CENTURION UNIVERSITY OF TECHNOLOGY AND MANAGEMENT ODISHA

CHOICE BEASED CREDIT SYSTEM

COURSE STRUCTURE &

SYLLABUS

B.Sc (Core Courses)

[*With effect from 2020-21 Academic Session]*

2020

Course Structure

(Core Courses)

Sl.No	Code	Subject Name	Cerdit	Course Type (Th+Pr+Pj)
1	CUTM1511	Calculus	6	3+1 +2
2	CUTM1512	Linear Algebra	6	3+1 +2
3	CUTM1513	Analysis-I	6	3+0 +3
4	CUTM1514	Ordinary Differential Equations	6	3+ 2+1
5	CUTM1515	Analysis-II	6	3+0 +3
6	CUTM1516	Modern Algebra	6	3+0 +3
7	CUTM1517	Partial Differential Equations and System of Ordinary Differential Equation	6	3+2 +1
8	CUTM1518	Numerical Analysis	6	3+ 2+1
9	CUTM1519	Advanced Analysis	6	3+ 0+3
10	CUTM1520	Complex Analysis	6	3+ 1+2
11	CUTM1521	Integral Transformations	6	3+1 +2
12	CUTM1522	Discrete Mathematical Structure	6	3+1 +2
13	CUTM1523	Linear Programming	6	3+2 +1
14	CUTM1524	Probability and Statistics	6	3+1 +2
		Total	84	

Centurion University

Course outline

CUTM1511 CALCULUS

Subject Name	Code	Type of course	T-P-Pj (Credit)	Prerequisite
CALCULUS	CUTM1511	Theory + Practice + Project	3-1-2	Nil

Objective

- To study how things change. It provides a framework for modeling systems in which there is change, and a way to deduce the predictions of such models.
- To construct a relatively simple quantitative models of change, and to deduce their consequences.

Learning Outcome

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

- Understand the importance of linear functions in mathematics.
- Deals with the major problems of differential and integral calculus.
- Recognize other important classes of functions (such as trigonometric and rational functions), and will be able to use calculus with these functions.

Course Outline

MODULE – I: Curvature (3hr+0hr+4hr)

Curvature, circle of curvature and radius of curvature, Radius of curvature in Cartesian and polar form.

Project 1: To find radius of curvature (Intrinsic and Parametric form)

Project 2: To find radius of curvature (Pedal form)

Module-II: Asymptotes(3hr+0hr+2hr)

Asymptotes and determination of asymptotes, Asymptotes parallel to coordinate axis, Rules to find asymptotes.

Project 3: To find asymptotes of different curves in implicit form

Module-III: Curve Tracing(4hr+6hr+6hr)

Curve Tracing, Tracing of Cartesian, parametric and polar curves.

Project 4: To trace some Cartesian curves (Folium of Descartes, Astroid)

Project 5: To trace some polar curves (Cardioid, Lemniscate of Bernaulli)

Project 6: To trace few more curves (Cartenary, Cycloid etc) and Loops

Practice 1: Plotting the graphs of the functions e^{ax+b}, log (ax + b), 1/(ax + b), sin (ax + b), cos(ax + b), |ax +b| and to illustrate the effect of a and b on the graph

Practice 2: Plotting the graphs of the polynomial of degree 4 and 5, the derivative graph, the second derivative graph and comparing them

Practice 3: Sketching parametric curves (e.g. Trochoid, cycloid, epicycloids, hypocycloid)

Module-IV: Reduction Formula(4hr+0hr+4hr)

Reduction formula, Reduction formula involving sine and cosine function sin ^nx cos ^nx, Reduction formula for integrals with limits from 0 to pi/2, Reduction formula for integral of sin^px, Cos^qx and also with limits from 0 to Pi/2.

Project 7: To find the Reduction formula for integrals of tan^nx, Cot ^nx, sec^nx, cosec^nx

Project 8: To find the Reduction formula for integral of sin^pxcos^qx for different values of p and q and different cases

Module-V: Rectification and Quadrature(6hr+0hr+2hr)

Rectification of curves, finding arc length for polar curves, area of plane regions for Cartesian, parametric and polar curves, Sectorial area.

Project 9: To find the Area bounded by closed curves

Module-VI: Volume of Solid Body Revolution(3hr+6hr+0hr)

Volume of solid of revolution, Volume of solid of revolution about any axis, Pappus theorem for volume of revolution.

Practice 4: Tracing of conics in Cartesian coordinates/polar coordinates

Practice 5: Sketching ellipsoid, hyperboloid of one and two sheets,

Practice 6: Sketching elliptic cone, elliptic paraboloid, hyperbolic paraboloid using Cartesian coordinates

Module-VII: Vector Differential Calculus(7hr+0hr+6hr)

Introduction to vector calculus: Definitions and characteristics of vectors, algebraic operations, Directional derivatives and directional derivatives along any line, Gradient of scalar point function, Divergence and curl of vector point functions, Second order differential operator the Laplacian operator and its properties.

Project 10: To explain about vector, different types of vector and vector algebra with suitable example

Project 11: To explain the geometrical significance of Gradient of scalar point function with some examples

Project 12: To discuss Laplacian operator and its different properties

Text Books:

1. A Text book of Calculus Part – II : Shanti Narayan

   Chapters: 8 (Art. 24, 25), 10 (Art. 33, 34, 35, 36, 37,

   38).

2. A Text book of Calculus Part-III : Shanti Narayan

   Chapters: 1 (Art. 1, 2, 3), 3(Art 7, 8, 9), 4(Art 10, 11, 12) omitting Simpson's rule), 5(Arts 13, 14), 6(Arts 15, 16).

3. A Textbook of Vector Calculus by Shanti Narayan & P. K. Mittal, S. Chand & Co., 2003

   Chapters: 1, 6.

Reference Books:

1. J. Strauss, G.L. Bradley and K. J. Smith, Calculus, 3rd Ed., Dorling Kindersley (India) P. Ltd. (Pearson Education). Delhi, 2007.
2. Anton, I. Bivens and S. Davis, Calculus, 7th Ed., John Wiley and Sons (Asia) P. Ltd., Singapore, 2002.
3. B. Thomas and R. L. Finney. Calculus, 9th Ed., Pearson Education, Delhi, 2005
4. Courant and F. John Introduction to Calculus and Analysis (Volumes I & II). Springer-Verlag. New York. Inc., 1989

Course outline

CUTM1512 LINEAR ALGEBRA

Subject Name	Code	Type of course	T-P-Pj	Prerequisite
LINEAR ALGEBRA	CUTM 1512	Theory ,Practice & Project	3-1-2	NIL

Objective

- This course unit aims to introduce the basic ideas and techniques of linear algebra for use in many other lecture courses.
- Solve systems of linear equations using various methods including Gaussian and Gauss Jordan elimination and inverse matrices.
- Prove basic results in linear algebra using appropriate proof-writing techniques such as linear independence of vectors; properties of subspaces; linearity, injectivity and surjectivity of functions; and properties of eigenvectors and eigenvalues.

Learning outcome

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

- Use the basic concepts of vector and matrix algebra, including linear dependence / independence, basis and dimension of a subspace, rank and nullity, for analysis of matrices and systems of linear equations.
- Evaluate determinants and use them to discriminate between invertible and non-invertible matrices.
- Solve systems of linear equations using multiple methods, including Gaussian elimination and matrix inversion. Carry out matrix operations, including inverses and determinants.
- Demonstrate understanding of linear independence, span, and basis.

Course outline

Module I

Vector spaces, definition and examples,Subspace,Span of a set.

Project-1: Preparation of detail report on Vector space,Subspace

Project-2: To show that span of a subset of a vector space is a Vector space

Module II

Linear dependence and independence **,** Dimension and basis

Project-3: Preparation of detail report on dependency of vectors .

Project-4: Finding dimension and basis of a vector Space.

Module III

Linear transformation, definition and examples, Range and kernel, Rank and nullity, The space L (U,V)

Project-5:To find out Range and Kernel of different Linear Transformations.

Project-6: Establishment of R(T) and N(T) are sub spaces of V and U respectively in the linear map T:U-->V

Module IV

Composition of Linear maps,Matrix and linear map,linear operations,matrix multiplication

Project-7: To show that L(U,V) is a vector space

Project-8: Establish the condition of non Singularity of Linear Map.

Module V

Rank and nullity of matrix,Transpose of a matrix,Elementary row operations

Project-9: Preparation of working rule for finding rank of a matrix with example.

Project-10:To find the matrix associated with Linear Maps

Practice 1 : Introduction to MATLAB. Matrix addition and multiplication

Practice 2 : Matrix Transpose , Matrix Inversion

Module VI
Systems of linear equations,Matrix inversion,Determinants, minors **,**Rank of a

matrix Project-11: Finding rank of a matrix by Determinant Method

Practice 3: Finding Rank of a Matrix

Practice 4: Solution of AX=B using Gauss Elimination method .

Module VII
Product of determinants,Application to linear equations,Eigen value and Eigen vector

Project-12: Finding the eigen value and eigen vector of a 3x3 matrix having repeated root in it's characteristic equation.

Practice 5 : Solution of AX=B using, Gauss Seidal and Gauss-Jacobi method

Practice 6 : Finding Eigen Values and Eigen vectors of Matrix

Text Book:

An Introduction to Linear Algebra by V. Krishnamurty,V.P.Mainra, J.L.Arora, Affiliated East-West press Pvt.Ltd.

Chapters: 3,4 (4.1 to 4.7), 5,6 (6.5 to 6.8)

Reference Books:

Basic Structures in Algebra, Part-I : J.N. Patnaik

Matrix Theory and Linear Algebra : I.N. Herstein and D.J. Winter (Ma Chilan Publishing company)

First course in Linear algebra : Bhattacharya, Jain and Nagpaul (New Age International)

Developed by:(Faculty name) : Dr T.N.Samantara

Developed on (Month and Year): May 2020:

Course outline

CUTM-1513 ANALYSIS-I

Subject Name	Code	Type of course	T-P-Pj (Credit)	Prerequisite
ANALYSIS-I	CUTM-1513	Theory	3-0-3	Nil

Objective:

- Analysis extends and refines calculus; it encompasses differentiation, integration, measure, limits, infinite series, and analytic functions, primarily in the context of real and complex number systems.
- In much of analysis, the emphasis is not on finding explicit solutions to specific problems, but rather on determining which problems can be solved and what general properties solutions may share

Learning Outcome:

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

- Describe the real line as a complete, ordered field, Use the definitions of convergence as they apply to sequences, series, and functions,
- Determine the continuity, differentiability, and integrability of functions defined on subsets of the real line, Produce rigorous proofs of results that arise in the context of real analysis.

Course Outline

Module-I (5 hr+0 hr+4 hr)

Field Structure and Order Structure; Bounded and unbounded Sets, Supremum, Infimum; Completeness in the Set of Real numbers; Archimedean Property of Real numbers; Inequalities and Metric property of R

project 1: A study on completeness property of R and its application.

project 2: A Report on Some Inequalities of Real Numbers.

Module-II (5 hr+0 hr+6 hr)

Neighborhood of a point, Interior point of a set, Open Sets; Some Important Theorems on open Sets; Limit point of a Set, Closed Sets, Closure of a Set, Dense Set; Some Useful Theorems on Open Set and Closed Sets; Blozano-weirstrass theorem for Sets.

Project 3 : A study on some Useful Theorems on Limit point of a Sets.

Project 4: A Study on some Useful Theorems on Open Set and Closed Sets.

Project 5: A study on the Blozano-weirstrass theorem for Sets.

Module-III (6 hr+0 hr+6 hr)

Real Sequences and Theorems on Convergence of Sequence; Limit point a Sequence and Bolzano-Weierstrass theorem for Sequences; Convergent and Non-Convergent Sequences; Cauchy's general Principle of Convergence and Cauchy Sequence; Some Important theorems on Real Sequences; Monotonic Sequences and Sub sequences.

Project 6: A Report on Cauchy's general Principle of Convergence and Cauchy Sequence.

Project 7: A Report on Convergent and Non-Convergent Sequences.

Project 8: A study on Some Important Theorems of Real Sequences.

Module-IV (5 hr+0 hr+6 hr)

Infinite Series and Some Preliminary Theorems; Positive term Series and Condition for Convergence ; Geometric Series and Comparison Series for Convergence of Infinite Series; Comparison Tests for Positive Term Series ; Cauchy's Root test and D' Alembert's Ratio Test.

Project 9: A study on Some useful theorems of Infinite Series.

Project 10: A report on Comparison Test for Positive term Series.

Project 11: A Report on Cauchy's Root test and D' Alembert's Ratio Test.

Module-V (3 hr+0 hr+4 hr)

Alternating Series and Leibnitz Test ; Absolute and Conditional Convergence; Solving problems on Absolute and Conditional Convergence.

Project 12: A Report on Alternating Series and Leibnitz Test.

Project 13: A Report on Absolute and Conditional Convergence.

Module-VI (4 hr+0 hr+4 hr)

Limit and Continuity of Functions; Discontinuities and Types of Discontinuity;Uniform continuity and related Theorems; Differentiability of Real functions.

Project 14: A Report on Finding Limit and continuity of Functions.

Project 15: A Report on Differentiability of Real functions.

Module-VII (4 hr+0 hr+6 hr)

The Derivative and Higher Order Differentiation's; Darboux's Theorem and Roll's Theorem; Lagrange's Mean value theorems and Cauchy's Mean value Theorem ;Taylor's Theorem with Reminder.

Project 16: A Report on Darboux's Theorem and Roll's Theorem .

Project 17: A Report on Lagrange's Mean value theorems and Cauchy's Mean value Theorem.

Project 18 : A study on Taylor's Theorem with Remainder and its Importance.

Text Book:

1. Mathematical Analysis (Wiley Eastern) : S.C. Malik and S.Arora (4 th Edition) Chapters: 1 (except 4.3 and 4.4), 2, 3, 4 (upto Art.5 and Art 10.1, 10.2), 5, 6,

Reference Books:

1. Fundamental of Mathematical Analysis :G. Das&S.Pattanayak
2. Fundamentals of Real Analysis :S.L.Gupta& Nisha Rani
3. Mathematical Analysis-II : Sharma &Vasistha

Centurion University

Course outline

CUTM1514 ORDINARY DIFFERENTIAL EQUATIONS

Subject Name	Code	Type of course	T-P-Pj (Credit)	Prerequisite
ORDINARY DIFFERENTIAL EQUATIONS	CUTM1514	Theory + Practice	3-2-1	Nil

Objective

- To understand most of the physical phenomena from Science and Engineering which are modeled by differential equations
- To develop the ability to apply differential equations to significant applied and/or theoretical problems.

Learning Outcome

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

- Learn fundamental concepts of ODE theories and where and how such equations arise in applications to scientific and engineering problems.
- Be competent in solving linear/non-linear 1st& higher order ODEs using analytical methods to obtain their exact solutions.
- Find power series solutions of 2nd order differential equations.

Course Outline

Module-I (T-5 hrs-P-4 hrs-P-2 hrs)

Introduction to ordinary differential equations, First order and first degree differential equation, Variable separation method, Homogeneous differential equation, Non-homogeneous equation of first degree.

Practice-1 : Solving One dimensional heat flow equations using Python

Practice-2 : Solving Predator-Prey Equations using Python

Project-1 : Study on different types of first order and first degree ordinary differential equations used in mathematical models

Module-II (T-6 hrs-P-4 hrs-P-2 hrs)

Exact differential equations, Non-exact differential equations, Integrating factors.

Practice-3 : Solving Growth model (exponential case only) using Python

Practice-4 : Solving Decay model (exponential case only) using Python

Project-2 : Study of Non-exact differential equations and their solutions

Module-III (T-4 hrs-P-4 hrs-P-2 hrs)

Linear equation, Bernoulli's equation, Introduction to Second and Higher order Linear Homogeneous and Non-homogeneous equations with constant and variable coefficients.

Practice-5 : Solving Oxygen debt model using Python

Practice-6 : Solving Mixing Concentrations problems using Python

Project -3 : Applications of first order differential equations to Decay models

Module-IV (T-4 hrs-P-4 hrs-P-0 hrs)

Complimentary function and Particular integral, Finding particular integrals for the differential equations containing the Exponential functions, Trigonometric functions (Sine and Cosine) using inverse operator method.

Practice-7 : Solving Escape velocity Problem using Python

Practice-8 : Solving Free Damped Motion of a Spring System using Python

Module-V (T-4 hrs-P-4 hrs-P-2 hrs)

Finding particular integrals for the differential equations containing Power functions, Product of exponential function with other functions, Functions in the form xV(x) using inverse operator method, Solving second order linear equations using variation of parameters method.

Practice-9 : Solving Free Undamped Motion of a Spring System using Python

Practice-10 : Solving RL circuit problems using Python

Project -4 : Study on Variation of parameter method for solving second order differential equations

Module-VI (T-4 hrs-P-2 hrs-P-2 hrs)

Solving second order linear equations using Method Of Undetermined Coefficients, Linear equations reducible to constant coefficient form, Euler-Cauchy equation, Legendre's equation.

Practice-11 : Euler Method for solving Second order differential equation using Python

Practice-12 : Solving Forced Vibration of a Spring System using Python

Project -5 : Study on Method Of Undetermined Coefficients for solving second order differential equations

Module-VII (T-3 hrs-P-0 hrs-P-2 hrs)

Power series solution, Power series solutions of second order differential equations.

Project -6 : Study on Power series solutions

Text Book:

1. Sinha Roy and S. Padhy, A Course of Ordinary and Partial Differential Equations, Kalyani Publishers, New Delhi.

Chapters: 1, 2(2.1 to 2.7), 4(4.1 to 4.8), 7(7.1 to 7.3)

Reference Books:

1. Differential Equations and their Applications: Martin Braun, Springer International.
2. Advanced Differential Equations: M. D. Raisinghania, S. Chand & Company Ltd., New Delhi.
3. A First Course in differential Equations with Modeling Applications: G. Dennis Zill, Cengage Learning India Pvt. Ltd.
4. Text Book of Differential Equations : N.M. Kapoor
5. Introductory course in Differential Equations : D.A. Murray
6. Differential Equations: S. L. Ross, John Wiley & Sons, India, 2004.

Centurion University

Course outline

CUTM-1515 ANALYSIS-II

Subject Name	Code	Type of course	T-P-Pr (Credit)	Prerequisite
ANALYSIS-II	CUTM-1515	Theory	3-0-3	Nil

Objective:

- To introduce Riemann integrable and Riemann sums.
- To describe various theorems about Riemann sums and Riemann integrals and emphasize the proofs' development.
- To evaluate the definite integral, double integral and triple integral

Learning Outcome:

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

- DefineIntegrability of continuous,Piecewise Continuous and Monotone Functions.
- Be competent in solving Improper Integrals, Double integration and triple integrals over different region.
- Applychange of variables in double integrals and triple integrals

Course Outline

Module-I

Improper Integrals Definitions and Types; Convergence of Unbounded Functions with Finite Limit of Integration; Comparison Test For Convergence and Beta Function; General Test for Convergence and Absolute Convergence For Finite Range Integrals; Examining Convergence of Finite Range Integrals.

Project 1: A Report on Beta Function,its Properties and Application.

Project 2: A Report on Different types of Comparison Tests in Improper Integrals

Project 3: A Report on Convergence of Finite Range Integrals.

Module-II

Infinite Range Integrals and Convergence of Infinite Range of Integrals; Comparison Test For Convergence and Gamma Function; General Test for Convergence and Absolute Convergence For Infinite Range; Problems on Examining Convergence of Infinite Range Integrals.

Project 4: A Report on Gamma Function, its Properties and Application.

Project 5: A Report on Convergence of Infinite Range Integrals.

Module-III

Double Integrals Definition and Techniques of Evaluation; Double Integration Over a Rectangle; Condition Of Integrability and Some Theorems; Calculation Of Double Integral Over a Rectangle.

Project 6: A Report on Double Integrals with its Properties and Evaluation Techniques.

Project 7: A Report on Setting up Limits of Integration for Evaluating double Integrals

Project 8: A Report on Area calculated as A Double Integral and Finding Area of Regions.

Module-IV

Double Integral Over a Region(Closed Bounded Domain); Calculation Of Double Integral Over a Closed Domain; Calculation Of Double Integral by Changing the Order Of Integration; Change of Variable in Double Integrals; Computing Double Integrals by Change of variable Techniques.

Project 9: Test of Convergence of Improper Integral for Finite range of Integration

Project 10: Test of Convergence of Improper Integral for Infinite range of Integration

Project 11: A collection of Different Test Criteria for Convergence of Improper Integrals

Module-V

Double Integrals in Polar Co-ordinates; Computing Double Integrals in Polar Co-ordinates ; Triple Integrals Concepts and Definitions ;Triple Integrals over a Parallelepiped; Calculation of a Triple integrals Over a Parallelepiped.

Project 12: A Report on Application of Double Integrals in Polar Co-ordinates.

Project 13 :A Reports on Triple Integrals and its Applications to Solve Problems.

Project 14: A Report on Some Important Theorems on Triple Integrals.

Module-VI

Triple Integral Over Regions(Bounded Domaines); Volume Of Solids by Triple Integrals; Calculation of a Triple Integrals Over any Region on R3.

Project 15: A Report on Solving Problems on Triple integrals over a Parallelepiped .

Project 16: A Study on Volume Calculated as A triple Integral and Calculating Volume Of Solids.

Module-VII

Triple Integrals in Cylindrical and Spherical Co-ordinates; Problems on Cylindrical and Spherical Co-ordinates; Change of variable in Triple integrals ; Computing Triple Integrals by Change of variable Techniques.

Project 17: A Report on Determining Limits of Integration for Cylindrical Co-ordinates in triple Integrals.

Project 18: A Report on Change of variable in Triple Integrals with the help of Jacobians.

Text Book:

1. S.C. Mallik& S. Arora,Mathematical Anyalysis, New Age Pub. House New Delhi. Chapters: 11, 17 (2.1 to 2.8, 3.1 to 3.4, 5.1 to 5.2), 18 (7.1 to 7.7)

Reference Books:

2. Calculus Early Transcendentals 10th Ed - Howard Anton, Iril Bivens & Stephen Davis .Joh Wiley & Sons
   Chapter : 14 (Except 14.4 and 14.8).
3. Topics In Calculus By R.K Panda & P.K Satapathy, S.G Publication,Puri

Centurion University

Course outline

CUTM1516 MODERN ALGEBRA

Subject Name	Code	Type of course	T-P-Pr (Credit)	Prerequisite
MODERN ALGEBRA	CUTM1516	Theory	3-0-3	Nil

Objective

- A major objective is to introduce students to the language and precision of modern algebra. This means that the course will be proof-based, in the sense that students will be expected to understand, construct, and write proofs.
- A challenge for all students of mathematics is to balance the understanding with the communication. There is a tendency to think you are finished once you see why a mathematical statement is true or false.
- In fact you are just half-way there because constructing a legitimate proof involves different skills and expertise than the discovery part of the process. In this course both angles of problem-solving will be stressed.

Learning Outcome

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

- Effectively write abstract mathematical proofs in a clear and logical manner.
- Locate and use theorems to solve problems in number theory and theory of polynomials over a field.
- Demonstrate ability to think critically by interpreting theorems and relating results to problems in other mathematical disciplines.
- Demonstrate ability to think critically by recognizing patterns and principles of algebra and relating them to the number system.
- Work effectively with others to discuss homework problems put on the board.

Course Outline

Module-I

Definition and examples of groups, Subgroups and examples of subgroups.

Project-1 Collection of abelian groups using different properties.

Project-2 Report on multiplication modulo and addition modulo groups.

Project-3 Finding elements of $U_n(K)$

Module-II

Lagrange's Theorem and Consequences, Fermat's little theorem, Cyclic groups of Group G.

Project-4 Finding order of a subgroup using Lagrange's Theorem

Project-5 Uses of Fermat's little theorem

Module-III

Classification of Subgroups of Cyclic group, Cosets and Properties of Cosets

Project-6 List of the elements of the groups $< n >$ in Z_m

Project-7 Index of a subgroup H in G

Module-IV

Permutation Groups

Project-8 A group model of A_4

Project-9 Digit scheme based on D_5

Project-10 Rotation of Tetrahedron

Module-V

Application of cosets to permutation groups, Normal subgroups

Project-11 Collections of application of cosets to different groups

Project-12 Application to public key cryptography

Project-13 Reports on Stabilizer point and Orbit point

Module-VI

Quotient groups, Group Homomorphism, Properties of Homomorphism

Project-14 Reports on Quotient groups

Project-15 Properties of Homomorphism with examples.

Project-16 Collection on examples of group

Homomorphism. **Module-VII**

Isomorphism: Definition and examples, Cayleys Theorem **Project-17** First, second and third Isomorphism theorems **Project-18** Uses of Cayleys Theorem

Text Book:

1. Joseph A. Gallian, Contemporary Abstract Algebra (4th Edn.), Narosa Publishing House, New Delhi.
   Chapters: I, II, III, IV, V, VI VII, IX

Reference Books:

1. University Algebra – N.S. Gopalkrishna (Wiley Eastern)
2. Modern Algebra – Vatsa and Vatsa (New Age International)
3. Topics in algebra - I. N. Herstein (Vikas Pub. House)

Centurion University

CUTM1517 PARTIAL DIFFERENTIAL EQUATIONS AND SYSTEM OF ORDINARY DIFFERENTIAL EQUATIONS

Subject Name	Code	Type of course	T-P-PJ (Credit)	Prerequisite
PARTIAL DIFFERENTIAL EQUATIONS AND SYSTEM OF ORDINARY DIFFERENTIAL EQUATIONS	**CUTM1517**	**Theory + Practice**	**3-2-1**	**Nil**

Objective

- Introduce students to partial differential equations.
- Introduce students to how to solve linear and non-linear Partial Differential with different methods.
- To practice heat and wave equations in 2D and 3D..

Learning Outcome

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

- solve linear partial differential equations of both first and second order
- apply partial derivative equation techniques to predict the behavior of certain phenomena.
- apply specific methodologies, techniques and resources to conduct research and produce innovative results in the area of specialization.
- extract information from partial derivative models in order to interpret reality.

Course Outline

Module-I (4h+4h+2h)

Linear Homogeneous and Non-homogeneous system of Differential Equations with constant coefficients.

Practice-1

To find the general solution of linear homogeneoussystem of differential equations by using Matlab.

Practice-2

To find the general solution of linear non-homogeneoussystem of differential equations by using Matlab.

Project -1

To make a report of an application of linear system of differential equation

Module-II(4h+4h+2h)

Simultaneous linear first order differential equations in three variables, Pfaffian differential equations, Methods of Solutions of Pfaffian differential equations in three variables.

Practice-3

To find the solution ofsimultaneous linear first order differential equations by using Matlab.

Practice-4

To find the Solutions of system of differential equations in three Variables by using Matlab.

Project-2

Tomake a report on simultaneous Linear Differential Equations.

Module-III(4h+4h)

Introduction to first order partial differential equations, formation of first order partial differential equations, linear Partial differential equations.

Practice-5

To find the solution of first order partial differential equations by using Matlab

Practice-6

To find the solution of first order Quasi-linear partial differential equations by using Matlab

Module-IV(5 h+4h+2h)

Non-linear partial differential equations, Special types of first-order equations, Charpit Equation, solutions of partial differential equations of first order satisfying given initial conditions.

Practice-7

To find the solution of 1-d Wave equation by using Matlab

Practice-8

To find the solution of 1-d Heat equation by using Matlab

Project-3

Summary of Special types of partial Differential Equations**.**

Module-V(4h+2h+2h)

First order homogeneous PDE with constant coefficients, higher order homogeneous PDE with constant coefficients.

Practice-9

To find the solution of first order homogeneous partial differential equations by using Matlab

Project-4

Briefly describe Homogeneous Partial differential Equations with suitable examples.

Module-VI(6h+2h+2h)

Higher order linear Non-homogeneous PDE with constant coefficients, general Solution of PDE by using inverse operators.

Practice-10

To find the solution of 2-d Wave equation by using Matlab

Project-5

Make a report onNon-homogeneous Partial differential Equations with constant coefficients.

Module-VII(3h+4h+2h)

Solution of homogeneous and non-homogeneous PDE with variable coefficients,

Practice-11

To find the solution of 2-d heat equation by using Matlab

Practice-12

To find the solution of 2-d Laplace equation by using Matlab

Project-6

Summary of Non-homogeneous Partial differential Equations with variable coefficients.

Text Book:

1. J. Sinha Roy and S.Padhy, A course on ordinary and partial differential equation, KalyaniPublisers, New Delhi, Ludhiana,2012

Reference Books:

1. LoknathSahoo, Calculus and ordinary differential equations, Kalyani Publication, Reprint-2017
2. TynMyint-U and LokenathDebnath, Linear Partial differential Equations for Scientists and Engineers, 4thEdition, Springer, Indian reprint, 2006
3. S.L. Ross, Differential Equations, 3rd Ed., John Wiley and Sons, India, 2004

Centurion University

CUTM1518 NUMERICAL ANALYSIS

Subject Name	Code	Type of course	T-P-PJ (Credit)	Prerequisite
NUMERICAL ANALYSIS	CUTM1518	Theory + Practice	3-2-1	Nil

Objective

- To understand the limitations of analytical methods and the need for numerical methods and the ability to apply these numerical methods to obtain the approximate solutions to engineering and mathematical problems.
- Ability to decide and to derive appropriate numerical methods for approximating the solutions of various types of problems in engineering and science and analyze the error incumbent in any such numerical approximation.
- Ability to report analysis, solution and results in a standard engineering format.

Learning Outcome

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

- Perform error analysis to select an appropriate numerical model and to estimate errors in numerical solution of a given problem.
- Derive a variety of numerical algorithms/methods & compare the viability of different approaches to the numerical solutions of various mathematical problems arising in roots of linear and non-linear equations, interpolation and approximation, numerical differentiation and integration, system of linear algebraic equations and differential equations.
- Analyze and evaluate the accuracy of common numerical methods.

Course Outline

Module – I (5hr+6hr+0hr)

Introduction to Numerical Analysis, Concept of Number system: Binary numbers, octal numbers, hexa-decimal numbers. Floating point Arithmetic, K – digit Arithmetic, Dealing with Errors: Relative, absolute, roundoff, truncation.

Practice 1: Calculate the sum 1+1/2+1/3+1/4+ +1/N. using python

Practice 2: To find the absolute value of an integer using python

Practice 3: Enter 100 integers into an array and sort them in an ascending order using python

Module – II (7hr+8hr+4hr)

Numerical Solution of non-linear equations: method of bisection, Regula-falsi method, Secant method, Newton-Rapshon method, fixed point iteration method.

Practice 4: To find the approximate value of a polynomial using Bisection method.

Practice 5: To find the approximate value of a polynomial using Newton Rapshon method

Practice 6: To find the approximate value of a polynomial using Secant method

Practice 7: To find the approximate value of a polynomial using Regula Falsi method

Project 1: Numerical Methods for Solving Systems of Nonlinear Equations

Project 2: A Study on Transcendental and Polynomial equations.

Module – III (3hr+2hr+2hr)

Polynomial Interpolation, Existence and uniqueness of interpolating polynomials, Lagrange's interpolating polynomial.

Practice 8: To find the value of a function using Lagrange interpolation

Project 3: A study on Lagrange interpolation

Module – IV (4hr+2hr+4hr)

Newtons Divided Difference Interpolating Polynomial, Forward and backward Difference operators. Newton's Forward and backward Difference Interpolation formula

Practice 9: Solving problems on Newton forward/backward difference formula using python

Project 4: A study on Newton's Divided Difference Interpolation Formula

Project 5: A study to apply Newton forward difference/backward formula on solving numerical problems with MATLAB program

Module – V (5hr+4hr+0hr)

Numerical Integration, Newton-cotes rule, Trapezoidal Rule, Simpsons 1/3 rd rule, Simpsons 3/8 th rule.

Practice 10: Solving a problem on trapezoidal rule using python

Practice 11: Solving a problem on Simpson's 1/3 rd rule using python

Module – VI (2hr+0hr+0hr)

Compound Quadrature rules, Gauss-Legendre Rules,

Module – VII (4hr+2hr+2hr)

Numerical solution of Differential Equation, Euler's method, Runge-Kutta 4^{th} order method

Practice 12: Solving Problems on 4th order Runge-Kutta method using python

Project 6: A Study on Runge-Kutta method

Text Book:

1. A Course on Numerical Analysis : B. P. Acharya & R. N. Das, Kalyani Publisher Chapters: 1, 2 (2.1 – 2.4, 2.6, 2.8, 2.9), 3 (3.1 to 3.4, 3.6 to 3.8). 6 (6.1- 6.3, 6.5, 6.10, 6.11), 7 (7.1, 7.2, 7.3, 7.4 & 7.7)

Reference Books:

1. M.K. Jain, S.R.K. Iyengar and R.K. Jain, Numerical Methods For Scientific And Engineering Computation, 6th Ed., New Age International Publisher, India, 2007.
2. John H. Mathews and Kurtis D. Fink, Numerical Methods Using MatLab, 4th Ed., Phi Learning Private Limited, 2012.

Centurion University

Course outline

CUTM1519 ADVANCED ANALYSIS

Subject Name	Code	Type of course	T-P-Pj (Credit)	Prerequisite
ADVANCEDANALYSIS	CUTM1519	Theory	3-0-3	Nil

Objective

- To point out that iterative processes and convergence of sequences occur in many areas of mathematics, and to develop a general context in metric spaces.
- To provide a basic course in analysis.
- To reinforce ideas of proof.

Learning Outcome

- Understand the Euclidean distance function on R^n and appreciate its properties, and state and use the Triangle and Reverse Triangle Inequalities for the Euclidean distance function on R^n
- Explain the definition of continuity for functions from R^n to R^m and determine whether a given function from R^n to R^m is continuous
- Explain the geometric meaning of each of the metric space properties and be able to verify whether a given distance function is a metric
- Distinguish between open and closed balls in a metric space and be able to determine them for given metric spaces
- Define convergence for sequences in a metric space and determine whether a given sequence in a metric space converges
- State the definition of continuity of a function between two metric spaces

Course Outline

MODULE – I (5hr+0hr+6hr)

Metric Spaces: Definition and examples, open and closed spheres,

Project-1: Write a report on applications of metric spaces.

Project-2: Show that the class denote a set of all bounded sequence of real numbers is a metric space.

Project-3: Show that the class of all sequences is a metric space.

MODULE – II (3hr+0hr+4hr)

Neighbourhoods, Interior points. Open set

Project-4: Write a report on limit points and their applications.

Project-5(Flip class): Prove theorems on Neighbourhoods, Interior points

MODULE – III (5hr+0hr+6hr)

Closed set, boundary points, limit points and isolated points, closure of a set, dense sets.

Project-6: Write a report on difference between open set closed set and limit point , interior point with appropriate examples.

Project-7: Write the difference between boundary points, limit points and isolated points explain through examples.

Project-8 (Flip class): Prove theorems on closed set and dense sets.

MODULE – IV (4hr+0hr+6hr)

Separable metric spaces, sequences in metric space, convergent sequences, Cauchy sequences

Project-9: Write a report on applications of convergent sequences and Cauchy sequences.

Project-10: Every convergent sequence is bounded. Is the reverse true? Justify your answer with suitable example.

Project-11(Flip class): Prove theorems on convergent sequences and Cauchy sequences.

MODULE – V (4hr+0hr+4hr)

Complete metric space, subspace, Cantor's theorem. Continuous functions,

Project- 12(Flip class): Prove theorems on Complete metric space, subspace.

Project-13(Flip class): : Prove that addition, subtraction, multiplication and division (with condition) of continuous functions are continuous

MODULE – VI (4hr+0hr+6hr)

Uniform continuity, Connectedness, connected subsets of separated sets.

Project-14(Flip class): Prove theorems on Uniform continuity and Connectedness.

Project- 15: Write the difference between continuity and uniform continuity and explain through a proper example..

Project-16 (Flip class): Prove theorems on connected subsets of separated sets.

MODULE – VII (5hr+0hr+4hr)

Disconnected sets, contraction mappings, Banach fixed point theorem.

Project- 17(Flip class): Geometrical interpretation of connected and disconnected sets.

Project-18: Write some applications of Banach fixed point theorem.

BOOK PRESCRIBED

1. K. Jain and K. Ahmad, Metric Spaces, Narosa Publishing House, New Delhi. Chapters :2 (2.1-2.4, 2.6-2.9), 3(3.1-3.4), 4(4.1-4.3), 6(6.1,6.2), 7(7.1)
2. Methods of Real analysis-R.G. Goldberg. Chapters: 4(4.2,and 4.3), 5,and 6 (up to 6.8)

BOOKS FOR REFERENCE

1. S.C. Malik and S. Arora – Mathematical Analysis (New Age International)
2. Principles of Mathematical Analysis – Walter Rudin, III Edition, McGRAW-Hill Book Co.

Centurion University

CUTM1520 COMPLEX ANALYSIS

Subject Name	Code	Type of course	T-P-Pj (Credit)	Prerequisite
COMPLEX ANALYSIS	CUTM1520	Theory	3-1-2	Nil

Objective

- To understand the application of Complex Analysis to Two-Dimensional problems in Physics including Hydrodynamics and Thermodynamics and also in Engineering fields such as; Nuclear, Aerospace, Mechanical and Civil engineering, signal processing & communications.
- To acquire the skill of evaluating contour integrals using Cauchy's integral formula and Cauchy's integral theorem.

Learning Outcome

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

- To get equipped with the understanding of the fundamental concepts of functions of a complex variable along with the concepts of analyticity, Cauchy-Riemann relations and harmonic functions.
- Evaluate complex contour integrals applying the Cauchy's integral theorem and Cauchy's integral formula.

Course Outline

Module I (T-5 hrs-P-4 hrs-P-2 hrs)

Complex numbers, Algebra of complex numbers, Modulus and argument, Roots of a complex number.

Practice-1 : Plotting complex numbers in Matlab
Practice-2 : Finding the modulus and argument of a complex number using Matlab
Project-1 : Finding roots of different complex numbers

Module II (T-3 hrs-P-2 hrs-P-2hrs)

Functions of a complex variable, Limit and continuity, Differentiation, Cauchy-Riemann equations.

Practice-3 : Plotting complex functions using Matlab

Project-2 : Verifying Cauchy-Riemann equations for complex functions in cartesian form and polar form

Module III (T-4 hrs-P-0 hrs-P-2 hrs)

Analytic functions, Laplace equation, Harmonic and Conjugate harmonic functions, Method of finding out conjugate harmonic functions and the corresponding analytic function, Entire functions.

Project-3 : Finding conjugate harmonics of different harmonic functions and the corresponding analytic functions

Module IV (T-4 hrs-P-2 hrs-P-4 hrs)

Complex exponential functions, Logarithmic functions, Trigonomertric functions, Hyperbolic functions.

Practice-4 : Generate and plot Complex Exponential Signal Graph in Matlab

Project-4 : Study on Complex Exponential and Logarithmic functions

Project-5 : Studying properties of Complex trigonometric and hyperbolic functions

Module V (T-3 hrs-P-2 hrs-P-4 hrs)

Definite integrals of complex functions, Contours, Evaluation of Contour integrals using Cauchy's Integral Theorem.

Practice-5 : Integrating complex functions using Matlab

Project-6 : Evaluation of different types of Contour integrals using Cauchy's Integral Theorem

Module VI (T-6 hrs-P-2 hrs-P-6 hrs)

Cauchy's Integral Formula for complex functions and their derivatives, Convergence of sequences and series, Taylor series, Maclaurin series.

Practice-6 : Finding out the Taylor series expansion of a function using Matlab

Project-7 : Evaluation of different types of Contour integrals using Cauchy's Integral Formula

Project-8 : Study on Radius of convergence of a Power series

Project-9 : Taylor series expansion of different complex functions

Project-10 : Maclaurin series expansion of different complex functions

Module VII (T-5 hrs-P-0 hrs-P-4 hrs)

Conformal mapping, Bilinear Transformation, Fixed points, Cross ratio.

Project-11 : Study on Bilinear Transformations

Project-12 : Study on Conformal mappings **Text**

Book:

1. James Ward Brown and Ruel V. Churchill, Complex Variables And Applications, 8th Ed., Mc-Graw Hill International Edition, 2014.

   Chapters: 1, 2(12, 13, 15 to 26), 3(29, 30, 34, 35), 4(37 to 41, 50 to 52), 5(55, 56, 57), 8(93, 94), 9(101).

Reference Book:

2. Complex Analysis – L. V. Ahlfors, Mc-Graw Hill International Editions (Vikas Publications – Second Edition)

Centurion University

CUTM1521 INTEGRAL TRANSFORMS

Subject Name	Code	Type of course	T-P-Pj (Credit)	Prerequisite
INTEGRAL TRANSFORMS	CUTM1521	Theory	3-1-2	Nil

Objective

- To describe the ideas of Fourier and Laplace Transforms and indicate their applications in the fields such as application of PDE,
- Digital Signal Processing, Image Processing, Theory of wave equations, Differential Equations and many others.
- To use Fourier series for solving boundary value problems appearing in scientific& engineering problems.

Learning Outcome

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

- Learn application of MATLAB programming.
- Solve differential & integral equations with initial conditions using Laplace transform.
- Evaluate the Fourier transform of a continuous function and be familiar with its basic properties.
- Solution of integral equation and their application.

Course Outline

Module-I(T-4 h + Pr-2 h+ Pj-4 h)

Introduction to Integral Transforms, Laplace Transforms, and Properties of Laplace transforms, unit step function, second shifting theorem.

Practice-1

Laplace Transform and Inverse Laplace Transform Using Matlab.

Project-1

Make a short draft of properties of Laplace transform from memory. Then compare your notes with the text and write a report of 2-3 pages on these operations and their significance in applications.

Project-2

Find the Laplace transform of the following functions.

Module-II(T-4 h + Pj-4 h)

Unit impulse function, Laplace transforms of Derivatives and Integrals, Derivatives and Integrals of Transforms.

Project-3

Find the inverse Laplace transform of Derivative and integral properties.

Project-4

Find the Laplace transform of unit impulse function and unit step function.

Module-III(T-4 h + Pr-2 h+ Pj-4 h)

Evaluation of integrals, convolutiontheorem, inverse Laplace transform.

Practice-2

To solve integral equations by using Matlab.

Project-5

Evaluation of integrals by using Laplace transform.

Project-6

Find the inverse Laplace transform by using convolution theorem.

Module-IV(T-4 h + Pr-2 h+ Pj-4 h)

Solution of differential equations, integral equations.

Practice-3

Find the solution of differential equations by Laplace Transform Using Matlab.

Project-7

Solve the differential equation by using Laplace transform.

Project-8

Solve the integral equation by using Laplace transform.

Module-V(T-4 h + Pr-2 h+ Pj-4 h)

Periodic function, Fourierseries, Fourier series expansion of an arbitrary period, even and odd functions, half Range Expansions of a Fourier series.

Practice-4

Find the Fourier series expansion of a periodic function by using Matlab.

Project-9

Find the Fourier series expansion of a 2-pi periodic function.

Project-10

Find the Half range expansion of Fourier cosine and sine series.

Module-VI(T-4 h + Pr-2 h+ Pj-2 h)

Complex form of Fourier series, Fourier Integrals, Different forms of Fourier Integral Theorem.

Practice-5

Find the Fourier Series Coefficients by using Matlab.

Project-11

Find the Fourier sine and cosine integral of the following functions.

Module-VII(T-4 h + Pr-2 h+ Pj-2 h)

Fourier Transforms, Infinite Fourier Transforms, Finite Fourier transform, Properties Fourier Transform.

Practice-6

First Fourier transform by using Matlab.

Project-12

Make a short draft of properties of Fourier transform from memory. Then compare your notes with the text and write a report of 2-3 pages on these operations and their significance in applications.

Text Book:

M.D. Raisinghania, H.C. Saxena and H.K. Dass: Integral Transforms, S. Chand & Company LTD.Chapters: 1(1.1-1.5,1.7 to 1.10,1.12) 2(2.2,2.4,2.5,2.6), 3(3.1 to 3.21), 4(4.1, 4.4, 4.5 to 4.13, 4.15 to 4.17), 5(5.1, 5.16), 6(6.1 to 6.3, 6.6 to 6.8, 6.11), 7(7.1 to 7.3).

Reference Text Book:

1. Higher Engineering Mathematics by B.V.Ramana.

2. An introduction to non-harmonic Fourier series,Author(s):Robert M. Young.

3. Advanced Engineering Mathematics by E.Kreyszig (10th edition).

Centurion University

CUTM1522 DISCRETE MATHEMATICAL STRUCTURE

Subject Name	Code	Type of course	T-P-Pj (Credit)	Prerequisite
DISCRETE MATHEMATICAL STRUCTURE	CUTM1522	Theory	3-1-2	Nil

Objective

- To understand mathematical reasoning in order to read, comprehend and construct mathematical arguments as well as to solve problems, occurred in the development of programming languages.
- To work with different types of Sets, Lattices and Boolean Algebra.

Learning Outcome

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

- Evaluate elementary mathematical arguments and identify fallacious reasoning.
- Apply the logical structure of proofs and work symbolically with connectives and quantifiers to produce logically valid, correct and clear arguments.
- Reformulate statements from common language to formal logic. Apply truth tables and the rules of propositional and predicate calculus.

Course Outline

Module-I (T-5 hrs-P-4 hrs-P-4 hrs)

Introduction to Logic, Logical connectives, Converse, Inverse, Contrapositive, Proportional Equivalences, Propositional Calculus, Translating English sentences to Logical expressions.

Practice-1 : Finding the truth values of compound propositions using Python

Practice-2 : Writing conditional statements in Python

Project-1 : Study on equivalent statements in Logic

Project-2 : Study on Propositional Calculus

Module-II (T-5 hrs-P-0 hrs-P-4 hrs)

Predicates, Quantifiers, Bound and free variables, Rules of inference, Derivation of Valid conclusion, Nested Quantifiers.

Project-3 : Study on Universal Quantifiers and Existential Quantifiers

Project-4 : Study on Valid arguments in Logic

Module-III (T-4 hrs-P-0 hrs-P-4 hrs)

Recurrence Relation and it's solution by using Generating function, Pigeon-Hole Principle.

Project-5 : Study on different types of Recurrence relations

Project-6 : Study on Pigeon-Hole Principle

Module-IV (T-4 hrs-P-6 hrs-P-2 hrs)

The basics of counting, Generalized Permutations, Combinations and their Applications.

Practice-3 : Finding Factorial of a number using Python

Practice-4 : Finding out the value of P(n,r) using Python

Practice-5 : Finding out the value of C(n,r) using Python

Project-7 : Study on permutations and combinations

Module-V (T-4 hrs-P-2 hrs-P-2 hrs)

Relations and their operations and properties, Equivalence relation, Representation of a relation, Closure of a relation.

Practice-6 : Finding Composition of Relations using Python

Project-8 : Study on different types of Relations

Module-VI (T-3 hrs-P-0 hrs-P-4 hrs)

Partial order relation, Partially ordered set and totally ordered set, Hasse diagram, Maximal and minimal elements, Greatest and least elements, Supremum and infimum of a Poset.

Project-9 : Study on partially ordered sets and Totally ordered sets

Project-10 : Study on Hasse Diagram

Module-VII (T-5 hrs-P-0 hrs-P-4 hrs)

Lattice and it's algebraic structure, Properties of a Lattice, De-Morgan's Law, Bounded and Distributive Lattices, Boolean Algebra, Boolean Function.

Project-11 : Study on Lattices and Ordered Sets

Project-12 : Study on Boolean Algebra

Text Book:

1. Kenneth H. Rosen, Discrete Mathematics and Applications, Tata Mc-Graw Hill Publications,

Chapters: 1(1.1 To 1.5), 5(5.1, 5.2, 5.5), 6(6.1, 6.2, 6.4), 7, 10(10.1, 10.2).

Reference Book:

1. Discrete Mathematics with Graph Theory by Edgar G. Goodaire and Michael M. Parmenter

Centurion University

Course Outline

CUTM1523 LINEAR PROGRAMMING

Subject Name	Code	Type of Course	T-P-Pj (Credit)	Prerequisite
LINEAR PROGRAMMING	**CUTM1523**	**T + P + Pj**	**3-2-1**	**Nil**

Course Objective

- To introduce a brief understanding about Linear Programming Problems.
- To cater the characteristics of Linear Programming Problems and its Applications.
- To demonstration of the utilization of Linear Programming Problems in industry and business.

Learning Outcome

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

- Formulate the necessary and sufficient optimality conditions for linear programming and demonstrate the geometrical interpretation of these conditions.
- Use various techniques to solve basic transportation and network problems.
- Use the mathematical foundations learned in this course to formulate new applications as optimal decision problems and seek appropriate solutions algorithms.

Course Outline

CUTM1523 Linear Programming (3-2-1)

Module I (5 Hours)

Linear programming problems (LPP): Introduction to linear programming problems (LPP), Mathematical formulation of the linear programming problems with illustrations

Practice 1: (2 Hours)

Formulation of maximization type linear programming problem using excel solver

Practice 2: (2 Hours)

Formulation of minimization type linear programming problem using excel solver

Assignment 1: (2 Hours)

Formulation of Manufacturing/Production Problem to LPP

Module II (4 Hours)

Graphical method used for solving linear programming problem. Feasible region of LPP, unbounded solution to the LPP in graphical method, Canonical and standard form of LPP.

Practice 3: (2 Hours)

Solution of graphical method of LPP using excel solver

Practice 4: (2 Hours)

Solving manufacturing problem using excel solver

Practice 5: (2 Hours)

Solving diet problem using in excel solver

Assignment 2: (2 Hours)

Formulation of investment and diet problems to LPP and its graphical solution.

Module III (5 Hours)

Simplex Method: Basic and non basic variables, Theory of Simplex method, optimality and unboundlessness, Simplex algorithm, Simplex method in tableau format.

Practice 6: (2 Hours)

Solving Maximization problem using Simplex method in excel solver

Practice 7: (2 Hours)

Solving Minimization problem using Simplex method in excel solver

Assignment 3: (2 Hours)

Solution of linear programming problem using simplex method.

Module IV: (5 Hours)

Introduction to artificial variables, Two –phase simplex method, Big-M method, Degeneracy problem in simplex method

Practice 8: (2 Hours)

Solving linear-programming problem using Two Phase method in excel solver

Practice 9: (2 Hours)

Solving linear-programming problem using Big-M method in excel solver

Assignment 4: (2 Hours)

Solution of linear programming problem using penalty method.

Module V: (4 Hours)

Transportation Problem: Introduction to transportation problem, Initial basic feasible solution to transportation problem using North-West Corner, Least Cost Method and Vogel's approximation Method.

Practice 10: (2 Hours)

Solving Transportation problem using North West Corner method in excel solver

Practice 11: (2 Hours)

Solving Transportation problem using Least Cost method in excel solver

Assignment 5:

Initial basic feasible solution to transportation problem

Module VI: (4 Hours)

Optimal solution to transportation problem using MODI method, Unbalanced transportation problem, Degeneracy in transportation problem.

Practice 12: (2 Hours)

Solving Transportation problem using Vogel's Approximation method in excel solver

Assignment 6: (2 Hours)

Optimal solution to transportation problem using MODI method

Module VII: (4 Hours)

Assignment Problem: Introduction to assignment problem, Mathematical formulation of assignment problem, Solution to assignment problem using Hungarian method

Assignment 7: (2 Hours)

Solution to assignment problem using Hungarian method

Text Books:

Kanti Swarup, P.K. Gupta and Man Mohan-Operations Research, S. Chand and Co. Pvt.Ltd.

S. Kalavathy- Operations Research, Vikas Publishing House Pvt. Ltd.

Reference Book:
Mathematical Programming by N. S. Kambo, East West Press.

Centurion University

Course Outline

CUTM1524 PROBABILITY AND STATISTICS

Code	Course Title	T-P-Pj (Credit)	Prerequisite
CUTM1524	PROBABILITY AND STATISTICS	3-1-2	NIL

Objective

- To translate real-world problems into probability models.
- To motivate students in an intrinsic interest in statistical thinking.
- To recognize the role and application of probability theory, descriptive and inferential statistics in many different fields of science and engineering.
- To apply probability and statistics in engineering and science like disease modeling, climate Prediction and computer networks etc.

Learning outcome

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

- Define and illustrate the concepts of sample space, events and compute the probability and conditional probability of events.
- Define, illustrate and apply the concepts of discrete and continuous random variables, the discrete and continuous probability distributions.
- Define, illustrate and apply the concept of the expectation to the mean, variance and covariance of random variables.
- Compute probabilities based on practical situations using the Binomial, Poisson and Normal distributions.

Course content

Module I: (4 hrs+2 hrs+4hrs)

Probability: Axiomatic definitions of probability, Sample Space, Probability axioms, Independent events, Mutually Exclusive Event, Equally Likely Events

Practice-1(2 hrs)

Bayes Theorem using MATLAB

Project-1 (2hrs)

Application of conditional probability analysis to the clinical diagnosis

Project-2(2hrs)

A Report on Bayes' Theorem and its Application in Different Fields

Module II :(4 hrs+2 hrs+4hrs)

Discrete random variables, Continuous random variables, Expectation of random variables, Variance and Standard Deviation

Practice-2(2hrs)

Probability Density Function using MATLAB

Project-3(2hrs)

A Report on Random Variables with Examples

Project-4 (2hrs)

A Report on Moment Generating Function of Distributions

Module III:(6 hrs+4 hrs+4hrs)

Binomial distribution, Poisson distribution, Poisson Distribution as the limiting case of Binomial Distribution

Practice-3(2 hrs)

Binomial distribution using MATLAB

Practice-4(2 hrs)

Poisson distribution - algorithm in Matlab

Project-5(2hrs)

Comparative study between Binomial distribution and Poisson distribution

Project-6(2hrs)

Report on Poisson distribution with their Business Applications in analyzing

data sets

Module IV:(4 hrs+2hrs+8hrs)

Uniform distribution, Normal distributions, Normal approximation to the Binomial distributions

Practice-5(2hrs)

Gaussian distribution – how to plot it in Matlab

Project -7(2hrs)

Flip class

A Report on Gamma, Exponential, Beta Distributions

Project-8(2hrs)

A Report on Central Limit Theorem (CLT) and its Applications in election polls

Project-9(2hrs)

Flip class

A Report on Negative binomial Distribution

Project-10(2hrs)

Flip class

A Report on Geometric distributions

Module V:(4 hrs+0 hr+0 hr)

Distribution of two random variables, Expectation of function of two random variables

Module VI:(4 hrs)

Conditional distributions and expectations.

Module VII:(4 hrs+2 hrs+4hrs)

Correlation coefficient, Co-variance independent random variables, linear regression of two variables

Practice-6(2hrs)

Covariance & Correlation Coefficient calculation in MATLAB

Project-11 (2hrs)

Flip Class

A Report on Markov's inequality

Project -12(2hrs)

Flip Class

A Report on Chebyshev's inequality

Total Hrs=T(30hrs+P(12hrs)+Pj(24hrs))

Text Books:

1. Irwin Miller and Marylees Miller, John E. Freund, Mathematical Statistics with Applications, 7th Ed., Pearson Education, Asia, 2006.
2. Sheldon Ross, Introduction to Probability Models, 9th Ed., Academic Press, Indian Reprint, 2007.

Reference Books:

1. Statistical Methods By S.P. Gupta (31st Edition) ; Publisher: Sultan Chand & Sons
2. Mathematical Statistics By S.C. Gupta & V.K. Kapur(10th Edition); Publisher: Sultan Chand & Sons.

Course outline Prepared by: **Dr.Banitamani Mallik**

Date:08-06-2020