CENTURION UNIVERSITY OF TECHNOLOGY AND MANAGEMENT, ODISHA

SCHOOL OF PARAMEDICS & ALLIED HEALTH SCIENCES

Centurion
UNIVERSITY

Shaping Lives...
Empowering Communities...

BACHELOR OF SCIENCE IN CLINICAL MICROBIOLOGY

2021

SYLLABUS

BACHELOR OF SCIENCE IN CLINICAL MICROBIOLOGY

Programme Structure

BASKET 1	**BASKET 2**	**BASKET 3**	**BASKET 4**	**TOTAL CREDITS**
School Core Courses	**Discipline Core Courses**	**Ability Enhancement Compulsory Course (AECC)** To be selected from University Basket	**Skill Courses** (To be selected from University Basket)	
SC-1 SC-2 SC-3 SC-4 SC-5 SC-6 SC-7	DC-1 DC-2 DC-3 DC-4 DC-5 DC-6 DC-7 DC-8 DC-9 DC-10 DC-11 DC-12 DC-13 DC-14 DC-15 DC-16 DC-17 DC-18 DC-19	AECC-I AECC-II	SFS-1 SFS-2 SFS-3 SFS-4 SFS-5	
28 Credits	**86 Credits**	**6 Credits**	**20 Credits**	**140 Credits (Minimum Credits required)**

BASKET I

School Core Courses

Sl. No.	CODE	SUBJECT	SUBJECT TYPE (T+P+Pj)	CREDITS
SC-1	CUTM1708	Human Anatomy and Physiology	2+1+0	3
SC-2	CUTM1729	Cell Biology	3+0+1	4
SC-3	CUTM1730	Medical Instrumentation and Technique	2+2+0	4
SC-4	CUTM1732	Biochemistry	3+1+0	4
SC-5	CUTM1715	Clinical Pathology	3+1+0	4
SC-6	CUTM1736	Immunology	3+2+0	5
SC-7	CUTM1737	Molecular Biology	3+0+1	4

BASKET II

Discipline Core Courses

Sl. No.	CODE	SUBJECT	SUBJECT TYPE (T+P+Pj)	CREDITS
DC-1	CUTM1731	Haematology	3+2+0	5
DC-2	CUTM1733	Microbiology	3+2+0	5
DC-3	CUTM1734	Medical Law and Ethics	2+0+1	3
DC-4	CUTM1713	Systemic Bacteriology	3+1+0	4
DC-5	CUTM1735	Systemic Virology & Mycology	3+2+0	5
DC-6	CUTM1721	Research Methodology	2+0+1	3
DC-7	CUTM1738	Analytical Biochemistry	3+2+0	5
DC-8	CUTM1740	Public Heath Microbiology	3+1+0	4
DC-9	CUTM1739	Pharmaceutical Microbiology	3+1+0	4
DC-10	CUTM1741	Industrial Microbiology	3+0+1	4
DC-11	CUTM1742	Basic Computer and Information Science	0+2+0	2
DC-12	CUTM1746	Epidemiology	2+0+1	3
DC-13	CUTM1747	Diagnostic Bacteriology	3+2+0	5
DC-14	CUTM1745	Diagnostic Mycology	3+1+0	4
DC-15	CUTM1743	Diagnostic Virology	3+0+1	4
DC-16	CUTM1744	Diagnostic Parasitology	3+1+0	4
DC-17	CUTM1754	Mini Project	0+0+2	2
DC-18	CUTM1755	Internship		12
DC-19	CUTM1756	Project		12

NOTE: Along with the School core and Disciple core subjects, the students need to opt for AECC Courses, Skill/ Domain/ Elective courses and value- added courses from the University Basket, as per the requirement by the University.

BASKET I

School Core Courses

SC1- CUTM1708- Human Anatomy and Physiology

Subject Name	Code	Type of course	T-P-Pj	Prerequisite
Human Anatomy and Physiology	CUTM1708	Theory+ Practice	2-1-0	Fundamental Science

Objective

- To identify different types of cells and describe their functions.
- To identify the organelles of a typical cell and describe their functions.
- To identify the major components of the integumentary system and describe their functions.
- To identify the major structures of the skin and describe their functions
- To identify the major components of the skeletal system and describe their functions.
- To identify the major components of the circulatory, endocrine, nervous system etc and describe their functions.

Course Outcome

- Use anatomical terminology to identify and describe locations of major organs of each system covered.
- Explain interrelationships among molecular, cellular, tissue, and organ functions in each system.
- Describe the interdependency and interactions of the systems.
- Explain contributions of organs and systems to the maintenance of homeostasis.
- Identify causes and effects of homeostatic imbalances.
- Describe modern technology and tools used to study anatomy and physiology.

Course Outline

Module-I (10 Hours)

Scope of Anatomy and physiology. Terms and terminology used in Anatomy. Structure of cell, function of its components with special reference to mitochondria and microsomes.

Elementary tissues: Anatomy of epithelial tissue, muscular tissue, connective tissue and nervous

tissue.

Skeletal System: Skeleton system with classification, types of bone, features of long bone, ossification, blood supply, Joints – classification with examples, structure of typical synovial joints, Joint disorders.

Practice: Demonstration of individual bone from skeleton.

Identification of different organs and system from chart.

Module-II (13 Hours)

Cardiovascular System: Composition and functions of blood. Blood groups – ABO system and Rh factor and coagulation of blood. Brief information regarding disorders of blood. lymph – origin, circulation, functions of lymph and lymph nodes. Structure and functions of various parts of the heart. Blood pressure and its recording. Brief information about cardiovascular disorders.

Respiratory system: Introduction and functional anatomy of respiratory tract, physiology of respiration.

Practice: Demonstration the morphology of different blood cells

Measurement of Blood pressure, impulses, Heart beats, respiration rate etc.

Module-III (15 Hours)

Urinary System: Various parts of urinary system and their functions, structure and functions of kidney. Physiology of urine formation. Patho-physiology of renal diseases and edema.

Digestive System: Anatomy of digestive system and their functions. Structure and functions of liver, physiology of digestion and absorption.

Endocrine System: Endocrine glands and Hormones. Reproductive system. Structure and function of sense organs.

Practice: Demonstration of various parts of body, tissues of body, parts of digestive system, parts of respiratory system, parts of excretory system. Identification of different organs and system from chart

Suggested Readings:

1. Text book Anatomy & Physiology for nurses by Evelyn Pearce, Publisher Faber & Faber.
2. Text book Anatomy and Physiology for nurses by Sears, Publisher Edward Arnold.
3. Anatomy & Physiology- by Ross and Wilson, Publisher Elsevier.
4. Anatomy& Physiology: Understanding the human body by Clark, Publisher Jones & Bartlett.
5. Anatomy and Physiology for nurses by Pearson, Publisher Marieb & Hoehn.
6. Anatomy and Physiology by N Murgesh, Publisher Satya

SC2-CUTM1729- Cell Biology

Subject Name	Code	Type of course	T-P-Pj	Prerequisite
Cell Biology	CUTM1729	Theory+ Project	3-0-1	Fundamental Science

Objective

- .Determine the parts of the cell membrane and the cell wall
- Distinguish the types and mechanism of mutation
- Compare and contrast the events of cell cycle and its regulation
- Understand the dynamic character of cellular organelles

Course Outcome

- Describe the fundamental principals cellular biology
- Develop a deeper understanding of cell structure and how it relates to cell functions.
- Understand how cells grow, divide, and die and how these important processes are regulated.
- Understand cell signaling and how it regulates cellular functions. Also how its dis-regulation leads to cancer and other diseases.

Course Outline

Module –I (12 Hr)

An Overview of Cells: History, Cell theory, Structure and Function of Cell and its Organelles: Biological membranes - Nucleus - Nuclear envelope, Nucleolus, Mitochondria, Chloroplasts, Lysosomes, Gloxysomes and Peroxisomes, endoplasmic reticulum, ribosomes, Golgi complex (Structural organization, function, marker enzymes of the above organelles), Cell types: prokaryotes vs. eukaryotes; from single cell to multi-cellular organism; Different molecules of cell- water, salt and mineral ions etc.

Module- II (14 Hr)

Cell cycle and its regulation, Cellular communication and cell mobility: Cell cycle: G0/G1, S, G2 and M phages (Cell Division: Mitosis, meiosis and cytokinesis); regulation of cell cycle; cell adhesion and roles of different adhesion molecules, gap junctions, Extra- Cellular Matrix (ECM), Cell-cell interaction and cell- ECM interaction, The cytoskeleton, Microtubule- based movement and microfilament -based movement.

Module-III (14 Hr)

Cell signaling, Programmed Cell Death (Apoptosis) and Cancer: Hormones and their receptors, cell surface receptor, signaling through G-protein coupled receptors (G-PCR), Tyrosine Kinase, signal transduction pathways, second messengers, regulation of signaling pathways, bacterial and plant two-component systems, bacterial chemotaxis, Intrinsic and Extrinsic apoptotic pathway, Caspase enzyme, Biology and elementary knowledge of development and causes of cancer; Tumor viruses, Oncogenes and tumor suppressor genes.

Suggested Readings:

1. The Cell a Molecular Approach (4th Edition) by Cooper & Hausman **https://www.thebiomics.com/books/cell-biology/cell-molecular-approach-cooper-and-hausmn-4th-ed.html**
2. Molecular Biology by Friefelder David, Publisher Narosa www.alibris.com/Molecular-Biology-David.
3. Introduction to Cell biology by John K Young, World Scientific publishing company www.overdrive.com/.../introduction-to-cell-biology
4. Introduction to biology,3rd tropic edition by D G Maackean www.amazon.com/Introduction-Biology-D-G-Mackean/.

SC3-CUTM1730-Basic Medical Instrumentation and Techniques

Subject Name	Code	Type of course	T-P-Pj	Prerequisite
Basic Medical Instrumentation and Techniques	CUTM1730	Theor+Practice	2-2-0	Fundamental Science

Objective

- To learn the principle, instrumentation & application of Microscopy
- Principle, instrumentation & application of Centrifugation

- Principle of Spectroscopy

Course Outcome

- After completion of the course the student will be efficient in handling the microscopy equipment's.
- They will also be able to have idea about handling instruments like centrifuge, spectrophotometer, chromatography, flow cytometer, Automated and semi-automated Biochemistry analyzer.
- The conceptual understanding of the subject provides opportunities for skill enhancement and scopes for higher education.

Course Outline

Module -I (12 hrs)

Microscopic techniques: Principle, Instrumentation, Specimen preparation and Application: Phase–contrast microscopy, fluorescene microscopy, polarization microscopy, electron microscopy (Scanning and Transmission); Bacterial Colony Counter (Principle and working). Laminar Air Flow (Principle and working technique).

Practice: Demonstration of different Microscopes with their operation and maintain technique.

Module- II (14 hrs)

Colorimeter: Principle and Instrumentation; **Spectrophotometry**: Ultraviolet, Mass spectrophotometry; Flame photometry. **Centrifugation**: Principle; Preparative, Analytical, Density gradient centrifugation. **Cytometry**: Types, Flow cytometry and its applications.

Practice*:* Operation, Demonstration and Quality control of Centrifuge, UV-Vis spectrometer, Colorimeter.

Module- III (14 hrs)

Microtomy: Sectioning, Staining. Application, Principle and Application of: Fully Automated Biochemistry Analyser, Semi- automated Biochemistry Analyser, Coagulometer. Principle, working and uses of: Incubator, Hot air oven, Autoclave.

Practice: Demonstration *of* Auto/ Semi auto Analyzer; Working procedure of microtome, Incubator, Hot air oven, autoclave and others

Suggested Readings:

1. Wilson K and Walker J. (2010). Principles and Techniques of Biochemistry and Molecular Biology. 7th Ed., Cambridge University Press.
   (e-Book link: https://www.pdfdrive.com/principles-and-techniques-of-biochemistry-and-molecular-biology-e174866056.html)
2. Nelson DL and Cox MM. (2008). Lehninger Principles of Biochemistry, 5th Ed., W.H. Freeman and Company.
   (e-Book link: https://www.pdfdrive.com/lehninger-principles-of-biochemistry-5th-edition-d164892141.html)
3. Willey MJ, Sherwood LM & Woolverton C J. (2013). Prescott, Harley and Klein's Microbiology. 7thEd., McGraw Hill.
   (e-Book link: https://www.pdfdrive.com/prescott-harley-and-kleins-microbiology-7th-ed-e188166539.html)
4. Labs for Life
   (e-source link: http://labsforlife.in/InstructionalVideo.aspx **)**

   (e-Book link- https://books.google.co.in/books?id=z9SzvsSCHv4C&printsec=frontcover&dq=instrumentation&hl=en&sa=X&ved=2ahUKEwjipqrO347qAhUjwzgGHRomCNUQ6wEwAHoECAIQAQ#v=onepage&q=instrumentation&f=false)

SC4-CUTM1732- Biochemistry

Subject Name	Code	Type of course	T-P-Pj	Prerequisite
Biochemistry	CUTM1732	Theory+ Practice	3-1-0	Fundamental Science

Objective

- To understand the concept of metabolism of carbohydrates
- To understand the significance of amino acids, proteins
- Use of enzymes in enhancing metabolic reactions
- Role of lipids

Course Outcome

- After completion of the course the student will be developed a very good understanding of various biomolecules which are required for development and functioning of cells.
- Would have understood the significance of carbohydrates in energy generation andas storage food molecules for cells.
- They would have understood the significance of proteins and enzymes in accelerating various metabolic activities.
- The conceptual understanding of the subject provides opportunities for skill enhancement and scopes for higher education.

Course Outline

Module- I

Structure of enzyme: Apoenzyme and cofactors, prosthetic group-TPP, coenzyme NAD, metal cofactors, Classification of enzymes.

Mechanism of action of enzymes: active site, transition state complex and activation energy. Lock and key hypothesis, and Induced Fit hypothesis.

Enzyme inhibition, enzyme kinetics.

Diagnostic value of serum enzymes: Creatinine kinase, Alkaline phosphatase, Acid phosphatase, LDH, SGOT, SGPT, Amylase, Lipase, Carbonic anhydrase etc.

Practice: Study of effect of temperature on enzyme activity
Study of effect of pH on enzyme activity

Module- II

Carbohydrates: Biomedical importance & properties of Carbohydrates, Classification,

Families of monosaccharides: aldoses and ketoses, trioses, tetroses, pentoses, and hexoses. Stereo isomerism of monosaccharides, epimers, Haworth projection formulae for glucose; chair and boat forms of glucose.

Metabolism: Glycogenesis & glycogenolysis, Glycolysis, citric acid cycle & its significance, Components of respiratory chain, energy relationships during cell respiration, types of respiration. HMP shunt & Gluconeogenesis, regulation of blood glucose level.

Practice: Estimation of Glucose in urine
Estimation of Glucose in blood

Module- III

Amino acids: Classification, essential & non-essential amino acids. Chemistry of Proteins & their related metabolism, Classification, biomedical importance.

Metabolism: Ammonia formation & transport, Transamination, Decarboxylation, Urea cycle, metabolic disorders in urea cycle, catabolism of amino acids.

Practice: Estimation of Protein in urine
Estimation of Protein in blood

Module- IV

Chemistry of Lipids & their related metabolism: Classification, biomedical importance, essential fatty acids. Brief out line of metabolism: Beta oxidation of fatty acids, fatty liver, Ketogenesis, Cholesterol & it's clinical significance, Lipoproteins in the blood composition & their functions in brief, Atherosclerosis.

Diabetes mellitus:its types, features, gestation diabetes mellitus, glucose tolerance test, glycosuria, Hypoglycaemia & its causes.

Practice: Estimation of Bile pigment in urine
Estimation of Bile salts in urine

Suggested Readings:

1. Victor W. Rodwell, David A. Bender, Kathleen M. Botham, Peter J. Kennelly, P. Anthony Weil (2018) Harper's Illustrated Biochemistry. Mc Graw Hill.
(e-Book link: https://www.pdfdrive.com/harpers-illustrated-biochemistry-d176838999.html)
2. Nelson DL and Cox MM. (2008). Lehninger Principles of Biochemistry, 5th Ed., W.H. Freeman and Company.
(e-Book link: https://www.pdfdrive.com/lehninger-principles-of-biochemistry-5th-edition-d164892141.html)
3. Donald Voet, Judith G. Voet (2011) Biochemistry 4th Edition. Wiley Publishers.
(e-Book link: https://www.pdfdrive.com/biochemistry-4th-edition-e165192126.html)
4. Jeremy M. Berg, John L. Tymoczko, LubertStryer. Biochemistry 7th Edition. W.H. Freeman and Company, New York.
(e-Book link: https://www.pdfdrive.com/biochemistry-seventh-edition-e167675390.html)

Simulation links for labs:

1. Lecturio
(e-source link: https://app.lecturio.com/#/course/s/8014)
2. Labs for Life
(e-source link: http://labsforlife.in/InstructionalVideo.aspx**)**

SC5-CUTM1715 -Clinical Pathology

Subject Name	Code	Type of course	T-P-Pj	Prerequisite
Clinical pathology	CUTM1715	Theory+ Practice	3-1-0	Fundamental Science

Objective

- Analyze body fluid for diagnosis of disease
- Analyze waste product for diagnosis of disease
- Understanding DOT Policy
- Understand Physiological disorder and infectious disease
- Analysis of pregnancy

Course Outcome

- Able to collect pathological specimen
- Able to detect diabetes, ketosis, nephritis, jaundice and other physiological disorder
- Able to detect infectious disease (UTI, Hematuria, Filaria, Dysentery, Ulcer, TB, etc.)
- Preservation and processing of pathological sample.
- Identification of Parasites
- Analysis of Infertility disorder

Course Outline

Module-I (16 Hrs)

Introduction of clinical pathology, Composition, collection and preservation of urine, Physical examination of Urine, Chemical Examination of Urine - Sugar and Ketone bodies, Diabetes and Ketosis, Nephritis and UTI, Albumin, Phosphate, BJP, Bile Salt and Bile pigment, Chemical Examination of Urine - Multistix reagent strip, Jaundice, Microscopical Examination of Urine, Operation of Urine Analyzer, Pregnancy test, Report writing and report analysis of Urine

Practice: Operation of Urine analyzer, Benedict Test, Heat and Acid Test, Rothera's Test, Benzidine Test, Fouchet's Test

Lab:-Urine Analysis: Collection and Physical Examination, Specific Gravity, Benedict's Qualitative test, Acetone Rothera's Test, Protein and BJP Test, Hay's Test and Fouchet's test, Benzidine test, Microscopical Examination, Pregnancy Test, Auto-mentation by Urine analyzer

Module-II (14 Hrs)

Respiratory Tract Infection: Gram Staining and ZN Staining, Basic of DOT Centre, Report writing and report analysis of sputum, Sputum for the diagnosis of Mycobacterium tuberculosis, Clinical significance and Report writing of Stool, Difference between Amoebic, Dysentery and Bacillary Dysentery, Microscopical Examination of Stool, Physical and Chemical examination of Stool, Composition, collection and preservation of stool

Practice: Microscopic finding of stool, Morphology of stool parasite

Lab:- Stool Analysis: Collection and physical examination, Chemical Examination, Occult test and reducing sugar, Microscopical Examination: Protozoa, Microscopical Examination: Helminthes

Sputum Analysis: Collection and physical examination, Tuberculosis (ZN Stain), Respiratory infection (Gram Stain)

Module-III (15 Hrs)

Routine laboratory investigation of Pleural Fluid, Routine laboratory investigation of Pericardial Fluid, Routine laboratory investigation of Synovial Fluid, Synovial fluid: Collection and preservation, Examination of CSF related to Meningitis, Brain Tumour and other disorder, CSF: Composition, Collection, Preservation and physical examination, Report analysis and report writing of Semen, Semen examination for male infertility disorder, Semen: Composition, function, collection and physical examination

Practice: Gram stain, ZN Stain, General consideration on specimen collection

Lab:- Semen Analysis: Collection and physical examination, Chemical Examination, Microscopical examination

CSF Analysis: Collection and Routine Examination

Synovial Fluid: Collection and Routine examination

Pleural Fluid: Collection and routine examination

Pericardial Fluid: Collection and routine examination

Bacteriological Examination of throat swab

Suggested Readings:

1. Textbook of Clinical laboratory methods and diagnosis by Gradwohls, Publisher Mosby
2. Medical laboratory technology Vol.1 by K. L. Mukherjee, 2007, Publisher Tata McGrawHill
3. Textbook of medical laboratory technology by Praful B Godkar, Publisher Bhalan

4. Medical laboratory science theory and practice by J Ochei and Kolhatkar, 2002, Tata McGraw-Hill, Publisher TBS

SC-6 - CUTM1736- Immunology

Subject Name	Code	Type of course	T-P-Pj	Prerequisite
Immunology	CUTM1736	Theory + Practice	3-2-0	Fundamental Science

Objective

- Understanding the concept of Innate & adaptive immune system; complement system; Hypersensitivity.
- Clinically relevant serological analysis for deeper understanding of antigen-antibody interaction.

Course Outcome

- Application of Immunology in disease diagnosis.
- The conceptual understanding of the subject provides opportunities for employability and scopes for higher education.

Course Outline

Module-I

Immunity: Classification, Measurement of immunity, Local immunity, Herd immunity. **Antigens:** Types of antigen, Epitope. Biological Classes of antigens, Superantigens.

Immunoglobulins: Antibody structure, Immunoglobin classes.

Practice: Collection of blood sample by vein puncture
Separation and preservation of serum

Module-II

Complement System: Principal pathways of Complement activation, Quantitation of Complement (C) and its Components. Biosynthesis of complement, Complement Deficiencies.

Antigen-Antibody Reactions, Antigen-Antibody measurement, Parameters of serological tests.Serological Reactions.

Practice: Performing Serological tests: Widal test, VDRL test, ASO test, C-Reactive Protein test,

Rheumatoid factor (RF) test

Precipitation in agarose gel

Performing Ouchterlony Double diffusion test

Demonstration of SDS-PAGE

Demonstration of ELISA

Demonstration of Western blotting

Module-III

Immune Response: Types of Immune response, Humoral immunity, Cell-mediated Immune Responses, Cytokines, Immunological tolerance.

Hypersensitivity Reactions: Classification of hypersensitivity reactions, Type I Hypersensitivity (IgE Dependent). Type II Hypersensitivity: Cytolytic and Cytotoxic. Type III Hypersensitivity-Immune Complex-mediated, Type IV Hypersensitivity-Delayed Hypersensitivity.

Suggested Readings:

1. Kuby's Immunology (7th Ed) - by J. Owen, J. Punt, S. Strandford. Macmillan Higher Education, England.
   (e-book link: https://www.pdfdrive.com/kuby-immunology-7th-edition-2013-e44842271.html)
2. Roitt's Essential Immunology (13th Ed)- by Seamus J. Martin, Dennis R. Burton, Ivan M. Roitt. Wiley Blackwell.
   (e-book link: http://dl.mehrsys.ir/pdf-books/Roitt_s%20Essential%20Immunology%20Thirteenth%20Edition(www.myuptodate.com).pdf)
3. Prescott, Harley, and Klein's Microbiology (Seventh Edition)- by Joanne M. Willey, Linda M. Sherwood, Christopher J. Woolverton. McGrawHill.
4. Microbiology An Introduction (10th Edition)- by Gerard J. Tortora, Berdell R. Funke, Christine L. Case. Pearson.
5. Text book of Microbiology (7th Edition)- by Ananthanereyan & Paniker, Publisher Universities press.
   (e-book link: https://www.pdfdrive.com/textbook-of-microbiology-e177143667.html)
6. Practical Immunology (4th Edition)- by Frank C. Hay, Olwyn M.R. Westwood. Blackwell Science.
   (e-Book link: https://www.pdfdrive.com/practical-immunology-d34330313.html)

Online Tutorial links:

1. Fundamentals of Immunology: Innate Immunity and B-Cell Function
   (Coursera link: https://www.coursera.org/learn/immunologyfundamentalsimmunitybcells)

2. Fundamentals of Immunology: T Cells and Signaling
   (Coursera link: https://www.coursera.org/learn/immunologyfundamentalstcellssignaling)
3. Fundamentals of Immunology: Death by Friendly Fire
   (Coursera link: https://www.coursera.org/learn/immunology-friendlyfire)
4. The Immune System: New Developments in Research
   (edX link: https://www.edx.org/course/the-immune-system-new-developments-in-research-par)

SC-7- CUTM1737- Molecular Biology

Subject Name	Code	Type of course	T-P-Pj	Prerequisite
Molecular Biology	**CUTM1737**	Theory + Project	3-0-1	Fundamental Science

Objective

- To provide depth knowledge of biological or medicinal processes through the investigation of the underlying molecular mechanisms.
- Understanding of chemical and molecular processes that occur in and between cells. Understanding will become such that , can be able to describe and explain processes and their meaning for the characteristics of living organisms.

Course Outcome

- Conduct independent work in a laboratory.
- Read scientific articles and gain a critical understanding of their contents.
- Give a spoken and written presentation of scientific topics and research results.
- Present hypotheses and select, adapt and conduct molecular and cell-based experiments to either confirm or reject the hypotheses.

Course outline

Module I

Introduction: a. Introduction to molecular biology, b. Molecular biology of cell. Evolution and Molecular structure of cell and its organelles. Types of cells. Including different kinds of Prokaryotic and eukaryotic cells, Cell growth, Cell adhesion, cell junctions and extra cellular matrix organelles,

Cell cycle, Cell membrane and its structure (fluid-mosaic model). Factors influencing on membrane fluidity, asymmetry of membrane and membrane transport (active and passive)

Project Topic: Causes, types and molecular mechanism of human cancer.

Module II

Molecular Nature of the Genetic Material in Prokaryotic and Eukaryotic Cells: Molecular biology of Genes, DNA: Molecular structure, types: Primary, secondary and tertiary, Double helix, types, Transferring information from DNA to RNA, Synthesis of RNA, Translation RNA: Molecular structure, types. Evolution of DNA and RNA, Gene and genetic codes.

Project Topic: Tumor suppressor gene and oncogene.

Module III

General Concept on: a. Regulation of the Gene Expression b. Regulating the Metabolism: The Lac-Operon system, Catabolic repression, Trp Operon system: regulating the biosynthesis of the tryptophan, Gene expression in Eukaryotic cells, Plasmids: types, maintenance and functions.

Project Topic: Human Genome Project.

Module IV

DNA Replication and Gene Expression: DNA Replication: Semi conservative Nature of DNA Replication, DNA Replication in prokaryotic Cells, DNA Replication in Eukaryotic cell, Enzymes involved in DNA Replication: DNA polymerases, Proofreading, post-replication Modification of DNA. Transferring information from DNA to RNA, Synthesis of RNA (Transcription), RNA polymerase, Initiation and Termination of Transcription, Post and co- transcription modification of the RNA. Protein Biosynthesis**:** Translation of the genetic code, Translation of m RNA, Role of r-RNA in protein synthesis, Forming the polypeptides- elongation, Termination of the protein biosynthesis.

Project Topic: Molecular basis, types, causes and a case study of the effects of DNA mutation.

Suggested Readings:

1. Molecular Biology of the gene (7th Ed) by James D. Watson.
   E-booklink-https://www.pdfdrive.com/molecular-biology-of-the-gene-e158278674.html
2. Genes XII by Lewin's.

E-book link- https://www.pdfdrive.com/lewins-genes-xii-e168024578.html

3. Molecular cell biology (5th Ed) by Lodish H.
   E-book link- https://www.pdfdrive.com/molecular-cell-biology-lodish-5th-ed-e15674865.html

BASKET II
Discipline Core Courses

DC-1-CUTM1731-Haematology

Subject Name	Code	Type of course	T-P-Pj	Prerequisite
Hematology	CUTM1731	Theory+Practice	3-2-0	Basic Medical science

Objective

- The overall aims are that the student should obtain advanced knowledge of themost common hematologic diseases & understanding the concept of Blood cells and other blood components.
- Be able to handle an investigation of hemorrhagic disorder and laboratory abnormalities such as anaemia, polycythemia, leukopenia, leukocytosis, thrombocytopenia, thrombocytosis, elevated ESR etc within hematology.
- Clinically relevant hematological analysis for deeper understanding of Evaluate normal and abnormal cell morphology with associated diseases and other blood components.

Course Outcome

- Differentiate various laboratory test findings with their associated clinicalconditions.
- Identify the various skills necessary to perform blood counts, evaluate bloodelements, and report results within the stated limits of accuracy.
- Describe the various components of blood, their functions, and roles in variousdisease states.
- To be able to demonstrate good skills in the relevant Hematology laboratorymethodology.
- Collection of blood for the investigations.
- Be able to distinguish the developmental stages of blood cells. It will alsocover Bone marrow examination.
- To learn about tests carried out for hematological investigations.
- To be able to carry out blood sampling.

Course Outline

Module- I (8 Hrs)

Scope & importance of Hematology, important equipment and chemicals, various test performed in Hematology laboratory, Focusing different blood cells through microscope.

Practice*:* Demonstration of instruments used in hematology- Microscope, Blood Cell counter, Sahli's Apparatus.

Module- II (12 Hrs)

Identify and/or confirm the composition & function of various red blood cell inclusions. Function of normal cellular components. Formation of blood, Synthesis of blood in Bone marrow- Erythropoiesis, leucopoiesis, thrombopoiesis. Anticoagulants: definition, Uses, Different types of Anticoagulants., mode of action, their merits and demerits. Morphology of normal blood cells, abnormal morphology & diseases.

Practice*:* Demonstration of different blood cell, their synthesis from slide presentation or chart. Demonstration the normal and abnormal morphology of different blood cells.

Module- III (10 Hrs)

Hematological Disorders

1. Classification of Anemia: Morphological &etiological.
2. Iron Deficiency Anemia: Distribution of body Iron, Iron Absorption, causes of iron deficiency,lab findings.
3. Megaloblastic Anemia: Causes, Lab findings.
4. Hemolytic Anemia: Definition, causes, classification & lab findings.

Bone Marrow: Cell composition of normal adult Bone marrow, Aspiration, Indication, Preparation & Staining, Special Stain for Bone Marrow -Periodic Acid Schiff, Sudan Black

Leukemia: Classification, Blood Picture, Differentiation of Blast Cells.

Practice*:* Collection of blood by different methods

Different normal and abnormal morphology of RBCs, WBCs, Platelet.

Module- IV (10 Hrs)

Collection of blood, Methods & Preparation of Stains and Smears

Practice*:*

Cleaning and drying of glass and plastic ware, Collection of venous and capillary blood, cleaning of glass-syringes and its sterilization. Preparation of buffers, Preparation of the stains and other reagents,

Preparation of peripheral blood film (PBF), To stain a peripheral blood Film by Leishman- stain, Haemoglobin estimation (Sahli's method and cyanmethaemoglobin method).

Module- V (10 Hrs)

Routine Hematological Tests:

Complete blood cell count, ESR, Differential Leukocyte count, Total leukocyte count, Bleeding time and Clotting time, Blood Grouping and Rh Typing.

Practice:

Complete Blood Counts, Determination of Haemoglobin, TRBC Count by Haemocytometers, TLC by Haemocytometer, Differential Leukocyte count, Determination of Platelet Count. Determination of ESR by wintrobes, Determination of ESR by Westergeren's method, Determination of PCV by Wintrobes, Erythrocyte Indices- MCV, MCH, MCHC. Reticulocyte Count, Absolute Eosinophil Count, Bleeding time and Clotting time, Blood Grouping and Rh Typing

Suggested Readings:

1. Textbook of Medical Laboratory Technology P.B Gotkar Mumbai, Bhalani Publishing House
2. Text book of Medical Laboratory Technology by Paraful B. Godkar, Publisher Bhalani
3. Text book of Medical Laboratory Technology (2nd edition) by V.H Talib, Publisher CBS
4. Atlas of hematology (5th edition) by G.A. McDonald, Publisher Churchill Livingstone
5. Medical Laboratory Technology By K.L Mukharjee, Publisher McGraw Hill education pvtlimited
6. Text book of Medical Laboratory Technology (6th edition) by Ramnik Sood,Jaypee Publication.
7. Ebook link-https://www.pdfdrive.com/hematology-basic-principles-and-practice-e176384006.html
8. Ebook link-https://www.pdfdrive.com/hematology-basic-principles-and-practice-expert-consult-online-and-print-expert-consult-title-online-print-5th-edition-e186195241.html
9. Ebook link-https://books.google.co.in/books?id=6sfacydDNsUC&printsec=frontcover&dq=hematology&hl=en&sa=X&ved=2ahUKEwja9-ve3I7qAhUwzTgGHSMUDekQ6wEwAHoECAQQAQ#v=onepage&q=hematology&f=false
10. Ebook link-https://books.google.co.in/books?id=QQcYAAAAYAAJ&printsec=frontcover&dq=hematology&hl=en&sa=X&ved=2ahUKEwja9-ve3I7qAhUwzTgGHSMUDekQ6wEwAnoECAIQAQ#v=onepage&q=hematology&f=false

DC-2- CUTM1733- Microbiology

Subject Name	Code	Type of course	T-P-Pj	Prerequisite
Microbiology	CUTM1733	Theory+ Practice	3-2-0	Fundamental Science

Objective

- To know various Culture media and their applications and also understand various physical and chemical means of sterilization
- To know General bacteriology and microbial techniques for isolation of pure culturesof bacteria, fungi and virus
- To master aseptic techniques and be able to perform routine culture handling tasks safely and effectively

Course Outcome

- This study demonstrates the theory and practical skills in microscopy and their handling techniques and staining procedures.
- Understanding the details of microbial cell organelles.
- Provides knowledge on growth of microorganism.
- Provides knowledge Culturing microorganism.

Course Outline

Module –I (14 Hours)

Microbiology: Definition, history, host- microbe relationship, and safety measures in a microbiology laboratory. Morphology of bacterial cell wall, Bacterial anatomy (Bacterial cell structure: including spores, flagella, pili and capsules). Sporulation. Classification of bacteria according to cell wall and shape (arrangement), Classification of micro-organisms. Growth and Nutrition of Microbes**:** General nutritional requirements of bacteria, Bacterial growth curve

Practice:

1. Handling of Microscope
2. To learn techniques for Inoculation of bacteria on culture media.
3. To isolate specific bacteria from a mixture of organisms.

Module-II (11 Hours)

Sterilization: Definition, sterilization by dry heat, moist heat (below, at & above 100° C), Autoclave, Hot air oven, Radiation and Filtration, preventive measures, controls and sterilization indicators. Use of laminar flow in sterilization.

Antiseptics and Disinfectants: Definition, types, properties, mode of action and use of disinfectants and antiseptics, efficiency testing of disinfectants.

Practice:

1. To demonstrate simple staining (Methylene blue)
2. Bacterial identification: To demonstrate reagent preparation and procedure for Gram stain, Z-N staining, Capsule staining, Demonstration of flagella by staining methods, Spore staining, To demonstrate spirochetes by Fontana staining procedure

Module-III (15 Hours)

Staining techniques: Methods of smear preparation, Gram stain, AFB stain, Albert's stain and special staining for spore, capsule and flagella, Culture Media, Liquid and solid media, defined and synthetic media, routine laboratory media (basal, enriched, selective, enrichment, indicator, and transport media). Different Culture, media their preparation and uses in microbial growth.

Practice:

1. Biochemical tests for identification of bacteria
2. Preservation of stock cultures of bacteria
3. Antibiotic susceptibility test

Suggested Reading:

1. Medical Laboratory Technology by Kanai Lal Mukherjee; Tata McGraw Hill, New Delhi
2. Microbiology by Prescott
3. An Introduction to Medical Laboratory Technology by FJ Baker; Butterworth – Heinemann; Oxford
4. Practical Book of Medical Microbiology by Satish Gupta; JP Brothers, New Delhi
5. Medical Laboratory Manual for Tropical Countries Vol. I and II by Monica Cheesbrough; Cambridge University Press; UK
6. Textbook of Medical Laboratory Technology by Praful B Godkar; Bhalani Publishing House, Mumbai
7. Text book of Medical Microbiology by Gruckshiank

DC-3- CUTM1734 - Medical Law and Ethics

Subject Name	Code	Type of course	T-P-Pj	Prerequisite
Medical Law and Ethics	CUTM1734	Theory+ Project	2-0-1	Fundamental Science

Objective

- The course provides an introduction to ethics generally and more specifically to medical ethics, examining in particular the principle of autonomy, which informs much of medical law. The course then considers the general part of medical law governing the legal relationship between medical practitioners and their patients. It considers the legal implications of the provision of medical advice, diagnosis and treatment. Selected medico-legal issues over a human life are also examined. These may include reproductive technologies, foetal rights, research on human subjects, organ donation, the rights of the dying and the legal definition of death.

Course Outcome

- The ethical underpinnings of the laws relate to medicine.
- The law of negligence in the context of the provision of healthcare, Legal and ethical issues surrounding end and beginning of life decisions,
- The maintenance of professional standards in the healthcare profession, and
- The role of policy in the formation of law as it relates to medicine.

Course Outline

Module-1

1. The Indian medical council act, 2. Medical council of India (functions),3. Functions of state medical councils, 4. The declaration of Geneva

Module-2

1. Duties of medical practioners 2. Regarding red cross emblem 3. Professional secrecy 4. Privileged communication.

Module-3

1. Professional negligence 2. Medical mal occurrence 3. Contributory negligence 4. Criminal negligence

Module-4

1. Corporate negligence 2. Ethical negligence 3. Precautions against negligence 4. difference between professional negligence and infamous conduct.

Module-5

1. Malpractice litigation involving various specialities 2. Prevention of medical negligence 3.supreme court of India guidelines on medical negligence 3. The therapeutic misadventure 4. Vicarious liability

Module-6

1. Products liability 2. medical indemnity insurance 3. Medical records 4. Consent in medical practice

Module-7

1. Euthenesia 2. Deaths due to medical care 3. Malingering

Text books

1. Medical Law and Ethics by Shaun D Pattinson, 5 th edition, 2017.

DC-4 - CUTM1713- Systemic Bacteriology

Subject Name	Code	Type of course	T-P-Pj	Prerequisite
Systemic Bacteriology	CUTM1713	Theory+ Practice	3-1-0	Fundamental Science

Objective

- To learn opportunities in the basic principles of medical microbiology and infectious disease.
- To study mechanisms of infectious disease transmission, principles of aseptic practice, and the role of the human body's normal microflora.
- To understand the importance of pathogenic bacteria in human disease with respect to infections of the respiratory tract, gastrointestinal tract, urinary tract, skin and soft tissue.

Course Outcome

- The course provides the conceptual basis for understanding pathogenic microorganisms and the mechanisms by which they cause disease in the human body.
- Recall the relationship of this infection to symptoms, relapse and the accompanying pathology.
- Explain the methods of microorganism's control, e.g. chemotherapy & vaccines. Solve problems in the context of this understanding.

Course Outline

Module –I (9 Hrs)

Morphology, cultural characteristics, biochemical reaction, pathogenesis/disease caused & lab diagnosis, Prevention and Control of: Cocci (Gram Positive): Aerobic**:** Micrococcus sps., Staphylococcus sps., Streptococcus sps. Anaerobic**:** Peptococcus sps., Peptostreptococcus sps., Villanelle sps., Acidaminococcus spp, and others. Cocci (Gram Negative): Aerobic: Neisseria spp., Anaerobic Gram-negative bacteria.

Practice: Culture techniques
Culture media
Identification of *Staphylococcus* sp.

Module -II (12 Hrs)

Morphology, cultural characteristics, biochemical reaction, pathogenesis/disease caused & lab diagnosis, Prevention and Control of : Aerobic non-spore forming gram positive bacilli:
Bacillus spp.**,** Corynebacterium spp., Actinomyces, Nocardia spp., Mycobacterium spp.-pathogenic, Tubercle bacilli and MOTT bacilli (Atypical mycobacterium) and Hansen's bacilli and others. Anaerobic: Bifidobcterium spp., Eubacterium spp., Actinomyces spp., Propionebacterium, Clostridium spp., and others.

Practice: Preparation of media
Media used for biochemical identification & their uses
Identification of *Mycobacterium* sp.

Module -III (18 Hrs)

Morphology, cultural characteristics, biochemical reaction, pathogenesis/disease caused & lab diagnosis, Prevention and Control of Gram- Negative Bacilli Aerobic**:** Enterobacteriaceae, Citrobacter spp , Edwardsiellaspp ,Enterobacter spp , Escherichia coli, Ewingella , Hafnia spp., Klebsiella spp., Morganella spp., Proteus spp., Porvidencia spp., Salmonella spp., Serratia spp., Shigella spp., Yersinia

spp., Vibrio spp., Pseudomonas spp., Clamydia and chlamydophila, Brucella spp., Bordetella spp., Haemophilus spp., mycoplasma spp.

Practice: Culture methods & identification of common bacteria on media.
Antibiotic sensitivity testing.
Identification of *Escherichia , Klebsiella, Proteus sp.*

Suggested Readings:

1. Textbook of Microbiology- Ananthanarayan & Paniker (10th Ed)
2. Microbiology (7th Ed)- by Prescott
3. Medical Microbiology- by David Greenwood et al (Elseviere)
4. Essential Medical Microbiology- by Rajesh Bhatia (4th Ed)
5. Medical Microbiology- by Kayser et al
6. The short text book of medical microbiology- by Satis Gupte (10th Ed)

DC-5- CUTM1735- Systemic Virology & Mycology

Subject Name	Code	Type of course	T-P-Pj	Prerequisite
Systemic Virology & Mycology	CUTM1735	Theory+ Practice	3-2-0	Fundamental Science

Objective

- To learn opportunities in the basic principles of medical microbiology and infectious disease.
- To study mechanisms of infectious disease transmission, principles of aseptic practice, and the role of the human body's normal microflora.
- To understand the importance of pathogenic Virus and fungus in human disease with respect to infections of the respiratory tract, gastrointestinal tract, urinary tract, skin and soft tissue.

Course Outcome

- The course provides the conceptual basis for understanding pathogenic microorganisms and the mechanisms by which they cause disease in the human body
- Know the methods used in studying viruses and fungi.

- Recall the relationship of this infection to symptoms, relapse and the accompanying pathology.
- Explain the methods of microorganism's control, e.g. chemotherapy & vaccines. Solve problems in the context of this understanding.

Course Outline

Module-1 (18 Hours)

Structure, cultivation and properties of Viruses. Classification of Medically Important Viruses. Genetic material, Organ system involved, Transmission.

Replication of Viruses, Virus Host Interaction, Bacteriophage. Epidemiology, Pathogenesis, Treatment, Prevention and Control of Viral Diseases (DNA Viruses) *Adenoviridae, Poxviridae, Herpes viridaes*, Epidemiology, Pathogenesis, Treatment, Prevention & Control of Viral Diseases (RNA Viruses) *Orthomyxoviridae, Paramyxoviridae, Picornaviridae, Corona viridae, Rhabdoviridae, Retrovirida.*

Practice:

1. Demonstration of virus isolation techniques.
2. Demonstration of cell and tissue culture techniques used for virus isolation
3. Serological techniques used in diagnostic virology

Module-2 (7 Hours)

Mycology, Classification, Scope and medical importance of fungi. General Structure of Fungus and Yeast. Laboratory Methods of Fungal Isolation and Identification. Superficial and Cutaneous Mycoses. Subcutaneous Mycoses. Systemic Mycosis caused by Endemic Dimorphic Fungal Pathogens, Opportunistic Mycoses

Practice:

4. Organization of laboratory – Mycology
5. Preparation of different media, chemical and stain for fungus study
6. Microscopic examination of saprophytic molds / Collection of agar plates for exposure

Module-3 (15 Hours)

Pathogenic Group of Fungi: Opportunistic pathogens, True pathogens: *Blastomyces dermatitidis*, *Cooccidioidesimmitis, Paracocidioidesbrasiliensis*, *Histoplasma capsulatum.* A. Dermatophytes: *Mycrosporum* (Hair, skin), *Tricophyton* (Skin, hair, nail), *Epidermophyton* (Skin, nail), *Aspergillus spp.* Dermatomycosis (*Candida albicans, Cryptococcus neofornans*)

Practice:

7. Slide culture technique for Superficial infections
8. Culture and identification of yeasts
9. Processing of specimens in Mycology lab

Suggested Reading:

1. Textbook of Microbiology- Ananthanarayan & Paniker (10th Ed)
2. Medical Microbiology-by Fritz H. Kayser et al
3. Fundamental medical mycology / Errol Reiss, H. Jean Shadomy, and G. Marshall Lyon III
4. Essential Medical Microbiology- by Rajesh Bhatia (4th Ed)
5. Clinical Microbiology Procedures Handbook- by Amy L. Leber (4th Ed)
6. The short text book of medical microbiology- by Satis Gupte (10th Ed)

DC-6- CUTM1721- Research Methodology

Subject Name	Code	Type of course	T-P-Pj	Prerequisite
Research Methodology	CUTM1721	Theory+ Project	2-0-1	Fundamental Science

Objective

- To equip students with a basic understanding of the underlying principles of quantitative and qualitative research methods.
- Provide students with in-depth training on the conduct and management of researchfrom inception to completion using a wide range of techniques.

Course Outcome

- Students can understand the ethical and philosophical issues associated with researchin education
- This study provides knowledge on various modes of presenting and disseminating research findings.
- Enable students to acquire expertise in the use and application of the methods of data collection and analysis.
- Provide learning opportunities to critically evaluate research methodology andfindings.
- Enable students to be reflexive about their role and others' roles as researchers.

Course Outline

Module- I (9 Hrs)

Introduction to Research: Definition, Scope, Limitations, and Types. Objectives of Research. Research Process: Proposal Development: Basic steps involved in the health research proposal development process Literature Review: Importance and Sources, Strategies for gaining access to information, Library search, Computer search.

Research Designs: Research Title and Objectives Criteria for selecting a research title, Formulation of research objectives, Types of research objectives, Qualities of research objective

Module- II (8 Hrs)

Data Collection: Secondary Data, Primary Data, and Methods of Collection. Scaling Techniques: Concept, Types, Rating scales & Ranking Scales, Scale Construction Techniques and Multi-Dimensional Scaling. Sampling Designs: Concepts, Types and Techniques and Sample size Decision.

Module- III (14 Hrs)

Research Hypothesis**:** Definition, Qualities of research hypothesis Importance and types of research hypothesis. Theory of Estimation and Testing of Hypothesis Small & Large Sample Tests, Tests of Significance based on t, F, Z test and Chi-Square Test. Designing Questionnaire. Interviewing. Tabulation, Coding, Editing. Interpretation and Report Writing.

Project: Writing a review on Nosocomial urinary tract infection.

Writing a research article on antibiotic resistance patterns in wound infections.

Writing a review on Virus culture

Literature survey on Covid-19

***Suggested Readings*:**

1. Research Methodology by C.R. Kothari (3rd Ed)
2. Research Methodology In the Medical & Biological Sciences by Petter Laake et al.
3. Essentials of Research Design and Methodology by Geoffrey Marczyk et al.
4. WHO, Health Research Methodology: A guide for training in research Methods, 2nd Edition, WHO- WIPRO
5. A Student's Guide to Methodology by Clough P and Nutbrown C. Sage Publication.
6. National Ethical Guidelines for Health Research in Nepal, Available at Nepal Health Research Council.

7. Field Trials of Health Interventions in Developing Countries by Smith PG, Morrow.

DC-7 - CUTM1738- Analytical Biochemistry

Subject Name	Code	Type of course	T-P-Pj	Prerequisite
Analytical Biochemistry	CUTM1738	Theory+ Practice	3-2-0	Fundamental Science

Objective

- Understanding the concept of Biochemical analyzing instruments both automated andsemi automated.
- To learn about how to Care & Maintenance of Equipment & Chemicals.
- To learn normal ranges of biochemical components in our body.
- Clinically relevant biochemical analysis for deeper understanding of all biochemical components i.e., Proteins, Electrolytes, Hormones etc.

Course Outcome

- Understanding of instrumentation technique & principle of spectrophotometry, colometry, photometry and electrolyte analyzer.
- To learn about Various tests carried out for biochemical analysis & Hormone investigations.
- To learn about safety precautions and handling the equipment in biochemicallaboratory.

Course Outline

Module- I (12 Hrs)

Chromatography: Paper, Thin layer, Column, Ion exchange, Affinity chromatography, Gel filtration, Gas Chromatography, HPLC, FPLC

Practice: Handling the Equipments and chemicals used in biochemical laboratory.

Module-III (12 Hrs)

Electrophoresis: Moving boundary, Zone (Paper Gel) electrophoresis, Immuno electrophoresis, Isoelectric focusing, 2-D electrophoresis. Principle, Instrumentation, Specimen preparation and Application of: X-ray diffraction, NMR, ESR

Practice: Estimate Erythrocyte sedimentation rate

Module- III (26 Hrs)

Principle and Application of: Fully Automated Biochemistry Analyser, Semi- automated Biochemistry Analyser, Coagulometer. Method of estimation and assessment for: a. Glucose tolerance test. Clearance test for renal function. Gastric analysis, LFT, KFT, Lipid profile, Qualitative test for Urobilinogens, Renal calculi, Barbiturates, T3, T4 and TSH, 17 Ketosteroids. Principles, clinical significance and procedures for estimation, of Acid phosphatase, Alkaline phosphatase, Lactate dehydrogenase, Aspartate transaminase, Alanine, transaminase and Creatine phosphokinase.

Practice*:* Glucose Tolerance Test, Clearance Test, Gastric juice collection, Gastric Analysis, Kidney Function Test, Liver Function Test, Lipid Profile, Renal calculi, Hormone Test

Suggested readings:

1. Handbook of Christen Medical Association, India (CMAI) Medical Laboratory Technology- Robert H.Carman. 2nd Edn. CMAI, New Delhi.
2. Text book of Medical Laboratory Technology, P.B. Godkar 2nd Edn. Bhalani Publication.
3. Handbook of Biochemistry by M. A. Siddique 8th Edn. Vijay Bhagat Scientific Book
4. Principle of Biochemistry by Lehninger
5. Biochemistry by Voet&Voet
6. Biochemistry by Stryer
7. Biochemistry of Metabolic process by Asim Kumar Roy, Kalyani Publication
8. Ebook link- https://www.cartercenter.org/resources/pdfs/health/ephti/library/lecture_notes/health_science_students/medicalbiochemistry.pdf
9. Ebook link- https://books.google.co.in/books?id=Je_pJfb2r0cC&printsec=frontcover&source=gbs_ge_summary_r&cad=0#v=onepage&q&f=false
10. Ebook link- https://books.google.co.in/books?id=csPcDAAAQBAJ&printsec=frontcover&source=gbs_ge_summary_r&cad=0#v=onepage&q&f=false
11. Ebook link- https://books.google.co.in/books?id=2FkXAwAAQBAJ&printsec=frontcover&source=gbs_ge_summary_r&cad=0#v=onepage&q&f=false

DC-8- CUTM1740- Public Heath Microbiology

Subject Name	Code	Type of course	T-P-Pj	Prerequisite
Public Health Microbiology	CUTM1740	Theory+ Practice	3-1-0	Fundamental Science

Objective

- To learn the occurrence, abundance and distribution of microorganism in the community and their role in the associated with Public health and also learn different methods for their detection and characterization.
- To understand the basic principles of environment microbiology and be able to apply these principles to understanding and solving environmental problems – Water pollution and waterborne diseases, Air pollution and airborne infections.

Course Outcome

- Understanding the role of microbiologist in public health
- Study of Air borne & water borne infection

Course Outline

Module- 1 (7 Hours)

Introduction to Public Health**:** Definition, scope, concept and importance of public health microbiology, Roles of microbiologist in public health, Concept of health and disease, Indicators of health, Microbial association of water, air and soil, Basic concept on pollution (air, water, noise, radiation and waste pollution) and public health hazard in the community.

Practice:

1. Isolation and identification of microorganism from different food products: meat, canned juice, milk, cheese and ice cream.
2. Isolation and Identification of microorganisms (hospital acquired infection)

Module- 2(14 Hours)

Air Borne Infections:

1. Introduction**:** Air and its composition, Microbial air pollution, Sources of air pollution &

control**,** Indicator of air pollution – WHO guide line (microbial pollution).

2. Air borne diseases: Transmission of pathogens, Respiratory infection (Viral, bacterial, fungal), Sources of infection, characters of organisms and controls of: Bacterial pneumonia, Diphtheria, Tuberculosis, Influenza, Measles.

3. Method of measuring microorganisms in air.

Practice:

3. Selection, collection, perseveration and transportation of samples from thecommunity to the laboratory.

Module- 3 (19 Hours)

Water Borne Infections:

1. Introduction: Definition of wholesome and safe water, Nature, cycle, sources, importance and quality (WHO guide line) of water. Water pollution and sanitation,

2. Microorganisms in water: Transmission of pathogens, Water borne diseases (Viral, bacterial, protozoal), Sources of infection, characters of organisms and control of: Hepatitis, Cholera, Typhoid, Amoebiasis, Giardiasis, Poliomyeliti. Water Pollution Control.

3. Method of Measuring Microorganisms in Water. Water Treatment, Control of Water Borne Diseases.

Practice:

4. Isolation and Identification of microorganisms from air.
5. Isolation and Identification of microorganisms from water and evaluation of water quality

Suggested Readings:

2. A Text Book of Microbiology, by Ghimire P. & Parajuli K. VidhyarthiPustakBhandar Publication, Kathmandu.
3. Text Book of Social and Preventive Medicine by Park JE and Park K
4. Evidence Based Public Health by Brownson, RC., Baker, EA., Leet. TL., Follespie. KN, Oxford University Press
5. The Quest for Health, Educational Enterprises, Kathmandu, by Dixit H.
6. Epidemiology for Public Health Practice, by Friis, RH., and Sellers, TA, 2nd Edition, Gaithersburg, MD: Aspen Publication,
7. Modern Food Microbiology, by Jay, J, H 3rd Edition CBS Publication and Distributors Delhi 1987.
8. Introduction to Soil Microbiology, Martin Alecender, *by* Academic press, 1961**.**

DC-9- CUTM1739- Pharmaceutical Microbiology

Subject Name	Code	Type of course	T-P-Pj	Prerequisite
Pharmaceutical Microbiology	CUTM1739	Theory+ Practice	3-1-0	Fundamental Science

Objective

- Understanding of types & synthesis of antimicrobial agents
- Manufacture of antibiotics
- To understand the mechanism of action of antibiotics
- To study how microorganisms are known to develop resistance to antibiotics

Course Outcome

- With the completion of the course, the students will acquire detailed knowledge of antimicrobial agents, their mechanism of action and basis of resistance of microbes to these antimicrobials, formulations.
- They will develop an understanding of different types of disinfectants/antiseptics and their uses, evaluation of their bactericidal and bacteriostatic action.
- The conceptual understanding of the subject provides opportunities for employbility and scopes for higher education.

Course Outline

Module- I

Pharmaceutical Microbiology: Chemical disinfectants, Antiseptic, Antibiotics, static and cidal activity. Types of Antibiotics. Synthetic Antimicrobial Agents, Antifungal drug, Antiviral drug.

Practice: Sterilization methods used in Microbiology Lab

Isolation of human pathogens in sterile condition

Module-II

Manufacture of Antibiotics: Production of penicillin, Production of Streptomycin. Assessment of New

Antibiotics: Parameters for determination of the usefulness of antibiotics (in vitro and in vivo). Pharmacokinetics and Pharmacodynamics of Antimicrobial agents. Antibiotic Assay: Microbiological methods: Disc diffusion technique, Dilution technique. Microbial Spoilage and Preservation of Pharmaceutical Products.

Practice: Test for Bacteriostatic and Bactericidal activity:

Disc test

Dilution test

Module- III

Mechanisms of Action of Antibiotics: Cell wall synthesis inhibitors, Inhibitors of protein biosynthesis, Inhibitors of tetrahydrofolate, Disorganize the cytoplasm membrane. Mode of action of Antibiotics (Cell wall synthesis inhibitors, Inhibitors of protein biosynthesis, Inhibitors of tetrahydrofolate, Disorganize the cytoplasm membrane). Bacterial Resistance to Antibiotics.Biochemical mechanisms of resistance, Genetic basis of antibiotic resistance. Problems in antibiotic therapy due to resistance.

Practice: Screening of herbal plants for Antibiotic activity

Sterility testing of pharmaceuticals

Bacteriological analysis of water

Suggested Readings:

1. W B Hugo and A D Russel, Pharmaceutical Microbiology, 2nd Edition
   (e-Book link: https://www.pdfdrive.com/hugo-and-russells-pharmaceutical-microbiology-e34745384.html)
2. T H Sandal Pharmaceutical Microbiology: Essentials for quality assurance and quality control. Woodhead Publishing Series.
   (e-Book link: https://www.pdfdrive.com/pharmaceutical-microbiology-essentials-for-quality-assurance-and-quality-control-e157918748.html)
3. Willey MJ, Sherwood LM & Woolverton C J. (2013). Prescott, Harley and Klein's Microbiology. 7thEd., McGraw Hill.
   (e-Book link: https://www.pdfdrive.com/prescott-harley-and-kleins-microbiology-7th-ed-e188166539.html)

Online tutorial links:

1. Lecturio link
   (https://app.lecturio.com/#/course/s/6956)

Subject Name	Code	Type of course	T-P-Pj	Prerequisite
Industrial Microbiology	CUTM1741	Theory+Project	3-0-1	General Microbiology

Objective

- Describe the use of microorganism in different industries to produce valuable products like drugs, beverages and different food products etc.
- To developed skills for growing microorganisms in the laboratory for the production of different products by different microorganisms.

Course Outcome

- Students has acquired a fairly good knowledge of how microbes are used in the fermentative production of organic acids, alcohols, enzymes, antibiotics and various foods in the industry.
- Enhances analytic ability of various physical parameters which affect production of industrial products by the microorganisms and the safety aspects of the production and use of these products.
- The conceptual understanding of the subject provides opportunities for employability and scopes for higher education.
- Develops laboratory skills in producing alcohol and enzymes by fermentative process using bacteria/yeast.

Course Outline:

Module 1

Introduction to Industrial Microbiology: Introduction, History, Definition and scope. Industrial Equipment and Uses**.** Fermentation Process: Primary and secondary screening, Detection and assay of fermentation products- Physical and chemical assays, Biological assay Stock culture, Fermentation media, Inoculums preparation, Increasing products.

Project Topic: 1. Design a protocol for the treatment of community sewage in your locality.

Module II

Typical Fermentation Process: Antibiotic drug fermentation - Penicillin, Streptomycin, Bacterial insecticide, other antibiotics. Acetone, Lactic acid, Brewing. Biological Waste Treatment / Bioremediation**:** Anaerobic fermentation. Production of**:** Vitamin, Vaccines, Milk & Milk Products, Food, Baker's yeast, Food and feed yeasts, Mushrooms, Vinegar(Acetic acid) Enzymes**:** Amylase, Proteolytic enzyme, Pectinases, Invertase Other enzymes.

Project Topic:

1. Detail fermentation process of a food product and the advantages of fermented food.
2. Fermenter Designing

Module III

Industrial sewage and its treatment: Introduction, Industrial pollution, Types of sewage. Microbiology of Domestic sewage and industrial sewage. Methods for the treatment of industrial effluent and sewage-Primary treatment, secondary treatment and tertiary treatment.

Project Topic:

1. Impacts of industrial pollution on Society and Environment and its prevention and control.

Suggested Readings:

1. Industrial Microbiology (2nd Ed.) by A. H. Patel.
2. Modern industrial Microbiology and Biotechnology.
   (E-book link- https://www.pdfdrive.com/modern-industrial-microbiology-and-biotechnology-e33452862.html)
3. L. E. Casida, JR., *Industrial Microbiology*, 1991, Wiley Eastern Limited, New Delhi,

DC-11- CUTM1742- Basic Computer and Information Science

Subject Name	Code	Type of course	T-P-Pj	Prerequisite
Basic Computer and Information Science	CUTM1742	Practice	0-2-0	Fundamentals of Computer

Objective

- Identify the function of computer hardware components.
- Identify the factors that go into an individual or organizational decision on how topurchase computer equipment.
- Identify how to maintain computer equipment and solve common problems relatingto computer hardware.
- Identify how software and hardware work together to perform computing tasks andhow software is developed and upgraded
- Identify different types of software, general concepts relating to software categories, and the tasks to which each type of software is most suited or not suited.

Course Outcome

- Understand the fundamental hardware components that make up a computer'shardware and the role of each of these components.
- Understand the difference between an operating system and an application program,and what each is used for in a computer.
- Describe some examples of computers and state the effect that the use of computer technology has had on some common products

Course Outline

Module- I

Introduction to computer: introduction, characteristics of computer, block diagram of computer, generations of computer. Types of Input output devices. Processor and memory: The Central Processing Unit (CPU), main memory. Storage Devices.

Module- II

Introduction to MS-Word: introduction, components of a word window, creating, opening and inserting files, editing a document file, page setting and formatting the text, saving the document, spell checking, printing the document file, creating and editing of table, mail merge. Introduction to Excel:

introduction, about worksheet, entering information, saving workbooks and formatting, printing the worksheet, creating graphs. Introduction to power-point: introduction, creating and manipulating presentation, views, formatting and enhancing text, slide with graphs.

Module- III

Introduction to MS-DOS: History of DOS, features of MS-DOS, MS-DOS Commands (internal and external). Introduction of windows: History, features, desktop, taskbar, icons on the desktop, operation with folder, creating shortcuts, operation with windows (opening, closing, moving, resizing, minimizing and maximizing, etc.). Computer networks: introduction, types of network (LAN, MAN, WAN, Internet, Intranet), network topologies (star, ring, bus, mesh, tree, hybrid). Internet and its Applications: definition, brief history, basic services (E-Mail, File Transfer Protocol, telnet, the World Wide Web (WWW)), www browsers, use of the internet.

Suggested readings:

1. Objective Computer Awareness
2. Computer Networking (Global Edition)

DC-12 - CUTM1746- Epidemiology

Subject Name	Code	Type of course	T-P-Pj	Prerequisite
Epidemiology	CUTM1746	Theory+Project	2-0-1	Fundamental Science

Objective

- Understand the basic epidemiological methods and study designs.
- Understand and discuss population-based perspective to examine disease and health – related events.
- Discuss the ethical issues in epidemiological research.
- Explain the importance of epidemiology for informing scientific, ethical, economic and political discussion of health issues.
- Describe a public health problem in terms of person, place, and time.
- Evaluate the strengths and limitations of epidemiologic reports

- Apply concepts, methods, and tools of public health data collection, analysisand interpretation, and the evidence-based reasoning and informatics approaches that are essential to public health practice.

Course Outcome

- Distinguish between definitions of epidemiology and clinical epidemiology and public health research.
- Apply the terminology of the Epidemiologic Triad to an infectious disease.
- Describe the important historic events in the field of epidemiology.

Course Outline

Module-I (8 Hrs).

Introduction to Principles of Epidemiology: History, Definition, and scope of epidemiology, Achievements in epidemiology, Terms &Terminologies used in epidemiology. Measuring Health and Disease: Definitions of health and disease, Measures of disease frequency Use of available information, Comparing disease occurrence

Module-II (6 Hrs)

Concept of Epidemiological Study: Basic concepts of epidemiology Descriptive / Analytical, Applied/Experimental, Field Epidemiology. Concept of Prevention and Control of Diseases: Causation in epidemiology: The concept of cause, Establishing the cause of a disease Epidemiological markers, Phenotypic and genetic markers including molecular epidemiology.Disease surveillance: Clinical, Laboratory

Module-III (6 Hrs)

Communicable disease epidemiology, Clinical epidemiology, Environmental & occupational epidemiology, Nutritional epidemiology, Reproductive epidemiology, Social epidemiology, Food epidemiology. Epidemiology, Health services and health Policy: Health care planning, Monitoring & evaluation, The planning cycle, Epidemiology, public policy and health policy, Healthy public policy in practice

Suggested Readings:

1. Basic Epidemiology. By Beaglehole R., Bonita R., Kjellstrom , World Health Organization,Geneva,**https://books.google.com/books/about/Basic_Epidemiology.html?id=AAZGobMNTXgC**
2. Field Epidemiology, By B Gregg, 2nd Edition, Oxford University Press, 2002 **academic.oup.com/aje/article/156/8/783/78217**
3. Gordis L. E*pidemiology,* 2nd Edition, WB Saunders Company Aharcourt Health Sciences Company, Philadelphia. www.bookdepository.com/Epidemiology-Leon-Gordis/..
4. Epidemiology in Medicine, by LipppincottEilliams and Wilkins, and Walters Kluwer Company wkauthorservices.editage.com/.../medicine.html
5. Epidemiology, Principle and Method, McMahon B, Trichopoulos D, by 2nd Edition, Boston, Little, Brown.

DC-13- CUTM1747 - Diagnostic Bacteriology

Subject Name	Code	Type of course	T-P-Pj	Prerequisite
Diagnostic Bacteriology	CUTM1747	Theory+ Practice	3-2-0	Fundamental Science

Objective

- To confirm the suspicion of infectious bacterial disease.
- To identify the etiologic agent by isolating the causative bacterial pathogen.

Course Outcome

- Study of Lab diagnosis for Enteric infection, Respiratory tract Infection, Oral & Stomach infection, Urinary tract infections.
- Study of control measures for nosocomial infection.
- Student can safeguard himself & society and can work diagnostics and hospitals

Course Outline

Module -I (10 Hours)

Aerobic Culture: Scope and importance of aerobic culture, Factors affecting aerobic culture, Various media and techniques of aerobic culture. Laboratory Diagnosis of Enteric Infections: (Terminology, mechanism of infection, etiology, conventional and rapid diagnostic methods) Enteric fever / Typhoid fever, Bacterial endocarditis, Bacteraemia, Septicemia, Pyrexia of unknown origin (PUO).

Practice:

1. Isolation & identification of different groups of bacteria in laboratory
2. Antibiotic susceptibility test
3. Preparation and use of different stains in bacteriology laboratory Grams stain, ZN stain, Albert stain, Spore stain, Capsule stain, Flagella stain, Motility test

Module -II (7 Hours)

Laboratory Diagnosis of Respiratory Tract Infection (RTI): (Terminology, mechanism of infection, etiology, conventional and rapid diagnostic methods) Lower RTI, Upper RTI. Laboratory Diagnosis of Urinary Tract Infection: (Terminology, mechanism of infection, etiology, conventional and rapid diagnostic methods)

Practice:

4. Anaerobic Culture
5. Laboratory Diagnosis of Pus
6. Laboratory Diagnosis of GI Tract

Module -III (10 Hours)

Laboratory Diagnosis of Oral, Throat and Stomach Infection**:** (Terminology, mechanism of infection, etiology, conventional and rapid diagnostic methods) Gingivitis and anaerobic infection of oral cavity. Peptic ulcer (with emphasis in mechanism of peptic ulcer caused by *Helicobacter pylori)*, Laboratory Diagnosis of Eye Infection: (Terminology, mechanism of infection, etiology, conventional and rapid diagnostic methods) Corneal ulcer, Conjunctivitis.

Practice:

7. Laboratory Diagnosis of Mycobacterium Infection
8. Laboratory Diagnosis of Venereal Diseases
9. Performance of different Tests Rapid Diagnostic Tests Molecular Tests 8 hours Interpretation of Test Results 5 hours Test reporting

Suggested Readings:

1. Textbook of Microbiology- Ananthanarayan & Paniker (10th Ed)
2. Medical Microbiology-by Fritz H. Kayser et al
3. Bailey and Scott's Diagnostic Microbiology(12th) Ed
4. Essential Medical Microbiology- by Rajesh Bhatia (4th Ed)
5. Clinical Microbiology Procedures Handbook- by Amy L. Leber (4th Ed)

6. The short text book of medical microbiology- by Satish Gupte (10th Ed)

DC-14 - CUTM1745 - Diagnostic Mycology

Subject Name	Code	Type of course	T-P-Pj	Prerequisite
Diagnostic Mycology	CUTM1745	Theory+ Practice	3-1-0	Fundamental Science

Objective

- To confirm the suspicion of fungal disease.
- To identify the etiologic agent by isolating the causative fungal pathogen.

Course Outcome

- This course provides learning opportunities in the basic principles of medical microbiology and infectious fungal diseases.
- The course provides the conceptual basis for understanding pathogenic fungi and the mechanisms by which they cause disease in the human body.
- Student can safeguard himself & society and can work diagnostics and hospitals

Course Outline

Module-I (11 Hours)

Diagnostic Mycology: Medically important fungi, Opportunistic Fungi

Fungal Diseases: Mycoses

1. Superficial mycoses
2. Subcutaneous mycoses
3. Cutaneous mycoses: Trichophytosis, Microsporiosis, Epidermophytosis.
4. Systemic mycoses: Histoplamosis, Blastomycosis, Cryptococcosis, Coccidioidosis, Paracoccidioidosis .

Practice:

1. Antifungal Sensitivity Test: Antibiotics.
2. Preparation of stock solution of drug

Module- II (12 Hours)

Pathogenesis and Laboratory Diagnosis of Mycotic Infections: Aspergillus spp, Candida albicans, Fusarium spp, Cryptococcus neoformans, Histroplasma capsulatum, Sporothourixspp, Philophora spp., Trichophotonmicrosporium, Epidermphyton spp. Blastomyces dermastitidis, Coccidiodisimmitens.

Practice:

3. Dilution technique
4. Determination of Minimal inhibitory concentration (MIC)

Module-III (17 Hours)

Isolation and Identification of Fungi (Laboratory Diagnosis):A. Selection, collection and transportation of specimens 5 hours Skin, Hair, Nail, Mucous membranes, Ear, eye, Cornial ulcer, Pus, Blood, Biopsy, Sputum, Urine, Vaginal and Cervical swab, Stool samples, Plural and peritonial fluid, Superficial, sub-cutanious and cutanious samples.B. Smear Preparation: 2 hours KOH Preparation, 20% KOH with 20% Glycerol, KOH – DMSO (DimethyalSulphoxide) 100% Lactophenol Cotton Blue, India ink preparation.

Practice:

5. Preparation of different media, chemical and stain for fungus study
6. Isolation and identification of different fungi of medical important

Suggested Readings:

1. Textbook of Microbiology- Ananthanarayan & Paniker (10th Ed)
2. Medical Microbiology-by Fritz H. Kayser et al
3. Fundamental medical mycology / Errol Reiss, H. Jean Shadomy, and G. Marshall Lyon III
4. Essential Medical Microbiology- by Rajesh Bhatia (4th Ed)
5. Clinical Microbiology Procedures Handbook- by Amy L. Leber (4th Ed)
6. The short text book of medical microbiology- by Satis Gupte (10th Ed)

DC-15- CUTM1743- Diagnostic Virology

Subject Name	Code	Type of course	T-P-Pj	Prerequisite
Diagnostic virology	CUTM1743	Theory +Project	3-0-1	Basic virology

Objective

- Understanding laboratory diagnosis of virus by both conventional and molecular approach.
- To produce a cadre of specialized medical virologists who would help establish clinical diagnostic services in various hospitals/centres.

Course Outcome

- Organise sample collection, transportation, processing and storage in an appropriate manner.
- Plan, write and implement research projects in virology, analyze their results and publish these in peer-reviewed journals.
- Coordinate with concerned agencies regarding viral diseases and their outbreaks.
- Plan and execute epidemiological studies and provide advice in relation to viral diseases.

Course Outline

Module I

Laboratory Organization: Guidelines on Establishment of Virology Laboratory by WHO – key elements of a virology laboratory- Room (space), Electricity, Water supply, Sterility etc.

Specimen management- Selection of specimen, specimen collection, optimal times for collection of specimen, specimen transport and storage, Biosafety- Personal protective equipment , Minimizing equipment and technique-related hazards, Management of laboratory waste, Labelling of wastes etc. Quality systems – Documentation and Standard Operating Procedure (SOP).

Module II

Clinical Virology-

Viral infections of the skin - including pediatric exanthems and enanthems, Viral respiratory infections- pharyngitis, croup, bronchiolitis, pneumonia etc , Viral CNS infections - encephalitis, meningitis, acute

flaccid paralysis, etc. Viral gastroenteritis - viruses causing diarrhea. Viral hepatitis – due to HAV, HBV, HCV, HDV, HEV etc.Viral infections in the immunocompromised persons–in transplant recipients. Congenital viral infections – Human Cytomegalovirus (HCMV), rubella virus, Varicella Zoster Virus (VZV), etc. Sexually transmitted viral infections .Oncogenic viral infections .HIV/AIDS.

Project Topic: Middle East respiratory syndrome (MERS) respiratory infection in human.

Project Topic: Severe acute respiratory syndrome (SARS) respiratory infection in human.

Module III

Virological techniques for cultivation and identification of virus- Isolation of viruses- Cell (tissue) culture; - Embryonated hen's egg inoculation (various routes) - Animal inoculation method. Identification of virus- Direct examination of specimen: Electron microscopy (TEM and SEM), Staining and microscopy for viral inclusion bodies, Molecular techniques for direct identification of viral genomes- Nucleic acid amplification techniques (PCR, real-time PCR, etc). Indirect Examination of specimen: Cytopathic effect, Neutralization assay, Haemadsorption etc and serological assay (Immunofluroscence, Haemagglutination inhibition assay (HAI), Complement fixation tests (CFT) and ELISA. Antiviral drugs, Laboratory diagnosis of important DNA and RNA viruses.

Project topic: Molecular methods for laboratory diagnosis of corona virus (CoV).

Project topic: Comparative study of serological and molecular methods for lab diagnosis of corona virus (CoV).

Suggested Readings:

1. Bailey & Scott's Diagnostic Microbiology. (e-book-https://www.pdfdrive.com/bailey-scotts-diagnostic-microbiology-e187863782.html)
2. Basic virology by Edward K. Wagner. (e-book -https://www.pdfdrive.com/basic-virology-e18900518.html)
3. Essential in clinical microbiology by C A Kauffman and J D Sobel, 2nd Ed. (Ebook-link- https://www.pdfdrive.com/essentials-of-clinical-mycology-second-edition-e39564930.html)

DC-16- CUTM1744- Diagnostic Parasitology

Subject Name	Code	Type of course	T-P-Pj	Prerequisite
Diagnostic Parasitology	CUTM1744	Theory+ Practice	3-1-0	Basic Parasitology

Objective

- To explain the mechanisms of pathogenesis from a gross, microscopic and molecular perspective.
- Recognize the disgnostic stage of the infection under the microscope and to manage the infected patient.
- To examine parasites and parasitism, emphasizing the influence of parasites on the ecology and evolution of free-living species, and the role of parasites in global public health.

Course Outcome

- Organise sample collection, transportation, processing and storage in an appropriate manner.
- Plan, write and implement research projects in parasitology, analyze their results and publish these in peer-reviewed journals.
- Coordinate with concerned agencies regarding protozoan and helminth diseases and their outbreaks.
- Plan and execute epidemiological studies and provide advice in relation to protozoan diseases.

Course Outline:

Module I

Laboratory Organization (Parasitology Lab). Selection, Collection, Perseveration and Transportation of Samples.

Practice: Safety measures in Parasitology lab and laboratory organization.

Module II

Laboratory Diagnosis, of the Intestinal and Vaginal Parasites:

(Terminology, mechanism of infection, etiology, conventional and rapid diagnostic methods) **Protozoa:** Entamoeba histolytica, Giardia lamblia, Trichomonas spp, Cyrptosporidium, Cyclospora cayantenensis, Isospora

Helminthes: Ascaries lumbricoides, Hook worm: Anacyclostoma and Necator, Enterobius vermicularis, Trichuris trichuira, Strongloides spp., Taenia spp., Echinococcus spp., Hymonolepis nana. Tissue and Blood Parasites:Malaria spp, Leishmania spp(Kalaazar), Wachereria spp. Brugia, Loaloa, Oncocerca, Dracuhculus, Paragonimus westermani/hertmani.

Practice: Examination of stool for parasite identification. Examination of clinical sample for parasite identification.

Module III

Laboratory Diagnosis of Various Parasites: Direct method, Indirect method, Rapid methods, Molecular Technique -Parasite Culture. Different Stains used in Diagnostic Parasitology.

Practice: Demonstration of different rapid methods for parasite identification.

Suggested Readings:

1. Textbook of medical Parasitology.
   (e-book link- https://www.pdfdrive.com/textbook-of-medical-parasitology-textbook-of-medical-parasitology-e128716897.html)
2. Parasitology book by K.D. Chatterjee.
   (e-book link- https://sites.google.com/site/bkthrtrpazg/atahrgiwu.
   https://www.goodreads.com/book/show/24366965-parasitology-protozoology-and-helminthology-with-two-hundred-fourteen.)
3. Stool Examination
   https://www.youtube.com/watch?v=_ePqcdDKCe0
   https://www.youtube.com/watch?v=MRzUXg8kFiY
   https://www.youtube.com/watch?v=-iI2PxmHxuo
4. Malaria thick smear preparation.
   https://www.youtube.com/watch?v=WPP7AjmStBg
5. Malaria thin smear preparation.
   https://www.youtube.com/watch?v=acoALifVvb8

DC-17- CUTM1754- Mini Project

Subject Name	Code	Type of course	T-P-Pj	Prerequisite
Mini Project	CUTM1754	Project	0-0-2	Basic Medical science

The student is supposed to carry out project work in assistance with a mentor. The project should be relevant to the syllabus and should be qualitatively initiated towards fetching a research publication/ case study/ clinical study/ community service/ survey on successful completion within the stipulated time.
Outcome: Research paper publication/ new idea generation/ case study/ clinical study/ community service/ survey.

DC-18- CUTM1755 - Internship

Subject Name	Code	Type of course	T-P-Pj	Prerequisite
Internship	**CUTM1755**	Project	0-0-12	Basic Medical science

Internship Thesis Guideline

This Guideline is designed to provide students the knowledge and practice of public health research activity, to enable them to carry out researches and solve research related problems and to help them in writing thesis and defend their work. Upon successful completion of the course, the students shall be able to:

1. Search relevant scientific literature
2. Develop a research proposal
3. Employ appropriate data collection techniques and tools
4. Manage collected data
5. Analyze data with appropriate statistical techniques
6. Write thesis
7. Defend the findings

Proposal Development:

At the ending of third year (Sixth Semester), students individually consultation with designated faculties and extensive literature survey will develop research proposal during the initial 6 months period.

Data Collection/ Thesis Writing:

Students will carry out data collection, data management, data analysis, and thesis writing during theremaining period (Six Semester).
The Dissertation should have following format:

1. Title
2. Introduction
3. Materials and Methods
4. Results
5. Discussion
6. Conclusion
7. Recommendation
8. References
9. Appendix

Internship

1. Case record

2. Lab management and ethics
3. Evaluation -Guide(internal)
    a. -Industries guide(external)
    b. -University-project report/ Viva

DC-19- CUTM1756 - Project

Subject Name	Code	Type of course	T-P-Pj	Prerequisite
Project	**CUTM1756**	Project	0-0-12	Basic Medical science

Project work:

Suggested Project title

1. Antibacterial activity of sweet orange (citrus sinesis) on *Staphylococcus aureu*s and *Escherchia coli* isolated from wound infected.
2. The incidence of *Salmonella* and *Escherchia coli* in livestock (Poultry) feeds
3. Microbial evaluation of milk from a dairy farm.
4. Gastroenteritis in primary school children (6-12yr) of specific locality.
5. Comparative analysis of microbial load of the main water production and water available toCUTM campus