting, Plaster Mould Casting, Lost Foam Method, Continuous Casting); **Machining Processes** (Traditional-Turning, Milling, Drilling, Shaping, Grinding & Finishing, Non-Traditional- EDM. AJM, LBM etc.)

Practice:

1. Pattern & Mold Making in Sand Casting.
2. Butt Joint by using Oxy Acetylene Gas Welding.
3. Joining of Metal Sheets using Spot Welding.
4. Soldering & Brazing Practice.
5. TIG Welding of Stainless Steel
6. MIG Welding Technique and Applications
7. EDM working Principle and Process Parameters

Module V: Process Planning (5 hrs)



Process Planning (Concept, Manufacturing Planning, Process Design, Process Planning Activities, Process Sheet, Process Selection Parameters, Steps in Process Planning, Computer Aided Process Planning)

Practice

8. Process Planning & Simulation in DELMIA

Module VI: Computer Aided Production Management(7 hrs)

Role of Computer in Product Design and Management(Computer in Manufacturing & Design Process, Creation of Manufacturing Data Base, Computer Integrated Manufacturing, Communication Network, Production Flow Analysis, Group Technology); **Process & Product Design** (Degree of Accuracy, Finish and Tolerance, Capability Studies, Basic Product Design Rules for Casting, Forging, Machining, Sheet Metal and Welding.Physical Properties of Engineering Materials and their Importance on Products, Selection of Plastics, Rubber, Composites and Ceramics for Product Design)

9. Casting Design & Analysis using CATIA

10. Forging Design & Analysis using CATIA

Module VII: Industrial Ergonomics (3 hrs)

Man/Machine Considerations, Ease of Maintenance.Ergonomic Considerations in Product Design, Anthropometry, Design of Controls& Displays, Man/Machine Information Exchange, Process Sheet Detail and Their Importance, Advanced Techniques for Higher Productivity, Just-in-Time and Kanban System, **Modern Approaches to Product Design**(Concurrent Design, Quality Function Development, Rapid Prototyping)

Text Books:

1. Balasubramaniam R.,”Callister's Materials Science and Engineering”, 2nd Edition, Wiley.
2. Rao P.N., “Manufacturing Technology”, Volume 1, Mc-Graw Hill.
3. Chitale A.K.,Gupta R.C.”Product Design & Manufacturing”, 6th Edition, PHI Learning.

Reference Books:

1. Campbell F., “Elements of Metallurgy and Engineering Alloys”, ASM International.



2. Kesavan R., Elanchezhian C., Vijaya Ramnath B., “Process Planning & Cost Estimation”, New Age International.

Material in Product Design and Development

Code	Course Title	Credit	T-P-PJ
CUTM1080	Material in Product Design and Development	2	1-1-0

Objective

- Identify and select suitable material for product design.
- Understanding various material selection for manufacturing processes
- Application of smart materials, shape memory metals, Nano materials.
- Understand the concept of bio materials.
- Understand concept of smart and hybrid materials.

Course outcomes

- Understand the concept of elastic and plastic deformation.
- Identify and select suitable material for product design.
- Understand manufacturing characteristics of materials
- Understanding various manufacturing process.
- Understanding Application of smart materials, shape memory metal, Nano material.
- Understood the concept of smart and hybrid materials.

Course content

Module I: Classification of materials

(2 hrs)

Introduction to material classification, Steel, Stainless Steel & Types, HSLA Steels, Dual Phase Steels, Tool and Die Steels. Nonferrous Alloys- Aluminum & Alloys, Copper & Alloys, Zinc & alloys, Nickel & Alloys , Magnesium Alloys, Titanium Alloys, Super Alloys.

Module II : Material behavior

(10 hrs)

Elastic and Plastic deformation- Mechanism of Plastic deformation-yield stress and shear strength-Perfect and Real crystals- Effect of strain rate and temperature on plastic behavior- Super plasticity- Deformation of non crystalline materials

Expt-1 - To study Creep transient for different materials using virtual lab.

Expt-2: To study the effect of obstacle distance on the creep transient behavior of materials using virtual lab.

Expt-3: To evaluate modulus of elasticity of materials using nano indentation using virtual lab.

Expt-4: To find indent depth on materials using nano indentation.

Expt- 5-To find out plastic work done during nano indentation.

Module III: Material Selection for Process modeling and product design (4 hrs)

Material selection- Cost and service requirement- Recycling- Selection of material for mechanical properties- Strength, toughness and fatigue- Material selection for durability and surface wear and Corrosion resistance- Functional relation between materials and processing- Manufacturing characteristics of metals- Material selection using Ashby charts and other aids material selection for aero, auto and nuclear application- Case studies in material selection.

Expt-6- Practice on material selection using Ashby charts

Expt-7- Case study on material selection for bicycle frame using material chart.

Expt-8- Case study on material selection for car brake using material chart.

Expt-9- Case study on material selection for Knee implant.

Module III: Shape memory Alloys and Nano materials (3 hrs)

Introduction to Smart materials and its applications, Shape memory metals and its applications, Introduction to Nano-materials, CNTs Production Process and Uses, Fibers Production and Uses. Introduction to bio materials.

Expt-10- To imagine the cytoskeleton of cells proliferation on bio materials Surface.

Module IV: Polymer Composite materials (3 hrs)

Polymer- Thermosetting, Thermoplastics; Elastomers- Natural & Synthetic Rubber; Composites Material- Classification Based on Matrix and Topology, Particle Reinforced Composites, Fiber Reinforced Composites. Structural Composites, Constituents of Composites, MMC, PMC and FRP. Ceramic Composites, Geo synthetics, Pre-stressed Hollow Concrete Panel, Carbon Composites Fullerenes, Bucky Ball Structures, Grapheme.

Module V: Prefab materials (2 Hrs)

Prefabricated Materials: Types and Applications, Autoclaved Aerated Concrete (AAC), Cellular Lightweight Concrete (CLC).

Module VI: Developments in material processing (3 hrs)

Introduction to Microelectro mechanical Systems (MEMS) and its applications, Micro fabrication technologies- Tool for micro fabrication- Diamond and high speed machining- LIGA micro fabrication process- Multilayer X-ray lithography-

**Module VII: Introduction to smart /intelligent and Hybrid materials
hours)**

Overview of Smart / Intelligent Materials, Primitive Functions of Intelligent materials, Intelligence Inherent in Materials, Actuator Materials, Sensing Technologies, Micro-sensors, Intelligent Systems, Hybrid Smart Materials, Passive Sensory Smart Structures, Reactive actuators based smart structures, Active Sensing and Reactive Smart Structures, Smart Skins

Practice :

1. Virtual lab by IIT kanpur.

Text Books:

1. Materials Science and Engineering, W D Callister, 2014, 2nd Edition, Wiley India Private Limited, India.

Reference Books:

1. Material Science and Engineering, V Raghavan, 2013, 5th Edition, PHI publication, India.
2. Material Science and Engineering, S Chawla, 2011, 1st Edition, Dhanpat Rai & co Private Ltd., India.

Computer Aided Engineering

Code	Course Title	Credit	T-P-PJ
CUTM1081	Computer Aided Engineering	3	0-2-1

Objective

- This course will help student to use structural scenario, thermal scenario and to do Structural analysis and Thermal analysis of various problems.

Course outcomes

- Create complete finite element models
- Submit and monitor analysis jobs
- View and evaluate simulation results

Course content

Module I: Material and Selection Properties

(6 Hrs)

Property Module, Material Definitions, Linear Elasticity, Large Strain Elasticity, Metal Plasticity, Material Calibration, Material Databases, Section Properties

Practice:

1. Analysis of crack in pressure vessel
2. Cable stayed bridge simulation

Module II: Element Selection Criteria

(6 Hrs)

Solid Element Selection, Structural vs. Continuum Elements, Modeling Bending Using Continuum Elements, Stress Concentrations

Practice:

3. Stress analysis of rail road with wheel.
4. Bike frame structural analysis

Module III: Meshing

(8 Hrs)

Mesh Module, Mesh Elements Mesh Generation Workflow, Local Fine-tuning Quality Checks, Mesh Compatibility, Mesh Convergence, Dependent and Independent Part Instances



Practice:

5. Airplane bracket structural analysis
6. Structural analysis of wind turbine blade

Module IV: Boundary Condition

(6 Hrs)

Step Module, Analysis Steps and Procedures, Output Requests, Output Files

Load Module, Loads and Boundary Conditions, Initial Conditions

Practice:

7. Generative structural analysis applied for design optimization
8. Stress analysis on a backhoe

Module V: Contact

(6 Hrs)

Mechanical Contact Properties, Contact Domain, Contact Formulation and Controls, Handling

Initial Over closures, Contact Output

Practice:

9. Analysis of Economizer.
10. Analysis of Screw Jack

Module VI: Analysis Procedures

(6 Hrs)

Model and Analysis Steps, Analysis Procedures, The static, general analysis procedure, Finding a converged solution, The Static, Linear Perturbation procedure, Buckle procedure, Frequency Procedure, The dynamic, explicit analysis procedure, Stability Limit, Analysis Continuation Techniques

Practice:

11. Steady state analysis of a composite bar.

Module VII: Thermal Analysis

(8 Hrs)

Steady State Heat Transfer, Transient Heat Transfer, Thermal Interfaces, Thermal Stress Analysis

Practice:

12. Temperature distribution in radiators used in automobiles
13. Oven radiation simulation

14. Steady state thermal analysis of tungsten coil with internal heat generation
15. Thermal analysis of disc brake

Projects

1. Thermal Analysis of PV Solar Pannel
2. Structural and thermal analysis of Green House
3. Structural analysis of Quadcopter.
4. Structural analysis of landing gear.
5. Numerical study on different types of fins.
6. Overhead tank failure analysis.
7. Analysis of Rocket Nozzle
8. Analysis of BAJA SAE
9. Structural and Thermal Analysis of Downdraft Gasifier
10. Structural and Thermal Analysis of Stirling Engine
11. Structural Analysis of Hydraulic Press
12. Structural Analysis of Elevating Conveyor

Text Books/ Reference Books/ Reference Material

1. SIMULIA: 3DS Learning Space

Source of reference: 3DS peer learning

Quality Assurance

Code	Course Title	Credit	T-P-PJ
CUTM1082	Quality Assurance	2	1-1-0

Objective

- To introduce the concept of SQC
- To understand Design of Experiments concept and ANOVA test
- To learn about the different plots in quality control

Course outcomes

- Understand quality function deployment principles
- Understand concept of Failure mode affect analysis and apply it in product design process.
- Carry out statistical analysis of experiment, ANOVA ratio test and apply advanced DOE method for product testing.
- Understand statistical process control techniques and reliability concepts.
- Understand SIX SIGMA process and lean production concept.
- Prepare Pareto diagrams, cause and effect diagrams, matrix plots and 3-D plots.

Course content

Module I: Design for Quality (1hr)

Quality Function Deployment, Objectives and functions, Design process, controlling factors in design process.

Module II: Failure Mode Effect Analysis (FMEA) (3hrs)

Basic methods: Refining geometry and layout, general process of product embodiment, embodiment checklists, FMEA method.

Practice 1: Performing a FMEA of a Wooden Chair.

Module III: Design of Experiments (DOE) (4hrs)

Design of Experiments: Basic methods, two factorial experiments, orthogonality, Base design method, higher factorial experiments.



Practice 2: Design of Experiments for comfort conditions in a room using Minitab.

Module IV: Analysis of Variance (ANOVA) (4hrs)

Statistical analysis of experiments, degree of freedom, correlation coefficient, ANOVA test, residual plots.

Practice 3: Performing ANOVA to know the significance of influencing parameters for comfort conditions in a room using Minitab.

Module V: Statistical Process Control (SPC) (2hrs)

Frequency distributions and histograms, Pareto diagrams, Probability distribution, Matrix plots and 3D plots.

Module VI: Reliability (4hrs)

Reliability – Survival and Failure, series and parallel systems, mean time between failure, mean time to repair.

Practice 4: Determining the reliability of series and parallel systems.

Module VII: Design of Six Sigma (4hrs)

Basics of six sigma, project selection for six sigma, six sigma problem solving, six sigma and lean production.

Practice 5: Determining the six sigma limits during machining a cylindrical work piece on CNC lathe.

Text Books:

1. Stastical Quality Control, M. Mahajan, Khanna Publisher.
2. Reliability Engineering, L.S. Srinath, Affiliated East West Press.

Reference Books:

1. Robust Design for Quality Engineering and Six Sigma, Sung H. Park, World Scientific Publisher.

Online Source: (Used in MINI TAB Software)

Course outline Prepared by: Santosh Patro

Date: 5-06-2020

Source of reference: 1. curriculum PG Diploma Tool Design -level-8

Applied Ergonomics

Code	Course Title	Credit	T-P-PJ
CUTM1083	Applied Ergonomics	2	0-1-1

Objective

- Use the Human Ergonomics software to create an accurate simulation of a human entity and its work environment to ensure a natural operation

Course outcomes

- Create, manipulate, and analyze how the manikins interact with a product and its environment

Course content

Module I: Introduction

4(hrs)

Introduction to Human Factors, Anthropometry and Workplace Design, Biomechanics of Work, Work Physiology, Stress and Workload, Introduction to Virtual Ergonomics Solution

Module II: Preparing Work Environment 2 (hrs)

Workbenches & Tool bars, Setting Options, Exploring the 3D Environment

Module III: Creating Manikin & Workspace 2 (hrs)

Creating Workspace, Setting Manikin Properties, Manipulating Manikin, interacting with workspace, setting manikin constraints, creating catalogs, performing clash analysis

Module IV: Human Measurements 2(hrs)

Workbenches & Tool bars, Human measurements editor, summing up using the editor

Module V: Human Activity Analysis 2 (hrs)

Workbenches & Tool bars, Human Activity Analysis, summing up the analysis

Module VI: Human Posture Analysis 2 (hrs)

Workbenches & Tool bars, Human Posture Analysis, summing up the analysis

Module VII: Human Task Simulation 4 (hrs)



Creating Process Activity, Creating a Manikin Activity, Inserting, resources, motion analysis, Human task simulation, Master project on Ergonomics

Text Books:

1. DassaultSystemes Companion Learning Space- Virtual Ergonomics Simulation

Reference Books:

Computer Aided Manufacturing

Code	Course Title	Credit	T-P-PJ
CUTM1084	Computer aided manufacturing	2	0-2-0

Objective

- Create 2-D geometry and 3-D models using various Commands in Master CAM software.
- Create part programs for CNC machining, Contour Concept of cutter compensation using G codes and M codes.
- Create tool path and program for 2-D Lathe operations
- Create tool path and program for 2-D milling, drill tool path, circular milling and facing operation.

Course outcomes

- Create 2-D Geometry and 3-D models using various Command in Master CAM software.
- Identify G-Codes and M-codes for programming
- Create 2-D tool path and program for 2-D facing , turning , drilling in lathe.
- Create 2-D tool path and program for circular milling and facing operations.
- Simulation of CNC programs using Master CAM software.

Course content

Module I: Introduction to CAM and Identification of toolbars in

Master CAM software

(2 hrs)

Introduction to Computer Aided manufacturing and Master CAM. Identification of sketch toolbars like profile, operations toolbars and using the toolbars to generate the sketch.

Expt1: Create a 2D sketch using sketch tool bar and operations tool bar

Module II- 3-D models using various Commands in Master CAM software (2 Hrs)

Draw 3-D profiles using various sketch based features like extrude, revolve, Boolean features, rib, slot, groove etc.

Expt-2- Create 3 D model using various commands

Module III : Identification and use of G-code and M code in programming for lathe

(4 hrs)

Functions of G-Code and M-code in lathe machine .Selection and use of G-codes and M codes. Measure tool and work data offset data-X-Z offsets for lathes. Work offsets, length offsets and tool radius for machining center for creating part programming. Cutter compensation.

Expt-3- Create work offset for CNC milling machine using Master CAM.

Expt-4- Create Work off set for CNC lathe using master CAM

Module IV: Create 2D tool path for lathe operations (6hrs)

2D Tool path generation. Concepts of Machining: CNC control basics, & coordinate Systems, Selection of tool, tool parameters, Compensations Program Manager / Creation of 2D tool path for 2D turning , facing ,drilling operations

Expt-5- Create 2D tool path for facing and turning operation in lathe.

Expt-6- Create 2D tool path for a drilling operation in lathe.

Expt-7- Create 2D tool path for a given job in lathe.

Module V: Create 2D tool path for milling operations (6 hrs)

Selection of appropriate tool path for milling operation. Proper machine selection, job setting, tool selection. Selection of appropriate machining tolerance, machining parameters like speed, feed and depth of cut. CNC Programming 2-D milling, circular milling operations.

Expt-8- Create 2D tool path for facing and profile cutting.

Expt-9- Create 2d tool path for circular pocketing.

Expt-10- Create 2D tool path for circular counterering.

Module VI: Post processing (3 hrs)

Post Processing: Generating NC / NC Files / Editing NC Files / Simulation of tool path.

Expt -11 Create a 2D tool path for a job in CNC milling machine and simulate it.

Expt-12- Create 2D tool path for a job in CNC lathe machine and simulate it.

Module : VII: Transferring Part programming into CNC machine

CNC interface with master CAM ,CNC controls and editing on a machine



Expt-12 : Transfer master CAM program to the CNC machine and perform dry run for a job.

Reference Books:

1. Groover, M.D and simmers ,E.W, CAD/CAM :Computer aided design and Manufacturing ,Person Education India.
2. Manuals of CAD/CAM software package on CAM module and CNC machine.

CNC Programming and CNC Machining

Code	Course Title	Credit	T-P-PJ
CUTM1085	CNC Programming and CNC Machining	2	0-2-0

Objective

- Evaluate manufacturing assignment based on critical thinking and problem solving skills. Become a good communicator and effective team member.
- Practice writing complex “G” code programs for CNC turning centers that meet the part specification
- Interpret and demonstrate complex “G” code programs for CNC milling centers that meet the part specification
- Prepare “G: code programs to perform secondary operations including tapping, countersinking, counter boring, and threading.
- Describe and illustrate common problems with tooling and fixtures in CNC programming and machining.

Course outcomes

- Explain applications and advantages of CNC machines and technology
- Demonstrate and explain various CNC control Calculate technological data for CNC machining
- Understand the importance and use of PPE’s
- Prepare and understand line program for various profiles Identify and set parameters for various simulators
- Prepare programs,demonstrate, simulate and operate CNC lathe machines for various machining operations
- Prepare programs,demonstrate, simulate and operate CNC milling machines for various machining operations
- Define and explain Modern CNC systems and explain its importance in manufacturing

Course content

Module I: introduction to CNC technology & programming(3hrs)

Introduction to CNC technology – CNC machines controls. History & development of CNC

technology. Conventional Vs. non-conventional machine tool. Numerical control on CNC machine tools CNC control and CNC Control and types of CNC control Calculation of technological data for CNC machining. CNC clamping system

Expt1: Identification of different parts of CNC lathe including data input

Expt2: Identification of different parts of CNC mill including data input

Module II: Drawing interpretation(3hrs)

Drawing interpretation practice, identifying feature from sketch and operation from feature

Expt3: Practice on CNC controller using on-screen simulation for generating different profile

Module III: CNC programming (4hrs)

Introduction to CNC programming Introduction and demonstration of line programs CNC programming on lathe & milling machine using iso codes into the CNC simulator. CNC programming for lathe and milling machines using different machining cycles into the CNC simulator. Procedures Associated with part programming, Cutting process parameter selection, Process planning issues and path planning, G & M Codes, Interpolations, Canned Cycles and Subprograms.

Expt4: Writing simple code and test on controller for CNC lathe

Expt5: Writing simple code and test on controller for CNC mill

Expt6: programming canned cycles for simple profile

Module IV: Program generation for CNC milling and turning(3hrs)

Tool compensations Exposure for programming and simulator of FANUC, SINUMERIC Programming exercise.

Expt 7: Machining of programmed exercise on CNC lathe machine.

Expt 8: Machining of programmed exercise on CNC milling machine.

Module V: CNC Turning (4hrs)

Plan and optimize programs for CNC turning operations. Calculate parameters like speed feed etc. and set a references for the various operations. Prepare operation and operation sequence for the

lathe operations like turning, grooving etc. Prepare & set CNC lathe operations and test run programmed Execute program and inspect simple geometrical forms / standard parts Use of various PPE's on CNC lathe machine

Expt 9-11: Programming for complex shape cylindrical objects with parameter selection, machining. (at least 3 exercises)

Module VI: CNC Milling(4hrs)

Plan and optimize programs for CNC Milling operations. Calculate parameters like speed feed, depth of cut etc. and set a references for the various operations. Various methods of work process like edge finding block center etc. Prepare & set CNC Milling operations and test run programmed. Execute program and inspect simple geometrical forms / standard parts. Use of various PPE's on CNC milling machine

Expt 12-14: Programming for complex shape prismatic objects with parameter selection, machining. (at least 3 exercises)

Module VII: Modern CNC systems (4hrs)

Introduction to advanced CNC systems: Computer Aided Part Programming (CAPP), it's application using Solidworks/MasterCAM. comparison of manual part programming and CAPP for a simple component, Automatic Tool Changer, Automatic Pallet Control, Automatic Storage & Retrieval Systems.

Expt 15: comparison of manual part programming and CAPP for a simple component
Text Books:

1. Programming of CNC machines, by Ken Evans
2. CNC Programming Handbook by Peter Smid
3. NC Control by Kundra Rao, Tewari

Reference Books:

3. https://cache.industry.siemens.com/dl/files/554/74475554/att_56792/v1/PGsl_0313_e_n_en-US.pdf
4. G codes, M codes Handbook, by Mazak Corporation, sources:
 - a. available at Mini Tool Room, Parlakhemundi campus, CUTM

b. <https://gist.github.com/anonymous/f14c73a7174bf8a43f0c970817897454>

Source of reference;1. curriculum PG Diploma Tool Design and CAD/CAM-level-8

Quora.com

Note: 1 credit theory=10 hrs lecture, 1 credit practice/project=12.5 hrs lab/workshop/field work in a semester

Design of Tools, Jigs and Fixtures

Code	Course Title	Credit	T-P-PJ
CUTM1086	Design of Tools, Jigs and Fixtures	3	2-1-0

Objective

- To learn basic concepts, functions and design principles of Jigs, Fixtures and Dies
- To know the importance of work piece location & clamping

Course outcomes

- Able to Understand and Analyse customers need
- Able discuss and finalise product needs
- Conceive the tool design parameters
- Design against standard and parameters
- Test against specifications and standards
- Develop prototype / simulation
- Interpret of output and confirming to specifications
- Communicate with manufacturing line
- Take remedial action if required

Course content

Module I: Locating Elements (3hrs)

Introduction, Jigs (Production Devices), Locating Principle, Locating methods and devices

Practice 1: Fabrication of a V – Locator for locating a cylindrical work piece.

Module II: Clamping Devices (3hrs)

Introduction, Pneumatics and hydraulic actuation clamping, Analysis of clamping force

Practice 2: Estimation of clamping force during clamping of a cylindrical work piece with a V-Locator.

Module III: Design of Jigs

(6hrs)

Introduction, drill bushes, elements of jig, construction, material for jig elements, different types of jigs

Practice 3: Designing of a Plate Jig.

Practice 4: Designing of a Swinging Leaf Jig.

Module IV: Drill Jigs

(3hrs)

Automatic drill jig, rack and pinion indexing device, Air operated drilling jig component, group jigs and fixtures, chip control, economic justification for jigs and fixtures

Practice 5: Study of Automated Jigs.

Module V: Design of fixtures

(6hrs)

Introduction, Design principles of fixtures, types of fixture, general principles of boring fixtures, classification of boring fixture, lathe fixture, broaching fixture, Milling fixture, Grinding fixture

Practice 6: Designing a Lathe Fixture.

Practice 7: Designing a Milling Fixture.

Module VI: Design of Dies for Sheet Metal Work

(5hrs)

Introduction, Types of dies, clearance and tolerance of die opening and punch, force, power, energy in shearing, strip layouts, economical stock utilization

Practice 8: Designing a progressive die for making of washer

Module VII: Design of Drawing and Forming Dies

(6hrs)

Theory of drawing, blank development, strain factor, calculation of force, construction of drawing and drawing dies, Modern Metal forming techniques

Practice 9: Designing a Forging die for making a gear blank

Practice 10: Designing a drawing die for making a circular cross-sectional wire.

Text Books:

1. Joshi, P H, Jigs & Fixtures, 2010, 3rd Edition, McGraw Hill.

2. Nagpal, G R, Tool Engineering & Design, 2000, Khanna Publishers.

Reference Books:

1. Venkataraman, K, Design of Jigs, Fixtures & Press Tools, 2015, Wiley & Sons
2. Mehta, N K, Metal Cutting and Design of Cutting Tools, Jigs & Fixtures, 2015, McGraw Hill

Advanced Metrology

Course Code	Course Title	Credit	T-P-PJ
CUTM1087	Advanced Metrology	2	1-1-0

Course Objective

- To Make Students Familiar with the Measuring Systems, and the Standard of Measurements. Learns about Basic Measurement Devices.
- Understanding the Basic Measurement Systems in the Real Time Engineering Applications.
- Enables Students to Work in Quality Control and Quality Assurances Divisions Industries.

Course Outcomes

- Selecting Suitable Measuring Instruments for Basic and Typical Applications in the Industries.
- Analyze Measurement Requirement.
- Can Choose Transducer & Sensors for Products.

Course Outline

Module: I Introduction to Metrology

(2Hours)

Introduction to Metrology; Importance and Need for Measurements and Metrology; Need for Inspection; Precision & Accuracy; Errors in Measurement.



Practice-1: Introduction to Metrology laboratory. Steel Rule, Tape, Right Angle Protractor, Surface Plate

Module: II Standards of Measurement (4 Hours)

Verniers and micrometers least count calculation, Uses of Slide callipers, Height Gauge, Micrometer and 3 point bore micrometer

Practice-2. Vernier Caliper inside, outside, depth measurement and Height Gauge

Practice-3. Micrometers, Outside Inside Micrometer, Depth Micrometer

Practice-4 Three point Bore Micrometer

Module: III Slip Gauges (2 Hours)

Types of Slip Gauge blocks and uses

Practice 5- Calibration of measuring Instruments using slip gauge blocks

Module: IV Limits, Fits and Tolerances (3 Hours)

Limits, Fits, Tolerances: Definitions, Types of Fits (Clearance, Transition and Interference) Allowances, Hole and Shaft basis systems with Numerical

Module: V Angle Measurement (3 Hours)

Spirit Level, Sine Bar and Bevel Protractor. Least count determination and applications

Practice-6. Sine Bar/Spirit Level Measurement of Angles on a Surface plate

Practice 7: Angle measurement by Bevel Protractor

Module: VI Gauge Design (2 Hours)

Design of Go and NO GO gauges, Ring gauge and Plug Gauge applications

Practice-8. Study and use Gauges-Filler, Radius, Thread, Wire, Snap, Go-NoGo gauge

Module: VII Measurement Machines (6 Hours)

Tool makers Microscope: Principle and applications, Measuring Machines: Coordinate Measuring Machine, Talysurf, Profile Projector

Practice-9. Measurement of template using Profile Projector

Practice 10: Measurement of Profile by Tool makers microscope

Practice 11: Measurement of surface roughness using Talysurf

Text books:

1. Gupta, I C, A Text Book of ENGINEERING METROLOGY.2016. 8th Edition, Reprint, Dhanpat Rai Publication, New Dehi-110002
2. Narayana, K L, Engineering Metrology.2014. Third Edition, Scitech Publication(India) Privet Limited

Reference Books:

1. Mahajan, M, A Text Book of Metrology. 2010. Dhanpat Rai & Co(P)Ltd, ISBN 13 : 978-817700051

Thermodynamics

Code	Course Title	Credit	T-P-PJ
CUTM1088	Thermodynamics	3	2-1-0

Objective

- To know the laws of thermodynamics and conditions for energy transformation
- To get familiar with different thermodynamic properties of pure substances

Course outcomes

- Utilize the concepts of work and energy to evaluate control volumes as well as closed systems
- Students will be able to do energy analysis and determine efficiency of various thermal devices

Course content

Module I: Basic Concepts of Thermodynamics 4(hrs)

System, Surroundings, Universe, State, Thermodynamic Properties, Process, Types of Process, Reversible and Irreversible process, Quasi-static Process, Cycle, Point and path functions, Thermodynamic Equilibrium, Ideal gas, Ideal gas equation

Module II: Zeroth Law of Thermodynamics 4(hrs)

Zeroth Law of Thermodynamics, Temperature, Measurement of Temperature, Temperature Measuring Instruments, Relationship between Temperature Scales

Practice:

Temperature Measurement by using Thermocouple, Thermistors and Resistance Temperature Detector (RTD)

Module III: Work Transfer and Heat Transfer 5(hrs) Work Transfer, Sign Convention of Work, PdV Work for Various Quasistatic Processes, Heat Transfer, Different Modes of Heat Transfer

Practice:

- Simulation of Heat Transfer in Conduction, Convection and Radiation using Finite Element Method in Simulia (Plane Wall, Fin, Metal Rod)
- Thermal Stress Analysis of IC Engine Piston using Simulia
- Thermal Analysis of Intake Manifold of Engine using Simulia

Module IV: First Law of Thermodynamics6(hrs)

First Law of Thermodynamics Applied to Closed System, Energy, PMM1, Enthalpy, Specific Heat at Constant Volume and Constant Pressure, First Law of Thermodynamics Applied to Open System, Control Volume, Mass Balance and Energy Balance, Nozzle, Diffuser, Turbine, Compressor, Throttling Device, Heat Exchanger

Practice:

- Thermal Analysis of Nozzle, Diffuser, Turbine, Compressor, Boiler, Heat exchanger using Simulia

Module V: Second Law of Thermodynamics5(hrs)

Kelvin Planks statement, Clausius Statement, PMM2, Working of Heat Engine, Refrigerator and Heat Pump, Carnot Cycle & Carnot Theorem

Practice:

- Working of Refrigerator and Heat Engine

Module VI: Entropy4(hrs)

Introduction to Entropy, Principle of Increase of Entropy, Clausius Inequality, Change in Entropy in Different Processes

Practice:

- Entropy Change of Metal Bar with Temperature Gradient using Simulia

Module VII: Properties of Pure Substances 5(hrs)

Introduction to Pure Substance, Phase Change Processes of Pure Substances, T-V, P-V, P-T and H-S Diagram for Steam, Dryness Fraction of Steam, Different Types of Steam. Introduction to



Steam Tables: Specific Volume, Pressure, Temperature, Enthalpy and Entropy

Practice:

- Conversion of water to steam
- Determination of properties of steam from Mollier Chart

Text Books:

1. P.K. Nag, "Engineering Thermodynamics", Tata Mcgraw-Hill Publishing Company Limited
2. Y.A Cengel, M. A Boles, "Thermodynamics an Engineering Approach", Tata Mcgraw-Hill Publishing Company Limited

Reference Books:

1. R K Rajput, "A Text Book of Engineering Thermodynamics ", Laxmi Publications
2. Sontag,Borgnakke, VanWyllen, " Fundamentals of Thermodynamics", Willey Publisher

Fluid Mechanics with Finite Volume Method

Code	Course Title	(Credit)	T-P-PJ
CUTM1089	Fluid Mechanics with Finite Volume Method	3	2-1-0

Objective

- To learn To learn fundamentals of computational methods like FVM for solving linear and non-linear partial differential equations related to fluid dynamics
- To emphasizes the basic underlying fluid mechanical principles governing energy transfer in a fluid flow systems with their performances in different field of engineering applications

Course outcomes

- After completion of the course, the students will able to evaluate finite difference/volume schemes on model problems of computational fluid dynamics.
- Students will learn to develop steady state mechanical energy balance equation for fluid flow systems, estimate pressure drop in fluid flow systems

Course content

Module I: Introduction to Finite volume Method

(6 hrs)

Fundamentals of Finite volume methods, different types of finite volume grids, approximation of surface and volume integrals; interpolation methods, Review of governing equations, Classification of governing equations , Staggered and co-located formulation

Practice:

1. 2D mapped Mesh for rectangular pipe
2. 2D mapped Meshing for Aerofoil.

Module II: Grid generation

(6 hrs)

Grid generation, creating, updating and managing meshes, Steady diffusion equation on structured meshes, Unsteady diffusion equation on structured meshes, Linear system solvers, finite volume discretization of steady and unsteady diffusion equation, Finite volume discretization of convection-diffusion problem

Practice:

3. 3D structure mesh of Circular Cylinder
4. 3D unstructured mesh with primes layers for Aerofoil
5. 3D coarse/ medium/ fine sweep mesh for pipe

Module III: Incompressible flow field calculation with finite volume method (5 hrs)

Navier-stokes equation, Discretization of the Momentum Equation: Stream Function-Vorticity approach and Primitive variable approach, Staggered grid and Collocated grid solutions of Navier-stokes equation with finite volume method, boundary condition, Reynolds averaged Navier-Stokes equations.

Module IV: Fluid kinematics (2 hrs)

Types of flow, Continuity equation (in one, two & three dimension steady state fluid flow analysis with finite volume method, velocity and acceleration fields, streamline, streak line, path line, velocity potential function and stream function, Rotation and vorticity.

Module V: Fluid Dynamics with Finite volume method (4 hrs)

Lagrangian and Eulerian Approach, Euler's equation of motion along a stream line for ideal flow, Principle of conservation of energy with finite volume method, Integration of Euler's equation along a stream line, Bernoulli's equation

Practice:

6. Fluid Analysis of Bernoulli's equation: Flow in a contracting pipe through CFD simulation

Module VI: Flow through Pipes (5 hrs)

Reynolds's Experiment, Laws of Laminar and Turbulent Friction, Introduction Turbulence modeling through Finite volume method, Hagen Poiseuille Equation for laminar flow through pipe, Darcy-Weisbach Equation for Turbulent flow through pipe.

Practice:

7. Fluid Analysis of Laminar flow in 3D Circular Pipe through CFD simulation
8. CFD Simulation of the Water Flow Passing Through a Converging Pipe.
9. CFD Analysis to determine the frictional losses in the pipe.

Module VII: Flow Measurement (5 hrs)

Flow through small orifice meter, Mouthpiece, Velocity Measurement using Pitot tube, Prandtl



tube, Flow measurement in pipes-Flow, Venturi Meter, Flow rate Measurement in channel- Weir and Notches

Practice:

10. CFD Analysis of Fluid flow through Orifice meter
11. CFD Analysis of Fluid flow through adjustable channel
12. CFD Analysis of Fluid flow simulation through Venturi Meter

Text Books:

1. R.K. Bansal, Fluid Mechanics and Hydraulic Machines, Laxmi Publications, ninth edition

Reference Books:

2. P.N. Modi & S.N. Seth, Hydraulics & Fluid Mechanics, Rajsons Publications Pvt. Ltd, Twentieth Edition

Hydraulic Machinery

Code	Course Title	(Credit)	T-P-PJ
CUTM1090	Hydraulic Machinery	2	1-1-0

Objective

- To emphasize Principle of operation of hydraulic machines and their system design
- To familiarize their huge applications in different industries

Course outcomes

- After completion of the course, the students will have a strong foundation on the pertinent equations to engineering design of the machines for required applications.
- Students will learn to determine performance characteristics of fluid machinery by using various simulation tools

Course content

Module I: Principle of Operation of Hydraulic Machinery (2 hrs)

Introduction to hydraulic machines: Classification and operation principle, Euler equation for turbo machines: net head developed by pump and Turbines

Module II: Radial and Axial flow pumps (8 hrs)

Velocity triangle of pumps, effect of inlet swirl on velocity triangles, Constructional features of Centrifugal Pump, design aspect, working principle and efficiencies, work done by the impeller, priming, specific speed, NPSH, effect of swirl on the cavitations, working principle and design aspect of gear oil pump.

Practice:

1. Flow analysis of fluid of Centrifugal pump through Simulia software
2. Flow analysis of gear oil pump through Simulia software
3. Performance Characteristics of Centrifugal Pump through Virtual lab

Module III: Positive displacement Pumps (3 hrs)

Working principle of Reciprocating Pump, discharge, work done and power requirement, ideal indicator diagram, and slip, characteristic H-Q curve of positive displacement pump

Practice:



4. Performance Characteristics of Double Acting Reciprocating Pump through Virtual lab.

Module IV: Hydraulic Turbine: Impulse Turbine (6 hrs)

Classification, definitions of heads and efficiencies, Pelton Wheel - Construction and working principle, work done and hydraulic efficiency, design aspects.

Practice:

5. Simulation of Pelton Turbine through simulia software
6. Performance Characteristics of Pelton Turbine through Virtual lab.

Module V: Hydraulic Turbine: Reaction Turbine (6 hrs)

Reaction turbine (Francis, Kaplan) -Components, working principle, work done and efficiency, draft tube, specific speed, cavitations

Practice:

7. Performance Characteristics of Francis Turbine Simulia software.
8. Simulation of Kaplan turbine through Virtual lab.

Text Books:

1. R.K. Bansal, Fluid Mechanics and Hydraulic Machines, Laxmi Publications, ninth edition

Reference Books:

1. P.N. Modi & S.N. Seth, Hydraulics & Fluid Mechanics, Rajsons Publications Pvt. Ltd, Twentieth Edition

Source of reference;

1. <https://nptel.ac.in/course.html>
2. www.vlabs.ac.in

Theory of Machines

Code	Course Title	(Credit)	T-P-PJ
CUTM1091	Theory of Machines	3	2-1-0

Objective

<ul style="list-style-type: none"> To cover the kinematics and dynamics of planar single degree freedom mechanisms To develop skills for designing and analyzing linkages, cams, gears and other mechanisms To address the underlying concepts, methods and application of different machines.

Course outcomes

<ul style="list-style-type: none"> To understand the implication of computed results in kinematics to improve design of a mechanism. To Interpret the simple given dynamic problems and solve them for positions, velocities and accelerations, etc

Course content

Module I: MECHANISMS

(03hrs)

Theory

Planar Mechanisms: Kinematic Link, Pair, Chain and Mechanism, Types of Links and Joints, Degree of Freedom, Grashof's Law for four bar Mechanism; Inversions of four bar Mechanism, Single Slider Crank Mechanism and Double Slider Crank Mechanism;

Practice

(01 hrs)

1. Position Analysis of Grashof and Non-Grashof four bar Mechanism.
2. Position Analysis of Slider Crank Mechanism, Scotch Yoke Mechanism and Elliptical Trammel

Module II: MOTION ANALYSIS(03hrs)

Theory

Instantaneous Centre of Rotation, Number and Types of Instantaneous Centers, Kennedy Theorem, Relative Velocity Method, Velocities and acceleration in Four Bar and Slider Crank Mechanism.

Practice

(02 hrs)

3. Instantaneous Center Method to Find Velocity of Various Mechanisms.

4. Velocity Analysis of Grashof and Non-Grashof Four Bar Mechanism
5. Velocity Analysis of Slider Crank Mechanism .
6. Acceleration Analysis of Slider Crank Mechanism

Module III: POWER TRANSMISSION SYSTEM(03hrs)

Theory

Classification and Basic Terminology, Fundamental Law of Gearing,

Gear trains: Simple, Compound, Reverted and Epi-Cyclic Gear Trains

Flat Belt, V Belt and Rope Drives and chain drives ,Length of open and cross belt drive, Power Transmitted by Belts and Ropes.

Practice

(02 hrs)

7.Experiment to calculate sensitiveness of Governor

8.Length of open and cross belt drive

Module IV: CAMS& GOVERNOR(03hrs)

Theory

Various Types of Cams and Followers; Displacement, Velocity and Acceleration Diagrams for Different Follower Motions; Nomenclature of Cam Profile;

Classification of Governors, Working principle of various type of centrifugal governors, Terminology related to Governor.

Practice

(03 hrs)

9. Construction of cam profile using Solid works software

10. Cam analysis of a Knife edge and roller follower

11.To calculate sensitiveness of Governor

Module V: GYROSCOPE (02hrs)

Theory

Gyroscopic Couple, Gyroscopic Effect on Naval Ships and Aeroplanes, Stability of four wheeler

Practice (01 hrs)

12. Determine Gyroscopic Couple on Motorized Gyroscope

Module VI: BALANCING(03hrs)

Theory

Static and Dynamic Balancing, Balancing of Several Masses Revolving in the Same Plane and Different Planes, Balancing of Reciprocating Mass

Practice (02 hrs)

13. Balancing of Several Masses Revolving in the Same and Different Planes

14. Balancing of Reciprocating masses by Simulation

Module VII: VIBRATION (03hrs)

Theory

Basic Concepts and Types of Vibration, Methods of Vibration Analysis, Free Undamped Longitudinal, Transverse and Torsional Vibrations, Damped Free Vibrations, Logarithmic Decrement, Vibration Isolation and Transmissibility;

Practice (02 hrs)

15. Determination of Critical or Whirling Speed of Shaft

16. Simple and Compound Pendulum

Text Books:

- 1.S. S. Rattan Theory of Machines,. Tata McGraw-Hill Education, 2014
2. Joseph E Shingley Theory of Machines and Mechanisms oxford publication

Reference Books:

2. Singh. S, Theory of Machines, Khanna publishers.
3. Norton R.L, Design of Machinery, McGraw-Hill.

Heat and Mass Transfer With FDM/FVM

Code	Course Title	Credit	T-P-PJ
CUTM1092	Heat and Mass Transfer With FDM/FVM	3	2-1-0

Objective

- To provide a good exposure for the students to various phenomena associated with fluid flow and different modes of heat & mass transfer

Course outcomes

- Students will be able to analyze and design various Equipment used in industry using principles of Heat Transfer

Course content

Module I: Conduction

(5 Hrs)

Fourier's Law of Conduction, General Heat Conduction Equation in Different Coordinate Systems (No Derivation), One Dimensional Steady State Conduction in Plane Wall, Composite Wall, One Dimensional Steady State Conduction in Composite Cylinders and Composite Spheres with Convective Atmosphere. Electrical Analogy, Conduction with Internal Heat Generation.

Practice

1. To find the thermal conductivity of a material by the two slabs guarded hot plate method.
2. To find heat transfer through composite wall using Simulia

Module II: Fins and Transient Conduction

(6 Hrs)

Overall Heat Transfer Coefficients, Critical Thickness of Insulation, Heat Transfer from Extended Surfaces, Effectiveness and Efficiency, Unsteady State Heat Conduction, Lumped Heat Capacity System and Lumped Capacitance Method.

Practice

3. To find the thermal resistance of the sample.
4. To find the thermal resistance of the sample using Simulia
5. To find the heat transfer in Transient Heat Conduction using Simulia



Module III: Convection

(9 Hrs)

Hydrodynamic and Thermal Boundary Layer, Principles and Governing Equations, Forced Convection: External Flow over a Flat Plate, Cylinder, Sphere and Non-Circular Ducts, Use of Empirical Relations, Internal Flow Through Pipe, Annular Spaces and Non-Circular Conduits, Natural Convection: Vertical, Horizontal, Inclined Surfaces.

Practice

6. To determine the overall heat transfer coefficient at the surface of a given vertical metal cylinder by the natural convection method.
7. To verify Newton's Law of Cooling of different materials and different liquids.
8. To determine heat transfer coefficient using Simulia
9. To find the temperature variation and heat transfer along cylinder in forced convection using Simulia
10. To find the temperature variation and heat transfer along solid cylinder in natural convection using Simulia

Module IV: Heat Transfer With Phase Change

(2 Hrs)

Film Wise and Drop Wise Condensation, Boiling Heat Transfer, Regimes of Boiling.

Module V: Heat Exchangers

(6 Hrs)

Types of Heat Exchangers, Heat Exchanger Analysis Types of Heat Exchangers, Heat Exchanger Analysis, LMTD, Overall Heat Transfer Coefficient, Heat Exchanger Effectiveness, NTU.

Practice

11. Determination of Effectiveness and Efficiency of Parallel Flow and Counter Flow Heat Exchanger.
12. CFD simulation of Heat Exchanger using Simulia

Module VI: Radiation

(8 Hrs)

Electromagnetic Spectrum, Black Body Emission, Emissive Power, Laws of Radiation, Nature of Black and Grey Bodies, Concepts, Radiation Shape Factor, Thermal Resistance and Electrical Analogy, Radiation Heat Transfer Between Two Surfaces, Reradiating Surface, Radiation Shield.

Practice

13. To find the emissivity of different material surface.
14. Verification of Stefan Boltzmann's Law using simulia

Module VII: Mass Transfer

(4 Hrs)



Introduction, Analogy between heat and mass transfer, Mass diffusion, Fick's law of diffusion, boundary conditions, Steady mass diffusion through a wall, Mass convection.

Text Books:

1. Mahesh M. Rathore, Engineering Heat Transfer , Jones & Bartlett Learning, 2011
2. YunusCengel, Heat And Mass Transfer: Fundamentals And Applications, McGraw-Hill Higher Education, 2014

Reference

1. R.C Sachdeva, Fundamentals of Heat and Mass Transfer
2. R.K. Rajput, Heat Transfer, Laxmi Publication

Books:

Course outline Prepared by:-Prof.Mukundjee Pandey, Dr.Ashok Mishra, Dr. Vijay
Date: - 25/05/2020
Source of reference:- NPTEL, Coursera, Udemy, MIT Open Course Ware & Virtual
Amrita Laboratories Universalizing Education

Theories of Failure Using Finite Element Analysis

Code	Course Title	Credit	T-P-PJ
CUTM1062	Theories of Failure Using Finite Element Analysis	4	2-2-0

Objective

- To educate the students on basic theories behind mechanics of solids.
- To educate the students on Finite Element Analysis concept applicable to Practical conditions.
- To educate the students on Failure Criterion which will be useful for designing Practical problems.
- To educate the students on using 3D Experience Tools for analysis of various mechanical structures and load transmitting elements.

Learning outcome

- Students will have knowledge and practical engineering skills in analysis of mechanical strength of structures and load transmission elements and will be able to design them based on input data.
- Students will be able to deploy 3D Experience Platform to develop design solutions.
- Students will be able to apply the Concept of Meshing and Failure Criteria to Practical Problems which will lead Economical and safe in Design Aspect.

Course content

Module I Introduction to Finite Element Analysis (FEA) and 3D Experience Platform - (4(T)+5(P)) (9 Hours)

Introduction to FEA: Need for Studying FEA; Types of Analysis; Discretization of a Structure; Element Shapes, Nodes and Degrees of Freedom; Mesh Refining, Element Aspect Ratio, Use of Symmetry, Principle of Convergence; General Procedure of FEA.

Material failure Behaviour: Stress–Strain Diagrams for Ductile and Brittle Materials.

Equivalent stresses for varying orientations, Principal stresses, maximum shear stress, Mohr's circles.

Practice:

1. Introduction to 3D Experience Platform: About the Apps and their Applications from

Engineering Point of View.

2. Analysis of Steel Bridge – Simulation using 3D Experience Tool.

3. Tensile Test using Simulation 3D Experience Tool.

4. Stress Strain Curve of a Ductile Material (Mild Steel) using Universal Testing Machine

Module II Mesh Generation and Modeling of Truss Structure (1(T)+ 4(P) (5 Hours)

Mesh Generation and Methods of Meshing and Types of Meshing. Procedure for selecting the method of meshing and type of meshing. Importance and application of Stiffness Matrix for different types of elements and the procedure for getting the results.

Practice:

5. 3D Experience Simulia – Modelling and Meshing of Transmission line tower.

Module III Stresses and Deflection Criteria: (5(T)+ 4(P) (9 Hours)

Procedure for Drawing Shear Force and Bending Moment Diagrams, Point of Contra Flexure.

Stresses (No Derivation): Simple or Pure Bending, Flexure Formula, Section Modulus, Neutral Axis, Determination of Bending Stresses, Shear Stress Distribution for Different Sections.

Deflection: Equation of Elastic Curve, Direct Integration Method

Practice:

6. 3D Experience Simulia – Modelling and Finite Element Analysis of Framed Structure subjected Earthquake Loads.

Module IV: Theories of Failure: (2(T)+ 4(P) (6 Hours)

Theories of Failure: Failure Under Biaxial Loading, Rankine's Theory, Guest's or Tresca's Theory, Von Mises Theory, Graphical Representation of Failure, Safety Factors, Prevention of Failure in Design Stage, Diagnosis of Failure In Post-Manufacturing Stage.

Practice:

7. 3D Experience Simulia: Bicycle Frame Structural Analysis

Module V: Torsion: (3(T)+ 4(P) (7 Hours)

Torsion: Torsion Equation, Design of Shafts, Power Transmitted by Shafts, Composite Shafts, Combined Bending and Torsion, Closed-Coiled Helical Springs, Spring Connected in Series and

Parallel.

Dynamic Analysis: Fundamentals of Vibration; Evaluation of Natural Frequencies and Mode Shapes (Eigen values and Eigenvectors); Non-linear Analysis, Fatigue Analysis. Structures Subjected to Blast Loads.

Practice:

8. Simulation: Static and Dynamic Analysis of Shaft

Module VI Pressure Vessels (1(T)+ 2(P)) (3 Hours)

Longitudinal and Hoop Stress in Thin-walled Pressure Vessels Subjected to Internal Pressure.

Practice:

9. Simulation: Crack Analysis of Thin walled Pressure Vessels.

Module VII Fatigue and Fracture: (3(T)+ 4(P)) (7 Hours)

Fatigue: Failure Under Cyclic Loading, Endurance Limit. S-N Curve, Stress Concentration, Goodman and Soderberg Criteria.

Fracture: Types of Failure, Brittle and Ductile Fracture, Basic Modes of Fracture. Griffith's Analysis, Crack Growth and Stress Intensity Factor.

10. Fatigue Analysis of Crankshaft of Two-Wheeler

Text Books:

1. Strength of Materials, S.S. Rattan, Tata Mc-Graw Hill Publication.
2. Advanced Mechanics of Materials, A.P. Boresi and R.J. Schmidt, Willey India

Reference Books:

1. Elements of Fracture mechanics, Prashant Kumar, McGraw Hill Education (India)
2. Engineering Mechanics of Solids, Egor P. Popov, Pearson publication
3. Strength of Materials, R.K.Bansal, Laxmi Publications.

Optimization Techniques

Code	Course Title	Credit	T-P-PJ
CUTM1093	Optimization Techniques	2	0-2-0

Objective

- To Create an Engineering design methodology using a mathematical formulation of a design problem to support selection of the optimal design among alternatives

Learning outcome

- Ability to apply the theory of optimization methods and algorithms to develop and for solving various types of optimization problems
- Ability to go in research by applying optimization techniques in problems of Engineering and Technology
- Ability to solve the mathematical results and numerical techniques of optimization theory to concrete Engineering problems by using computer software

Course content

Module-I: Linear Programming: Graphical Method, Simplex method, Penalty Method

Module-II: Transportation Models, Assignment Models, Sequencing and Scheduling Models by Johnson's Algorithm

References

- Harvey M. Wagner, *Principles of Operations Research*, Englewood Cliffs, Prentice-Hall, 1969
- S D Sharma and Himansu Sharma, *Operations Research: Theory, Methods and Applications*, 15 Edition, Kedarnath Ramnath & Co

External Links:

<https://www.informs.org/Resource-Center/INFORMS-Student-Union/Consider-an-Analytics-OR-Career>

<https://www.informs.org/>

https://en.wikipedia.org/wiki/Operations_research

Google and YouTube

Database Management Systems

Code	Course Title	Credit	T-P-PJ
CUTM1059	Database Management Systems	3	2-1-0

Objective

- To understand the different issues involved in the design and implementation of a database system.
- To study the physical and logical database designs, database Modeling, relational, hierarchical, and network models
- To understand and use data manipulation language to query, update, and manage a database
- To develop an understanding of essential Properties of DBMS concepts such as: database security, integrity, concurrency
- To design and build a simple database system and demonstrate competence with the fundamental tasks involved with modeling, designing, and implementing a DBMS.

Learning outcome

- Describe the fundamental elements of relational database management systems
- Explain the basic concepts of relational data model, entity-relationship model, relational database design, relational algebra and SQL
- Design ER-models to represent simple database application scenarios
- Convert the ER-model to relational tables, populate relational database and formulate SQL queries on data
- Improve the database design by normalization
- Familiar with basic database storage structures and access techniques: file and page organizations, indexing methods including B tree, and hashing

Course content

Module-1: DBMS Concepts [5 Hrs]

Data Abstraction - Data models and data independence. Instances and Schemas. Components of a DBMS and overall structure of a DBMS- Life Cycle of a DBMS application- Database terminology.

Module-2: Data Modeling [5Hrs]

Basic concepts- Types of data models- Conceptual, physical and logical database models- E-R data model and Object-oriented data model. Components of ER Model- ER Modeling symbols.

Entity and entity sets- Relations and relationship sets- E-R Diagrams- Reducing E-R Diagrams into tables.

Practice

Assume we have the following application that models soccer teams, the games they play, and the

players in each team. In the design, we want to capture the following:

- We have a set of teams, each team has an ID (unique identifier), name, main stadium, and to which city this team belongs.
- Each team has many players, and each player belongs to one team. Each player has a number (unique identifier), name, DoB, start year, and shirt number that he uses.
- Teams play matches, in each match there is a host team and a guest team. The match takes place in the stadium of the host team.
- For each match we need to keep track of the following:
 - The date on which the game is played
 - The final result of the match
 - The players participated in the match. For each player, how many goals he scored, whether or not he took yellow card, and whether or not he took red card.
 - During the match, one player may substitute another player. We want to capture this substitution and the time at which it took place.
 - Each match has exactly three referees. For each referee we have an ID (unique identifier), name, DoB, years of experience. One referee is the main referee and the other two are assistant referee.

Design an ER diagram to capture the above requirements. State any assumptions you have that affects your design (use the back of the page if needed). Make sure cardinalities and primary keys are clear.

Module-3: Relational DBMS Model [5 Hrs]

Basic concepts, Attributes and domains- Intention and extensions of a relation- concept of integrity and referential constraints- Relational Query Languages (Relational algebra and relational calculus (Tuple and domain relational calculus)).

Module-4: Relational Database Design [6 Hrs]

Notion of normalized relations- Normalization using Functional Dependency- First Normal form- Second Normal Form- Third Normal form- BCNF.

Practice

Perform NF on the given table

[CLICK HERE FOR TABLE](#)



Module-5: SQL [6 Hrs]

Structure of a SQL query- DDL and DML, TCL- SQL queries and sub queries- Tables, views and indexes.

Practice

To study DDL-create and DML-insert commands.

(i) Create tables according to the following definition.

```
CREATE TABLE DEPOSIT (ACTNO VARCHAR2(5) ,CNAME VARCHAR2(18) , BNAME  
VARCHAR2(18) , AMOUNT NUMBER(8,2) ,ADATE DATE);  
CREATE TABLE BRANCH(BNAME VARCHAR2(18),CITY VARCHAR2(18)); CREATE  
TABLE CUSTOMERS(CNAME VARCHAR2(19) ,CITY VARCHAR2(18));  
CREATE TABLE BORROW(LOANNO VARCHAR2(5), CNAME VARCHAR2(18), BNAME  
VARCHAR2(18), AMOUNT NUMBER (8,2));
```

(ii) Insert the data as shown below.

DEPOSIT

[CLICK HERE FOR TABLE](#)

BRANCH

[CLICK HERE FOR TABLE](#)

CUSTOMERS

[CLICK HERE FOR TABLE](#)

BORROW

[CLICK HERE FOR TABLE](#)

- (1) Describe deposit, branch.
- (2) Describe borrow, customers.
- (3) List all data from table DEPOSIT.
- (4) List all data from table BORROW.
- (5) List all data from table CUSTOMERS.
- (6) List all data from table BRANCH.
- (7) Give account no and amount of depositors.
- (8) Give name of depositors having amount greater than 4000.
- (9) Give name of customers who opened account after date '1-12-96'.

Module-6:Aggregate functions [4 Hrs]

Set Operations, predicates and joins, Set Membership- Tuple variables- Set comparison- Database modifications using SQL.

Practice

Create the below given table and insert the data accordingly.

Create Table Job (job_id, job_title, min_sal, max_sal)

COLUMN NAME DATA TYPE

job_id Varchar2(15)

job_title Varchar2(30)

min_sal Number(7,2)

max_sal Number(7,2)

Create table Employee (emp_no, emp_name, emp_sal, emp_comm, dept_no)

COLUMN NAME DATA TYPE

emp_no Number(3)

emp_name Varchar2(30)

emp_sal Number(8,2)

emp_comm Number(6,1)

dept_no Number(3)

Create table deposit(a_no,cname,bname,amount,a_date).

COLUMN NAME DATA TYPE

a_no Varchar2(5)

cname Varchar2(15)

bname Varchar2(10)

amount Number(7,2)

a_date Date

Create table borrow(loanno,cname,bname,amount).

COLUMN NAME DATA TYPE

loanno Varchar2(5)

cname Varchar2(15)

bname Varchar2(10)

amount Varchar2(7,2)

Insert following values in the table Employee.

emp_n emp_name emp_sal emp_comm dept _no

101 Smith 800 20

102 Snehal 1600 300 25

103 Adama 1100 0 20

104 Aman 3000 15

105 Anita 5000 50,000 10

106 Sneha 2450 24,500 10

107 Anamika 2975 30

Insert following values in the table job.

[CLICK HERE FOR TABLE](#)

Insert following values in the table deposit.

[CLICK HERE FOR TABLE](#)

Perform following queries

- (1) Retrieve all data from employee, jobs and deposit.
- (2) Give details of account no. and deposited rupees of customers having account opened between dates 01-01-06 and 25-07-06.
- (3) Display all jobs with minimum salary is greater than 4000.
- (4) Display name and salary of employee whose department no is 20. Give alias name to name of employee.
- (5) Display employee no,name and department details of those employee whose department lies in(10,20)

To study various options of LIKE predicate

- (1) Display all employee whose name start with 'A' and third character is 'a'.
- (2) Display name, number and salary of those employees whose name is 5 characters long and first three characters are 'Ani'.
- (3) Display the non-null values of employees and also employee name second character should be 'n' and string should be 5 character long.
- (4) Display the null values of employee and also employee name's third character should be 'a'.
- (5) What will be output if you are giving LIKE predicate as '%_%' ESCAPE '\'

To Perform various data manipulation commands, aggregate functions and sorting concept on all created tables.

- (1) List total deposit from deposit.
- (2) List total loan from karolbagh branch
- (3) Give maximum loan from branch vrce.
- (4) Count total number of customers
- (5) Count total number of customer's cities.
- (6) Create table supplier from employee with all the columns.
- (7) Create table sup1 from employee with first two columns.
- (8) Create table sup2 from employee with no data
- (9) Insert the data into sup2 from employee whose second character should be 'n' and string should be 5 characters long in employee name field.
- (10) Delete all the rows from sup1.
- (11) Delete the detail of supplier whose sup_no is 103.
- (12) Rename the table sup2.
- (13) Destroy table sup1 with all the data.
- (14) Update the value dept_no to 10 where second character of emp. name is 'm'.
- (15) Update the value of employee name whose employee number is 103.

To study Single-row functions.



- (1) Write a query to display the current date. Label the column Date
- (2) For each employee, display the employee number, job, salary, and salary increased by 15% and expressed as a whole number. Label the column New Salary
- (3) Modify your query no 4.(2) to add a column that subtracts the old salary from the new salary. Label the column Increase
- (4) Write a query that displays the employee's names with the first letter capitalized and all other letters lowercase, and the length of the names, for all employees whose name starts with J, A, or M. Give each column an appropriate label. Sort the results by the employees' last names.
- (5) Write a query that produces the following for each employee:
earns monthly
- (6) Display the name, hire date, number of months employed and day of the week on which the employee has started. Order the results by the day of the week starting with Monday.
- (7) Display the hiredate of emp in a format that appears as Seventh of June 1994 12:00:00 AM.
- (8) Write a query to calculate the annual compensation of all employees (sal+comm.).

Displaying data from Multiple Tables (join)

- (1) Give details of customers ANIL.
- (2) Give name of customer who are borrowers and depositors and having living city nagpur
- (3) Give city as their city name of customers having same living branch.
- (4) Write a query to display the last name, department number, and department name for all employees.
- (5) Create a unique listing of all jobs that are in department 30. Include the location of the department in the output
- (6) Write a query to display the employee name, department number, and department name for all employees who work in NEW YORK.
- (7) Display the employee last name and employee number along with their manager's last name and manager number. Label the columns Employee, Emp#, Manager, and Mgr#, respectively.
- (8) Create a query to display the name and hire date of any employee hired after employee SCOTT.

Module-7: Transaction Management [8 Hrs]

Subqueries, Manipulating Data, Transaction management and Concurrency control

Practice

To apply the concept of Aggregating Data using Group functions.

- (1) List total deposit of customer having account date after 1-jan-96.
- (2) List total deposit of customers living in city Nagpur.
- (3) List maximum deposit of customers living in bombay.
- (4) Display the highest, lowest, sum, and average salary of all employees. Label the columns Maximum, Minimum, Sum, and Average, respectively. Round your results to the nearest whole number.
- (5) Write a query that displays the difference between the highest and lowest salaries. Label the

column DIFFERENCE.

- (6) Create a query that will display the total number of employees and, of that total, the number of employees hired in 1995, 1996, 1997, and 1998
- (7) Find the average salaries for each department without displaying the respective department numbers.
- (8) Write a query to display the total salary being paid to each job title, within each department.
- (9) Find the average salaries > 2000 for each department without displaying the respective department numbers.
- (10) Display the job and total salary for each job with a total salary amount exceeding 3000, in which excludes president and sorts the list by the total salary.
- (11) List the branches having sum of deposit more than 5000 and located in city bombay.

To solve queries using the concept of sub query.

- (1) Write a query to display the last name and hire date of any employee in the same department as SCOTT. Exclude SCOTT
- (2) Give name of customers who are depositors having same branch city of mr. sunil.
- (3) Give deposit details and loan details of customer in same city where pramod is living.
- (4) Create a query to display the employee numbers and last names of all employees who earn more than the average salary. Sort the results in ascending order of salary.
- (5) Give names of depositors having same living city as mr. anil and having deposit amount greater than 2000
- (6) Display the last name and salary of every employee who reports to ford.
- (7) Display the department number, name, and job for every employee in the Accounting department.
- (8) List the name of branch having highest number of depositors.
- (9) Give the name of cities where in which the maximum numbers of branches are located.
- (10) Give name of customers living in same city where maximum depositors are located.

Manipulating Data

- (1) Give 10% interest to all depositors.
- (2) Give 10% interest to all depositors having branch vrce
- (3) Give 10% interest to all depositors living in n
agpur and having branch city bombay.
- (4) Write a query which changes the department number of all employees with empno 7788's job to employee 7844's current department number.
- (5) Transfer 10 Rs from account of anil to sunil if both are having same branch.
- (6) Give 100 Rs more to all depositors if they are maximum depositors in their respective branch.
- (7) Delete depositors of branches having number of customers between 1 to 3.
- (8) Delete deposit of vijay.
- (9) Delete borrower of branches having average loan less than 1000.



To apply the concept of security and privileges.

To study Transaction control commands

[VIRTUAL LAB](#)

TEXT BOOKS

Database Management Systems: Raghu Ramakrishnan

ORACLE PL/SQL Programming – Scott Urman BPB Publications.

REFERENCES

Database Systems Concepts – Henry F Korth, Abraham Silberschatz.

Database Management Systems – Alexis Leon, Mathews Leon – Leon, Vikas Publications

Programming in Java(Same as Java Technologies)

Code	Course Title	Credit	T-P-PJ
CUTM1058	Programming in Java(Same as Java Technologies)	3	2-1-0

Objective

- Understand fundamentals of programming such as variables, conditional and iterative execution, methods, etc.
- Understand fundamentals of object-oriented programming in Java, including defining classes, invoking methods, using class libraries, etc.
- Be aware of the important topics and principles of software development
- Have the ability to write a computer program to solve specified problems
- Have the ability to write a computer program to solve specified problems
- Be able to use the Java SDK environment to create, debug and run simple Java programs

Learning outcome

- Use an integrated development environment to write, compile, run, and test simple object-oriented Java programs
- Read and make elementary modifications to Java programs that solve real-world problems
- Identify and fix defects the common safety issues in code
- Document a Java program using Javadoc
- Use a version control system to track source code in a project
- Qualify confidently any interview process where Java is the requirement

Course content

Module I: Introduction to Java (8 hrs)

Features and Installation, Java Programming Basics, Decision Making and Looping, Class and Object, Inheritance

Practice 1 (1 Hr)

Practice 2 (1 Hr)

Module II: Package and Safe Code (5 Hr)

Interfaces, Packages and Access Protection, Exception Handling (Fault Tolerant Programming)

Practice 3 (1 Hr)



Module III: Collection and Threads (5 Hr)

ArrayList, Vector, Set, Map, Multi-threaded Programming, Synchronization

Practice 4 (1 Hr)

Module IV: Language and Utility Packages (5 Hr)

String Handling, Wrappers, Runtime Memory Management, Cloning, Calendar, Date and Time Facilities, Scanner, Internationalization

Practice 5 (1 Hr)

Practice 6 (1 Hr)

Module V: Input/ Output and Applets (5 Hr)

Byte and Character Stream I/O, Persistence, Applet: Architecture, Skeleton, and Implementation

Practice 7 (1 Hr)

Practice 8 (1 Hr)

Module VI: GUI Programming (5 Hr)

AWT: Container, Components, Layout Managers, Event Handling

Practice 9 (1 Hr)

Practice 10 (1 Hr)

Module VII: Networking and Advanced (5 Hr)

Networking Fundamental, Client-Server Communication, Remote Method Invocation (RMI), Java Virtual Machine (JVM) Tuning, Java Profiler

Practice 11 (1 Hr)

Practice 12 (1 Hr)

Text Book(s):

1. Java The Complete Reference, Fifth Edition, C25 Herbert Schildt, McGraw-Hills

Reference Book(s):



1. Murach's Java Programming, 5th Edition, Joel Murach, Mike Murach & Associates, 2011, ISBN-78-1-943872-07-7
2. Introduction to Java Programming, Comprehensive, 10th ed., Y. Daniel Liang, 2014. ISBN-10: 0133813460, ISBN-13: 9780133813463

<https://nqr.gov.in/qualification-title?nid=3002>
<https://www.cdac.in/index.aspx?id=DAC&courseid=0#>
<https://canvas.harvard.edu/courses/63117/assignments/syllabus>
<https://canvas.harvard.edu/courses/69911/assignments/syllabus>
<https://xid.harvard.edu/xid-apps/submitAccountForm.do>

YouTube Resources:

- freeCodeCamp.org
- Codearchery
- Edureka
- free project
- Jenkov

Online Source(s):

1. <https://docs.oracle.com/javase/tutorial/java/index.html>
2. <https://www.programiz.com/java-programming>
3. <https://marcus-biel.com/>

Software/Tool(s): Java 8, Eclipse IDE

Online Compiler: <https://ideone.com/>

Online Coding Practice: <https://www.hackerrank.com/>

List of Practices:

Practice 1 (Module-I)

Program-1:

Write a program that computes the standard deviation of a set of floating point numbers that the user enters. First the user says how many numbers N are to follow. Then the program asks for and reads in



each floating point number. Finally it writes out the standard deviation. The standard deviation of a set of numbers X_i is:

$$SD = \text{Math.sqrt}(\text{avgSquare} - \text{avg}^2)$$

Here, avg is the average of the N numbers, and avg^2 is its square.

avgSquare is the average of $X_i * X_i$. In other words, this is the average of the squared value of each floating point number.

For example, if $N = 4$, say the numbers were:

$X_i \quad X_i * X_i$

2.0 4.0

3.0 9.0

1.0 1.0

2.0 4.0

sum 8.0 18.0

Now:

$$\text{avg} = 8.0/4 = 2.0$$

$$\text{avg}^2 = 4.0$$

$$\text{avgSquare} = 18.0/4 = 4.5$$

$$SD = \text{Math.sqrt}(4.5 - 4.0) = \text{Math.sqrt}(.5) = 0.7071067812$$

To do this you will need to do several things inside the loop body for each floating point value as it comes in: add it to a sum, square it and add it to a sum of squares. Then after the loop is finished apply the formula.

Program-2 and Program-3:

Two suggested competitive programs to solve on HackerRank

<https://www.hackerrank.com/domains/java>

Practice 2 (Module-I)

Program-1:

Better encapsulation of the Goods class would call making instance variables private and using getter and setter methods to access them. A further refinement would be to make the class abstract and to define additional child classes. Here is a revised Goods class:

```
public abstract class GoodsSGA
{
    private String description;
    private double price;
    private int quantity;
    public GoodsSGA( String des, double pr, int quant )
    {description = des;
    price = pr;
    quantity = quant;}
    double getPrice()
    {return price;}
    void setPrice( double newPrice)
    {price = newPrice;}
    int getQuantity()
    {return quantity;}
    void setQuantity ( int newQuantity )
    {quantity = newQuantity;}
    public String toString()
    {return "item: " + description + " quantity: " + quantity + " price: " + price ;}
```

Revise the source code for the classes Food, Toy, and Book. (Perhaps call the revised classes FoodSG,



ToySG, and BookSG.) create a new class ToiletrySG for things like bubble bath. Create a new testing class, StoreSG to test your revised classes.

Note: the child classes will need to use the getter and setter methods to access the instance variables that are declared as private in GoodsSG.

Program-2 and Program-3:

Two suggested competitive programs to solve on HackerRank

<https://www.hackerrank.com/domains/java>

Practice 3 (Module-II)

Program-1:

User-Friendly Division Practice:

Put in a loop so that the user is repeatedly asked for the numerator and the divisor. For each set of data, the program prints out the result, or an informative error message if there is a problem (division by zero or poor input data).

The program continues looping, even if there is a problem Exit the loop when data entered for the numerator start with characters "q" or "Q". Don't print out an error message in this case.

Don't ask for the divisor if the user just asked to quit.

Here is sample output from one run:

Enter the numerator: 12

Enter the divisor: 4

12 / 4 is 3

Enter the numerator: 12

Enter the divisor : 0

You can't divide 12 by 0

Enter the numerator: glarch

You entered bad data.

Please try again.



Enter the numerator: quit

You will need to use the method `charAt()` from the `String` class.

Program-2 and Program-3:

Two suggested competitive programs to solve on HackerRank

<https://www.hackerrank.com/domains/java>

Practice 4 (Module-III)

Program-1:

In mathematics, several operations are defined on sets. The union of two sets A and B is a set that contains all the elements that are in A together with all the elements that are in B. The intersection of A and B is the set that contains elements that are in both A and B. The difference of A and B is the set that contains all the elements of A except for those elements that are also in B.

Suppose that A and B are variables of type `Set` in Java. The mathematical operations on A and B can be computed using methods from the `Set` interface. In particular:

`A.addAll(B)` computes the union of A and B; `A.retainAll(B)` computes the intersection of A and B; and `A.removeAll(B)` computes the difference of A and B. (These operations change the contents of the set A, while the mathematical operations create a new set without changing A, but that difference is not relevant to this exercise.)

For this exercise, you should write a program that can be used as a “set calculator” for simple operations on sets of non-negative integers. (Negative integers are not allowed.) A set of such integers will be represented as a list of integers, separated by commas and, optionally, spaces and enclosed in square brackets. For example: `[1,2,3]` or `[17, 42, 9, 53,108]`. The characters `+`, `*`, and `-` will be used for the union, intersection, and difference operations. The user of the program will type in lines of input containing two sets, separated by an operator. The program should perform the operation and print the resulting set.



Here are some examples:

Input Output

[1, 2, 3] + [3, 5, 7] [1, 2, 3, 5, 7]

[10,9,8,7] * [2,4,6,8] [8]

[5, 10, 15, 20] - [0, 10, 20] [5, 15]

To represent sets of non-negative integers, use sets of type `TreeSet<Integer>`. Read the user's input, create two `TreeSets`, and use the appropriate `TreeSet` method to perform the requested operation on the two sets. Your program should be able to read and process any number of lines of input. If a line contains a syntax error, your program should not crash. It should report the error and move on to the next line of input. (Note: To print out a Set, A, of Integers, you can just say `System.out.println(A)`. We've chosen the syntax for sets to be the same as that used by the system for outputting a set.)

Program-2 and Program-3:

Two suggested competitive programs to solve on HackerRank

<https://www.hackerrank.com/domains/java>

Practice 5 (Module-IV)

Program-1:

Password Checker:

Write a program that repeatedly asks the user for a proposed password until the user enters an acceptable password. When the user enters an acceptable password, the program writes a message and exits.

Acceptable passwords:

Are at least 7 characters long.

Contain both upper and lower case alphabetic characters. Contain at least 1 digit. The logic of this program can be quite tricky. Hint: use `toUpperCase()`, `toLowerCase`, and `equals()`. You will also need nested ifs.

Here is a run of the program:

Enter your password:

snowflake

That password is not acceptable.

Enter your password:

SnowFlake

That password is not acceptable.

Enter your password:

snowflake47

That password is not acceptable.

Enter your password:

Snowflake47

Acceptable password.

Program-2 and Program-3:

Two suggested competitive programs to solve on HackerRank

<https://www.hackerrank.com/domains/java>

Practice 6 (Module-IV)

Program-1:

Secret Code:

A text message has been encoded by replacing each character of the message with an integer. Each integer is an index into a key-phrase that contains all the lower case letters of the alphabet as well as the space character. The key-phrase may contain the same character in several locations. The encoded text is series of integers, like this:



35 10 10 33 9 24 3 17 41 8 3 20 51 16 38 44 47 32 33 10 19 38 35 28 49

To decode the message, look up each integer in the key-phrase and output the corresponding character.

For example, say that the key-phrase is this (the index of each character has been written above it):

111111111122222222223333333333444444444455

0123456789012345678901234567890123456789012345678901

six perfect quality black jewels amazed the governor

using each integer from the encoded text as an index into the phrase results in the decoded message:

attack the bridge at dawn

Write a program that decodes a secret message contained in a text file. The first line of the text file contains the key-phrase. Then the file contains a sequence of integers, each of which indexes the key-phrase. Find the character corresponding to each integer and output the secret message. Note if a character character such as 'e' occurs several places in the key-phrase it may be encoded as different integers in different parts of the secret message.

(The recipient of the secret message gets only the file of integers and must put the key-phrase at the top of the file.) For example, here is the contents of a secret message file ready for the program:

six perfect quality black jewels amazed the governor

35 10 10 33 9 24 3 17 41 8 3 20 51 16 38 44 47 32 33 10 19 38 35 28 49

Here is a sample run of the program:

```
C:\> java Decode < secretFile.txt
```

attack the bridge at dawn

You will need the charAt() method of String.

Here is another secret message file, with key-phrase inserted, that you can use to test your program:

six perfect quality black jewels amazed the governor

31 16 2 3 4 42 48 7 27 9 10 43 12 13 35 15 1 40 18 3

20 15 33 23 24 32 26 29 28 27 21 31 25 14 34 14 36

42 38 19 40 41 27 3 44 50 46 42 48 49 50 6



Program-2 and Program-3:

Two suggested competitive programs to solve on HackerRank

<https://www.hackerrank.com/domains/java>

Practice 7 (Module-V)

Program-1:

Stop Word Remover:

Write a program that reads in a file of text, perhaps the text of a novel. The program copies the same text to an output file, except that all the useless words such as "the", "a", and "an" are removed. (Decide on what other words you wish to remove. The list of words removed is called a stop list.) Do this by reading the text file token by token using `hasNext()` and `next()`, but only writing out tokens not on the stop list.

Prompt the user for the names of the input and output files.

Fairly Easy: The output file will have only N tokens per line. Do this by counting tokens as you output them. N will be something like 10 or 12.

Improved Program: Preserve the line structure of the input file. Do this by reading each line using `nextLine()` and then creating a new `Scanner` for that line. (Look at the on-line documentation for `Scanner`.)

With each line's `Scanner`, use `hasNext()` and `next()` to scan through its tokens.

Harder: Write out no more than N characters per line. N will be something like 50. Do this by keeping count of the number of characters written out per line. The `length()` method of `String` will be useful. If X characters has already been written to the current line, and if X plus the length of the current token exceeds N , then start a new line.



Program-2 and Program-3:

Two suggested competitive programs to solve on HackerRank

<https://www.hackerrank.com/domains/java>

Practice 8 (Module-V)

Program-1:

E-Mail Address Extractor:

Write a program that scans a text file for possible e-mail addresses. Addresses look like this:

someone@somewhere.net

Read tokens from the input file one by one using `hasNext()` and `next()`. With the default delimiters of `Scanner`, an entire e-mail address will be returned as one token. Examine each token using the `indexOf()` method of `String`. If a token contains an at sign `@` followed some characters later by a period, regard it as a possible e-mail address and write it to the output file.

Programs such as this scan through web pages looking for e-mail addresses that become the targets of spam. Because of this, many web pages contain disguised e-mail addresses that can't easily be automatically extracted.

Program-2 and Program-3:

Two suggested competitive programs to solve on HackerRank

<https://www.hackerrank.com/domains/java>

Practice 9 (Module-VI)

Program-1:

User-friendly Fat Calculator, with Advice:

Further modify the calories from fat calculator so that it includes another `TextField` that will be set with the text "Too many fat calories" if the percentage of calories from fat is equal or greater than 30 percent, or to "Healthy amount of fat" if the percentage is less than that.

Program-2 and Program-3:

Two suggested competitive programs to solve on HackerRank



<https://www.hackerrank.com/domains/java>

Practice 10 (Module-VI)

Program-1:

Three Button Monte:

Write a program to implement a game:

There are three buttons in the frame. Two of the buttons cause the program to quit using `System.exit(0)`; the remaining button changes the frame to green (a win!) The winning button is different each time the game is played.

The easy way to do this (although it seems unfair to the user) treats each button the same way. The `actionPerformed()` method does not check which button was clicked. When any button is clicked, the method picks a random integer from 0 to 2 and performs the "winning" action if the integer happens to be 0. Otherwise, it performs the "losing" action. To the user, it seems like there is a "winning" button and two "losing" buttons. But, in fact, it does not matter which button was clicked.

This is similar to some electronic gambling devices in casinos, where it appears to the user that there are "winning moves" and "losing moves" but in fact the machine actually ignores what the user has done and just declares a "win" every now and then, according to predetermined odds.

You will need the `Random` class:

```
Random randNum = new Random(); // create a Random number object
```

```
...
```

```
int someInt = randNum.nextInt(3); // someInt gets a number from 0 to 2
```

Program-2 and Program-3:

Two suggested competitive programs to solve on HackerRank

<https://www.hackerrank.com/domains/java>

Practice 11 (Module-VII)

Content Delivery with Networking:



Write a Client-Server program where the client queries with a name of file and the server delivers the content of requested files to the client over the network.

(Improve the program by making the server multi-threaded)

Practice 12 (Module-VII)

Greet the user with Remote Method Invocation:

Write a program using RMI, where the user invokes a method on remote object with username as parameter and receives a greeting message based on time of the day along with username.

Projects

However, not limited to:

1. Chat application
2. Text Editor application
3. GUI based Scientific Calculator
4. Paint application
5. Slam book

(*PROJECT REVIEWS WILL COMMENCE BEYOND CLASS HOURS)

Monitoring:

Credit will be received only on making an honest effort. It is expected that students will finish watching all lecture video and complete all challenge problems by the end of each lecture week.

Borrowing code from other sources is allowed only with proper attribution and credit given to the original author(s).

List of Common Programs to solve using Java:

1. Program to calculate area of a triangle

2. Program to solve quadratic equation

3. Program to swap two variables (with and without using third variable)

4. *Program to generate random numbers in various ways*
5. *Program to convert miles to kilometers and vice-versa*
6. *Program to convert celsius to fahrenheit and vice-versa*
7. *Program to check if a number is odd or even*
8. *Program to check if input year is leap year*
9. *Program to test primality*
10. *Program to print all prime numbers in an interval using "Sieve of Eratosthenes"*
11. *Program to generate factorial of all elements in an array*
12. *Program to display the multiplication table up to 20*
13. *Program to print the fibonacci sequence*
14.
Program to check armstrong number, perfect number, Harshad number
15. *Program to generate armstrong numbers in an Interval*
16. *Program to find the sum of Harshad numbers in an interval*
17. *Program to display powers of two Using lambda*
18. *Program to perform conversions among decimal to binary, octal and hexadecimal*
19. *Program to display ASCII table*
20. *Program to find HCF/GCD and LCM*
21. *Program to find factors of given natural number*
22. *Program to make a simple calculator*

23. *Program to shuffle deck of cards*
24. *Program to generate fibonacci sequence using recursion*
25. *Program to find sum of natural numbers using recursion*
26. *Program to find factorial of number using recursion*
27. *Program to convert decimal to binary using recursion*
28. *Program to add two matrices*
29. *Program to obtain transpose of a matrix*
30. *Program to multiply two matrices*
31. *Program to check if a string is palindrome*
32. *Program to remove punctuations from a string*
33. *Program to sort words lexicographically*
34. *Program to illustrate different set operations*
35. *Program to count frequency of each vowel in a string*
36. *Program to find hash value of a file*

This course on courseware: <http://courseware.cutm.ac.in/courses/java-technologies/>

Database Management Systems

Code	Course Title	Credit	T-P-PJ
CUTM1059	Database Management Systems	3	2-1-0

Objective

- To understand the different issues involved in the design and implementation of a database system.
- To study the physical and logical database designs, database Modeling, relational, hierarchical, and network models
- To understand and use data manipulation language to query, update, and manage a database
- To develop an understanding of essential Properties of DBMS concepts such as: database security, integrity, concurrency
- To design and build a simple database system and demonstrate competence with the fundamental tasks involved with modeling, designing, and implementing a DBMS.

Learning outcome

- Describe the fundamental elements of relational database management systems
- Explain the basic concepts of relational data model, entity-relationship model, relational database design, relational algebra and SQL
- Design ER-models to represent simple database application scenarios
- Convert the ER-model to relational tables, populate relational database and formulate SQL queries on data
- Improve the database design by normalization
- Familiar with basic database storage structures and access techniques: file and page organizations, indexing methods including B tree, and hashing

Course content

Module-1: DBMS Concepts [5 Hrs]

Data Abstraction - Data models and data independence. Instances and Schemas. Components of a DBMS and overall structure of a DBMS- Life Cycle of a DBMS application- Database terminology.

Module-2: Data Modeling [5Hrs]

Basic concepts- Types of data models- Conceptual, physical and logical database models- E-R data model and Object-oriented data model. Components of ER Model- ER Modeling symbols. Entity and entity sets- Relations and relationship sets- E-R Diagrams- Reducing E-R Diagrams into tables.

Practice

Assume we have the following application that models soccer teams, the games they play, and

the

players in each team. In the design, we want to capture the following:

- We have a set of teams, each team has an ID (unique identifier), name, main stadium, and to which city this team belongs.
- Each team has many players, and each player belongs to one team. Each player has a number (unique identifier), name, DoB, start year, and shirt number that he uses.
- Teams play matches, in each match there is a host team and a guest team. The match takes place

place

in the stadium of the host team.

- For each match we need to keep track of the following:
 - The date on which the game is played
 - The final result of the match
 - The players participated in the match. For each player, how many goals he scored, whether or not he took yellow card, and whether or not he took red card.
 - During the match, one player may substitute another player. We want to capture this substitution and the time at which it took place.
 - Each match has exactly three referees. For each referee we have an ID (unique identifier), name, DoB, years of experience. One referee is the main referee and the other two are assistant referee.

Design an ER diagram to capture the above requirements. State any assumptions you have that affects your design (use the back of the page if needed). Make sure cardinalities and primary keys are clear.

Module-3: Relational DBMS Model [5 Hrs]

Basic concepts, Attributes and domains- Intention and extensions of a relation- concept of integrity and referential constraints- Relational Query Languages (Relational algebra and relational calculus (Tuple and domain relational calculus).

Module-4: Relational Database Design [6 Hrs]

Notion of normalized relations- Normalization using Functional Dependency- First Normal form- Second Normal Form- Third Normal form- BCNF.

Practice

Perform NF on the given table

[CLICK HERE FOR TABLE](#)

Module-5: SQL [6 Hrs]

Structure of a SQL query- DDL and DML, TCL- SQL queries and sub queries- Tables, views and indexes.

Practice

To study DDL-create and DML-insert commands.

(i) Create tables according to the following definition.

```
CREATE TABLE DEPOSIT (ACTNO VARCHAR2(5) ,CNAME VARCHAR2(18) , BNAME
VARCHAR2(18) , AMOUNT NUMBER(8,2) ,ADATE DATE);
```

```
CREATE TABLE BRANCH(BNAME VARCHAR2(18),CITY VARCHAR2(18)); CREATE
TABLE CUSTOMERS(CNAME VARCHAR2(19) ,CITY VARCHAR2(18));
```

```
CREATE TABLE BORROW(LOANNO VARCHAR2(5), CNAME VARCHAR2(18), BNAME
```

VARCHAR2(18), AMOUNT NUMBER (8,2));

(ii) Insert the data as shown below.

DEPOSIT

[CLICK HERE FOR TABLE](#)

BRANCH

[CLICK HERE FOR TABLE](#)

CUSTOMERS

[CLICK HERE FOR TABLE](#)

BORROW

[CLICK HERE FOR TABLE](#)

- (1) Describe deposit, branch.
- (2) Describe borrow, customers.
- (3) List all data from table DEPOSIT.
- (4) List all data from table BORROW.
- (5) List all data from table CUSTOMERS.
- (6) List all data from table BRANCH.
- (7) Give account no and amount of depositors.
- (8) Give name of depositors having amount greater than 4000.
- (9) Give name of customers who opened account after date '1-12-96'.

Module-6:Aggregate functions [4 Hrs]

Set Operations, predicates and joins, Set Membership- Tuple variables- Set comparison- Database modifications using SQL.

Practice

Create the below given table and insert the data accordingly.

Create Table Job (job_id, job_title, min_sal, max_sal)

COLUMN NAME DATA TYPE

job_id Varchar2(15)

job_title Varchar2(30)

min_sal Number(7,2)

max_sal Number(7,2)

Create table Employee (emp_no, emp_name, emp_sal, emp_comm, dept_no)

COLUMN NAME DATA TYPE

emp_no Number(3)

emp_name Varchar2(30)

emp_sal Number(8,2)

emp_comm Number(6,1)

dept_no Number(3)

Create table deposit(a_no,cname,bname,amount,a_date).

COLUMN NAME DATA TYPE

a_no Varchar2(5)

cname Varchar2(15)

bname Varchar2(10)

amount Number(7,2)

a_date Date

Create table borrow(loanno,cname,bname,amount).

COLUMN NAME DATA TYPE

loanno Varchar2(5)

cname Varchar2(15)

bname Varchar2(10)

amount Varchar2(7,2)

Insert following values in the table Employee.

emp_n emp_name emp_sal emp_comm dept_no

101 Smith 800 20

102 Snehal 1600 300 25

103 Adama 1100 0 20

104 Aman 3000 15

105 Anita 5000 50,000 10

106 Sneha 2450 24,500 10

107 Anamika 2975 30

Insert following values in the table job.

[CLICK HERE FOR TABLE](#)

Insert following values in the table deposit.

[CLICK HERE FOR TABLE](#)

Perform following queries

(1) Retrieve all data from employee, jobs and deposit.

(2) Give details of account no. and deposited rupees of customers having account opened between dates 01-01-06 and 25-07-06.

(3) Display all jobs with minimum salary is greater than 4000.

(4) Display name and salary of employee whose department no is 20. Give alias name to name of employee.

(5) Display employee no,name and department details of those employee whose department lies in(10,20)

To study various options of LIKE predicate

(1) Display all employee whose name start with 'A' and third character is 'a'.

(2) Display name, number and salary of those employees whose name is 5 characters long and first three characters are 'Ani'.

(3) Display the non-null values of employees and also employee name second character should be 'n' and string should be 5 character long.

(4) Display the null values of employee and also employee name's third character should be 'a'.

(5) What will be output if you are giving LIKE predicate as '%_%' ESCAPE '\'

To Perform various data manipulation commands, aggregate functions and sorting concept on all created tables.

(1) List total deposit from deposit.

(2) List total loan from karolbagh branch

(3) Give maximum loan from branch vrce.

(4) Count total number of customers

(5) Count total number of customer's cities.

(6) Create table supplier from employee with all the columns.

- (7) Create table sup1 from employee with first two columns.
- (8) Create table sup2 from employee with no data
- (9) Insert the data into sup2 from employee whose second character should be 'n' and string should be 5 characters long in employee name field.
- (10) Delete all the rows from sup1.
- (11) Delete the detail of supplier whose sup_no is 103.
- (12) Rename the table sup2.
- (13) Destroy table sup1 with all the data.
- (14) Update the value dept_no to 10 where second character of emp. name is 'm'.
- (15) Update the value of employee name whose employee number is 103.

To study Single-row functions.

- (1) Write a query to display the current date. Label the column Date
- (2) For each employee, display the employee number, job, salary, and salary increased by 15% and expressed as a whole number. Label the column New Salary
- (3) Modify your query no 4.(2) to add a column that subtracts the old salary from the new salary. Label the column Increase
- (4) Write a query that displays the employee's names with the first letter capitalized and all other letters lowercase, and the length of the names, for all employees whose name starts with J, A, or M. Give each column an appropriate label. Sort the results by the employees' last names.
- (5) Write a query that produces the following for each employee:
earns monthly
- (6) Display the name, hire date, number of months employed and day of the week on which the employee has started. Order the results by the day of the week starting with Monday.
- (7) Display the hiredate of emp in a format that appears as Seventh of June 1994 12:00:00 AM.
- (8) Write a query to calculate the annual compensation of all employees (sal+comm.).

Displaying data from Multiple Tables (join)

- (1) Give details of customers ANIL.
- (2) Give name of customer who are borrowers and depositors and having living city nagpur
- (3) Give city as their city name of customers having same living branch.
- (4) Write a query to display the last name, department number, and department name for all employees.
- (5) Create a unique listing of all jobs that are in department 30. Include the location of the department in the output
- (6) Write a query to display the employee name, department number, and department name for all employees who work in NEW YORK.
- (7) Display the employee last name and employee number along with their manager's last name and manager number. Label the columns Employee, Emp#, Manager, and Mgr#, respectively.
- (8) Create a query to display the name and hire date of any employee hired after employee SCOTT.

Module-7: Transaction Management [8 Hrs]

Subqueries, Manipulating Data, Transaction management and Concurrency control

Practice

To apply the concept of Aggregating Data using Group functions.

- (1) List total deposit of customer having account date after 1-jan-96.
 - (2) List total deposit of customers living in city Nagpur.
 - (3) List maximum deposit of customers living in bombay.
 - (4) Display the highest, lowest, sum, and average salary of all employees. Label the columns Maximum, Minimum, Sum, and Average, respectively. Round your results to the nearest whole number.
 - (5) Write a query that displays the difference between the highest and lowest salaries. Label the column DIFFERENCE.
 - (6) Create a query that will display the total number of employees and, of that total, the number of employees hired in 1995, 1996, 1997, and 1998
 - (7) Find the average salaries for each department without displaying the respective department numbers.
 - (8) Write a query to display the total salary being paid to each job title, within each department.
 - (9) Find the average salaries > 2000 for each department without displaying the respective department numbers.
 - (10) Display the job and total salary for each job with a total salary amount exceeding 3000, in which excludes president and sorts the list by the total salary.
 - (11) List the branches having sum of deposit more than 5000 and located in city bombay.
- To solve queries using the concept of sub query.

- (1) Write a query to display the last name and hire date of any employee in the same department as SCOTT. Exclude SCOTT
- (2) Give name of customers who are depositors having same branch city of mr. sunil.
- (3) Give deposit details and loan details of customer in same city where pramod is living.
- (4) Create a query to display the employee numbers and last names of all employees who earn more than the average salary. Sort the results in ascending order of salary.
- (5) Give names of depositors having same living city as mr. anil and having deposit amount greater than 2000
- (6) Display the last name and salary of every employee who reports to ford.
- (7) Display the department number, name, and job for every employee in the Accounting department.
- (8) List the name of branch having highest number of depositors.
- (9) Give the name of cities where in which the maximum numbers of branches are located.
- (10) Give name of customers living in same city where maximum depositors are located.

Manipulating Data

- (1) Give 10% interest to all depositors.
- (2) Give 10% interest to all depositors having branch vnce
- (3) Give 10% interest to all depositors living in n agpur and having branch city bombay.
- (4) Write a query which changes the department number of all employees with empno 7788's job to employee 7844's current department number.
- (5) Transfer 10 Rs from account of anil to sunil if both are having same branch.
- (6) Give 100 Rs more to all depositors if they are maximum depositors in their respective branch.
- (7) Delete depositors of branches having number of customers between 1 to 3.



(8) Delete deposit of vijay.

(9) Delete borrower of branches having average loan less than 1000.

To apply the concept of security and privileges.

To study Transaction control commands

[VIRTUAL LAB](#)

TEXT BOOKS

Database Management Systems: Raghu Ramakrishnan

ORACLE PL/SQL Programming – Scott Urman BPB Publications.

REFERENCES

Database Systems Concepts – Henry F Korth, Abraham Silberschatz.

Database Management Systems – Alexis Leon, Mathews Leon – Leon, Vikas Publications

The following colour represents the syllabus revision, skill, employability and entrepreneurship.

Green : Skill

Pink : Employability

Sky : Entrepreneurship

Centurion University of Technology and Management Odisha

CHOICE BASED CREDIT SYSTEM

COURSE STRUCTURE & SYLLABUS

BASKET - I



**Centurion
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School of Engineering & Technology

2021

**Course Structure
Basket - I**

Course Code	Course Title	Credits	Course Type T+P+PJ
CUTM1001	Differential Equations and Linear Algebra	3	2+0+1
CUTM1002	Laplace & Fourier Transforms	3	2+0+1
CUTM1003	Complex Analysis & Numerical Methods	3	2+0+1
CUTM1004	Discrete Mathematics	3	2+0+1
CUTM1005	Probability & Statistics	3	2+0+1
CUTM1925	Calculus	3	2+0+1
CUTM1006	Mechanics for Engineers	3	2+1+0
CUTM1007	Optics and Optical Fibres	3	2+1+0
CUTM1008	Applied Analytical Chemistry	3	2+1+0
CUTM1009	Applied Engineering Materials	3	2+0+1
CUTM1010	Environmental Studies	2	0+0+2

Syllabus

Differential Equations and Linear Algebra

Code	Course Title	Credit	T-P-PJ
CUTM1001	Differential Equations and Linear Algebra	3	2-0-1

Objective

- Introduce students to how to solve linear Differential Equations with different methods.
- To solve the system of linear equations appearing in the problems of electrical engineering, mechanical engineering etc.
- To use Eigen values and Eigen vectors in Control theory, vibration analysis, electric circuits, advanced dynamics problems.
- Introduce students how to solve first order and second order differential equations

Course outcome

- Understand the importance of linear functions in mathematics.
- Solve systems of linear equations using Gauss- elimination to reduce to echelon form.
- Learn fundamental concepts of ODE theories and where and how such equations arise in applications to scientific and engineering problems.
- Be competent in solving linear/non-linear 1st & higher order ODEs using analytical methods to obtain their exact solutions

Course content

Module-I

First order linear differential equations and its applications(Kirchhoff's law)

Project-1:Some applications of differential equations in RL electrical circuit problems

Module-II:

Second order linear homogeneous differential equations (Real roots, Real equal roots, Complex conjugate roots) and its applications.

Project-2: RLC Circuit, Pendulum

Module-III:

Second order linear non-homogeneous differential equations, Finding particular integral consisting of exponential, trigonometric functions (Sine, cosine) using inverse operator method

Project-3: Simple mass-spring system, Damped vibration system

Module IV:

Basic concepts of a matrices, solution of linear system of equations by Gauss elimination method, linearly independent and dependent of a vectors, rank of a matrix.

Project-4

Report on finding the traffic flow in the net of one-way streets

Module V:

Determinants and Cramer's Rule, Fundamental theorem of linear system of equations.

Module VI:

Eigenvalues and Eigen vectors of a matrix

Project-5

(i) Find the limit states of the Markov process model.

(ii) Find the growth rate in the Leslie model

Module VII:

Symmetric, Skew-Symmetric, Orthogonal Matrices and Properties

Project-6

To make a report to show that the product of two orthogonal matrices is orthogonal, and so is the inverse of an orthogonal matrix. What does this mean in terms of rotations?

Text Books:

1. Advanced engineering mathematics by Erwin Kreyszig, 8th edition
Chapter-6 (6.1-6.6), Chapter-7 (7.1,7.2)
2. Higher Engineering by B.V. Ramana
Chapter-8(8.1,8.2,8.21), Chapter-9 (9.2,9.3,9.5)

Reference Books:

1. J. Sinha Roy and S. Padhy, A Course of Ordinary and Partial Differential Equations, Kalyani Publishers, New Delhi.
2. G.B. Thomas, M.D. Weir, J.R. Hass, Thomas' Calculus, Pearson Publication.
3. R.G. Bartle, D.R. Sherbert, Introduction to Real Analysis, Wiley Publication

Laplace and Fourier Transform

Code	Course Title	Credit	T-P-PJ
CUTM1002	Laplace and Fourier Transform	3	2-0-1

Objective

- To describe the ideas of Fourier and Laplace Transforms and indicate their applications in the fields such as application of PDE, Digital Signal Processing, Image Processing, Theory of wave equations, Differential Equations and many others.
- To use Fourier series for solving boundary value problems appearing in scientific & engineering problems.

Course outcome

- Solve differential equations with initial conditions using Laplace transform.
- Evaluate the Fourier transform of a continuous function and be familiar with its basic properties.

Course content

Module-I (T-3-Pj-2)

Laplace Transforms, Properties of Laplace transforms, Unit step function.

Project-1

Make a short draft of properties of Laplace transform from memory. Then compare your notes with the text and write a report of 2-3 pages on these operations and their significance in applications.

Module-II (T-2-Pj-2)

Second shifting theorem, Laplace transforms of Derivatives and Integrals

Project-2

Find the Laplace transform of the following functions

Module-III (T-3-Pj-2)

Derivatives and Integrals of Transforms, Inverse Laplace transform.

Project 3:

Application of Unit step function (RC- Circuit to a single square wave).

Module- IV (T-2-Pj-2)

Solution of Differential Equation by using Laplace Transform.

Project 4: Find the solution of differential equation by using Laplace Transform.

Module-V (T-4-Pj-2)

Periodic function, Fourier series, Fourier series expansion of an arbitrary period, Half range expansions.

Project-5

Find the Fourier series expansion of a 2π periodic function.

Module-VI(T-3-Pj-2)

Complex form of Fourier series, Fourier Integrals, Different forms of Fourier Integral.

Project-6

Find the Fourier sine and cosine integral of the following functions.

Module-VII(T-3)

Fourier Transforms, Fourier sine and cosine Transforms.

Text Books:

- E. Kreyszig , Advanced Engineering Mathematics, Johnwiley& Sons Inc-8th Edition.Chapters:5(5.1 to 5.4(without Dirac's delta function)),10(10.1,10.4 and 10.7-10.9(definitions only , no proofs))
- Highjer Engineering Mathematics by B.V.Ramana, Tata McGraw-Hill Education India, Inc-8th Edition.

Reference Books:

- 1) Advanced Engineering Mathematics by P.V.O' Neil Publisher: Thomson
- 2) Mathematical Methods by Potter & Goldberg ; Publisher : PHI

Complex Analysis and Numerical Methods

Code	Course Title	Credit	T-P-PJ
CUTM1003	Complex Analysis and Numerical Methods	3	2-0-1

Objective

- To understand about Complex variables and complex functions.
- To acquire the skill of evaluating contour integrals using Cauchy's integral formula and Cauchy's integral theorem.
- To understand the limitations of analytical methods and the need for numerical methods and the ability to apply these numerical methods to obtain the approximate solutions to engineering and mathematical problems.

Course Outcome

- To get equipped with the understanding of the fundamental concepts of functions of a complex variable along with the concepts of analyticity, Cauchy-Riemann relations and harmonic functions.
- Evaluate complex contour integrals applying the Cauchy integral theorem, Cauchy integral formula.
- Derive a variety of numerical methods for finding out solutions of various mathematical problems arising in roots of linear and non-linear equations, Solving differential equations with initial conditions and Evaluating real definite integrals.

Course Outline

Module I (T-3 hrs-P-0-hrs-P-0 hrs)

Functions of a complex variable, Analytic functions, Cauchy-Riemann equations (Without Proof), Harmonic and Conjugate harmonic functions, Cauchy's Integral Theorem (Without Proof).

Project-1 : Verification of Cauchy-Riemann equations for complex functions in Cartesian form and Polar form

Module II (T-3 hrs-P-0 hrs-P-2 hrs)

Cauchy's Integral Formula (Without Proof), Cauchy's Integral Formula for higher order derivatives (Without Proof), Taylor series.

Project-2 : Evaluation of contour integrals using Cauchy's Integral Formula

Module III (T-4 hrs-P-0 hrs-P-2 hrs)

Laurent series (Without Proof), Pole, Residue, Residue Theorem (Without Proof), Evaluation of Real integral Type-I.

Module – IV (T-2 hrs-P-0 hrs-P-2 hrs)

Interpolation, Lagrange interpolation polynomial.

Project-3 : Finding out the value of a given function at an interior point on an unequal interval using Lagrange interpolation polynomial

Module – V (T-3 hrs-P-0 hrs-P-2 hrs)

Forward and backward difference operators, Newton's forward and backward difference Interpolation formulae.

Project-4 : Finding out the value of a given function at an interior point on an equal interval using Newton's forward and backward difference interpolation formulae

Module – VI (T-2 hrs-P-0 hrs-P 2 hrs)

Numerical Integration, Trapezoidal rule, Simpson's one third rule.

Project-5 : Evaluation of real definite integrals using Trapezoidal rule and Simpson's one third rule

Module – VII (T-3 hrs-P-0 hrs-P-2 hrs)

Runge-Kutta 2nd & 4th order methods.

Project-6 : Finding out Numerical solutions of differential equations using Runge-Kutta 2nd & 4th order methods

Text Book:

1) Advanced Engineering Mathematics by E. Kreyszig Publisher: Johnwiley& Sons Inc-8th Edition Chapters : 12 (12.3, 12.4), 13 (13.2 to 13.4), 14.4, 15 (15.1 to 15.4 Only Type-I integral), 17 (17.3, 17.5), 19 (19.1).

Reference Books:

- 1) Advanced Engineering Mathematics by P.V. O'Neil Publisher: Thomson
- 2) Fundamentals of Complex Analysis (with Applications to Engineering and Science) by E.B. Saff& A.D. Snider Publisher: Pearson
- 3) Numerical Methods for Scientific and Engineering Computation by M. K. Jain, S. R. K. Iyengar& R.K. Jain; New Age International Publishers.

4) Introductory Methods of Numerical Analysis by S.S. Sastry; Third Edition, Prentice Hall India.

Discrete Mathematics

Code	Course Title	Credit	T-P-PJ
CUTM1004	Discrete Mathematics	3	2-0-1

Objective

- To understand mathematical reasoning in order to read, comprehend and construct Mathematical arguments as well as to solve problems, occurred in the development of programming languages
- To work with discrete structures such as graphs to study the structure of the world wide web, to model a computer network and to find the shortest path between two places in a transportation network

Course Outcome

- Apply the logical structure of proofs and work symbolically with connectives and quantifiers to produce logically valid, correct and clear arguments.
- Evaluate elementary mathematical arguments and identify fallacious reasoning
- Reformulate statements from common language to formal logic
- Apply truth tables and the rules of propositional and predicate calculus
- Model and solve real world problems using graphs ,both quantitatively and qualitatively

Course Outline

Module -I

(4Hours)

Propositional Logic, Connectives, Truth tables of compound propositions, Propositional Equivalence.

Project 1: Given the truth values of the propositions p and q , find the truth values of the conjunction, disjunction, implication, bi-implication, converse, contrapositive and inverse.

Module -II

(3Hours)

Theory of inference, Predicates and Quantifiers, Rules of Inference.

Project 2: Build valid arguments of a given set of propositional logics and quantified statements using rules of inferences.

Module -III**(3 Hours)**

Relations and its properties, Partial Ordering, POSET, Totally Ordered Set.

Project 3: Define the properties of a relation on a set using the matrix representation of that relation with examples.

Module -IV**(3Hours)**

Hasse Diagram, Maximal & Minimal Elements of a Poset, Greatest & Least Elements of a Poset, Supremum & Infimum of a Poset, Lattice.

Project 4: Find a Topological Sort of a Poset.

Module -V**(3 Hours)**

Introduction to Graph Theory, Graph Terminology and Special types of Graphs, Representation of Graphs.

Project 5: Describe how some special types of graphs such as bipartite, complete bipartite graphs are used in Job Assignment, Model, Local Area Networks and Parallel Processing.

Module -VI**(3 Hours)**

Graph Isomorphism, Connectivity, Euler and Hamiltonian Graphs, Planar Graphs, Graph Coloring.

Project 6(i): Describe the scheduling of semester examination at a University and Frequency Assignments using Graph Colouring with examples. Find also their Chromatic numbers.

Project 6(ii): List out 10 pairs of Non-isomorphic graphs and explain the reason behind it.

Project 6(iii): List out all features of Euler and Hamiltonian Graphs. Justify whether the given set of graphs are Euler and Hamiltonian. Construct a Gray Code where the code words are bit strings of length three.

Module -VII**(4 Hours)**

Trees and their Properties, Spanning Trees, Minimum Spanning Trees, Kruskal's Algorithm.

Project 7: Find a minimum spanning tree in a given weighted graph using Kruskal's Algorithm.

Text Books:

1. Discrete Mathematics and its Applications by K.H.Rosen, Publisher: TMH, Sixth Edition, 2009.

Chapters: 1(1.1 ,1.2,1.3, 1.5); 7(7.1,7.6); 8(8.1 to8.5, 8.7, 8.8);9(9.1,9.4,9.5).

Reference Books:

1. Discrete Mathematical Structures with Applications to Computer Science, J. P. Trembkay, R. Manohar, Tata MC Graw – Hill Edition 38th reprint, 2010.
2. Discrete and Combinatorial Mathematics by R.P.Grimaldi Publisher: Pearson, 5th Edition, 2003.
3. Discrete Mathematics and Applications by Thomas Koshy Publisher: Elsevier, 2004.
4. Discrete Mathematical Structures by B. Kolman, R.C. Busby & S. Ross Publisher: PHI, 5th Edition, 2003

Probability and Statistics

Code	Course Title	Credit	T-P-PJ
CUTM1005	Probability and Statistics	3	2-0-1

Objective

- To translate real-world problems into probability models.
- To motivate students in an intrinsic interest in statistical thinking.
- To recognize the role and application of probability theory, descriptive and inferential statistics in many different fields of science and engineering.
- To apply probability and statistics in engineering and science like disease modeling, climate prediction and computer networks etc.

Course outcome

- Define and illustrate the concepts of sample space, events and compute the probability and conditional probability of events.
- Define, illustrate and apply the concepts of discrete and continuous random variables, the discrete and continuous probability distributions.
- Define, illustrate and apply the concept of the expectation to the mean, variance and covariance of random variables.
- Compute probabilities based on practical situations using the Binomial, Poisson and Normal distributions.

Course content

Module I :(3 hrs+2 hrs)

Sample spaces and events; axiomatic definition of probability; Axioms of Probabilities

Project-1

A Report on Application of probability to control the flow of traffic through a highway system, a telephone interchange, or a computer processor

Module II :(3 hrs +2 hrs)

Mutually Exclusive Events, Dependent and Independent Events. Conditional Probability

Project-2

A Report on Dependent and Independent Events with Examples

Module III:(3 hrs +2 hrs)

Discrete random variables and probability distributions, Continuous random variables and probability

distributions , Mean ,Variance and Moment Generating Function of Distributions

Project-3

Application of random variables in Engineering Field

Module IV:(3 hrs +2 hrs)

Uniform Distribution, Binomial Distribution, Poisson Distribution

Project-4

Applications of Poisson distribution

Module V:(3 hrs +2 hrs)

Normal Distribution, Working with Normal Tables, Normal Approximation to the Binomial Distributions

Project-5

Normal Distribution utilized in statistics, business settings, and government entities.

Module VI:(3 hrs)

Statistics: Random Sampling, Population and Sample, Sample Mean and Variances, Point and Interval Estimations, Confidence Intervals

Module VII:(3 hrs +2 hrs)

Regression and Correlation Analysis: Correlation Coefficient, Co-variance independent random variables, linear regression of two variables

Project-6

Uses of Regression and Correlation Analysis in Business

Text Books:

1. Name of Author, Title, Publication, Edition

Advanced Engineering Mathematics by E. Kreyszig Publisher: John Willey & Sons Inc-8th Edition

Reference Books:

1. Statistical Methods by S.P. Gupta (31st Edition); Publisher: Sultan Chand & Sons.

2. Mathematical Statistics by S.C. Gupta & V.K. Kapur (10th Edition); Publisher: Sultan Chand & Sons.

Calculus

Code	Course Title	T-P-PJ	Prerequisite
CUTM1925	Calculus	2-0-1	

Objective

- To apply the concepts of derivative to find curvature and radius of curvature of a curve.
- To apply concepts of Vector Calculus to the problems related to models in work, circulation and flux Problems, hydrodynamics and fluid dynamics etc.

Course Outcome

- Calculate curvature and radius of curvature for a given curve.
- Determine the important quantities associated with scalar and vector fields.
- Find gradient of a scalar point function, divergence and curl of a vector point function.
- Evaluate line integral, double integral and applying these concepts to find out work done by a force, volume of regions in space, center of gravity of a mass etc.
- Transform double integral to line integrals, triple integrals to surface integrals, surface integrals to line integrals and vice versa.

Course Outline

Module-I(3hr+0hr+2hr)

Curvature and Radius of curvature in Cartesian form.

Project 1: To find radius of curvature (Parametric form)

Module-II(2hr+0hr+4hr)

Vector algebra: Algebraic operations, Scalar product, Inner product, Vector product, Scalar and vector triple product.

Project 2: Problems based on inner product, scalar and vector triple products.

Project 3: To find angle between two vectors, area of triangle and parallelogram, volume of parallelepiped and tetrahedron using vector algebra.

Module III(2hr+0hr+4hr)

Gradient of scalar point function, Directional derivatives, Divergence and curl of vector point functions, second order differential operator: the Laplacian operator.

Project 4: To prove the identities with regards to Gradient, Divergence and Curl.

Project 5: To find normal vector to a plane using Gradient of scalar point function.

Module-IV: (3hr+0hr+0hr)

Line Integrals (path dependence and path independence), double integrals.

Module-V: (3hr+0hr+0hr)

Surface Integrals, Triple Integrals

Module-VI: (4hr+0hr+2hr)

Green's and Gauss's Theorems (without proof) and their applications to evaluate the integrals.

Project 6: To find center of gravity and moments of inertia of a mass density

Module-VII: (3hr+0hr+0hr)

Stokes' Theorem (without proof) and its applications to evaluate the integrals.

Text Books:

1. A Text book of Calculus Part – II by Shanti Narayan, Publisher: S. Chand & Company Ltd. Chapters: 8 (Art. 24, 25 (only for Cartesian and parametric curves)).
2. Advanced Engineering Mathematics by E. Kreyszig, Publisher: John Willey & Sons Inc.- 8th Edition Chapters: 8 (8.1 to 8.3, 8.9 to 8.11), 9 (9.1 to 9.7, 9.9).

Mechanics for Engineers

Code	Course Title	Credit	T-P-PJ
CUTM1006	Mechanics for Engineers	3	2-1-0

Objective

- To provide the students with a clear and thorough understanding on fundamentals of mechanics as applied to solve real-world problems.

Course outcome

- Use scalar and vector analytical techniques for analyzing forces in statically determinate structures.
- Analyze the frictional forces involved in planes, ladder friction and belt friction.
- Determine the centroid and moment of inertia of composite shapes.
- Apply fundamental concepts of kinematics and kinetics of particles to the analysis of simple, practical problems.
- Apply basic knowledge of mathematics and physics to solve real-world problems.

Course content

Module I: Force and Moment (4 Hrs. + 2 Hrs. practices)

Law of Transmissibility of a Force, Composition and Resolution of Forces, Resultant and Equilibrant, Resultant of Two and Several Forces, Moment of a Force and a Couple, Varignon's Principle of Moment

Practice-1: Verification of laws of parallelogram law of forces

Module II: Equilibrium

(3 Hrs. + 2 Hrs. practice)

System Isolation and Free Body Diagram, Particle Equilibrium, Lami's theorem, General Conditions of Equilibrium, Types of Supports and Support Reactions, Rigid Body Equilibrium.

Practice-2: To verify the condition of equilibrium by finding reactions at the support of a beam

Module III: Friction

(2 Hrs. + 2 Hrs. practice)

Basic Terms used in Dry Friction, Laws of Coulomb Friction, Equilibrium of Bodies on a Inclined Plane, Ladder Friction, Belt Friction

Practice-3: Determination of Angle of Repose

Module IV: Centroid**(2 Hrs.)**

Axis of Symmetry, Centroid of Lines, Areas and Volumes, Centroid of Composite Section.

Module V: Moment of Inertia**(3 Hrs. + 2 Hrs. practice)**

Rectangular and Polar Moment of Inertia, Radius of Gyration, Parallel Axis Theorem and Perpendicular Axis Theorem, Moment of Inertia of Composite Section

Practice-4: Determination of Moment of Inertia of a fly wheel.

Module VI: Kinematics of Linear Motion**(3 Hrs.)**

Kinematics of a Particle, Uniform and Variable Acceleration, Motion under Gravity

Module VII: Kinetics of Linear Motion**(3 Hrs. + 4 Hrs. Practice)**

Principles of Dynamics such as Newton's Second Law, Work-Energy Principle, Impulse-Momentum Principle, Law of Conservation Law of Momentum and Energy

Practice-5: Verification of Newton's second law of motion.

Practice-6: Verification of conservation of momentum in collision.

Text Books:

Engineering Mechanics; Statics and Dynamics by A. K. Tayal, Umesh Publications

Reference Books:

Engineering Mechanics by S. Timoshenko, D.H. Young and J.V. Rao, Tata McGraw Hill

Engineering Mechanics by D.S. Kumar, S.K. Kataria and Sons.

Optics and Optical Fibres

Code	Course Title	Credit	T-P-PJ
CUTM1007	Optics and Optical Fibres	3	2-1-0

Objective

- To train the students for the applications of the solar cell, laser and optical fiber in the field of engineering and technology.
- To learn and practice the techniques used by optical phenomenon so that these can be applied to actual field studies.

Course outcome

- Students should understand optical phenomena.
- Students should learn about different light sources and their use
- After completion of the course the students shall be able to understand the basic knowledge of solar cell, laser and optical fiber and instrumentation involved.
- Students should be able to understand optical fiber principle, operations and its applications.

Course outline

Module I: Reflection and Refraction (Derivation is not required) (3hours +2hours)

Reflection at plane surface, reflection at spherical mirrors, Paraxial rays and approximation. Sign convention, Location of the image formation, Spherical mirror equation, Refraction, Total internal reflection, Dispersion by a prism, Refraction through a prism.

Practice: 1

To determine the refractive index of glass slab using travelling microscope.

Module II: Lenses (Derivation is not required) (2hours+2hours)

Definition, Types of Lenses, Terminology associated with the Lens, Sign Convention Location of the image formation by graphical method for Lenses, Lens formula.

Practice: 2

To determine the dispersive power and Cauchy constants of the material of a prism using mercury source.

Module III: Interference (Derivation is not required) (2hours+2hours)

Superposition principle, definition of Interference, Coherence, Young's double slit experiment, Newton's rings theory- Determination of wave length of light.

Practice: 3

Newton's Rings-Refractive index of liquid

Module IV: Diffraction and Polarization (Derivation is not required) (3hours+2hours)

Types of diffraction, Fraunhofer diffraction at a single slit, Diffraction at N-parallel slits (plane diffraction grating) Polarisation, Types of polarized light and their representation, Brewster Law, Malus Law, polarization by double refraction, polarimeter, Applications of polarized light.

Practice: 4

To find grating element of a plan transmission diffraction grating.

Module V: Optical Properties and Laser (3hours+2hours)

Scattering, refraction, reflection, absorption & transmission, Introduction to optoelectronics, Concept of Light Emitting Diode, Stimulated and spontaneous emission, Basic principle of Lasers, Population inversion, Laser Pumping, Different levels of laser system, Ruby Laser, Applications of Lasers (Medicine, Metrology, Defenses, Nuclear energy, in communication, in consumer electronics industry)

Practice: 5

Wave length of LASER source by diffraction grating method

Module VI: Optical Fibers (3hours+1hours)

Introduction to fiber optics, structure of optical fibers, classification of optical fibers on the variation of refractive index, Classification of optical fibers on the variation of mode of transmission/core diameter, Numerical Aperture, Acceptance angle. Principle of optical fibers communication, optical communication (block diagram only),

Practice: 6

To find the numerical aperture of a given optic fiber and hence to find its acceptance angle.

Module VII: Optical Fibers (4hours+1hours)

Attenuation in optical fibers (Qualitative only-Scattering losses, Absorption losses, bending losses) Fiber Materials-Glass fibers, Plastic fibers, Light sources for fiber optics V-number of an optical fiber, optical fiber cables design, optical fiber connection, fiber splices, fiber connectors. Application of optical fibers- Cable TV, Networking, Power companies, Imaging, Sensors, Medical (Dental surgery, Endoscopy, Surgery)

Practice: 7

Measurement of bending loss.

Text Books:

1. A Text Book of Optics by M.N. Avadhanulu, BrijLal, N. Subrahmanyam, S Chand; 23rd Rev. Edn. [Module I&II]
2. Engineering Physics, by D.Thirupathi Naidu, M.Veeranjaneyulu, V.G.S Book links, 2017. [Module-III, IV]
3. Principles of Engineering Physics-2 by Md.Khan, S.Panigrahi, Cambridge University Press 2016. [module-V, VI&VII]

Reference Books:

1. Optics by Ajoy Ghatak, McGraw Hill Education; 6 edition, 2017.
2. Physics-I for engineering degree students by B.B. Swain and P.K. Jena.
3. Concepts in Engineering Physics by I Md. N. Kha, 2016.

Applied Analytical Chemistry

Code	Course Title	Credit	T-P-PJ
CUTM1008	Applied Analytical Chemistry	3	2-1-0

Course Objective

- Explain fundamental principles for environmental analytical methods (titration, electrochemistry, instrumentation and basic parameters of water, soil, fuel, etc)
- Point out suitable analytical techniques for analyzing a specific compound in an environmental matrix

Course Outcome

- Apply quality control on chemical analysis and laboratory work and explain its importance
- Plan and carry out laboratory experiments, including data analysis and conclusions
- Point out suitable techniques for sampling and handling of environmental samples

Module-I(4Hrs)

Water analysis:

Water softening processes: Lime-Soda, Zeolite and Ion exchange methods. Removal of DO and dissolved CO₂ from water by De-aeration method, Desalination of Brackish water by Reverse osmosis and electro dialysis process. Numericals on calculation of hardness of water, Lime-Soda calculation, Alkalinity of water.

1. Determination of hardness of water by EDTA method. (V. lab)
2. Determination of alkalinity of water. (V. lab)
3. [Determination of Dissolved Oxygen in water.](#) (V. lab)
4. [Determination of Biological Oxygen Demand.](#) (V. lab)
5. [Determination of Chemical Oxygen Demand.](#) (V. lab)

Module-II(2Hrs)

Soil Analysis:

Soil profile, Structure, and properties, Determination of soil properties, Fertility of the soil.

6. Determination of specific gravity of the soil by using pycnometer. (V.lab)
7. Determination of pH and electrical conductivity of soil sample.
8. Determination of moisture content in soil by oven drying method. (V. lab)

Module-III (4Hrs)

Fuel Chemistry-I:

Classification, combustion and chemical principles involved in fuel, calorific value: gross and net calorific values and their determination by bomb calorimeter. Proximate and ultimate analysis of coal and their importance. LPG, Water gas, producer gas, CNG.

9. Determination of calorific value of a fuel sample by using Bomb calorimeter. (V. lab)
10. Analysis of flue gases by Orsat's apparatus.

Module-IV (3Hrs)

Fuel Chemistry-II

Petroleum: its chemical composition and fractional distillation, cracking of heavy oil residues – thermal and catalytic cracking, knocking and chemical structure, octane number, synthesis and applications of bio-fuels, Photovoltaic cell.

11. Synthesis of biodiesel by transesterification process

Module-V(3Hrs)

Corrosion-Mechanisms, Factors affecting Corrosion; Protection from corrosion.

12. Estimation of ferrous ion in the given solution using standard potassium dichromate.

Module-VI (2Hrs)

Electrochemical Phenomenon

Electrochemical cell, Electrode potential, Determination of pH of a solution Using Calomel/ Quinhydrone Electrode.

Module-VII(2Hrs)

Error in Chemical analysis

Types of errors, Accuracy and precision, Absolute and relative uncertainty, mean and standard deviation.

Applied Engineering Material

Code	Course Title	Credit	T-P-PJ
CUTM1009	Applied Engineering Material	3	2-0-1

Objective

- To give an introduction to materials, ceramics, polymers, and electronic materials in the context of a molecular level understanding and their application in various field

Course outcome

- Students will understand the physical/chemical behaviors of materials.
- Students will be able to select materials, based on their properties and behaviors, for a given application.
- Students will understand how molecular interactions to the behavior of material give rise to macroscopic properties.

Course content

Module I: New Materials/Nanomaterials (5hrs)

Nanostructures and Nanomaterials: classification (Dimensionality, Morphology/ shape/structure of nano-entities, New Effect/ Phenomena). Hybrid nanomaterials. Effect of size, structure, mechanism, and property on material performance. Applications of nanomaterials in catalysis, telecommunication and medicine.

Project

Synthesis of TiO₂ and ZnO nanoparticles by Sol Gel ,Sonication and Precipitaion method and study their application .

Module II: Carbon Nanomaterials (5hrs)

Carbon nanomaterials, such as graphene, carbon nanotubes (CNTs), crystalline diamond, and diamond-like carbon , Properties and application of fullerenes,

Project

Synthesis and Fabrication of Graphene and Graphene Oxide by sol-gel techniques

Module III: Polymer (5hrs)

Mechanism of polymerization and synthesis of polymers, Copolymerization, Viscoelasticity. Elastomers-structure, Conducting polymers and applications, Fabrication and moulding of polymers, Synthesis, properties and uses PMMA, formaldehyde resins, melamine-formaldehyde-urea resins

Project

Preparation of polystyrene by anionic/cationic/emulsion polymerization method

Module IV: Composites (5hrs)

Composites: characteristics, types and applications, Nanocomposites , Polymer/ Metal oxide nanocomposites and its application

Project

Fabrication of Ceramic matrix particulate composite by powder metallurgy route.

Module V: Adhesives Lubricants (4hrs)

Adhesives, adhesive mechanism and applications, Lubricants-physical and chemical properties, types and mechanism of lubrication. Additives of lubricants and freezing points of lubricants

Module VI: Energy Storages material-I (4Hrs)

Fundamental aspects related to energy storage and conversion, lithium ion batteries, Lead acid batteries; Nickel Cadmium batteries; advanced batteries

Module VII: Energy Storages material-II(4Hrs.)

Super capacitors, fuel cells and Photovoltaic, Future of battery technology

Project

Fabrication of Fuel cell and its application

Text Books:

1. A Textbook of Engineering Chemistry, by Shashi Chawla
2. Engineering Chemistry, by P. C Jain and M. Jain
3. Advanced Polymer Chemistry, by M. Chanda

Reference Books:

4. Surfactants and Polymers in Aqueous Solution, by K. Holmberg, B. Jonsson, B. Kronberg and B. Lindman
5. Energy Scenario beyond 2100, by S. Muthukrishna Iyer

Environmental Studies

Code	Course Title	Credit	T-P-PJ
CUTM1010	Environmental Studies	2	0-0-2

Objective

- To introduces the environmental consequences of Industries on the human health and methods for minimizing their impact through technology and legal system to the undergraduate students.

Course outcome

- After learning this course one should be able to control pollution at individual level and also gains an idea about conservation of natural resources and its management.

Course content

Module-I: Fundamentals of Environmental Sciences

Assignment-1: Multidisciplinary nature of Environmental science

Assignment-2: Components of Environment

Assignment-3: scope and importance of environmental science

Module: II Ecology and Ecosystem

Assignment-1: Structure and function of ecosystem

Assignment-2: Types of ecosystem

Assignment-3: Ecological Succession

Module III- Biodiversity and its conservation

Assignment-1: Concepts of Biodiversity

Assignment-2:Biodiversity at local level, global level and National level

Assignment-3: Conservation of Biodiversity

Module IV- Natural resources and its conservation

Assignment-1: Land resources and its conservation

Assignment-2: Forest resources and its conservation

Assignment-3:Water resources and its conservation

Assignment-4:Energy resources and its conservation

Module V Environmental pollutions and its control measure

Assignment-1: Soil pollution

Assignment-2: Water pollution

Assignment-3: Air pollution

Assignment-4: Noise pollution

Module VI Natural Hazards and Disaster management

Assignment-1: Concepts of natural hazards

Assignment-2: Different types of natural hazards: cyclone, earthquake, volcanic eruption etc.

Assignment-3: Process of disaster preparedness and its management

Assignment-4: Solid waste management

Module VII Environmental issues and laws

Assignment-1: Major environmental issues like climate change, global warming, green house effects, Ozone layer depletion, Acid rain

Assignment-2: Water Act, 1974

Assignment-3: Air Act, 1981

Assignment-4: Environmental protection act, 1986

Reference Books:

1. Environmental Studies by U.N. Dash & H. D. Kumar, India Tech Publication, New Delhi
2. Environmental Studies by R. Rajagopalan Oxford University Press
3. Environmental Science and Engineering, 2E, by Aloka Debi, University Press

Centurion University of Technology and Management Odisha

CHOICE BASED CREDIT SYSTEM

COURSE STRUCTURE & SYLLABUS

BASKET - II



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Shaping Lives...
Empowering Communities...

School of Engineering & Technology

2020

Course Structure

Basket - II

Course Code	Course Title	Credits	Course Type T+P+PJ
CUTM1011	Optimisation Techniques	2	0-2-0
CUTM1012	Engineering Economics and Costing	3	2-0-1
CUTM1013	Project Management	3	2-0-1
CUTM1014	Gender, Human Rights and Ethics	3	1.5-0-1.5
CUTM1015	Climate Change, Sustainability and Organisation	3	1.5-0-1.5
CUTM1016	Job Readiness	6	0-6-0

Syllabus

Optimization Techniques

Code	Course Title	Credit	T-P-PJ
CUTM1011	Optimization Techniques	2	0-2-0

Course Rationale:

Operations research (OR) have many applications in science, engineering, economics, and industry and thus the ability to solve OR problems are crucial for both researchers and practitioners. Being able to solve the real life problems and obtaining the right solution requires understanding and modelling the problem correctly and applying appropriate optimization tools and skills to solve the mathematical model. The goal of this course is to teach you to formulate, analyse, and solve mathematical models that represent real-world problems. We will also discuss how to use EXCEL for solving optimization problems

Course Objectives:

To learn about the operations research techniques, model formulation and applications used to solve business decisions by using computer software

Course Outcomes: After completion of the course students

LO1. Ability to apply the theory of optimization methods and algorithms to develop and for solving various types of optimization problems

LO2. Ability to go in research by applying optimization techniques in problems of Engineering and Technology

LO3. Ability to solve the mathematical results and numerical techniques of optimization theory to concrete Engineering problems by using computer software

Course contents

Module-I: Linear Programming: Graphical Method, Simplex method, Penalty Method,

Module-II: Transportation Models, Assignment Models, Sequencing and Scheduling Models by Johnson's Algorithm

References Recommended:

Books

- Harvey M. Wagner, *Principles of Operations Research*, Englewood Cliffs, Prentice-Hall, 1969
- S D Sharma and Himansu Sharma, *Operations Research: Theory, Methods and Applications*, 15 Edition, Kedarnath Ramnath & Co

External Links:

<https://www.informs.org/Resource-Center/INFORMS-Student-Union/Consider-an-Analytics-OR-Career>

<https://www.informs.org/>

https://en.wikipedia.org/wiki/Operations_research

Google and YouTube

Journals:

- International Journal of operations Research
- European Journal of Operations Research
- **International Journal of Operations Research and Optimization**

Engineering Economics and Costing

Code	Course Title	Credit	T-P-PJ
CUTM1012	Engineering Economics and Costing	3	2-0-1

Course Rationale:

This course aims at providing the student with advanced concepts of engineering economic analysis and its role in engineering decision making.

Course Objectives:

CO1. Facilitate students to understand the basics of Economics and its application in the field of engineering

CO1.Enable students to understand the concepts of the time value of money and techniques for evaluation of engineering project

CO1.Equip students with the skills required to understand cost statements/records of the product and its effect on decision making

Course Outcomes: After completion of the course students

LO1. Apply the microeconomics concepts related to business and its impact on enterprise

LO1.Develop an awareness and understanding time value of money and techniques for evaluation of engineering project

LO1.Apply cost concepts to analyse common business management decisions such as pricing a product and services.

Course contents

Module: I: Engineering Economics – Nature and scope

General concepts on Micro & Macro Economics. The Theory of demand, Demand function, Law of demand and its exceptions, Elasticity of demand, Law of supply and elasticity of supply. Theory of production, Law of variable proportion, Law of returns to scale.

Module-II: Time value of money:

Simple and compound interest, Cash flow diagram, Principle of economic equivalence. Evaluation of engineering projects: Present worth method, Future worth method, Net present value method, internal rate of return method, Cost-benefit analysis in public projects. Depreciation: Meaning Causes, Factors affecting depreciation, Methods of providing depreciation, Straight Line Method & Diminishing Balance Method

Module-III

Cost concepts, Elements of costs, Preparation of cost sheet, Segregation of costs into fixed and variable costs. Break-even analysis (Simple numerical problems to be solved)

Indian Banking System: Banks: Meaning, nature, characteristic of the Indian banking system, functions of commercial banks, functions of Reserve Bank of India, Overview of Indian Financial System.

Books

- Riggs, Bedworth and Randhwa, “Engineering Economics”, McGraw Hill Education India.
- Mithani, D.M., Principles of Economics. Himalaya Publishing House
- Mishra, S. “Engineering Economics & Costing“, PHI
- Sullivan and Wicks, “ Engineering Economics”, Pearson
- Paneer Seelvan, R., “ Engineering Economics”, PHI
- Gupta, G.S., “ Managerial Economics”, TMH
- Lal and Srivastav, “ Cost Accounting”, TMH

Links to websites:

- <http://courseware.cutm.ac.in/>

Project Management

Code	Course Title	Credit	T-P-PJ
CUTM1013	Project Management	3	2-0-1

Course Objective:

- The successful development and implementation of all project's procedures.
- Learn project management methodology to initiate and manage projects efficiently and effectively
- Acquire key project management skills and strategies for Productive guidance, efficient communication and supervision of the project's team
- The achievement of the project's main goal within the given constraints

Course outcome:

- Develop a Project Charter document for any project
- Develop Project Management Plan document
- Acquire 10 knowledge area identified by PMI and its application while delivering a projects
- Implement the Project and Prepare a project document that they have undertaken as a learning tool
- Qualify CAPM/PMP certification offered by PMI

Course Content:

Unit: I

Project Management framework; Introduction to Project Management; Project Life Cycle and Organisation, Project vs. Operational work, Stakeholders, Organisational Influences

Project Management Process for a Project, groups, Initiating, planning, executing, monitoring &controlling and closing process groups.

Project management Knowledge area;

Project Integration Management; Develop project charter, develop project management plan, direct and manage project execution, monitor and control project work, perform integrated change control, close project or phase.

Unit: II

Project Scope Management; collect requirements, define scope, create WBS, verify scope, control scope

Project Time Management; Define activities, sequence activities, estimate, develop and schedule

Project Cost Management; Estimate costs, determine budget, control costs

Unit: III

Project Quality Management; Plan quality, perform quality assurance, perform quality control

Project HR Management; Develop HR plan, acquire project team, develop and manage project team

Project Communications Management; Identify stakeholders, plan communication, distribute information, manage expectation of stake holders, report performance

Unit: IV

Project Risk Management; Plan risks; identify risks, perform quality and quantitative risk analysis, plan risk responses, monitor and control risks

Project Procurement Management; Plan procurements, conduct procurements, administer procurements, close procurements

Project Stakeholders Management;Identifying stakeholders, stakeholder analysis, engagement

Note: Students can use any of these software for their project; MS. Excel/ Bitrix 24/Primavera/ Microsoft Projects

Books Recommended:

- 1) Project Management: A Managerial Process, Clifford F Gray & Eric W Larson, Tata McGrawHill
[Text book]
- 2) A Guide to the Project Management Body of Knowledge, 6th Edition, PMI
- 3) Project Management- A system Approach to Planning, Scheduling and Controlling (Harold Kerzner). CBS Publishers and Distributers, New Delhi.
- 4) Projects, Preparation, Appraisal and Implementation (Prasanna Chandra), 3rd Edition, Tata McGraw Hill, New Delhi.
- 5) Project Management (Nagarajan, K), New Age Publishers, New Delhi.
- 6) Project Management. A Managerial Approach (Meredith, R.J and Mantel, S.J), Wiley (India).

Gender, Human Rights and Ethics

Code	Course Title	Credit	T-P-PJ
CUTM1014	Gender, Human Rights and Ethics	3	1.5-0-1.5

Course Objectives

This course is about gender, human rights and ethics in which the student will be sensitized and exposed to related issues in the context of business and organisations in India. The specific objectives are:

- To develop an understanding of gender, human rights and ethics in an unequal society like India
- Sensitisation of how gender, human rights and ethics are significant in organisations.
- Integrating concerns related to gender, human rights and ethics in organisations.

Course Outcomes

- Understanding the complexity of issues and challenges relating to gender, human rights and ethics
- Be sensitive to gender, human rights and ethics within an organizational context,

- To integrate concerns related to gender, human rights and ethics into the policies, processes and systems in an organization.

Course Syllabus

Module 1

- Difference between sex and gender; social construction of gender and its outcomes in the form of behavior, roles, gender based division of labour, hierarchy; gender relations.
- Gender issues in organisations - significance of relations between structures, practices, context, interactions and power for construction of gender at organisational level
- Gender implications at workplace, management and leadership, Laws and Acts
- Comparing different types of organisations; how to create a gender sensitive organisation.

Module 2

- Introduction to human rights, Meaning and Definition, Types
- Human Rights Law: Protection, violation and the legal framework for their protection - International Human Rights Law, Universal Declaration of Human Rights
- Conflicts of Rights and its Significance to Organisations: Challenges of the past and challenges for the future. Persistence of social discrimination and inequality; efforts in the search for justice for past violations, continued struggle for human rights and accountability in an organisational context.

Module 3

- Introduction to and study of ethics; Indian and Western ethics
- Different ethical systems and perspectives; ethical relativism and its implications, utilitarianism, duty ethics and virtue ethics in organisations
- Critique of various ethical positions and develop their own position in an organizational context.

Session Plan

Session 1

Basic concepts on sex and gender; social construction of gender; constitutional provisions for gender equality.

PPT 1 - Introduction to Gender

1.5 mins video on Gender Equality and Poverty

<https://www.youtube.com/watch?v=4viXOGvvu0Y>

Session 2

Gender issues in different sectors – Health, Education, Governance, Livelihoods

PPT 2 - Gender issues in health

PPT 3 - Gender issues in education

PPT 4 - Gender issues in Governance

1.3 mins video on gender stereotypes and education

<https://www.youtube.com/watch?v=nrZ21nD9I-0>

Session 3

Approaches to address gender inequality – WID, WAD and GAD

PPT 5 - WID WAD GAD

TED talk by Deepa Bhardwaj - True equality is when both women and men have a voice - 13 mins

https://www.youtube.com/watch?v=BSRTZ_q4RX8

Session 4 & 5

Gender and organizational issues

PPT 6 - Gender and Organisations

PPT 7 - Gender Equality in Organisations

PPT 8 - Gender Mainstreaming and Attitude in Workplace

PPT 9 - Gender Sensitisation

3.22 mins on The Future of Gender Equality in Work by ILO

https://www.ilo.org/global/about-the-ilo/multimedia/video/institutional-videos/WCMS_558508/lang--en/index.htm

4.22 mins video on Gender Based Analysis

<https://www.youtube.com/watch?v=p6w-d1mmjFU>

Free Readings

Gender and Development - Concepts and Definitions

Gender and Organisational Change Training

Project

-Gender Responsive Governance in times of COVID 19

<https://in.one.un.org/gender-responsive-governance-in-the-times-of-covid-19/>

- SDG - Gender Equality Goal 5

<https://in.one.un.org/page/sustainable-development-goals/sdg-5/>

- Gender, Sustainability and Environment

Women Environment and Sustainable Development A Ca

- Good Practices of Gender Mainstreaming in India

Good Practices for Gender Mainstreaming

- Gender Equality Case Study

Gender Equality - Kerala Case Study

Session 6

Basic concepts on human rights; history of human rights; current significance

Videos on Basic concepts of human rights

<https://www.youtube.com/watch?v=ew993Wdc0zo>

<https://www.youtube.com/watch?v=JpY9s1Agbsw>

Videos on History of Human Rights

<https://www.youtube.com/watch?v=nDgIVseTkuE>

https://www.youtube.com/watch?v=6XXGF_V8_7M

Session 7

Violation and legal framework for the protection of human rights

Video on the Paris Principles

https://www.youtube.com/watch?v=ZEgD7pdXt_c

Video on Protection of Human Rights Act 1993 (for reference, bilingual)

<https://www.youtube.com/watch?v=qAiiOyL5WAw>

Session 8

Human rights and sustainability framework

Video on Human Rights and Sustainable Development

<https://www.youtube.com/watch?v=mHHy1gDn4x8>

Session 9 & 10

Human rights in the organizational context

Video on Why should your company care about human rights

<https://www.youtube.com/watch?v=mCtNx3hHZ08>

Video on UN Reporting Framework: Salient Human Rights Issues

<https://www.youtube.com/watch?v=LswDupgiZug>

Books:

1. Arihants UGC NET Human Rights and Duties

2. Kapoor, S. K. Central Law Agency's Human Rights under International Law and National Law

Ciapham Andrew, 2015, Human Rights: A Very Short Introduction, Oxford University Press

Smith Rhona, 2015, Textbook on International Human Rights, Oxford University Press

Free Online Sources:

<https://www.humanrightscareers.com/.../10-human-rights-study-books-you-can-download>

<https://www.humanrightscareers.com/courses/>

Session 11

Basic concepts in ethics

PPT - Introduction to Ethics

Video on Ethics defined

<https://www.youtube.com/watch?v=4vWXpzlL7Mo>

Session 12

Theoretical perspectives – utilitarianism, virtue ethics, duty ethics

PPTs - Duty Ethics

Utilitarianism

Virtue Ethics

Video on Utilitarianism

https://www.youtube.com/watch?v=-FrZl22_79Q

Video on virtue ethics

<https://www.youtube.com/watch?v=NMB1KpkKYao>

Video on deontology (duty) ethics

<https://www.youtube.com/watch?v=wWZi-8Wji7M>

Project (self exploration through case studies)

Fraudulent Books_1

Gifts from the Boss's Friend_1

Gifts from the Sales Representative_1

Session 13

Ethical relativism

PPT - Ethical Relativism

Video on Moral relativism

<https://www.youtube.com/watch?v=5RU7M6JSVtk>

Project (self-exploration through case studies)

Mining Data docx_1

Office Affair_2

On-time Delivery

Session 14 & 15

Ethics in organisations

Video on ethics in the workplace

<https://www.youtube.com/watch?v=0mUxMpMTT28>

Project (self-exploration through case studies)

Falsifying Attendance_1

Family Loyalty vs. Meritocracy 1

Rumors 1

The Supervisor's Choice 1

Books

Frankena, WK, 1973, Ethics (2nd Edition), Pearson.

Singer, P. 2011, Practical Ethics (3rd ed), Cambridge University Press.

Smart, JJC and Williams, B. 1973, Utilitarianism: For and Against, Cambridge University Press.

Climate Change, Sustainability and Organisations

Code	Course Title	Credit	T-P-PJ
CUTM1015	Climate Change, Sustainability and Organisations	3	1.5-0-1.5

Course Rationale:

This course is about climate change, sustainability and its implications for organisations. Climate change and sustainability are closely interlinked. Students will be exposed to related issues, challenges and debates on the subjects. They will develop an understanding of how organizational performance gets affected by climate change today. As organisations grow and diversify in India, there is a need to sensitise Management students to the significance of climate change and its impact on humanity and environment; Sustainable Development Goals (SDGs) and integrated reporting framework for sustainability of organisations.

Module 1: Climate Change and Organisations

Course Objectives:

- CO1. To develop an understanding about climate change in general, responses and debates
- CO2. To create awareness about the impact of climate change on organisations in performance, growth and sustainability
- CO3. To facilitate in developing reference points to factor in aspects of climate change in organizational planning and development

Course Outcomes:

- LO1. Students will be exposed to current climate change issues, challenges and debates
- LO2. They will be sensitive to its implications for organisations in different sectors
- LO3. The course will equip the students of Management to develop strategies for perspective planning of organisations

Course Contents:

1. Basics of climate change; impacts on various sectors; responses and mitigation efforts by the state and non-state agencies; debates and critiques
2. Sectoral implications of climate change – Agriculture and Forestry; Transportation; Buildings; Energy; Industry and Manufacturing
3. Climate change – specific impacts (Migration, Disasters and Pandemics)
4. Mitigation and adaptation keeping the sustainability of business organisations

Projects: Case study, videos, small group workshops, book reviews

Session Plan for Module 1 – Climate Change and Organisations (10 one hour sessions)

Session 1: Basic concepts of climate change, impacts, issues and challenges

Session 2: Responses and mitigation efforts by state and non-state agencies

Session 3: Debates and critiques on climate change

Session 4: Climate change and ecosystem

Session 5: Climate change and social sector – health, education and livelihood/food security

Session 6: Climate change and infrastructure and services – buildings, transportation, communication, electricity/energy

Session 7: Mitigation and adaptation of climate change impacts on business organisations

Session 8 and 9: Climate change impacts of migration, disasters and pandemics – societal and organisational implication

Session 10: Develop reference points to factor into perspective planning and development of organisations

Module 2 – Sustainability in Organisations

Course Objectives:

CO1. To develop an understanding of sustainable development, SDGs and their relevance for sustainability of organisations

CO2. To comprehend the application of the Integrated Reporting Framework for Sustainability in business.

Course Outcomes:

LO1. The student will develop an understanding of perspectives on SDGs, sustainability and development in the context of organisations

- LO2. Argue the business case for sustainability informed by an understanding of the impact of current global and local economic, social and environmental pressures (including pandemics)
- LO3. Develop an Action Plan through a Case Study for integrating sustainability across an organisation's value chain
- LO4. Develop and apply the Integrated Reporting Framework for Sustainability through a case.

Course Contents:

1. Sustainable development, debates, SDGs, challenges and opportunities; The business case and leadership for action
2. Regulatory environment and International policy; Integrated Reporting Framework for Sustainability
3. Production and consumption; Design, technology, and planning for sustainability
4. Communication and marketing; Collaboration and partnerships

Projects: Small group exercises, case analysis, video and book reviews

Session Plan for Module 2 – Sustainability in Organisations (10 one hour sessions)

Session 1: Sustainable development basics and introduction to SDGs (rationale, issues and challenges for India)

Session 2 to 6: Discussion on the 17 SDGs

Session 7: SDGs and its relevance for organisations

Session 8 to 10: Integrated framework for reporting sustainability in organisations; factoring aspects of SD into performance of organisations

The 17 sustainable development goals (SDGs) to transform our world:

GOAL 1: No Poverty

GOAL 2: Zero Hunger

GOAL 3: Good Health and Well-being

GOAL 4: Quality Education

GOAL 5: Gender Equality

GOAL 6: Clean Water and Sanitation

GOAL 7: Affordable and Clean Energy

GOAL 8: Decent Work and Economic Growth
GOAL 9: Industry, Innovation and Infrastructure
GOAL 10: Reduced Inequality
GOAL 11: Sustainable Cities and Communities
GOAL 12: Responsible Consumption and Production
GOAL 13: Climate Action
GOAL 14: Life Below Water
GOAL 15: Life on Land
GOAL 16: Peace and Justice Strong Institutions
GOAL 17: Partnerships to achieve the Goal

Videos – Climate Change

1. CSE Climate Change Analysis - <https://www.youtube.com/watch?v=5fyT3-9kxU4> (7.5 mins)
2. Climate Change is having Massive Impact on Indian Farmers - <https://www.youtube.com/watch?v=A8gcGalzqIw> (8.5 mins)
3. Climate Change in India: The Risks we face (NDTV) - <https://www.youtube.com/watch?v=AT1yi1tDenM> (20.28 mins)

Videos – Sustainable Development

1. Short Videos (5) on Sustainable Development Goals and one TED Talk <https://developmenteducation.ie/blog/2017/09/5-videos-sustainable-development-goals-worth-view-useful-ted-talk/>
2. Overview of Sustainable Development Goals - <https://www.youtube.com/watch?v=s190sjqYRdg> (7.43 mins)

Projects:

1. Climate change impacts on agriculture and policy responses – what is the current practice and its implications for the sector and people; give your own recommendations based on your understanding of issues, challenges, debates, critiques.
2. Marine fishing – fisherfolk
3. Forest dwellers

4. Business organisations – MSMEs, manufacturing, service industries; application of the integrated framework for sustainability reporting

Job Readiness

Code	Course Title	Credit	T-P-PJ
CUTM1016	Job Readiness	6	0-6-0

Course Objectives

Develop additional skills (verbal, logical, quantitative and reasoning) required to enhance employability as well as the entrepreneurial ability of the students

Course Outcomes

Achieve the following scores as a minimum:

IELTS 6.5

Verbal: 60% (average of 10 exams)

Quantitative: 60% (average of 10 exams)

Logical Reasoning: 60% (average of 10 exams)

Note: A student will be awarded the credits and grades as outlined in the attached presentation:
<https://drive.google.com/file/d/1Wst-jdAJuHHVtYC4F-p3SKuw1PHWOI1U/view?usp=sharing>

Course Syllabus

Course Division

Course I: IELTS - Reading, Listening, Speaking and Writing

Course II: IELTS Verbal

Course III: Quantitative Aptitude

Course IV: Logical Reasoning

Course I: IELTS - Reading, Listening, Speaking and Writing

Module I: IELTS Reading (18hrs)

- Skimming and Scanning
- Sentence Completion
- Choose the Correct options (A, B, C, D)
- Locating the Specific Information
- Assessment on Reading Skill

Module II: IELTS Listening (6hrs)

- Notes/ Form/Table completion
- Label the Map/Passage, Multiple Choice Questions
- Complete the Sentences, Listening to Find Information
- Assessment on Listening Skills

Module III: IELTS Speaking (18hrs)

- Speaking about yourself, your family, your work and your interests
- Introduction & Interview
- Topic Discussion (e.g, Environment, Covid 19, Job)
- Assessment on Speaking Skills

Module IV: IELTS Writing (6 hrs)

- Summarising the chart, table or graph
- Comparing and contrasting graphs and tables
- Describing maps & diagrams
- Agreeing & disagreeing
- Expressing a personal view & opinion
- Assessment on Writing Skill
- CV Writing (2nd year)
- Letter Writing
- Email Writing(2nd year)
- Getting Started –writing an introduction

Course II: IELTS Verbal

Module I: Grammar (4 Hrs)

- Articles
- Prepositions

- Subject-Verb
- Spotting Errors
- Sentence Correction

Module II: Vocabulary (5 Hrs)

- Synonyms
- Antonyms
- Contextual Vocabulary

Module III: Reading Comprehension (3 Hrs)

- Paragraph/ Sentence Completion
- Jumbled Sentences/ Jumbled Paragraph
- Reading Comprehension

Module IV: Verbal Analogies (3 Hrs)

Course III: Quantitative Aptitude

Module I: Number System & Operation (14 Hrs)

- Speed Math-1 : Multiplication tricks, Square, cube, square root, Cube root tricks
- Speed Math-2 : Speed Calculations
- Number System-01 : Operation on Numbers, Classification of Numbers, Tests of Divisibility, Unit Digit Calculation
- Number System-02 : Arithmetic Progression, Geometric Progression, Factors & Factorials, Trailing Zeroes, Remainder Theorem
- HCF & LCM : Concepts, short tricks, question discussion
- Average : Concepts, short tricks, question discussion
- Assessments

Module II: Basic Arithmetic (16 Hrs)

- Percentage-01 : Basics of Percentage, Effective percentage, shortcuts
- Percentage-02 : Advanced questions and discussions
- Profit & Loss-01 : Basics and advanced questions of Profit & Loss and shortcuts
- Profit & Loss-02 : MRP, Discount, Successive discount

- Ratio & Proportion : Types of ratios, Basics & Advanced Question
- Age : Concepts & Shortcuts
- Partnership : Concepts & Shortcuts
- Mixture & Alligation : Rule of Alligation, Basics & Advanced question, Short tricks
- Assessments

Module III: Time & Analysis (17 Hrs)

- Time, Speed, Distance : Concepts, Problems based on relations, Average speed, Stoppage time
- Trains : Relative Speed & All types of train problems
- Boats & Streams : Basics, Upstream, Downstream & Shortcuts
- Race : All concepts & Shortcuts
- Time & Work : Efficiency, wages, alternative day, chain rule
- Pipes & Cistern : Positive & Negative work
- Simple Interest : Concepts & Shortcuts on Simple Interest & Installments
- Compound Interest : Concepts & Shortcuts on Simple Interest & Installments
- Logarithm : All Formulae, concepts & Shortcuts
- Assessments

Module IV: Advanced Arithmetic (16 Hrs)

- Equation : Linear & Quadratic
- Permutation : All concepts & Shortcuts on factorial, fundamental principles of counting
- Combination : All concepts & Shortcuts on Selection (Groups/teams)
- Probability : Terms related to Probability, Event, Theorems related Probability, Conditional Probability. Shortcuts on coins, dices, balls, cards, etc
- Data Interpretation : (Bar/Pi-Chart /Line) graph
- Mensuration : Area & Volume
- Height & Distance : Lines of Sight, Horizontal line, Angle of Elevation, Angle of Depression
- Assessments

Course IV: Logical Reasoning

Module I: Verbal Reasoning-I (14 Hrs)

- Series-1 : Number series (Missing & Wrong)
- Series-2 : Letter, Alpha numeric, Miscellaneous series
- Coding & Decoding : Letter Coding, Number coding, Message coding, Substitution coding, Conditional coding
- Word Problem : Analogy, Odd man out, word formation, letter pair
- Logical Thinking : Brain Riddles
- Assessments

Module II : Verbal Reasoning-II (14 Hrs)

- Order & Ranking : Ranking & Sequence
- Direction Sense Test : Shortest Distance, Angular movement concept and Dusk & Dawn
- Clock : Concepts of Angle, Reflex angle, Right angle Opposite, Coincide and Incorrect clock
- Calendar : All concepts & Shortcuts
- Blood Relation : Jumbled-up descriptions, coded relations, Relation Puzzles
- Assessments

Module III : Non Verbal Reasoning (14 Hrs)

- Cubes & Dices
- Cubes & Cuboids
- Embedded Figure & Figure series
- Figure Puzzle & Figure grouping
- Figure Counting
- Mirror & Water Image
- Paper Cutting & Paper folding
- Assessments

Module IV: Advanced Reasoning (16 Hrs)

- Sitting Arrangement : Circular, Square, Rectangular, Linear, Triangular

- Puzzle : Box, Floor, Month, Day
- Advanced Puzzle : 3 variable
- Logical Venn Diagram
- Syllogism
- Statement & Conclusion
- Data Sufficiency
- Assessments

Centurion University of Technology and Management Odisha

CHOICE BASED CREDIT SYSTEM

COURSE STRUCTURE & SYLLABUS

BASKET - III



School of Engineering & Technology

2020

**Course Structure
Basket - III**

Course Code	Course Title	Credits	Course Type T+P+PJ
CUTM1017	Industrial IOT and Automation	6	3-2-1
CUTM1018	Data Analysis and Visualisation using Python	4	0-1-3
CUTM1019	Machine Learning using Python	4	1-2-1
CUTM1020	Robotic automation with ROS and C++	4	1-2-1
CUTM1021	Basics of Design Thinking	2	0-0-2
CUTM1022	System Integration with DYMOLA	2	0-0-2
CUTM1023	Smart Engineering Project (G2M)	3	0-0-3

Industrial IoT and Automation

Code	Course Title	Credit	T-P-PJ
CUTM1017	Industrial IoT and Automation	6	3-2-1

Objective

- Students will learn the new evolution in hardware, software, and data.
- While the promise of the Industrial Internet of Things (IIoT) brings many new business prospects, it also presents significant challenges ranging from technology architectural choices to security concerns.
- Students acquire upcoming Industrial Internet of Things: Roadmap to the Connected World Course offers important insights on how to overcome these challenges and thrive in this exciting space.

Course outcome

- Discover key IIoT concepts including identification, sensors, localization, wireless protocols, data storage and security
- Explore IoT technologies, architectures, standards, and regulation
- Realize the value created by collecting, communicating, coordinating, and leveraging the data from connected devices
- Examine technological developments that will likely shape the industrial landscape in the future
- Understand how to develop and implement own IoT technologies, solutions, and applications
- At the end of the program, students will be able to understand how to develop and implement their own IoT technologies, solutions, and applications.

Course content

MODULE 1: Introduction & Architecture

Theory

What is IIoT and connected world? The difference between IoT and IIoT, Architecture of IIoT, IOT node.

Challenges of IIOT

Hands-On

1. Introduction to Arduino, ES8266, Introduction to raspberry Pi.

MODULE2: IIOT Components

Theory:

Fundamentals of Control System, introductions, components, closed loop & open loop system.

Introduction to Sensors (Description and Working principle): What is sensor? Types of sensors, working principle of basic

Sensors -Ultrasonic Sensor, IR sensor, MQ2, Temperature and Humidity Sensors (DHT-11).Digital switch, Electro

Mechanical switches.

Practice:

2. Measurement of temperature & pressure values of the process using raspberry pi/node mcu.
3. Modules and Sensors Interfacing (IR sensor, ultrasonic sensors ,Soil moisture sensor) using raspberry pi/node mcu.
4. Modules and Actuators Interfacing (Relay, Motor, Buzzer) using raspberry pi/node mcu.

MODULE 3: Communication Technologies of IIoT

Theory:

Communication Protocols: IEEE 802.15.4, ZigBee, Z Wave, Bluetooth, BLE, NFC, RFID
Industry standards communication technology (LoRAWAN, OPC UA, MQTT), connecting into existing Modbus and Profibus
Technology, wireless network communication.

Practice:

5. Demonstration of MQTT communication
6. Demonstration of LoRa communication.

MODULE 4: Visualization and Data Types of IIoT

Theory:

Front end EDGE devices, enterprise data for IIoT, emerging descriptive data standards for IIoT, cloud data base, could
Computing, fog or edge computing,
Connecting an Arduino /raspberry pi to the Web: Introduction, setting up the Arduino/raspberry pi development
Environment, Options for Internet connectivity with Arduino, configuring your Arduino/raspberry pi board for the IoT.

Practice:

7. Visualization of diverse sensor data using dashboard (part of IoT's 'control panel')
8. Sending alert message to the user.

MODULE 5:

Theory

Extraction from Web: Grabbing the content from a web page, Sending data on the web, troubleshooting basic Arduino
issues, types of IoT interaction , Machine to Machine interaction (M2M).

Practice

9. Device control using mobile Apps or through Web pages.
10. Machine to Machine communication

MODULE 6: Control & Supervisory Level of Automation

Theory

Programmable logic controller (PLC), real-time control system, Supervisory Control & Data Acquisition (SCADA).

HMI in an automation process, ERP &MES

Practice

11. Digital logic gates programming using ladder diagram

12. Implementation of Boolean expression using ladder diagram
13. Simulation of PLC to understand the process control concept.

Module 7: Application of IIOT

Case study: Health monitoring, Iot smart city, Smart irrigation, Robot surveillance

Text Books:

1. Industrial IoT Challenges, Design Principles, Applications, and Security by Ismail Butun (editor)
2. Internet of Things with Arduino Cookbook, Marco Schwartz, ISBN 978-1-78528-658-2 2.

Reference Books:

1. The Internet of Things in the Industrial Sector, Mahmood, Zaigham (Ed.) (Springer Publication)
2. Industrial Internet of Things: Cybermanufacturing System, Sabina Jeschke, Christian Brecher, Houbing Song, Danda B. Rawat (Springer Publication)
3. Internet of Things- A Hands on Approach, Arshdeep Bahga and Vijay Madisetti , Universities Press , 2015.

Data Analysis and Visualization Using Python

Code	Course Title	Credit	T-P-PJ
CUTM1018	Data Analysis and Visualisation Using Python	4	0-1-3

Objective

- How to tell a story from data
- How to marshal the data for storyline
- The ability to develop visualisation to tell the story
- The focus is on analysis of data using visualisation as a tool

Course outcome

- To create impactful visualization with good story line.

Course content

Module-I

STORY BOARD DEVELOPMENT

The objective and flow of the story to be understood through cases

Module-II

DATA READING USING PYTHON FUNCTIONS

Python libraries: Pandas, NumPy, Plotly, Matplotlib, Seaborn, Dash

Data collection from online data sources, Web scrap, and data formats such as HTML, CSV, MS Excel, data compilation, arranging and reading data, data munging

Module-III

DATA VISUALISATION USING PYTHON LIBRARIES

Different graphs such as Scatterplot, Line chart, Histogram, Bar chart, Bubble chart, Heatmaps etc.

Dashboard Basics – Layout, Reporting, Infographics, Interactive components, live updating

Projects List

1. COVID 19
2. World Development Indicators

3. ERP dashboarding

4. Details of Social/ Empowerment schemes of Govt. etc.

References:

<https://www.programmer-books.com/wp-content/uploads/2019/04/Python-for-Data-Analysis-2nd-Edition.pdf>

<https://towardsdatascience.com/data-visualization/home>

Reading materials and videos available on internet on how to use ANACONDA, JUPYTER NOTEBOOK and Python Libraries

Machine Learning using Python

Code	Course Title	Credit	T-P-PJ
CUTM1019	Machine Learning using Python	4	1-2-1

Objective

- Understand the meaning, purpose, scope, stages, applications, and effects of ML.
- Explore important packages of python, such as numpy, scipy, OpenCV and scikit-learn.

Course outcome

- Students will able to Create and incorporate ML solutions in their respective fields of study.

Course content

Module 1 – Application and Environmental-setup (12 hrs)

- Applications of Machine Learning In different fields (Medical science, Agriculture, Automobile, mining and many more).
- Supervised vs Unsupervised Learning based on problem Definition.
- Understanding the problem and its possible solutions using IRIS datasets.
- Python libraries suitable for Machine Learning(numpy, scipy, scikit-learn, opencv)
- Environmental setup and Installation of important libraries.

Module 2 - Regression (8 hrs)

- Linear Regression
- Non-linear Regression
- Model Evaluation in Regression
- Evaluation Metrics in Regression Models
- Multiple Linear Regression
- Feature Reduction using PCA
- Implementation of regression model on IRIS datasets.

Module 3 - Classification (24 hrs)

- Defining Classification Problem with IRIS datasets.
- Mathematical formulation of K-Nearest Neighbour Algorithm for binary classification.
- Implementation of K-Nearest Neighbour Algorithm using sci-kit learn.
- Classification using Decision tree.
- Construction of decision trees based on entropy.
- Implementation of Decision Trees for Iris datasets .
- Classification using Support Vector Machines.
- SVM for Binary classification
- Regulating different functional parameters of SVM using sci-kit learn.
- SVM for multi class classification.
- Implementation of SVM using Iris datasets .

- Implementation of Model Evaluation Metrics using sci-kit learn and IRIS datasets.

Module 4 - Unsupervised Learning (12 hrs)

- Defining clustering and its application in ML .
- Mathematical formulation of K-Means Clustering.
- Defining K value and its importance in K-Means Clustering.
- Finding appropriate K value using elbow technique for a particular problem.
- Implementation of K-Means clustering for IRIS datasets

Projects

- To be defined based on respective study area of student.

References:

Text Book:

1. EthemAlpaydin, Introduction to Machine Learning, Second Edition,
<http://mitpress.mit.edu/catalog/item/default.asp?ttype=2&tid=12012>.

Web Resource:

1. <https://towardsdatascience.com/beginners-guide-to-machine-learning-with-python-b9ff35bc9c51>

Robotic automation with ROS and C++

Code	Course Title	Credit	T-P-PJ
CUTM1020	Robotic automation with ROS and C++	4	1-2-1

Course Content:

1. Robotic Automation Introduction
2. Sensors & Controllers
3. Sequential robot control
4. ROS & C++
5. Project

Course Objectives

- To upgrade knowledge levels of robotic application in modern industries
- Project based training

Course Outcomes

- Advanced knowledge on robotic automation
- Understand different types of devices to which robotic modules are connected
- Provide the knowledge about understand various types of robotic applications.
- Industry based project & advanced learning.

Course Syllabus

Module – 1

Robotic Automation Introduction

- 1.1 Basic's of automation
- 1.2 Use of robots in industry.

Module - 2

Sensor's requirement in robots.

- 2.1 Selecting sensors as per the project.
- 2.2 Specification checking of sensors.
- 2.3 Interfacing of sensor to controllers.

Practice

P2.1 TILT, PROXIMITY, TEMPERATURE, HUMIDITY, SMOKE, FINGERPRINT

P2.2 BLUETOOTH, ESP8266, GPS, GSM

Module - 3

Controllers and output port handling.

- 3.1 Concept of 8951 controller
- 3.2 Concept of Arduino and concept of Raspberry Pi.

Practice

P3.1 Port handling of 8951

P3.2 Port handling of Arduino

P3.3 Port handling of Raspberry Pi

Module- 4

Sequential robot control

4.1 Designing of sequential robot control system.

4.2 Writing of programs in different programming languages.

4.3 Controlling of input/output devices.

Practice

P4.1 Programming of controllers with different programming languages

P4.2 Designing of sequential control robot.

Module- 5

ROS & C++

5.1 What is Ubuntu & ROS?

5.2 Requirement and application of ROS.

5.3 ROS based simulation of Turtlbot.

5.4 Adding of robot with wheel & sensor. Placing robot inside Gazebo.

Practice:

P5.1 Ubuntu basic command.

P5.2 Installation of Ubuntu, ROS & Gazebo

P5.3 Turtlbot control application

P5.4 Gazebo based robot control and simulation.

P5.5 Python and C++ based programming to control robot.

Virtual LAB : Using ROBOMASTER (AWS)

Projects

1. Mobile controlled robot
2. Autonomous operated robot.
3. 3. Location targeted robot

Basics of Design Thinking

Code	Course Title	Credit	T-P-PJ
CUTM1021	Basics of Design Thinking	2	0-0-2

Course Rationale:

Steve Jobs famously said “Design is just not what it looks or feels like. Design it how it works”. Design Thinking is described as a discipline where designer’s sensibility and methods match with the needs of users. It draws on logic, imagination, intuition and systemic reasoning to explore the possibilities of a solution to a challenge and to create desired outcomes that benefit the end user. So, if you are among the one who is constantly thinking of solving a problem of business or society, it is ideal for you. This course will help you with the basics of design thinking and through an action centric learning approach, lead to creatively explore the challenges and by using the design thinking tool propose innovative solutions.

Course Objectives: The course aims to

- To orient the participants with the basics of the design thinking process
- To familiarize participants with the elements of Design thinking

Course Outcome: After completion of the course the students

- will be able to apply the design thinking process to innovative problem solving

Course contents:

Module: I

Basics of Design Thinking, Why Design Thinking, Design Thinking Mindset (Inspiration, Ideation and Implementation) Design thinking process, (Empathy, Define, Ideate, Prototype, Test). Cases of application of Design thinking approach (Intuit, IDEO, Infosys, IBM, Google, Apple, Jubilant Foods)

Module: II

Executing a Design Thinking Project- Apply Interviewing and empathy building technique, Drawing inferences from the observations, Defining a point of view, Ideation process, developing and testing prototypes and writing a story of a minimum viable solution.

Projects-

- Develop a customer friendly insulin pump design
- Develop a new customer experience for buying a diamond ring online
- Develop a new disease monitoring device for health workers working in remote areas.
- Designing an integrated machinery for end to end farm activities for small and marginal farmers.

- Design a Fund raising campaign

Recommended References:

Books: Tom Kelly & Jonathan Littman (2001). “The Art of Innovation” Broadway Publication.

System Integration with DYMOLA

Code	Course Title	Credit	T-P-PJ
CUTM1022	System Integration with DYMOLA	2	0-0-2

Course Objectives

- To provide powerful multi-disciplinary systems engineering through compatible model libraries for a large number of engineering domains.
- To design high-fidelity modeling of complex integrated systems.
- To design intuitive modeling i.e. advanced, formally defined object-oriented modeling language.
- To enable users to easily build their own components or adapt existing ones to match their unique needs.
- To provide hardware-in-the-loop simulations (HILS) i.e. real-time simulation with AurdinoUno, Python, Matlab, 3D real-time animation, CAD files import capability.
- To increase the ability to integrate with complex 3D geometry for integrated simulation.
- To increase powerful model management, calibration & optimization capabilities.

Course Outcomes

- The use of open standards such as DYMOLA (Modelica and FMI) is a key enabler to better understand the behavior of systems and to work and communicate accurately with partners and suppliers.
- DYMOLA is not only capable to support an ad-hoc modeling level, such as functional behavior or detailed design, but is also able to convert these predictive models into real-time models.
- The user can able to create new elements in an easy and intuitive way, to answer to its own modeling requirements.
- Future Centurions are ready for operating in many industries including automotive, aerospace, architecture, Motorsport, energy, and high tech.

Course Syllabus

Module 1 - Introduction Dymola and Modelica library

Package Browser, Component Browser, Parameter and Variable Editor Simulation Window, Modeling, and Simulation.

The Modeling window is used to compose models and model components.

The Simulation experiment on the model, plot results and animate the behavior.

Creating user-defined models and scripting using Modelica language.

Role Play – Explore the pre-defined libraries and Models, Creating a Package

Practice Project - Preparation of animated projects

<https://www.youtube.com/watch?v=39xyI0k>

<https://www.youtube.com/watch?v=FN8LlnTwzVE&t=314s>

Module 2 – Physical Modeling using DYMOLA

Import of user-defined libraries and packages, interfacing with physical models using ArduinoUno.

The Simulation experiment on the model using multi-domain libraries such as mechanical, electrical, control, thermal, pneumatic, hydraulic, powertrain, thermodynamics, vehicle dynamics, air-conditioning domains

Dymola interface that is stored in the Python package

Role Play – Explore the pre-defined libraries and Models, Creating a Package

Practice Project - Preparation of projects using user-defined packages,

Systems Physics with Modelica/Dymola

<https://www.youtube.com/watch?v=xlpHwX-W3Ns>

Module 3 – Animation and 3D view Using DYMOLA

MultiBody Frame Connector, Building a Mechanical Model, Concept of Furuta

Role Play - Practical session by students for students

Practice Project - Modeling of animated projects using the MultiBody library.

<https://www.youtube.com/watch?v=c9Ar2b4X5rQ>

<https://www.youtube.com/watch?v=k7ILBASaEJg>

Session Plan

Session 1

Project 1

Simulating a model – Modeling of Integrated circuits

Description: Use of Electrical and Electronics components.

Workbench Use: Behavior Modelling, Functional and Logical Design.

Session 2

Project 2

Simulating a model -Creating a model for Electric DC Motor

Description: Design a DC Motor Model, Test, and Simulation, Creating a library for components, Creating a model for motor drive, Scripting.

Workbench Use: Behavior Modelling, Modelica Standard Library.

Session 3

Project 3

Simulating a model -Simple Pendulum with Frictionless joint Using Multi-Body Library

Description: Design the Simple pendulum and the Furuta joint using Dymola and Modelica language. Friction joint for the Mechanical equipment.

Workbench Use: Behavior Modelling.

Session 4

Project 4

Simulating a model – Pick and Place Robot

Description: 5 Axis Pick and Place Robot Design, Validation, and Optimization in the 3DS platform.

Workbench Use: Behavior Modelling, Functional and Logical Design. Part design and Assembly Design.

<https://www.youtube.com/watch?v=9RgdZUvEjPw>

Session 5

Project 5

Simulating a model – 3D Printer Design

Description: Design All System and Sub System of the 3D Printer, Validation and Simulation using 3Ds Platform.

Workbench Use: Behavior Modelling, Functional and Logical Design. Part design and Assembly Design.

Session 6

Project 6

Simulating a model – Bicycle Behavior Modeling

Description: Design Power Train, Driving Cycle, part design, and Simulation.

Workbench Use: Behavior Modelling, Functional and Logical Design. Part design and Assembly Design.

Session 7

Project 7

Simulating a model – Refrigerator Compartment Door Design using Thermal Library

Description: This component model the airflow through the door of a refrigerator or freezer compartment.

Workbench Use: Behavior Modelling, Functional and Logical Design. Part design and Assembly Design.

Session 8

Project 8

Simulating a Model – Engine Analytic Using MultBody Library.

Description: Engine analytic, an engine with 6 cylinders, 6 planar loops, 1 degree of freedom, and analytic handling of kinematic loops.

Workbench Use: Behavior Modeling.

Session 9

Project 9

Simulating a model – Control the real and Digital servo motor ArduinoUno Library

Description: Control the Real and Digital Servo motor with simulation.

Workbench Use: Behavior Modelling, Arduino based System Design, and Functional and logical design.

Session 10

Project 10

Simulating a model – Virtual Universes with Poppy Humanoid Using ArduinoUno Library

Description: Virtual universes with a human assistant robot with simulation.

Workbench Use: Behavior Modelling, Arduino based System Design, Functional, and logical design.

Session 11

Project 11

Simulating a model – Implementation of Model using Python Library

Description: Modeling using python library, validation and optimization in the 3Ds platform.

Workbench Use: Behavior Modelling, Functional and Logical Design. Part design and Assembly Design.

Session 12

Project 12

Simulating a model – Industrial Robot Design

Description: 6 Axis industrial robot design, validation, and optimization in the 3Ds platform.

Workbench Use: Behavior Modelling, Functional and Logical Design. Part design and Assembly Design.

Session 13

Project 13

simulating a model – Temperature Control System Using State Graph

Description: The model contains an electric circuit with a heating resistor and a switch.

Workbench Use: Behavior Modelling.

<https://www.youtube.com/watch?v=zz-crJOG0&t=26s>

<https://www.youtube.com/watch?v=Zl592ARjnpU>

Session 14

Project 14

Simulating a model – Magnetic Ball System using Magnetic Library

Description: The electronic circuit consists of a voltage source, a resistor, and an inductor in the form of a tightly wound coil. An iron ball beneath the inductor experiences a gravitational force as well as an induced magnetic force (from the inductor) that opposes the gravitational force.

Workbench Use: Behavior Modelling.

Session 15

Project 15

Simulating a Model – Design of Water to Steam Converter Using Fluid Library

Description: Create a package under Fluid_Package called Water_To_Steam using temperature sensors.

Workbench Use: Behavior Modelling.

Session 16

Project 16

Simulating a Model – Design of Liquid Valve Control Using Fluid Library

Description: Building a simple circuit with two valves and a volume block.

Workbench Use: Behavior Modelling.

https://www.youtube.com/watch?v=P_YI3RiTl14

Centurion University of Technology and Management Odisha

Choice Based Credit System

Course Structure & Syllabus

Electrical and Electronics Engineering



School of Engineering & Technology

2020

CBCS Structure

Basket	Basket Category	Minimum Credits to be acquired by Regular students	Minimum Credits to be acquired by Lateral Entry students
I	Foundation Courses in Sciences	17	06
II	Foundation Courses in Humanities & Management [A: 6 credit (choice), B: 6 credit (Compulsory)]	12	6(Job readiness) + 3
III	Smart Stack	25	25
IV	Foundation and Core Engineering Courses	58*	48
V	Domain/Skill/Internship/Minor Project/MOOC	48	32
	Total Credits	160	120

Course Structure

Basket I	Foundation Courses in Sciences		
Course Code	Course Title	Credit	Type (Theory+Practice+Project)
CUTM1001	Differential Equations and Linear Algebra	3	2+0+1
CUTM1002	Laplace & Fourier Transforms	3	2+0+1
CUTM1003	Complex Analysis & Numerical Methods	3	2+0+1
CUTM1004	Discrete Mathematics	3	2+0+1
CUTM1005	Probability & Statistics	3	2+0+1
CUTM1925	Calculus	3	2+0+1
CUTM1006	Mechanics for Engineers	3	2+1+0
CUTM1007	Optics and Optical Fibres	3	2+1+0
CUTM1008	Applied Analytical Chemistry	3	2+1+0
CUTM1009	Applied Engineering Materials	3	2+0+1
CUTM1010	Environmental Studies	2	0+0+2

Basket II	Foundation Courses in Humanities & Management [A: 6 credit (choice), B: 6 credit (Compulsory)]		
Course Code	Course Title	Credit	Type (Theory+Practice+Project)
CUTM1011	Optimisation Techniques	2	0-2-0
CUTM1012	Engineering Economics and Costing	3	2-0-1
CUTM1013	Project Management	3	2-0-1
CUTM1014	Gender, Human Rights and Ethics	3	1.5-0-1.5
CUTM1015	Climate Change, Sustainability and Organisation	3	1.5-0-1.5
CUTM1016	Job Readiness	6	0-6-0

Basket III	Smart Stack		
Course Code	Course Title	Credit	Type (Theory+Practice+Project)
CUTM1017	Industrial IOT and Automation	6	3-2-1
CUTM1018	Data Analysis and Visualisation using Python	4	0-1-
CUTM1019	Machine Learning using Python	4	1-2-1
CUTM1020	Robotic automation with ROS and C++	4	1-2-1
CUTM1021	Basics of Design Thinking	2	0-0-2
CUTM1022	System Integration with DYMOLA	2	0-0-2
CUTM1023	Smart Engineering Project (G2M)	3	0-0-3

Basket IV	Core Course_ Electrical and Electronics Engineering		
Course Code	Course Title	Credit	Type (Theory+Practice+Proje

			ct
CUTM1028	OOPs with C ++ Programming	4	1-2-1
CUTM1029	Data Structures using C++	4	1-2-1
CUTM1030	Advanced Web Programming	4	1-2-1
CUTM1031	Java Technologies	4	2-1-1
CUTM1039	Embedded System Design Using ARM Cortex	6	3-2-1
CUTM1040	VLSI Design	6	3-2-1
CUTM1042	Electromagnetic Field Theory and Transmission Line	3	2-1-0
CUTM1043	Network Analysis	3	2-1-0
CUTM1051	Energy Production & Transmission	3	2-1-0
CUTM1052	Substation Switch gear & Protection	4	2-1-1
CUTM1053	System Modeling and Control	4	3-1-0
CUTM1054	Electrical Machines Operation and Control	4	2-2-0
CUTM1055	Industrial Power Electronics	4	2-1-1
CUTM1056	Digital Measurement and Instrumentation	3	2-1-0
CUTM1057	Basic Electrical Engineering	2	1-1-0
	Total Credits	58	

Basket V: Domain/Skill/MOOC/Minor Project/Internship/Applied Courses

Domain:

- Industrial Automation
- Operation and Maintenance of Electrical Grid System & Transformers
- Embedded System Design
- Renewable Energy Applications
- GO-TO MARKET (Digital Manufacturing)

Basket IV: Core Courses Syllabus

OOPs with C++ Programming

Code	Course Title	Credit	T-P-PJ
CUTM1028	OOPs with C++ Programming	4	1-2-1

Objective

- To understand how C++ improves C with object-oriented features
- To learn how to design C++ classes for code reuse
- To learn how inheritance and virtual functions implement dynamic binding with polymorphism
- To learn how to use exception handling in C++ programs

Course Outcome

- Apply the object-oriented programming approach in connection with C++
- Illustrate the process of data file manipulations using C++
- Apply virtual and pure virtual function & complex programming situations
- Write an error free program of minimum 200 lines of code

Course content

Module I: Revision of C programming

(8 hrs)

Revision of C Programming, Pointers, Functions (Call by value and reference), Recursion, Arrays using Pointers, Structures, Union, Enumeration and Typedef, File handling.

Programs:

1. Write a Program to perform Parameter passing.
2. Write a program to create a scientific calculator.
3. Write a program to convert a decimal to binary number using recursion.
4. Write a program to Read 'n' employee details and display the top 10 employees as per the salary.
5. Write a program to evaluate MCQ questions of an examination and generate the results using files.

Module II: Basics of Object oriented concepts

(8 hrs)

Object oriented concepts Classes and Objects, Encapsulation, Abstraction, Overloading, Inheritance, Polymorphism.

Beginning with C++, Tokens, Static Members, Constant Members, Expressions, Control Structure, Functions: parameter passing, inline function, function overloading.

Programs:

1. Write a program to read a number and check whether the number is Prime number , Palindrome number , Magic number , Armstrong number , Strong number or not.
2. Write definitions for two versions of an overloaded function. This function's 1st version sum() takes an argument, int array, and returns the sum of all the elements of the passed array. The 2nd version of sum() takes two arguments, an int array and a character ('E' or 'O'). If the passed character is 'E', it returns the sum of even elements of the passed array and if the passed character is 'O', it returns the sum of odd elements. In case of any other character, it returns 0 (zero).

Module III: Class-Object-Constructor**(10 hrs)**

Classes: data members, member function, array of objects, static data members, constant members function, and friend function.

Constructors, Encapsulating into an object, Destructors.

Programs:

1. Define a class to represent a book in a library. Include the following members:

Data Members

Book Number, Book Name, Author, Publisher, Price, No. of copies issued, No. of copies

Member Functions

- (i) To assign initial values
- (ii) To issue a book after checking for its availability
- (iii) To return a book
- (iv) To display book information.

2. A bank maintains two kinds of accounts for customers, one called as savings and the other as current account. The savings account provides compound interest and withdrawal facilities but no cheque book facility. The current account provides cheque book facility but no interest. Current account holders should also maintain a minimum balance and if the balance falls below this level a service charge is imposed.

Define a class to represent a bank account. Include the following members: Data members: 1. Name of the depositor. 2. Account number. 3. Type of account. 4. Balance amount in the account. Member functions: 1. To assign initial values. 2. To deposit an amount. 3. To withdraw an amount after checking the balance. 4. To display the name and balance. Write a main program to test the program

3. Declare a class to represent fixed-deposit account of 10 customers with the following data members:

Name of the depositor, Account Number, Time Period (1 or 3 or 5 years), Amount.

The class also contains following member functions:

- (a) To initialize data members.
- (b) For withdrawal of money (after half of the time period has passed).
- (c) To display the data members.

4. Create two classes DM and DB which store the value of distances. DM stores distances in meters and centimeters and DB in feet and inches. Write a program that can read values for the class objects and add one object of DM with another object of DB. Use a friend function to carry out the addition operation. The object that stores the results may be a DM object or DB object, depending on the units in which the results are required. The display should be in the format of feet and inches or meters and centimeters depending on the object on display.

Module IV: Inheritance

(8 hrs)

Associations, Inner Classes, Memory Management and pointers

Inheritance: Derived classes, member accessibility, forms of inheritance, virtual base classes.

Programs:

1. Write a Program to describe about all types of inheritance.
2. Create a base class called shape. Use this class to store two double type values that could be used to compute the area of figures. Derive two specific classes called triangle and rectangle from the base shape. Add to the base class, a member function `get_data()` to initialize base class data members and another member function `display_area()` to compute and display the area of figures. Make `display_area()` as a virtual function and redefine this function in the derived classes to suit their requirements. Using these three classes, design a program that will accept dimensions of a triangle or a rectangle interactively, and display the area.
3. An educational institution wishes to maintain a database of its employees. The database is divided into a number of classes whose hierarchical relationships are shown in following figure. The figure also shows the minimum information required for each class. Specify all classes and define functions to create the database and retrieve individual information as and when required.

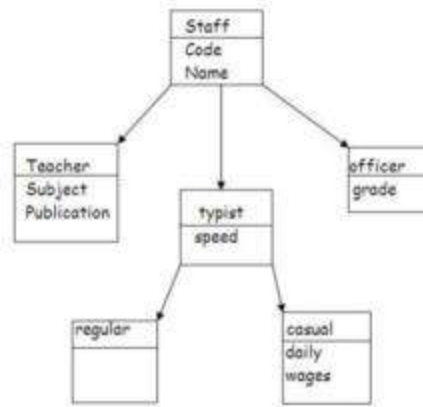


fig: class relationships (for exercise 8.3)

Module V: Polymorphism (8 hrs)

Polymorphism (Compile time Polymorphism, Run time Polymorphism), Virtual Functions, Abstract class, virtual destructors, Interfaces.

Programs:

1. Write a Program to overload ++ operator.
2. Write a program to overload + operator by concatenating strings.
3. Write a program to describe about virtual function.

Module VI: Exception Handling

(8 hrs)

Exception Handling, Managing Console I/O Operations, Streams & Files: streams, hierarchy of stream classes, working with files

Programs:

1. Write a Program to describe about exception handling mechanism.
2. Write a Program to describe multi catch statement.
3. Write a program to read a list containing item name, item code, and cost interactively and produce a three column output as shown below.

Name	Code	Cost
Turbo C++	1001	250.95
C primer	905	95.70
.....
.....

Note that the name and code are left-justified and the cost is right justified with a precision of two digits. Trailing zeros are shown.

4. Write a program that reads a text file and creates another file that is identical except that every sequence of consecutive blank spaces is replaced by a single space.

5. Write a program that reads character from the keyboard one by one. All lower case characters get store inside the file LOWER, all upper case characters get stored inside the file UPPER and all other characters get stored inside OTHERS.

Module VII: Templates

(8 hrs)

Advance Topics in C++ Object Design and Templates STL (Standard Type Libraries)RTTI (Run Time Type Identification) Advanced Typecasting ,new data types, new operators, class implementation, namespace scope , operator keywords, new headers , C++ Containers

Programs:

1. Write a function template for finding the minimum value contained in an array.

2. Imagine a publishing company that markets both books and audio-cassette versions of its works. Create a class called Publication that stores the title (a string) and price of a publication. From this class derive two classes: Book, which adds a page count (type int); and Tape, which adds a playing time in minutes (type float). Each of the three class should have a getdata() function to get its data from the user at the keyboard, and a putdata() function to display the data. Write a main() program that creates an array of pointers to Publication. In a loop, ask the user for data about a particular book or Tape, and use new to create a object of type Book or Tape to hold the data. Put the pointer to the object in the data for all books and tapes, display the resulting data for all the books and taps entered, using a for loop and a single statement such as `pubarr[i]->putdata();`to display the data from each object in the array.

Text Books:

3. E Balagurusamy, “Object Oriented Programming with C++”, Tata McGraw Hill, Sixth Edition.
4. Herbert Schlitz, “The Compete Reference C++”, Tata McGraw Hill, Fourth Edition.

Reference Books:

6. Ashok Kamthane, “Object Oriented Programming with ANSI and Turbo C++”, Pearson.
7. Behrouz A. Forouzan & Richard F. Gilberg “A Structured approach using C++” Cengage Learning Indian Edition.

Data Structures using C++

Code	Course Title	Credit	T-P-PJ
CUTM1029	Data Structures using C++	3	1-2-1

Objective

- Be familiar with techniques of algorithm analysis and Recursive method
- Be familiar with implementation of linked data structures such as linked lists and binary trees
- Be familiar with several sub-quadratic sorting algorithms including quick sort, merge sort and heap sort
- Be familiar with some graph algorithms such as shortest path and minimum spanning tree

Course Outcome

- Evaluate algorithms and data structures in terms of time and memory complexity of basic operations
- Define basic static and dynamic data structures and relevant standard algorithms for them: stack, queue, dynamically linked lists, trees, graphs, heap, priority queue, hash tables, sorting algorithms, min-max algorithm
- Determine and demonstrate bugs in program, recognize needed basic operations with data structures
- Formulate new solutions for programming problems or improve existing code using learned algorithms and data structures

Course content

Module I: Problem Solving Analysis

(6 hrs)

Define the problem, Identify the problem, Introduction to Problem Solving, Problem solving basics, Defining creativity v/s innovation

Find Creative Solutions using creativity tools

Effective problem solving approaches , Critical thinking and information analysis , Brainstorming, Reverse Brainstorming, Imagineering, Mind Mapping, Six Thinking Hats: A Tool to Strengthen Critical Thinking, Collaboration, Communication, and Creativity Skills , Analyzing the situation, Gathering information, Identifying solution criteria , Decision Making Methods , Charts and Diagrams , Applying outcome-based thinking

Evaluate and Select solution

Pro's and Con's, Force field analysis, Feasibility/Capability Analysis, Decision analysis, evaluating problems , Choosing among alternatives , Qualitative analysis, discussing qualitative

analysis techniques , Establishing objectives , Assigning weight to objectives in order to make the best decision , Creating a satisfaction scale to choose between alternatives

Implementing Decisions

Create an action plan, Break solution into action steps, Prioritize actions and assign roles (setting priorities for taking action) ,Follow-up at milestones

Programs:

1. Problem solving (Control structures, Arrays) using Raptor Tool.

Module II: Array & Stack

(9 hrs)

Analysis of different Algorithms, Asymptotic analysis, Algorithm analysis, Complexity Analysis, Application of Data structures

Basic Data Structures, Arrays, Stacks and its applications (Recursion, Infix to Postfix Conversion and Postfix Evolution

Programs:

1. Write a program to perform the following menu driven program on the input array.

- a. Insertion
- b. Deletion
- c. Searching
- d. Sorting
- e. Merging
- f. Display
- g. Exit

2. Write a program to perform the following menu driven program on the STACK.

- a. Push
- b. Pop
- c. Display
- d. Exit

Module III: Queue & Linked List

(9 hrs)

Queues, Priority Queues, Dequeues.

Linked lists: Single Linked List and Operations on Single Linked List (Creation Insertion , Deletion , Sorting and Reverse).

Programs:

1. Write a program to perform the following menu driven program on the Queue.

- a. Insertion

- b. Deletion
- c. Display
- d. Exit

2. Write a program to create a single linked list performs the following menu driven program.

- a. Insertion at front
- b. Insertion at end
- c. Insertion at particular position
- d. Deletion at front
- e. Deletion at end
- f. Deletion at particular position
- g. Display

Module IV: Stack & Queue Using Linked List

(8 hrs)

Circular linked list and Double linked list, Stack implementation using Linked List and Queue implementation using Linked List

Programs:

1. Write a program to create a Double linked list performs the following menu driven program.

- a. Insertion at front
- b. Insertion at end
- c. Insertion at particular position
- d. Deletion at front
- e. Deletion at end
- f. Deletion at particular position
- g. Display

2. Write a program to create a circular linked list and display it.

3. Write a program to implement Stack Using Linked List.

4. Write a program to implement Queue Using Linked List.

Module V: Trees

(10 hrs)

Trees and hierarchical orders ,Introduction to trees , Abstract trees , Tree traversals , Forests , Ordered trees , Binary trees , Perfect binary trees , Complete binary trees , Search trees , Binary search trees , AVL trees

Programs:

1. Write a program to create Binary tree and display it.

2. Write a program to create a BST and display it.
3. Write a program to print all pairs from two BSTs whose sum is greater than the given value.
4. Write a program to remove duplicate entries from the BST.
5. Write a program to create a AVL tree and display it.

Module VI: Searching & Sorting

(8 hrs)

Searching & Sorting algorithms , Objectives of Searching , The Sequential Search , Analysis of Sequential Search , The Binary Search , Analysis of Binary Search , Introduction to sorting , Insertion sort , Bubble sort , Heap sort ,Merge sort ,Quick sort

Programs:

1. Write a program to perform linear and binary search.
2. Write a program to perform selection sort, Bubble sort and Insertion sort.
3. Write a program to perform merge and quick sort.
4. Write a program to perform Heap sort.

Module VII: Hashing

(8 hrs)

Hash functions and hash tables ,Hashing & Introduction to hash tables ,Hash functions , Mapping down to $0 \dots M - 1$, Chained hash tables , Scatter tables , Open addressing , Linear probing , Quadratic probing , Double hashing, Poisson distribution , Collision Resolution Graph Terminology and Traversals.

Programs:

1. Write a program to perform Linear Probing.
2. Write a program to perform Double Hashing

Text Books:

1. Data Structures, Algorithms and Applications in C++, Sartaj Sahani, 2nd Edition.
2. Data Structures and Algorithms in C++, Michael T.Goodrich, R, Tamassia and D.Mount, wiley Student Edition, 7th edition, John Wiley and Sons.

Reference Books:

1. Data Structures and Algorithms Analysis in C++ by Mark Allen Weiss.
2. Data Structures and Algorithms in C++, 3rd edition, Adam Drozdek, Cengage Learning.

Source of reference; <http://courseware.cutm.ac.in/courses/data-structures-using-c/>

Advanced Web Programming

Code	Course Title	Credit	T-P-PJ
CUTM1030	Advanced Web Programming	4	1-2-1

Objective

- Understand client server architecture and able to use the skills for web project development.
- Create job opportunities as a web developer

Course Outcome

- Develop a static, interactive and well-formed webpage using JavaScript, CSS3 and HTML5.
- Use PHP7 to improve accessibility of a web document.
- Gain necessary skills for designing and developing web applications.

Course content

Module I: Web Programming Concepts(7hrs)

Architecture of the Web (1)

HTTP Protocols(1)

Difference HTTP1.0 and HTTP 1.1, Stateless nature of the protocol, Methods (GET, POST, HEAD, PUT, DELETE), HTTP session, Statuscodes, Persistent connections, HTTPS

HTML(1)

Document Object Model (DOM), Elements, Events

HTML 5(2)

Elements, Objects, Events, Canvas, Audio & Video Support, Geo-location Support

CSS(2)

Styling HTML with CSS, Inline Styling (Inline CSS), External Styling (External CSS), CSS Fonts, The CSS Box Model, The id Attribute, The class Attribute, HTML Style Tags

Practice

1. Write an HTML code to display your CV on a web page.
2. Write an HTML code to create a Home page having three links: About Us, Our Services and Contact Us. Create separate web pages for the three links.
3. Write an HTML code to create a Registration Form. On submitting the form, the user should be asked to login with this new credentials.
4. Write an HTML code to create your Institute website, Department Website and Tutorial website for specific subject.
5. Write an HTML code to create a frameset having header, navigation and content sections.

6. Write an HTML code to demonstrate the usage of inline CSS.
7. Write an HTML code to demonstrate the usage of internal CSS.
8. Write an HTML code to demonstrate the usage of external CSS.
- 9: Design your own website using HTML CSS
- 10: Design form using HTML and apply CCS

Module II: JavaScript & jQuery(14 hrs)

JavaScript (10)

Introduction to JavaScript: Variable, statements, Operators, Comments, constructs, Functions, expressions, Javascript console, Scope, Events, Strings, String Methods, Numbers, Number Methods, Dates, Date Formats, Date, Methods, Arrays, Array Methods, Booleans, Comparisons
Control Structures: Conditions, Switch, Loop For, Loop While, Break

Functions: Function Definitions, Function Parameters, Function Invocation, Function Closures

Objects: Object Definitions, Object Properties, Object Methods, Object Prototypes

Object Oriented Programming:

Method, Constructor, Inheritance, Encapsulation, Abstraction, Polymorphism, Javascript Validations, Document Object Model, Document and Events (DOM Manipulation)

HTML DOM: DOM Intro, DOM Methods, DOM Document, DOM Elements, DOM HTML, DOM CSS, DOM Animations, DOM Events, DOM EventListener, DOM Navigation, DOM Nodes, DOM Nodelist, Debugging, Type Conversion, Regular expressions, Errors, Debugging

Forms: Forms Validation, Forms API, JS Browser BOM, Window, Screen, Location, History, Navigator, Popup Alert, Timing, Cookies, Javascript Windows, Pushing code quality via JSLint tool, Security in Java Script

jQuery(4)

Basics of jQuery, jQuery selection and events, jQuery Effects, jquery traversal and manipulation, Data attributes and templates, jQuery Plugins, JQuery / Google Web Toolkit

Practice:

1. Write a Java script to prompt for users name and display it on the screen.
2. Design HTML form for keeping student record and validate it using Java script.
3. Write programs using Java script for Web Page to display browsers information.

4: Validate form page using JavaScript

5: use JQuery effect in page

6. Write a jQuery Code to Find the data passed with the on() method for each element.

7.Find the position of the mouse pointer relative to the left and top edges of the document.

8.Count the number of milliseconds between the two click events on a paragraph

9.Find all the text nodes inside a paragraph and wrap them with an italic tag

Module III: AJAX& JSON(8 hrs)

AJAX(3)

Design Introduction to Ajax,Web services and Ajax,Ajax using HTML, CSS, JavaScript,Ajax Framework and DOM,XMLHttpRequest,Ajax Architecture

Working with JSON (5)

JSON – Introduction,Need of JSON,JSON Syntax Rules,JSON Data - a Name and a Value,JSONObjects,JSONArrays,JSON Uses JavaScript Syntax,JSONFiles,JSON& Security

Concerns, Cross Site Request Forgery (CSRF), Injection

Attacks,JSXMLHttpRequestfunctions,JavaScriptXMLHttpRequest& Web APIs,JSON& Client Side Frameworks,JSON& Server Side Frameworks,Replacing XML with JSON,JSON

parsing,AJAX using JSON and jQuery

Practice:

1.Create an simple application using AJAX to show the table of numbers given by user at runtime.

2.Access web service using Ajax and handle using JSON

Module IV: Responsive Web Design (5 hrs)

Introduction

The Best Experience for All Users

- Desktop
- Tablet
- Mobile

Bootstrap

Overview of Bootstrap

Need to use Bootstrap

Bootstrap Grid System, Grid Classes, Basic Structure of a Bootstrap Grid

Typography

Tables, Images, Jumbotron, Wells, Alerts, Buttons, Button Groups, Badges/Labels, Progress

Bars, Pagination, List Groups, Panels, Dropdowns, Collapse, Tabs/Pills, Navbar, Forms, Inputs

Bootstrap Grids, Grid System, Stacked/Horizontal

Bootstrap Themes, Templates

Practice:

1. Create a responsive website using bootstrap

Module V: PHP(10 hrs)

PHP(10):

Introduction to PHP, Working with arrays, Functions, Forms, Handling date and Times, Working with Files, Session and state management, Database operations from PHP

Practice:

1. Develop student registration web application using PHP
2. Write a PHP database application that collects comments from users and makes it possible for users to view all the comments that have been submitted. You will need three files: an HTML page with a form where the user can enter a comment; a PHP program to process the input from this form by adding the comment to the database; and a PHP program that displays all the comments.

Module VI: Introduction to Drupal(5 hrs)

Drupal Basics, Content Management System, Content Management Framework, Web Application, Framework, Drupal Workflow, Bootstrap, hooks, callbacks, output, Modules (Core and Contributed), Nodes, Blocks, Regions, The Admin Interface (Overview), Content Management, Site Building, Site Configuration, User Management, Reports, Help, Content Translation, User Contributed Modules, Layouts in Drupal, File Systems

Practice:

1. Setup Drupal server and develop a site on it

Module VII: XML & Web Security (6 hrs)

XML (2)

Introduction to XML,XML Validation,Reason for XML,XML Tree Structure, XML DOM,XML DTD,XML Schema

XML style language(2)

XML and XSLT, XML Parsing,XML parsers (DOM & SAX),XML WSDL,RSS Feed

Web Security(2)

SQL Injection,Cross-Site Scripting (XSS),Security standards (OWASP)

Practice:

1. Creating XML Document
- 2.DTD creation
- 3.Test SQL Injection for student resgistration application

Text/Reference Books

- 1.Web Technologies: HTML, JAVASCRIPT, PHP, JAVA, JSP, XML and AJAX, Black Book Kindle Edition,byKogent Learning Solutions Inc.
- 2.HTML 5 Black Book, Covers CSS 3, JavaScript, XML, XHTML, AJAX, PHP and jQuery, 2ed Kindle Edition,by DT Editorial Services
- 3.Programming PHP: Creating Dynamic Web Pages, Third Edition, by Kevin Tatroe, O'REILLY
- 4.Introduction to JavaScript Object Notation: A To-the-Point Guide to JSON kindle Edition by Lindsay Bassett,O'REILLY
- 5.Bootstrap: Responsive Web Development by Jake Spurlock, Paperback

Project Work

- 1.Online Quiz System
- 2.Online Student feedback System
- 3.. Online Tutorial System
- 4.Restaurant Billing System
- 5.Online MCQ Database Bank System

Source of reference:<https://nqr.gov.in/qualification-title?nid=3002>

Courseware Link: <http://courseware.cutm.ac.in/courses/advanced-web-programming/Course>

Java Technologies

ode	Course Title	Credit	T-P-PJ
CUTM1031	Java Technologies	4	2-1-1

Objective

- Understand fundamentals of programming such as variables, conditional and iterative execution, methods, etc.
- Understand fundamentals of object-oriented programming in Java, including defining classes, invoking methods, using class libraries, etc.
- Be aware of the important topics and principles of software development
- Have the ability to write a computer program to solve specified problems
- Have the ability to write a computer program to solve specified problems
- Be able to use the Java SDK environment to create, debug and run simple Java programs

Course Outcome

- Use an integrated development environment to write, compile, run, and test simple object-oriented Java programs
- Read and make elementary modifications to Java programs that solve real-world problems
- Identify and fix defects the common safety issues in code
- Document a Java program using Javadoc
- Use a version control system to track source code in a project
- Qualify confidently any interview process where Java is the requirement

Course content

Module I: Introduction to Java (8 hrs)

Features and Installation, Java Programming Basics, Decision Making and Looping, Class and Object, Inheritance

Practice 1 (1 Hr)

Practice 2 (1 Hr)

Module II: Package and Safe Code (5 Hr)

Interfaces, Packages and Access Protection, Exception Handling (Fault Tolerant Programming)

Practice 3 (1 Hr)

Module III: Collection and Threads (5 Hr)

ArrayList, Vector, Set, Map, Multi-threaded Programming, Synchronization

Practice 4 (1 Hr)

Module IV: Language and Utility Packages (5 Hr)

String Handling, Wrappers, Runtime Memory Management, Cloning, Calendar, Date and Time Facilities, Scanner, Internationalization

Practice 5 (1 Hr)

Practice 6 (1 Hr)

Module V: Input/ Output and Applets (5 Hr)

Byte and Character Stream I/O, Persistence, Applet: Architecture, Skeleton, and Implementation

Practice 7 (1 Hr)

Practice 8 (1 Hr)

Module VI: GUI Programming (5 Hr)

AWT: Container, Components, Layout Managers, Event Handling

Practice 9 (1 Hr)

Practice 10 (1 Hr)

Module VII: Networking and Advanced (5 Hr)

Networking Fundamental, Client-Server Communication, Remote Method Invocation (RMI), Java Virtual Machine (JVM) Tuning, Java Profiler

Practice 11 (1 Hr)

Practice 12 (1 Hr)

Text Book(s):

1. Java The Complete Reference, Fifth Edition, C25 Herbert Schildt, McGraw-Hills

Reference Book(s):

1. Murach's Java Programming, 5th Edition, Joel Murach, Mike Murach & Associates, 2011, ISBN-78-1-943872-07-7
2. Introduction to Java Programming, Comprehensive, 10th ed., Y. Daniel Liang, 2014. ISBN-10: 0133813460, ISBN-13: 9780133813463

Source of reference;

<https://nqr.gov.in/qualification-title?nid=3002>

<https://www.cdac.in/index.aspx?id=DAC&courseid=0#>

<https://canvas.harvard.edu/courses/63117/assignments/syllabus>

<https://canvas.harvard.edu/courses/69911/assignments/syllabus>

<https://xid.harvard.edu/xid-apps/submitAccountForm.do>

YouTube Resources: freeCodeCamp.org
 Codearchery
 Edureka
 free project
 Jenkov

Online Source(s):

1. <https://docs.oracle.com/javase/tutorial/java/index.html>

2. <https://www.programiz.com/java-programming>

3. <https://marcus-biel.com/>

Software/Tool(s): Java 8, Eclipse IDE

Online Compiler: <https://ideone.com/>

Online Coding Practice: <https://www.hackerrank.com/>

List of Practices:

Practice 1 (Module-I)

Program-1:

Write a program that computes the standard deviation of a set of floating point numbers that the user enters. First the user says how many numbers N are to follow. Then the program asks for and reads in each floating point number. Finally it writes out the standard deviation. The standard deviation of a set of numbers X_i is:

$$SD = \text{Math.sqrt}(\text{avgSquare} - \text{avg}^2)$$

Here, avg is the average of the N numbers, and avg² is its square.

avgSquare is the average of $X_i * X_i$. In other words, this is the average of the squared value of each floating point number.

For example, if N = 4, say the numbers were:

$X_i \quad X_i * X_i$

2.0 4.0

3.0 9.0

1.0 1.0

2.0 4.0

sum 8.0 18.0

Now:

$$\text{avg} = 8.0/4 = 2.0$$

$$\text{avg}^2 = 4.0$$

$$\text{avgSquare} = 18.0/4 = 4.5$$

$$SD = \text{Math.sqrt}(4.5 - 4.0) = \text{Math.sqrt}(.5) = 0.7071067812$$

To do this you will need to do several things inside the loop body for each floating point value as

it comes in: add it to a sum, square it and add it to a sum of squares. Then after the loop is finished apply the formula.

Program-2 and Program-3:

Two suggested competitive programs to solve on HackerRank

<https://www.hackerrank.com/domains/java>

Practice 2 (Module-I)

Program-1:

Better encapsulation of the Goods class would call making instance variables private and using getter and setter methods to access them. A further refinement would be to make the class abstract and to define additional child classes. Here is a revised Goods class:

```
public abstract class GoodsSGA
{private String description;
private double price;
private int quantity;
public GoodsSGA( String des, double pr, int quant )
{description = des;price = pr;
quantity = quant;}
double getPrice()
{return price;}
void setPrice( double newPrice)
{price = newPrice;}
int getQuantity()
{return quantity;}
void setQuantity ( int newQuantity )
{quantity = newQuantity;}
public String toString()
{return "item: " + description + " quantity: " + quantity + " price: " + price ;}}
```

Revise the source code for the classes Food, Toy, and Book. (Perhaps call the revised classes

FoodSG, ToySG, and BookSG.) create a new class ToiletrySG for things like bubble bath. Create a new testing class, StoreSG to test your revised classes.

Note: the child classes will need to use the getter and setter methods to access the instance variables that are declared as private in GoodsSG.

Program-2 and Program-3:

Two suggested competitive programs to solve on HackerRank

<https://www.hackerrank.com/domains/java>

Practice 3 (Module-II)

Program-1:

User-Friendly Division Practice:

Put in a loop so that the user is repeatedly asked for the numerator and the divisor. For each set of data, the program prints out the result, or an informative error message if there is a problem (division by zero or poor input data).

The program continues looping, even if there is a problem Exit the loop when data entered for the numerator start with characters "q" or "Q". Don't print out an error message in this case.

Don't ask for the divisor if the user just asked to quit.

Here is sample output from one run:

Enter the numerator: 12

Enter the divisor: 4

12 / 4 is 3

Enter the numerator: 12

Enter the divisor : 0

You can't divide 12 by 0

Enter the numerator: glarch

You entered bad data.

Please try again.

Enter the numerator: quit

You will need to use the method charAt() from the String class.

Program-2 and Program-3:

Two suggested competitive programs to solve on HackerRank

<https://www.hackerrank.com/domains/java>

Practice 4 (Module-III)

Program-1:

In mathematics, several operations are defined on sets. The union of two sets A and B is a set that contains all the elements that are in A together with all the elements that are in B. The intersection of A and B is the set that contains elements that are in both A and B. The difference of A and B is the set that contains all the elements of A except for those elements that are also in B.

Suppose that A and B are variables of type set in Java. The mathematical operations on A and B can be computed using methods from the Set interface. In particular:

A.addAll(B) computes the union of A and B; A.retainAll(B) computes the intersection of A and B; and A.removeAll(B) computes the difference of A and B. (These operations change the contents of the set A, while the mathematical operations create a new set without changing A, but that difference is not relevant to this exercise.)

For this exercise, you should write a program that can be used as a “set calculator” for simple operations on sets of non-negative integers. (Negative integers are not allowed.) A set of such integers will be represented as a list of integers, separated by commas and, optionally, spaces and enclosed in square brackets. For example: [1,2,3] or [17, 42, 9, 53,108]. The characters +, *, and - will be used for the union, intersection, and difference operations. The user of the program will type in lines of input containing two sets, separated by an operator. The program should perform the operation and print the resulting set.

Here are some examples:

Input Output

[1, 2, 3] + [3, 5, 7] [1, 2, 3, 5, 7]

[10,9,8,7] * [2,4,6,8] [8]

[5, 10, 15, 20] - [0, 10, 20] [5, 15]

To represent sets of non-negative integers, use sets of type `TreeSet<Integer>`. Read the user's input, create two `TreeSets`, and use the appropriate `TreeSet` method to perform the requested operation on the two sets. Your program should be able to read and process any number of lines of input. If a line contains a syntax error, your program should not crash. It should report the error and move on to the next line of input. (Note: To print out a Set, A, of Integers, you can just say `System.out.println(A)`. We've chosen the syntax for sets to be the same as that used by the system for outputting a set.)

Program-2 and Program-3:

Two suggested competitive programs to solve on HackerRank

<https://www.hackerrank.com/domains/java>

Practice 5 (Module-IV)

Program-1:

Password Checker:

Write a program that repeatedly asks the user for a proposed password until the user enters an acceptable password. When the user enters an acceptable password, the program writes a message and exits.

Acceptable passwords:

Are at least 7 characters long.

Contain both upper and lower case alphabetic characters. Contain at least 1 digit. The logic of this program can be quite tricky. Hint: use `toUpperCase()`, `toLowerCase`, and `equals()`. You will also need nested ifs.

Here is a run of the program:

Enter your password:

snowflake

That password is not acceptable.

Enter your password:

SnowFlake

That password is not acceptable.

Enter your password:

snowflake47

That password is not acceptable.

Enter your password:

Snowflake47

Acceptable password.

Program-2 and Program-3:

Two suggested competitive programs to solve on HackerRank

<https://www.hackerrank.com/domains/java>

Practice 6 (Module-IV)

Program-1:

Secret Code:

A text message has been encoded by replacing each character of the message with an integer.

Each integer is an index into a key-phrase that contains all the lower case letters of the alphabet

as well as the space character. The key-phrase may contain the same character in several

locations. The encoded text is series of integers, like this:

35 10 10 33 9 24 3 17 41 8 3 20 51 16 38 44 47 32 33 10 19 38 35 28 49

To decode the message, look up each integer in the key-phrase and output the corresponding

character. For example, say that the key-phrase is this (the index of each character has been

written above it):

1111111111222222222233333333333444444444455

0123456789012345678901234567890123456789012345678901

six perfect quality black jewels amazed the governor

using each integer from the encoded text as an index into the phrase results in the decoded

message:

attack the bridge at dawn

Write a program that decodes a secret message contained in a text file. The first line of the text file contains the key-phrase. Then the file contains a sequence of integers, each of which indexes the key-phrase. Find the character corresponding to each integer and output the secret message. Note if a character character such as 'e' occurs several places in the key-phrase it may be encoded as different integers in different parts of the secret message.

(The recipient of the secret message gets only the file of integers and must put the key-phrase at the top of the file.) For example, here is the contents of a secret message file ready for the program:

```
six perfect quality black jewels amazed the governor  
35 10 10 33 9 24 3 17 41 8 3 20 51 16 38 44 47 32 33 10 19 38 35 28 49
```

Here is a sample run of the program:

```
C:\> java Decode < secretFile.txt  
attack the bridge at dawn
```

You will need the charAt() method of String.

Here is another secret message file, with key-phrase inserted, that you can use to test your program:

```
six perfect quality black jewels amazed the governor  
31 16 2 3 4 42 48 7 27 9 10 43 12 13 35 15 1 40 18 3  
20 15 33 23 24 32 26 29 28 27 21 31 25 14 34 14 36  
42 38 19 40 41 27 3 44 50 46 42 48 49 50 6
```

Program-2 and Program-3:

Two suggested competitive programs to solve on HackerRank

<https://www.hackerrank.com/domains/java>

Practice 7 (Module-V)

Program-1:

Stop Word Remover:

Write a program that reads in a file of text, perhaps the text of a novel. The program copies the same text to an output file, except that all the useless words such as "the", "a", and "an" are removed. (Decide on what other words you wish to remove. The list of words removed is called a stop list.) Do this by reading the text file token by token using `hasNext()` and `next()`, but only writing out tokens not on the stop list.

Prompt the user for the names of the input and output files.

Fairly Easy: The output file will have only N tokens per line. Do this by counting tokens as you output them. N will be something like 10 or 12.

Improved Program: Preserve the line structure of the input file. Do this by reading each line using `nextLine()` and then creating a new `Scanner` for that line. (Look at the on-line documentation for `Scanner`.) With each line's `Scanner`, use `hasNext()` and `next()` to scan through its tokens.

Harder: Write out no more than N characters per line. N will be something like 50. Do this by keeping count of the number of characters written out per line. The `length()` method of `String` will be useful. If X characters has already been written to the current line, and if X plus the length of the current token exceeds N, then start a new line.

Program-2 and Program-3:

Two suggested competitive programs to solve on HackerRank

<https://www.hackerrank.com/domains/java>

Practice 8 (Module-V)

Program-1:

E-Mail Address Extractor:

Write a program that scans a text file for possible e-mail addresses. Addresses look like this:
someone@somewhere.net

Read tokens from the input file one by one using `hasNext()` and `next()`. With the default delimiters of `Scanner`, an entire e-mail address will be returned as one token. Examine each token using the `indexOf()` method of `String`. If a token contains an at sign @ followed some characters later by a period, regard it as a possible e-mail address and write it to the output file.

Programs such as this scan through web pages looking for e-mail addresses that become the targets of spam. Because of this, many web pages contain disguised e-mail addresses that can't easily be automatically extracted.

Program-2 and Program-3:

Two suggested competitive programs to solve on HackerRank

<https://www.hackerrank.com/domains/java>

Practice 9 (Module-VI)

Program-1:

User-friendly Fat Calculator, with Advice:

Further modify the calories from fat calculator so that it includes another TextField that will be set with the text "Too many fat calories" if the percentage of calories from fat is equal or greater than 30 percent, or to "Healthy amount of fat" if the percentage is less than that.

Program-2 and Program-3:

Two suggested competitive programs to solve on HackerRank

<https://www.hackerrank.com/domains/java>

Practice 10 (Module-VI)

Program-1:

Three Button Monte:

Write a program to implement a game:

There are three buttons in the frame. Two of the buttons cause the program to quit using `System.exit(0)`; the remaining button changes the frame to green (a win!) The winning button is different each time the game is played.

The easy way to do this (although it seems unfair to the user) treats each button the same way. The `actionPerformed()` method does not check which button was clicked. When any button is clicked, the method picks a random integer from 0 to 2 and performs the "winning" action if the integer happens to be 0. Otherwise, it performs the "losing" action. To the user, it seems like there is a "winning" button and two "losing" buttons. But, in fact, it does not matter which button was clicked.

This is similar to some electronic gambling devices in casinos, where it appears to the user that there are "winning moves" and "losing moves" but in fact the machine actually ignores what the user has done and just declares a "win" every now and then, according to predetermined odds.

You will need the Random class:

```
Random randNum = new Random(); // create a Random number object  
int someInt = randNum.nextInt(3); // someInt gets a number from 0 to 2
```

Program-2 and Program-3:

Two suggested competitive programs to solve on HackerRank

<https://www.hackerrank.com/domains/java>

Practice 11 (Module-VII)

Content Delivery with Networking:

Write a Client-Server program where the client queries with a name of file and the server delivers the content of requested files to the client over the network.

(Improve the program by making the server multi-threaded)

Practice 12 (Module-VII)

Greet the user with Remote Method Invocation:

Write a program using RMI, where the user invokes a method on remote object with username as parameter and receives a greeting message based on time of the day along with username.

Projects

However, not limited to:

1. Chat application
2. Text Editor application
3. GUI based Scientific Calculator
4. Paint application
5. Slam book

(*PROJECT REVIEWS WILL COMMENCE BEYOND CLASS HOURS)

Monitoring:

Credit will be received only on making an honest effort. It

is expected that students will finish watching all lecture video and complete all challenge problems by the end of each lecture week.

Borrowing code from other sources is allowed only with proper attribution and credit given to the original author(s).

List of Common Programs to solve using Java:

1. Program to calculate area of a triangle

3. Program to solve quadratic equation

3. Program to swap two variables (with and without using third variable)

4. Program to generate random numbers in various ways

5. Program to convert miles to kilometers and vice-versa

6. Program to convert celsius to fahrenheit and vice-versa

7. Program to check if a number is odd or even

8. Program to check if input year is leap year

9. Program to test primality

10. Program to print all prime numbers in an interval using "Sieve of Eratosthenes"

11. Program to generate factorial of all elements in an array

12. Program to display the multiplication table up to 20

13. Program to print the fibonacci sequence

14. Program to check armstrong number, perfect number, Harshad number

15. Program to generate armstrong numbers in an Interval

16. Program to find the sum of Harshad numbers in an interval

17. Program to display powers of two Using lambda

18. Program to perform conversions among decimal to binary, octal and hexadecimal

19. Program to display ASCII table

20. Program to find HCF/GCD and LCM

21. Program to find factors of given natural number
22. Program to make a simple calculator
23. Program to shuffle deck of cards
24. Program to generate fibonacci sequence using recursion
25. Program to find sum of natural numbers using recursion
26. Program to find factorial of number using recursion
27. Program to convert decimal to binary using recursion
28. Program to add two matrices
29. Program to obtain transpose of a matrix
30. Program to multiply two matrices
31. Program to check if a string is palindrome
32. Program to remove punctuations from a string
33. Program to sort words lexicographically
34. Program to illustrate different set operations
35. Program to count frequency of each vowel in a string
36. Program to find hash value of a file

This course on courseware: <http://courseware.cutm.ac.in/courses/java-technologies/>

Embedded System Programming with ARM-Cortex

Code	Course Title	Credit	T-P-PJ
CUTM1039	Embedded System Programming with ARM-Cortex	6	3-2-1

Objective

- To allow students in Embedded System sectors to learn programming / Interfacing peripherals to ARM Cortex based Microcontroller

Course Outcome

- Describe the architectural features and instructions of 32 bit ARM Cortex M3 microcontroller.
- Understand the basic hardware components and their selection method based on the

characteristics and attributes of an Embedded System.

- Understand various Sensors, Actuators & Interfacing Modules.

Course content

Module I: EMBEDDED C

(4 Hrs)

Embedded System, Programming Embedded system, Factor for selecting the Programming language, Embedded C programming Language, Embedded C vs C.

Practice:

1. Familiarization with tools (STM32CubeMX, KeilVision IDE, Flash Magic & Proteus Simulator).
2. Programming STM32 using KeilVision& STM32CubeMX.

Module II: ARM-32 bit MICROCONTROLLER

(6 Hrs)

ARM Design Philosophy & RISC Architecture, Programmer's Model. ARM Cortex M, Cortex M Architecture, ARM Cortex-M Internals & Debugging.

Practice:

1. Familiarization with Different Processors and Controllers Boards (8, 16, 32, 64 bits)

Module III: STM32 GPIO MANAGEMENT

(14 Hrs)

GPIO Configuration, Driving De-initialization, Interfacing IO devices and its type – LEDs, Switches, Buzzer, Seven Segment Display, LCD (4 bit, 8 bit Mode), Keypad (4*4), DC Motor, Stepper Motor, Servo motor, Relay.

Practice:

1. Write an Embedded C program to interface LEDs with STM32.
2. Write an Embedded C program to interface Switch with STM32.
3. Write an Embedded C Program to design up counter & down counter using Seven Segment Display. (1 digit, 2 digit)
4. Write an Embedded C program to interface buzzer to control with the help of Switch.
5. Write an Embedded C program to display characters on Alphanumeric LCD.
6. Write an Embedded C program to interface Keypad and LCD with STM32.
7. Write an Embedded C program to interface DC Motors, Stepper Motor, and Servo Motor rotate clockwise, anticlockwise and in angle (45°, 90°, 180°).
8. Write an Embedded C program to interface relay to control the AC Appliances.

Module IV: STM32 INTERRUPT MANAGEMENT & UART

(14 Hrs)

NVIC Controller, Enabling Interrupt, Interrupt Priority Levels, UART Initialization, UART communication in polling Mode & in Interrupt Mode. Wireless Technologies- Bluetooth, Wi-Fi, RF.

Practice:

1. Write an embedded C program to generate an Interrupt process using STM32.
2. Write an Embedded C program to interface STM32 to Bluetooth Module to send & receive Data.
3. Write an Embedded C program to interface STM32 to GPS module to get a Location Coordinate.
4. Write an Embedded C program to interface STM32 to GSM module to Send & Receive SMS.
5. Write an Embedded C program RF module with STM32 to send and receive the data wirelessly.
6. Write and Embedded C program to design a system to read the RFID cards using STM32.
7. Write and Embedded C program to connect ESP8266 with STM32 to create a Webserver.

Module V: STM32 TIMERS , ADC, & DAC

(10 Hrs)

Timers Basics, General Purpose Timer, SysTick Timer, ADC & DAC Basics, Initialization, DAC Peripherals & Modules. Analog Sensors and its Types(Ultrasonic Sensor, Temperature, Humidity, Soil Moisture Sensor, PIR sensor)

Practice:

1. Write an Embedded C Programs to generate Delay using Timer.
2. Write an Embedded C program to display output for given analog input using internal ADC. (Use of Analog Sensors like Ultrasonic Sensor, Temperature, Humidity, Soil Moisture Sensor, PIR sensor)
3. Write an embedded C program to generate Triangular and Square waves using DAC.

Module VI: STM32 I2C & SPI

(10 Hrs)

I2C specification, Protocol configuration, I2C Peripherals. SPI Specification, Protocol configuration, it's Peripheral and Modules.

Practice:

1. Write an Embedded C program to build I2C communication between STM32 and Arduino
2. Write an Embedded C program to build SPI communication STM32 to the Arduino board.

Module VII: PWM & CAN (8 Hrs)

RTC feature and its Module, CAN Protocols Overview, Application, Architecture, Data Transmission & Data Frames.

Practice:

1. Write an Embedded C program to implement a Real-Time Clock.
2. Write an Embedded C program to Speed Control of DC motor using PWM.
3. Write an Embedded C program to change the intensity of Light using PWM.

Text Books:

1. Shibu K V, —Introduction to Embedded Systems, Tata McGraw Hill Education Private Limited, 2nd Edition
2. Noviello, Carmine. "Mastering STM32." Obtenido de <http://www2.keil.com/mdk5/uvision>,2017.
3. Norris, Donald. Programming with STM32: Getting Started with the Nucleo Board and C/C++. McGraw Hill Professional, 2018.

Reference Books:

1. STM32F10xx User Manual
2. <https://www.udemy.com/course/stm32cubemx-complete-training/learn/lecture/9606338#overview>

[1.https://www.udemy.com/course/embedded-c-programming-for-embedded-systems/](https://www.udemy.com/course/embedded-c-programming-for-embedded-systems/)

VLSI Design

Code	Course Title	Credit	T-P-PJ
CUTM1040	VLSI Design	6	3-2-1

Objective

- The objective of the course is to provide understanding of the entire logic design process with the analysis from combinational and sequential digital circuit design.
- Provide understanding of the techniques essential to the Verilog programming for Verification and Testing.
- To learn the architecture of most prominent vendor in the FPGA market, Xilinx FPGAs and Altera FPGAs.

Course Outcome

- Analyze combinational and sequential circuit design concepts.
- Develop FSMs & ASMs for the given problems.
- Write Verilog code, compile, simulate and execute on any VLSI design platform.
- Apply Verilog HDL for FPGA Programming.
- Implement Digital Circuits on Xilinx FPGAs and Altera FPGAs using Verilog HDL.

Course content

Module I: Introduction to VERILOG

(10 hrs)

Introduction to Verilog HDL & Hierarchical Modeling Concepts, Lexical Conventions & Data Types, System Tasks & Compiler Directives, Modules, Ports and Module Instantiation Methods, Modeling methods, Design Verification using Test benches

Practice

1. Introduction to Xilinx EDA Tool.
2. Introduction to XST Tool and ISIM Tool
3. Xilinx Tool Flow: Simulation and Synthesis
4. Module and Ports in Verilog
5. Data Types in Verilog Programming.

Module II: Boolean Algebra and Logic Minimization

(8hrs)

Binary Arithmetic and 1's and 2's Complementation, Basic Theorems and Properties, Canonical and Standard Form, Algebraic Simplification of Digital Logic Gates, The Karnaugh Map Method, Prime and Essential Implications, Don't Care Map Entries.

Practice

1. Gate level Modelling in Verilog.
2. Data flow Modelling in Verilog.
3. Behavioral Modelling in Verilog.

Module III: Combinational Circuit Design

(12hrs)

Arithmetic Circuits: Adder/Subtractor Circuits, Ripple Carry Adder, Universal Ripple carry Adder, BCD Adder, MultipliersComparators, Multiplexer, Demultiplexer, Decoder, Encoder and Priority Encoder, Code Converters: Binary to Gray, Binary to BCD.

1. Design of Arithmetic Circuits using Verilog.
2. Design of Encoder and Decoder using Verilog.
3. Design of Data selector and Data Distributor using Verilog.
4. Design of comparator and Code converters using Verilog.

Module IV: Sequential Circuit Design

(14hrs)

Latch, Flip-Flop: S-R,D,J-K,T, Flip-Flop Conversion and Excitations Counter: Asynchronous and Synchronous counter Design, Register: SISO, SIPO,PISO and PIPO, Universal Shift Register, Johnson counter and Ring Counter.

Practice

1. Design SR and D-Flip Flop Using Continuous and Procedural Assignments.
2. Design JK-Flip Flop And T-Flip Flop Using Verilog.
3. Design Shift Registers (SISO, SIPO, PISO, PIPO) using Verilog.
4. Design Ripple Counter and Up/Down Synchronous Binary Counter Using Verilog.

Module V: State Machines

(10 hrs)

Basic Finite state machines (FSM) structures, Mealy and Moore type FSM,Design of controller and Data path units,Controller Design using FSMs & ASMs

Practice

1. Design of Sequence Detectors allowing overlapping as well as non-overlapping.
2. Design of Mealy and Moore type FSM using Verilog.
3. Design of data controller using ASM.

Module VI: FPGA Architecture and Prototyping

(5 hrs)

Introduction to Programmable Logic and FPGAs, Popular CPLD & FPGA Families, Architecture of Xilinx and Altera FPGAs

Practice

1. Proto-typing of a design using FPGA Design Kit

Module VII: Synthesis and Timing

(6hrs)

FPGA Design Flow, Implementation Details Advanced FPGA Design tips, Logic Synthesis for FPGA, Static Timing Analysis

Practice

1. Design mapping and optimization
2. Analyze and resolve design problems
3. Report generation
4. Verilog gate-level netlist generation and post-synthesis timing data (SDF) extraction
5. Design constraints generation for placement and routing

Text Books:

1. M.Morris Mano., “Digital Design”, Pearson Education, 4th Edition.
2. Palnitkar, S. (2003). Verilog HDL: a guide to digital design and synthesis (Vol. 1). Prentice Hall Professional.

Reference Books:

1. Kohavi, Z., & Jha, N. K. (2009). Switching and finite automata theory. Cambridge University Press.
2. Jain, R. P. (2003). Modern digital electronics. Tata McGraw-Hill Education.

Electromagnetic Field Theory & Transmission Lines

Code	Course Title	Credit	T-P-PJ
CUTM1042	Electromagnetic Field Theory & Transmission Lines	3	2-1-0

Objective

- To introduce the fundamental theory and concepts of electromagnetic waves and transmission lines
- To impart knowledge on the concepts of electrostatics, electric potential, energy density and their applications.
- To impart knowledge on the concepts of magnetostatics, magnetic flux density, scalar and vector potential and its applications.
- To impart knowledge on the concepts of Faraday's law, induced emf and Maxwell's equations.
- Model and design the transmission lines at high frequencies.
- To apply Smith chart use for solution of transmission line problems and impedance matching.

Course Outcome

- Apply the principles of electrostatics to the solutions of problems relating to electric field and electric potential.
- Apply the principles of electrostatics to the solutions of problems relating to boundary conditions and electric energy density.
- Apply the principles of magnetostatics to the solutions of problems relating to magnetic field and magnetic potential,
- Apply the principles of magnetostatics to the solutions of problems relating to boundary conditions and magnetic energy density.
- Understand the concepts related to Faraday's law, induced emf and Maxwell's equations.
- Apply Maxwell's equations to solutions of problems relating to transmission lines and uniform plane wave propagation.

Course content

Module I: Electrostatics

(3hrs Theory + 2hrs Practice)

Introduction to Electrostatic Fields, Gauss's Law and Applications, Electric Potential, Maxwell's Two Equations for Electrostatic Fields, Electric Current and Current Density, Continuity Equation, Relaxation Time, Laplace's and Poisson's Equations.

Practice:

1. To Calculate the Electric field of a dipole using Coulomb's law in Matlab
2. Simulation of Electric Potential and Electric Field in Matlab

Module II: Magnetostatics**(3hrs Theory + 2hrs Practice)**

Biot-Savart Law: Current Flow – which path does it take, Ampere's Circuital Law, Magnetic Flux Density: Closed Loop Circuits, Magnetic Scalar and Vector Potentials, Forces due to Magnetic Fields, Inductances and Magnetic Energy.

Practice:

1. Magnetic field by an infinitely long line current using matlab
2. Magnetic field of a Circular current loop using Biot Savart's Law

Module III: Maxwell's Equations**(3hrs Theory + 1hr Practice)**

Maxwell's Equations and Boundary Conditions.

Practice:

1. Maxwell's Equation using matlab

Module IV: Electromagnetic Waves (3hrs Theory + 4hrs Practice)

Wave Equations for Conducting and Perfect Dielectric Media, Uniform Plane Waves, Wave Propagation in Lossless and Conducting Media, Polarization, Reflection and Refraction of Plane Waves – Normal and Oblique Incidences for both Perfect Conductor and Perfect Dielectrics, Brewster Angle, Critical Angle and Total Internal Reflection, Surface Impedance. Poynting Vector and Poynting Theorem.

Practice:

1. Linear and Circular Polarization of waves using matlab
2. 1-D standing wave using matlab
3. 2-D standing wave (TE) using matlab
4. 2-D standing wave (TM) using matlab
5. Design of Wireless Power Transfer using matlab

Module V: Introduction to Transmission Line Modelling (3hrs Theory + 3hrs Practice)

Introduction to Transmission line equations, Primary & Secondary constants Expressions for Characteristic Impedance, Propagation Constant, Phase and Group Velocities, Losslessness/Low Loss Characterization, Distortion, Loading, Transmission Line Effects, SC and OC Lines,

Reflection Coefficient, VSWR, $\lambda/8$, $\lambda/4$, $\lambda/2$ line impedance Transformations, Smith Chart – Configuration and Applications, Impedance Control.

Practice:

1. Reflection and transmission of a plane wave (S-wave)
2. Reflection and transmission of a plane wave (P-wave)
3. Radiation by an infinitesimal dipole

Module VI: Waveguides

(3hrs Theory)

Introduction, Rectangular Waveguides, electric and magnetic field patterns in TE₁₀ and TE₁₁ mode configuration, modes of TE wave in rectangular waveguide, field equations, impossibility of TEM wave propagation in waveguides, cutoff frequency of rectangular waveguide, propagation constant, wave impedance, phase velocity, group velocity, dominant mode and degenerate modes, related problems.

Module VII: Electromagnetic Computational Techniques

(3hrs Theory)

Introduction, Finite Difference Method (FDM), Finite Element Method (FEM) and Method of moments (MOM) technique.

Text Books:

1. Matthew N.O. Sadiku, “Elements of Electromagnetics”, Oxford Univ. Press.
2. G.S.N.Raju, “Electromagnetic Field Theory and Transmission Lines”, Pearson Education (Singapore) Pvt., Ltd.

Reference:

- 1.E.C. Jordan and K.G. Balmain, “Electromagnetic Waves and Radiating Systems”, PHI.
- 2.Seungbum Hong, "Electrodynamics: An Introduction", Coursera.
- 3.Seungbum Hong, "Electrodynamics: Electric and Magnetic Field", Coursera.
- 4.Seungbum Hong, "Electrodynamics: In-depth Solutions for Maxwell's Equations", Coursera.
- 5.Husain Habib, "Electromagnetic Tutorials part 1 with MATLAB & GeoGebra", Udemy.

Network Analysis

Code	Course Title	Credit	T-P-PJ
CUTM1043	Network Analysis	3	2-1-0

Objective

- To learn techniques of solving circuits involving different active and passive elements.
- To deliver problem solving skills on circuits through the application of simulation & programming techniques and principles to common circuit problems.
- To analyze the behavior of the circuit's response in time domain.

Course Outcome

- Apply the knowledge of basic circuit law and simplify the network using different techniques.
- Analyze the circuit using graphical method and network theorems.
- Infer and evaluate transient response, Steady state response
- Obtain the maximum power transfer to the load, and Analyze the series resonant and parallel resonant circuit.
- Evaluate two-port network parameters.

Course Content

Module I

(4 hrs)

Network Topology

Graph of a network, Concept of tree, Incidence matrix, Tie-set matrix, Cut-set matrix, Formulation and solution of network equilibrium equations on loop and node basis

Practice

- Incidence Matrix Formulation
- Tie-set Matrix Formulation
- Cut-set Matrix Formulation

Module II

(5 hrs)

Network Theorems

Substitution theorem, Reciprocity theorem, Maximum power transfer theorem, Tellegen's theorem, Millman's theorem, Compensation theorem

Practice

- Verification of Reciprocity theorem
- Verification of Tellegen's theorem
- Verification of Millman's theorem
- Verification of Maximum power transfer theorem
- Verification of Compensation theorem

Module III
Coupled Circuits

(5 hrs)

Theory

Coupled Circuits, Dot Convention for representing coupled circuits, Coefficient of coupling, Series and parallel resonant circuits: Band Width and Q-factor

Practice

1. Self-inductance, mutual inductance and coefficient of coupling to be determined for a 1- \emptyset transformer representing coupled circuit.
2. Frequency response of a series and parallel resonant circuit by laboratory set up.

Module IV
Network Laplace Transform

(5 hrs)

Application of Laplace transform: Circuit Analysis (Steady State and Transient)

Practice:

- Analysis of transient characteristics using Matlab
- AC and DC transient response analysis for RL,RC and RLC circuits

Module V
Two Port Network

(5 hrs)

Z, Y, ABCD and h-parameters, Reciprocity and Symmetry, Interrelation of two-port parameters, Interconnection of two-port networks

Practice:

- Determination of Z parameters
- Determination of Y parameters
- Determination of h parameters
- Determination of ABCD parameters

Module VI
Filters

(4 hrs)

Brief idea about network filters (Low pass, High pass, Band pass and Band elimination) and their frequency response

Practice:

- Design and frequency response analysis of Low Pass filter
- Design and frequency response analysis of High Pass filter
- Design and frequency response analysis of Band Pass filter
- Design and frequency response analysis of Band elimination filter

Module VII
Fourier Series

(5 hrs)

Theory

Fourier series, Fourier analysis and evaluation of coefficients, Steady state response of network to periodic signals, Fourier transform and convergence, Fourier transform of some functions

Practice:

- Fourier series expansion of Square wave
- Fourier series expansion of Sine wave

Text Books:

1. *M. E. VAN VALKENBURG- Network Analysis, PHI Publications*
2. *A K Chakraborty, “Network Theory,” DhanpatRai Publication*
3. *MAHMOOD NAHVI – Electric Circuits, SCHAUM’S Outlines Fifth Edition*

Reference Books:

1. *Smarajit Ghosh- Network Theory Analysis & Synthesis, MC Graw Hill Publishers*
2. *Dr. B.R.GUPTA-Network Analysis & Synthesis, S.Chand*

Energy Production & Transmission

Code	Course Title	Credit	T-P-PJ
CUTM1051	Energy Production & Transmission	3	2-1-0

Course Objective

- | |
|---|
| <ul style="list-style-type: none"> • To understand power generation and economics • To design the transmission line parameters • To understand the mechanical design of transmission lines |
|---|

Course Outcome

- | |
|--|
| <ul style="list-style-type: none"> • Able to understand the different functions of major equipment of the power plants and layout designing of the plants |
|--|

- Able to understand the economic aspects of power system generation
- Able to design transmission line cables

Course content

Module I: Thermal & Nuclear Power Plants

(6Hours)

Introduction: Statistics of generation of electric power from Conventional and non conventional sources of energy, Thermal & Nuclear power station: Schematic arrangement, Types of prime movers, types of reactors, speed control & auxiliaries, Environmental aspects for selecting the sites and locations, Hazards.

Practice:

1. Schematic Layout design Thermal Plant using AutoCad
2. Schematic Layout design Nuclear Plant using AutoCad

Module II: Hydro & Wind power plants

(4Hours)

Hydro power station: Schematic arrangement, Hydro turbines, Environmental aspects for selecting the sites and locations of hydro power stations, small hydro for irrigation, Wind power generation.

Practice:

3. Schematic Layout design of Hydro Plant using AutoCad

Module III: Power Generation Tariffs

(5Hours)

Tariff and Economic aspects in power Generation: Terms commonly used in system operation, various factors affecting cost of generation: Load curves, load duration curves, Connected load, maximum load, Peak load, base load and peak load power plants, load factor, Plant capacity factor, Plant use factor, Demand factor, diversity factor, Cost of power plant.

Practice: MATLAB

4. Preparation of Load calculator using MATLAB

Module IV: Transmission systems

(4 Hours)

Supply System: Different kinds of supply system and their comparison, choice of transmission voltage. Transmission Lines: Configurations, types of conductors, resistance of line, skin effect, Kelvin's law, Proximity effect,

Module V: Transmission line Parameters

(5 Hours)

Calculation of inductance and capacitance of single phase, three phase, single circuit and double circuit transmission lines, Representation and performance of short, medium and long transmission lines, T & Pi networks, ABCD parameters, Ferranti effect, Surge impedance loading.

Practice:

5. Designing of transmission line parameters using MATLAB

Module VI: Transmission line operation & Insulators**(5Hours)**

Phenomenon of corona, corona formation, calculation of potential gradient, corona loss, factors affecting corona, methods of reducing corona and interference Electrostatic and electromagnetic interference with communication lines.

Overhead line Insulators:

Type of insulators and their applications, potential distribution over a string of insulators, methods of equalizing the potential, string efficiency.

Practice:**6. Designing of Insulators and calculation of voltages using MATLAB****Module VII: Design of cables****(4 Hours)**

Calculation of sag & tension, effects of wind and ice loading, sag template, vibration dampers. Under Ground Insulated cables: Type of cables and their construction, dielectric stress, grading of cables, insulation resistance, capacitance of single phase and three phase cables, dielectric loss, heating of cables, Transmission line tower designs

Practice:**7. Designing of Cables****Text Books:**

1. Electrical power Generation, Transmission and Distribution S.N. Singh PHI 2nd Edition, 2009

Reference Books:

1. A Text Book on Power System Engineering A.Chakrabarti, Dhanpath Rai 2nd Edition

Substation Switch Gear & Protection

Code	Course Title	(Credit)	T-P-PJ
CUTM1052	Substation Switch Gear & Protection	4	2-1-1

Objective

- To understand the different components of substation.
- To understand the protection of different equipment in power system.

Course Outcome

- Able to understand the performance of different protection methods of different equipments.

- Able to understand the different components of substation and their operation.
- Able to design the power system switchgear.

Course content

Module I: Substation Systems

(6 Hours)

Introduction to Substation System: Definition of substation, necessity of substation, essential features, types of substation, single line diagram of substation, List and functions of each component of substation. Auxiliary systems, Over head earthing screen, Sub-station earthing system.

Practice:

1. Layout Design of 220KV substation using MATLAB
2. Layout Design of 400KV & 750KV substation using MATLAB as per IEEE standards

Module II: Operation & Maintenance of Substations

(10 Hours)

Testing and maintenance of Bus Bars, and Isolators: Types and ratings – Bus bar configuration, Tests on Bus bars. Types of isolators and ratings, Load Break switches, Maintenance of isolators, testing and maintenance of Power Transformers, Current and Voltage Transformers and Insulators: Preliminary tests, Final tests, Impulse test, Partial discharge test, Transformer maintenance. Current Transformer tests, Potential Transformer tests. CT and PT maintenance, Tests and maintenance of insulator

Practice:

3. Maintenance tests of CT & PT of substation as per manufacturers Hand book
4. Maintenance tests of Lightning Arrestor & Circuit Breaker of substation as per manufacturers Hand book
5. Maintenance tests of transformer as per manufacturers Hand book

Module III: Protection & System components

(5 Hours)

Need for protective schemes, Nature and Cause of Faults, Types of Fault, Effects of Faults, Zones of Protection, Primary and Backup Protection, Essential Qualities of Protection, Classification of Protective Relays, Automatic Reclosing, Current Transformers for protection, Voltage Transformers for Protection.

Module IV: Relays

(4 Hours)

Introduction, -Electromechanical Relays, Static Relays – Merits and Demerits of Static Relays, Numerical Relays, Comparison between Electromechanical Relays and Numerical Relays.

Practice:

6. Designing of a Digital Relay

Module V: Relay Operations

(7 Hours)

Introduction, Time – current Characteristics, Current Setting, Time Setting, Overcurrent Protective Schemes, Reverse Power or Directional Relay, Protection of Parallel Feeders, Protection of Ring Mains, Earth Fault and Phase Fault Protection, Combined Earth Fault and Phase Fault Protective Scheme, Phase Fault Protective Scheme, Directional Earth Fault Relay, Static Overcurrent Relays, Numerical Overcurrent Relays.

Module VI: Protection control systems

(5Hours)

Pilot Relaying Schemes: Introduction, Wire Pilot Protection, Carrier Current Protection
Numerical Differential Relays: Simple Differential Protection, Percentage or Biased Differential Relay, Differential Protection of 3 Phase Circuits, Balanced (Opposed) Voltage Differential Protection.

Rotating Machines Protection: Introduction, Protection of Generators

Transformer and Buszone Protection: Introduction, Transformer Protection, Buszone Protection, Frame Leakage Protection

Practice:

7. Design of Protection Scheme using MATLAB

Module VII: Circuit Breakers

(8 Hours)

Introduction, Fault Clearing Time of a Circuit Breaker, Arc Voltage, Arc Interruption, Restriking Voltage and Recovery Voltage, Current Chopping, Interruption of Capacitive Current, Classification of Circuit Breakers, Air – Break Circuit Breakers, Oil Circuit Breakers, Air – Blast Circuit Breakers, SF6 Circuit Breakers, Vacuum Circuit Breakers, High Voltage Direct Current Circuit Breakers, Rating of Circuit Breakers, Testing of Circuit Breakers.

Practice:

8. Design & simulation of Circuit breaker using 3DS Tools

Project:

1. Analysis of critically operating power system using MATLAB/DYMOLA

Text Books:

1. Fundamentals of Power System Protection Y.G.Paithankar S.R. Bhide PHI 1 st Edition, 2009

Reference Books:

1. Power System Protection and Switchgear, BhuvaneshOza et al McGraw Hill 1 st Edition, 2010

System Modeling & Control

Code	Course Title	(Credit)	T-P-PJ
CUTM1053	System Modeling and Control	4	3-1-0

Objective

- To teach how to convert a physical systems consist of mechanical and electrical system into a mathematical model.
- Analysis of a live system in time domain and frequency domain and application of controllers to get the desired response.

Course Outcome

- Students will understand the basics of a system.
- Student gain knowledge on stability of a system.
- Student will analyze the system and controller.
- Students will develop skill of designing automatic control system and controller for a particular application.

Course content

Module I: Introduction

(6 Hours)

Theory

Introduction to Control Systems: Basic Concepts of Control Systems, Open loop and closed loop systems; Servomechanisms, Laplace transform, Transfer functions, Concept of Pole and Zero.

Practice: Hardware/MATLAB

1. Study of Temperature control system
2. Using MATLAB, find the poles, zeros, gain and draw the pole-zero plot of the transfer function.

Module II: System Dynamics

(10 Hours)

Theory

Mathematical Models of Physical Systems: Differential Equations of Physical Systems, Mechanical Translational Systems, Rotational systems, Electrical Systems, Analogy between Mechanical and electrical quantities, Derivation of Transfer functions, Block Diagram Algebra, Signal Flow Graphs and Mason's Gain Formula.

Practice: MATLAB

3. Using MATLAB, find the transfer function from given block diagram.

Module III: Time Response Analysis

(8Hours)

Theory

Time Response Analysis: Type Test Signals, Time response of first order systems to unit step and unit ramp inputs, Time Response of Second order systems to unit step input, Time Response specifications, Steady State Errors and Static Error Constants of different types of systems.

Practice: MATLAB/DYMOLA

4. Standard Test Signals
5. Time response of first order systems to unit step and unit ramp inputs
6. Time Response of Second order systems to unit step input
7. Using MATLAB, determine the steady state error of the given system.

Module IV: Stability in Time Domain

(4 Hours)

Theory

Stability in Time Domain: Stability and Algebraic Criteria, concept of stability, Necessary conditions of stability, Hurwitz stability criterion, Routh stability criterion and Application of the Routh stability criterion to linear feedback system

Module V: Root Locus Technique

(5 Hours)

Theory

Root Locus Technique: Root locus concepts, Rules of Construction of Root locus and Determination of Roots from Root locus for a specified open loop gain.

Practice: MATLAB

8. Construct the root locus for 2nd & 3rd order system and analyze its stability (Gain)

Module VI: Frequency Response Analysis

(6Hours)

Theory

Frequency Response Analysis: Frequency domain specifications, correlation between Time and Frequency Response with respect to second order system, Bode plot, Determination of Gain Margin and Phase Margin from Bode plot.

Practice: MATLAB

9. Construct the bode plot for 2nd and 3rd order system and analyze its stability (PM & GM)

Module VII: Controllers

(4 Hours)

Theory

Controllers: Concept of Proportional, Derivative and Integral Control actions, P, PD, PI and PID controllers.

Practice: MATLAB/DYMOLA

10. Design of P, PD, PI and PID Controller for 2nd or 3rd order system

Text Books:

1. Saeed S. Hasan, "Automatic Control Systems," Kataria Publication, 9th Edition-2017.

Reference Books:

2. Nagrath J. and Gopal M., "Control Systems Engineering," New Age International Publishers, 6th Edition-2017.

Electrical Machines Operation and Control

Code	Course Title	T-P-PJ	Prerequisite
CUTM1054	Electrical Machines Operation and Control	3-1-0	Basic Electrical Engineering

Objective

- To introduce the students about principles of electromagnetism applied to alternating machines.
- To familiarize the students about the fundamental laws that governs the operation of machines and to extend its application to synchronous generator and motors.
- To introduce the students about the constraints associated with starting of Induction motors.
- Develop selection skill to identify the type of generators or motors required for particular application.
- Highlight the importance of transformers in transmission and distribution of electric power.

Course Outcome

- Distinguish the constructional similarity and dissimilarity between various machines.
- Perform different tests on various machines.
- Understand electromagnetic and electromagnetic induction
- Understand DC Machines
- Understand single and three phase A.C circuits, and Understand AC machines

Course content

Module-I: D.C. Machines (5 Hrs)

Theory

Construction, Classification and Principle of operation of DC machines.

Theory & testing:-EMF equation of DC generator, DC Motor Characteristics, Speed Equation of DC Motor. Characteristic for Speed Armature Current, Torque Armature Current and Speed Torque of (i) Separately Excited DC Motor, (ii) DC Shunt Motor, (iii) DC Series Motor, and (iv) DC Compound Motor, Comparison between Different types of DC Motors

Application- DC Generator, DC Motor-Types

Practice:

- 1) Determination of OCC (Open Circuit Characteristics) of D.C Shunt Generator.
- 2) Starting & Speed Control of D.C Shunt motor by (i) Field flux control method & (ii) armature voltage control method.
- 3) Starting & Speed Control of D.C Series motor by (i) Field flux control method & (ii) armature voltage control method.

MODULE II: Stepper Motors (Precision Machines) (6 Hrs)

Theory

Stepper motor drive, basic principles involved in stepper motor control, stepper motor specification, operation and commercial driver chips and packages, Brushless DC Motors, Reluctance Motor, Hysteresis Motor
Application in Medical, Automobile, Civil, Electrical etc

Practice:

- 4) Motor Voltage and Current Measurement.
- 5) ON-Load Tap changer

Module-III: Induction Motors (8 Hrs)

Theory

Principles of operation of induction motors, both single and 3-phase types. Torque-speed curves, Different types of single phase motors

Three Phase Induction Motor

Equivalent Circuit and Phasor Diagram, No-Load and Blocked Rotor tests, Determination of Parameters, Slip-Torque Characteristics Losses and Efficiency, Effect of rotor resistance, Starting and speed control methods, Cogging, Crawling and Electrical Braking of Induction Motors.

Applications of three & single phase motors which will assist in picking the right one for an application.

Practice:

- 5) Determination of parameter of a single phase induction motor and study of (a) Capacitor start induction motor (b) Capacitor start and capacitor run induction motor
- 6) Determination of Efficiency, Plotting of Torque-Slip Characteristics of Three Phase Induction motor by Brake Test.
- 7) Load test of a 3 phase slip ring induction motor.

Module-IV: Three Phase Synchronous Generators (7 Hrs)

Theory

Construction, Principle, Coil Pitch, Distributed Windings in A.C. Machines, The Equivalent Circuit of a Synchronous Generator (Armature Reaction Reactance, Synchronous Reactance and Impedance). The Phasor Diagram of a Synchronous Generator, Power and Torque in Synchronous Generators (Power Angle Equation and Power Angle Characteristic)

Practice:

- 8) Plotting the open circuit and short circuit characteristics of alternator.
- 9) Calculating the voltage regulation by synchronous impedance method.
- 10) Calculating the voltage regulation by zero power factor method.

Module-V: Parallel Operation Of Three Phase AC Synchronous Generators (4 Hrs)

Theory

Synchronous condenser, Hunting, Paralleling-Conditions, Procedure, Operation of Generators in Parallel with Infinite bus bar, Effect of excitation, effect of unequal voltage and steam power supply.

Practice:

- 11) Connection & verifying the conditions of parallel operation of alternators.
- 12) Verification of direct axis reactance, quadrature axis reactance
- 13) Load Sharing during parallel operation using Dymola.

Module-VI: Three Phase Synchronous Motors (6 Hrs)

Theory

Basic Principles of Motor operation, Construction, Starting Synchronous Motors, Synchronous Motor Ratings, Equivalent circuit & phasor diagram, Effect of excitation on varying load, power developed in a synchronous motor.

Applications of synchronous motors

Practice:

14) Study of universal motor and shaded pole motor.

15) Use of synchronous motor as a synchronous condenser for p.f improvement.

Module-VII: Single-Phase Transformers (9 Hrs):

Theory

Construction and principle of operation, EMF Equation, Transformation ratio, Practical and Ideal transformers

Three Phase Transformers: Three-phase transformer connections- Star-star, Two Single-Phase Transformers connected in Open Delta (V-Connection) and their rating, Delta-star, Zig-zag connections. Scott connection, Open delta connection. Auto Transformers, Welding Transformer.

Application of Single & Three Phase transformer

Practice:

16) Prescribed tests of single phase and three phase Transformer.

17) Load balancing in a three phase distribution Transformer.

18) Simulation of open delta condition of Transformer.

TEXT BOOK:

1. Electrical Machines – D P Kothari and I J Nagrath, Fourth Edition – Tata McGraw Hill.

REFERENCE BOOKS:

1. Electrical Machinery – P S Bimbhra – Khanna Publishers.
2. Electrical Machines - P. K. Mukherjee, S. Chakravarti, Dhanpat Rai & Sons

Industrial Power Electronics

Code	Course Title	Credit	T-P-PJ
CUTM1055	Industrial Power Electronics	4	2-1-1

Course Objective

- They must meet industrial requirement for power electronic engineers.
- They must be gaining adequate practical knowledge on power semiconductor devices, converters and their control techniques.
- They should know the typical applications to motor drives.

Course Outcome

- They will apply their knowledge of the electrical characteristics of power semiconductor devices.
- They will know how to select power semiconductor devices for a range of applications.
- They will understand the basic topology of converters, inverters and power supplies and design calculations for drive
- They will learn the power converter applications, and understand the approximations used.

Course content

Module I (6hrs.)

Power Semiconductor Devices

Introduction to power electronics, uncontrolled switches, semi-controlled switches, fully controlled switches, constructional features, operating principle, characteristics and specification of power semiconductor devices, hard and soft switching of power semiconductor switches.

Practice

1. Simulation of V-I characteristics of power diode & power transistor.
2. Simulation of V-I characteristics of MOSFET & IGBT.
3. Simulation of V-I characteristics of silicon-controlled rectifier.

Module II (3 hrs.)

Triggering Circuits

R- Triggering, R-C triggering, UJT triggering, design of UJT triggering circuit.

Practice

4. Simulation of R and RC triggering.
5. Simulation of UJT triggering

Module III (8 hrs)

AC to DC Converter

Overview of rectifiers, half wave uncontrolled rectifier with R load and R-L load, use of freewheeling diode, half wave rectifier R-L load with FWD, full wave bridge uncontrolled rectifier, half wave controlled rectifier with R load, R-L load and R-L load with free-wheeling diode, half controlled bridge rectifier, fully controlled bridge rectifier, effect of source inductance on the performance of ac to dc converters, power factor improvement, harmonic reduction, filter design.

Practice

6. Simulation of single phase half-wave and full-wave diode rectifier using R & L load.

7. Simulation of single phase fully controlled converter using R & L load.

8. Simulation of single phase semi converter using R-L load.

9. Simulation of 3-phase semi converter with R, R-L and dc motor load with/without freewheeling diode.

10. Simulation of 3-phase bridge converter with R, R-L and dc motor load with/without freewheeling diode.

Module IV: (10 hrs.)

DC to DC Converter

Introduction to chopper (Type A, B, C, D, E), switching techniques, step down dc chopper with R load, R-L-E load, step up dc chopper with R, R-L, R-L-E load, buck regulator, boost regulator, Buck-boost regulator, CUK and SEPIC converter, commutation of thyristor based circuits part-I, commutation of thyristor based circuits part-II, introduction to SMPS circuits, fly back type SMPS, forward type SMPS, design of transformer for SMPS circuits.

Practice

11. Simulation of buck converter.

12. Simulation of boost converter.

13. Simulation of buck boost converter.

Module V (6 hrs.)

DC to AC Converter

Introduction to inverters, importance and application of inverters, single phase half bridge inverter with R and R-L load, single phase bridge inverter with R and R-L load, three phase inverters, control techniques of inverter, single/multiple pulse width modulation, sinusoidal pulse width modulation and its realization, CSI, load-commutated CSI, industrial inverter.

Practice

14. Simulation of single-phase inverter & three phase inverter.

Module VI (3 hrs.)

AC to AC Converter

AC voltage controller: Single phase bi-directional controllers with R and R-L load, single phase cyclo-converters.

Practice

15. Simulation of single phase AC voltage controller&cyclo-converter.

Module VII

(9 hrs)

Application of Power Electronics Converters

Analysis of converter fed dc drives, analysis of chopper fed dc drives, analysis of VSI, CSI fed induction motor drives, automotive & traction system, industries as rolling mills, pumps, elevators, utility systems as FACTs, smart grid, and renewable energy as wind turbine.

Practice

16. Simulation of converter fed dc drives (Wind Turbines).

17. Simulation of chopper fed dc drives (PV Systems).

18. Simulation of induction motor drives (e-Vehicle).

19. Simulation of railway electrification system using Dymola

Project

1. 500 VA Sine wave Inverter

2. Industrial Battery Charger using SCR

3. Precision Illumination control of Lamp

4. Dual Converter using Thyristors

Text Books:

1. M. H. Rashid, "Power Electronics: Circuits, Devices and Applications," 4th Edition, Pearson, 2017
2. M. D. Singh & K. B. Khanchandani, "Power electronics", 2nd Edition, Tata McGraw-Hill, 2008

Reference Books:

1. J. Vithayathil, "Power Electronics: Principles and Applications", 2nd Edition TMH Edition, 1995
2. Mohan, Undeland and Robbins, "Power Electronics: Converters, Applications and Design" 3rd Edition Edition, 2007

Digital Measurement and Instrumentation

Code	Course Title	Credit	T-P-PJ
CUTM1056	Digital Measurement and Instrumentation	3	2-1-0

Objective

- The main objective of this course is to explain the operation, performance and application of Digital Measuring Instruments to the students.

Course Outcome

- Understand the construction, principle and characteristics of different types of digital measuring instruments
- Apply the knowledge about different instruments and can identify the best suitable instrument for a required typical measurement

Course Content

Module I (6 hrs)

Philosophy of digital measurements

Time Measurement Techniques: Error analysis in digital measurement, Measurement of time interval between two events, Error in time interval measurement, Vernier technique for small time measurement, Measurement of time interval with constraints, Measurement of periodic time, phase, Quality factor of ringing circuit, Decibel meter, Software controlled measurement.

Practice

- Error analysis of digital measurement using Matlab
- Simulation of Quality Factor of ringing circuit

Module II (5 hrs)

Digital frequency measurement techniques

Measurement of frequency, Ratio of two frequencies, Product of two frequencies, High frequency, average Frequency difference, Deviation of power frequency, Peak frequency. Fast low-frequency measurement, Digital Tachometer.

Practice

- Addition and product of different frequencies using Matlab
- Simulation of digital tachometer using Matlab

Module III (5 hrs)

Digitally Programmable Circuits

Single mode switching, Group mode switching, Resistors, Potentiometers, Amplifiers, Schmitt trigger, Dual polarity gain amplifiers. Programmable gain amplifier with dual output, Two stage programming, Programmable Biquads.

Practice:

- Analysis of switching using Matlab
- Simulation of programmable biquads using Matlab

Module IV (4 hrs)

Digital to Analog Converters

Output Input relation, DACs derived from programmable gain amplifiers, Weighted-resistor DAC, Weighted current DAC, Weighted reference voltage DAC, Ladder DAC, Switches.

Practice:

- Simulation of programmable gain amplifier using Matlab
- Simulation of DAC using Matlab

Module V (5 hrs)

Digital Voltage Measurement Techniques

Sampling theorem, Time-division multiplexing, Quantization, Indirect type A/D converters, Direct type A/D converters, Input circuitry of a digital voltmeter.

Practice:

- Simulation of Digital voltmeter using Matlab
- Analysis and simulation of digital multi-meter.

Module VI (4 hrs)

Digital Instrument

Need for digital instruments, Advantages of digital instruments, Essentials of digital instrument, Performance characteristics of digital instrument.

Digital Recording Systems

Input Conditioning Equipment, Digitizer, Multiplexer, Programme Pinboard, Linearizer, Digital Clock, Limit Detectors, Output Devices

Practice:

- Data fetching using controllers
- Simulation of digital clock using Matlab

Module VII: (4 hrs)

Signal Generator, Analyzers and Oscilloscopes:

Function Generator, Pulse Generator, RF Signal Generator, Harmonic Distortion Analyzer, Spectrum Analyzer, Digital Storage CROs

Practice:

- To study block wise Construction of a Function Generator
- Measure Voltage, Frequency, Phase and Modulation Index (Trapezoidal Method) using CRO
- Demonstrate features of Digital Storage Oscilloscope
- Measure unknown Frequency using Lissajous Patterns

Text Books:

1. T. S. Rathore- Digital Measurement Techniques, Alpha Science International Ltd
2. David A. Bell - Electronic Instrumentation and Measurements, Oxford Univ. Press, 1997
3. A. K. Sawhney – A Course in Electrical and Electronic Measurements and Instrumentation, Dhanpat Rai & Co

Reference Books:

1. PrithwirajPurkait- Electrical and Electronics Measurement and Instrumentation, MC Graw Hill Publishers
2. H.S. Kalsi-Electronic Instrumentation, Tata McGraw-Hill, New Delhi, 2010
3. R. K. Rajput- Electrical & Electronic measurement and Instrumentation, S. Chand Publication
4. K. Lal Kishore- Electronic Measurements and Instrumentation, Pearson Education 2010

Basic Electrical Engineering

Code	Course Title	(Credit)	T-P-PJ
CUTM1057	Basic Electrical Engineering	2	1-1-0

Objective

- In this course, student will come to know about the Basics of Electrical Engineering, Currents and Voltages across various Electrical elements.
- Their behavior in both Alternating Current and Direct Current circuits.
- Analysis of 1-phase and 3-phase AC wave forms.

Course Outcome

- Student will be exposed to the breadth of electrical engineering, able to gain knowledge in Electrical Circuits (AC and DC).
- Acquire knowledge on various parameters of electrical engineering and their properties with hands-on-practice of basic electrical experiments.

Course content

Module I: Basic Concepts and Basic Laws

(4hrs)

Theory

Essence of Electricity, Electric Field; Electric Current, Potential and Potential Difference, E.M.F., Electric Power, Ohm's Law, Basic Circuit Components, Ideal and Practical Sources, Source Conversion.

Practice:

1. Design and Analysis of Basic electrical circuits using Dymola. Plotting the V-I Characteristics of Incandescent lamp using Dymola.

Module II: Methods of Analysis (4hrs)

Theory

Network Analysis using Series and Parallel Equivalent, Voltage and Current Divider Circuits, Nodal Analysis, Mesh Analysis, Delta-Star & Star-Delta conversion.

Practice :

2. Verification of KCL and KVL in series and parallel circuits using Dymola.

Module III: DC Network Theorems (3hrs)

Theory

Analysis of Superposition, Thevenin's and Norton's theorem.

Practice:

3. Verification of Superposition, Thevenin's and Norton's theorem using Dymola.

Module IV: Introduction to Electromagnetism (4hrs)

Theory

Magnetic Circuits, B-H curve, Permeability, Reluctance, Solution of simple magnetic circuits, Hysteresis and Eddy current loss. Methods of preventing such losses. Solenoids and field coils. Application of solenoids in different circuits in Automobiles and in electrical circuit.

Practice (Hardware):

4. Observation of generation of magnetic flux for different input current in a coil and plotting B-H Curve.

Module V: Single-Phase Transformer (2hrs)

Practice (Hardware):

5. Study of Transformers, Linear Transformer Model, Ideal Transformer Model, No-load Loss and Load-loss Calculation.

Module VI: AC Circuit Analysis (3hrs)

Theory

Single-phase EMF Generation, Waveform and Phasor Representation, Average and Effective value of sinusoids, Peak factor & Form factor, Complex Impedance and Power using j-operator, Power factor.

Practice:

6. Calculation of current, voltage, power & power factor of series RLC circuit excited by 1- \emptyset A.C Supply using Dymola.

Module VII: Phasor Analysis (3hrs)

Theory

Three-Phase AC Circuits: Comparison between single-phase and three-phase systems, Three-phase EMF Generation, Line and Phase quantities in star and delta networks, Power and its measurement in three-phase balanced circuits.

Practice

7. Measurement of power and power factor in a 3- \emptyset AC circuit by (one, two and three) wattmeter using Dymola.

Recommended Books:

1. P. K. Sathpathy, "Basic Electrical Engineering," 3rd Edition, Oxford.
2. B. L. Thereja, "Electrical Technology", Volume-I, 2005 Edition (24th Revised Edition)
3. Hughes, "Electrical & Electronic Technology", Ninth Edition (Revised by J Hiley, K Brown, and I Smith), Pearson Education

Industrial Automation

Code	Course Title	(Credit)	T-P-PJ
IACU2100	Industrial Automation	24	5-9-10

Course Code	Course Title	Credits	Type T-P-PJ
CUIA2100	Introduction to Industrial Automation	1	1-0-0
CUIA2101	Advanced Programming & Control Blocks of PLC	3	1-2-0
CUIA2102	Control & Signal Wiring of PLC	2	0-2-0
CUIA2103	SCADA based advanced features	2	1-1-0
CUIA2104	SCADA & PLC based sequential control	1	0-1-0
CUIA2105	Human Machine Interface	3	1-2-0
CUIA2106	OPC server base data fetching & control	2	1-1-0
CUIA2107	Project	6	0-0-6
CUIA2108	Internship	4	0-0-4
	Total Credits	24	

Domain Track Objectives

- To upgrade knowledge levels needed for modern industries.
- Process & sequential control logic of industry.
- Project based training.

Domain Track Course Outcomes

- Gain knowledge on advanced industrial automation.
- Understand different types of Devices to which PLC input and output modules are connected.
- Provide the knowledge about understand various types of mobile applications.
- Industry based project & advanced learning.
- Students will develop skill of designing automatic control system and controller for a particular application.

Domain Syllabus

Course – 1: INTRODUCTION TO INDUSTRIAL AUTOMATION

- 1.1 Automation Uses
- 1.2 Automation - PLC Basics
- 1.3 Mechanical relays versus PLC
- 1.4 Functions of various blocks and working principle of advanced blocks.

Course – 2: ADVANCED PROGRAMMING & CONTROL BLOCKS OF PLC

- 2.1 CPT, ADD, SUB, MUL, DIV, SQR, NEG, TOD, FRD
- 2.2 MOV, MVM, AND, OR, XOR, NOT, CLR.
- 2.3 BSL, BSR, SQC, SQL, SQO, FFL, FFU, LFL, LFU
- 2.4 JMP, LBL, JSR, MCR
- 2.5 Connecting PLC software with SCADA software

Practice:

- P2.1 - Comparison of industry based analog signals.
- P2,2 - Detecting different product output of an industry
- P2.3 - Sequential control of an industry by using advanced blocks.
- P2.4 - Emergency control system of an industry
- P2.5 - Connecting PLC software with SCADA software

Course – 3: CONTROL & SIGNAL WIRING OF PLC

- 3.1 Control wiring of PLC.
- 3.2 PLC, Sensor and field instruments signal flow wiring.
- 3.3 Device connectivity

Practice:

- P3.1 PLC input/output wiring concept.

P3.2 Connecting relay, contactor, sensors and other field instruments.

P3.3 Controlling an industry motor using STAR-DELTA connection

Course – 4: SCADA BASED ADVANCED FEATURES

4.1 Alarms

4.2 Trends, Data base connectivity & Report generation

4.3 Recipe management

4.4 Security

Practice:

P4.1 - Data fetching and representing on graph and excel

P4.2 - Advanced controlling of industry by using SCADA

Course – 5: SCADA & PLC BASED SEQUENTIAL CONTROL

5.1 Script

5.2 Networking

5.3 Device connectivity.

Practice:

P5.1 Script

P5.2 Networking

P5.3 Device connectivity

Course – 6: HUMAN MACHINE INTERFACE

6.1 What is HMI. Use of HMI

6.2 Concept of different operational features

6.3 Connectivity of HMI and PLC.

Practice:

- P6.1 Alarms
- P6.2 Security
- P6.3 Recipe manager

Course – 7: OPC SERVER BASE DATA FETCHING & CONTROL

- 7.1 Study of Open Platform Communications
- 7.2 OPC to control PLC, SCADA.
- 7.3 OPC based different protocol concept.
- 7.4 Data handling using OPC.

Practice:

- P7.1 Installation of OPC
- P7.2 OPC protocols
- P7.3 Connectivity of PLC, SCADA & ARDUINO to OPC.

Operation and Maintenance of Electrical Grid System & Transformers

Domain Name	Code	Type of course	T-P-P	Pre-requisite
Operation and Maintenance of Electrical Grid System & Transformers	EGCU2090	Theory + Practice + Project	6-14-4	Nil

1. Track Total Credits:

Theory + Practice + Project: [6+14+4] (24)

2. Course objectives :

A] To create technically trained manpower readily available for recruitment to the power/energy Companies & Transformer Manufacturing firms in Electrical Sector.

B] Develop digital prototypes of the products and validate them and innovate for design efficiency

3. Course Outcomes :

A] Product: Manufacturing of commercially used distribution transformer

B] Project Report: Report on different Operation and maintenance procedures carried out on transmission and distribution system including Transformer Manufacturing & Testing Process

4. **Domain Structure** : The Domain will consist of following components and these components will be reflected in the grade sheet.
- a. CUEG 2090: Introduction, Power Scenario, Power Quality & Faulty clearance, [1-1-0]
 - b. CUEG 2091: Switchyard & substation Networks, [1-2-0]
 - c. CUEG 2092: Protection scheme & Switchgear, [1-2-0]
 - d. CUEG 2093: Cable system & Testing, [1-2-0]
 - e. CUEG 2094: Power Markets, [1-0-0]
 - f. CUEG 2095: Grid Safety, [0-2-0]
 - g. CUEG 2096: Transformer Manufacturing, [1-5-0]
 - h. CUEG 2097: Project, [0-0-4]

The Domain will be delivered through case studies, assignments and product development

Product Development Stack :

1. Distribution Transformer (Full product)
2. Smart Energy Meter (Modular Platform design and electric power train design , BIW)

5. Session Plan for the Entire Domain:

Course 1: **Generation, Transmission & Distribution scenario in India**

[Interactive + Modelling], [1-1-0], [20 Hrs]

- 1.1 Types of generation: Conventional and Non-conventional,
- 1.2 Thermal Power Plant, Hydro Power Plant,
- 1.3 Gas Power Plant, Nuclear Power Plant,
- 1.4 Co-generation Various sources Non-conventional Energy Sources.
- 1.5 Role of computers in distribution system planning-Load modelling
- 1.6 characteristics: definition of basic terms and loss factor
- 1.7 Classification of loads and their characteristics.
- 1.8 Distribution Feeders and Substations: Design consideration of Distribution feeders: Radial and loop types of primary feeders, voltage levels, and feeder-loading.

Video Links

- 1.2.1 https://www.youtube.com/watch?v=lh5_7sHyLU4
- 1.2.2 Hydro Power
- 1.3.1 Gas Power Plant
- 1.3.2 Nuclear Power Plant
- 1.3.3 1.4.1 Co-Generation

Practice

- 1. Load Modeling
- 2. Substation Modeling

Course 2: Switchyard/Substation Types

[Lab Practice in Own Distribution Network, Modelling], [1-2-0], [20 Hrs]

- 2.1 Single line diagram/equipments [Equipments-transformer, CB, fuse etc.]
- 2.2 Relays, Relaying schemes and auxiliaries Wiring Diagram
- 2.3 Layout of Sub-Station(33/11KV S/S, 220/33KV S/S)
- 2.4 Indoor and outdoor busbars — bus-bar mountings and their clearances.
- 2.5 Designing Electrical Transmission Tower Types and Design

Video Links

- 2.3.1 Substation layout
- 2.5.1 Transmission Tower Design

Practice

- 1. Design 33/11 KV substation
- 2. Single Line layout of substation

Course 3: System Protection & Auxiliaries

[Field Visit+ Lab Practice in Own Distribution Network] [1-2-0] [20 Hrs]

- 3.1 CT & PTs, Local & Back-up Protection. Protection Schemes,
- 3.2 New Generation Relays, Different types of indoor and outdoor CB, Breaker Maintenance,
- 3.3 Lightning Arrestors/Surge Arrestors, Isolators And Insulators,
- 3.4 Grounding system, Auxiliary System in Switchyard/Substation

Video Links

- 3.1.1 CT, PT, Relay
- 3.2.1 Distance Protection
- 3.4.1 Grounding/Earthing

Practice

1. Design Over current Protection for sub-station Feeder.
2. Measuring Earth Insulation Resistance

Course 4: Cables in Electrical System

[Visit to Standard Testing Lab, Workshop Practice], [1-2-0], [20 Hrs]

- 4.1 Modern trends in Underground Cabling Basic Concepts,
- 4.2 Materials Used in Cables, Conductors,
- 4.3 Testing and Commissioning of cables,

Video Links

- 4.1.1 Under Ground Cable
- 4.3.1 [Cable Laying](#)

Practice

1. IR Test of Cable
2. Cable Jointing

Course 5: Power System Market, Markets For Electrical Energy, Energy Conservation

[Interactive], [1-0-0] [3 Hrs]

- 5.1 Electricity Business
- 5.2 Electricity Market Models
- 5.3 Power Transfer, Inter & Intra State
- 5.4 Energy Efficiency in Grid

5.5 Energy conservation measures

Video Links

5.1 Power Market Fundamental

5.2 Power Exchange

5.5 Energy Conservation

Practice

1. Developing Market Model for electricity trading

Course 6: GRID Safety Norms, Electrical Accidents and prevention, Electricity Costing & Audit,

[Field Survey], [0-2-0], [5 Hrs]

6.1 Safety Requirement, Hazards, Electrical Accidents and prevention, First Aid

6.2 Safety : Safety Philosophy, Safety Procedures, GRID Safety Norms, Procedures for issuing L.C.P. and cancellation, Maintenance of Safety records.

6.3 First Aid : Places of Potential Hazards, Electric Shock Treatment, Artificial Respiration, Handling Emergency Conditions, Treatment of Wounds, Injuries & Burns.

6.4 Fire Fighting: Causes of Fire, Fire Extinction, Classification of Fires, Fire Fighting, Equipment: their operation – maintenance & refilling, Fire prevention.

6.5 Energy Audit.

Video Link

6.1.1 General Grid Safety

6.2.2 Industrial Safety

6.3.1 Electrical Shock First Aid

6.4.1 Fire Extinguisher

Practice

Hazard Analysis & Mitigation

Course 7: Principles of transformer

[DS Tools, Workshop Practice], [1-5-0], [20 Hrs]

7.1 Inner & Outer Part of Transformer,

7.2 Manufacturing of Transformer,

7.3 Transformer Test,

7.4 Conditions leading to faults in Transformer,

7.5 Maintenance of transformer

Practice

1. Transformer Manufacturing

2. Transformer Testing

3. Fault Finding & Corrective action

6. List of Projects/products to be done in domain: [200 Hrs]

1. Substation layout & Placement of equipment.
2. Protection System of 33/11/0.4 KV substation.
3. O & M of distribution substation.
4. Energy Audit
5. Safety Practice.
6. Transformer Manufacturing & Testing.

EVALUATION: As per Central QA system policy