CENTURION UNIVERSITY OF TECHNOLOGY AND MANAGEMENT, ODISHA

SCHOOL OF PARAMEDICS AND ALLIED HEALTH SCIENCES

BACHELOR OF SCIENCE IN MEDICAL LABORATORY TECHNOLOGY

2021

SYLLABUS

BACHELOR OF SCIENCE IN MEDICAL LABORATORY TECHNOLOGY

Programme Structure

BASKET 1	**BASKET 2**	**BASKET 3**	**BASKET 4**	
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	AECC-I AECC-II	SFS-1 SFS-2 SFS-3 SFS-4 SFS-5	**TOTAL CREDITS**
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	CUTM1720	Histology	3+1+0	4
DC-5	CUTM1727	Advanced Hematology	3+1+0	4
DC-6	CUTM1721	Research Methodology	2+0+1	3
DC-7	CUTM1738	Analytical Biochemistry	3+2+0	5
DC-8	CUTM1749	Applied Haematology	3+2+0	5
DC-9	CUTM1750	Immunopathology	3+0+1	4
DC-10	CUTM1748	Parasitology	3+2+0	5
DC-11	CUTM1742	Basic Computer and Information Science	0+2+0	2
DC-12	CUTM1725	Blood Banking	3+0+1	4
DC-13	CUTM1751	Medical Laboratory Management	3+0+2	5
DC-14	CUTM1753	Introduction to Quality and Patient Safety	3+0+2	5
DC-15	CUTM1752	Mycology & Virology	3+2+0	5
DC-16	CUTM1754	Mini Project	0+0+2	2
DC-17	CUTM1755	Internship	-	12

DC-18	CUTM1755	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-1 (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-2 (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-3 (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(14hrs)

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=f alse)

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 and as 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

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

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)

   Fundamentals of Immunology: Death by Friendly Fire
   (Coursera link: https://www.coursera.org/learn/immunology-friendlyfire)
3. 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 the most 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 clinical conditions.

Identify the various skills necessary to perform blood counts, evaluate blood elements,and report results within the stated limits of accuracy.

Describe the various components of blood ,their functions,and roles in various disease states.

To be able to demonstrate good skills in the relevant Hematology laboratory methodology.

Collection of blood for the investigations.

Be able to distinguish the developmental stages of blood cells.It will also cover 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, Sahali'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 BlastCells.

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 (Sahali'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 cultures of 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.

CourseOutline

Module -1(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-2 (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:

4. To demonstrate simple staining (Methylene blue)
5. 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-3 (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:

6. Biochemical tests for identification of bacteria
7. Preservation of stock cultures of bacteria
8. 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 law as it relates 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 - CUTM1720- Histology

Subject Name	Code	Type of course	T-P-Pj	Prerequisite
Histology	CUTM1720	Theory+Practice	3-1-0	Basic Medical Science

Objective

Understanding the concept of histotechnology; Basic concepts about routine methods of examination of tissues Collection.

perform routine laboratory procedures encompassing all major areas of the histology laboratory.

accurately and proficiently embed tissue and understand the principles of microtomy.

Clinically relevant onchological analysis for deeper understanding of abnormal cell growth at anywhere in human body.

The conceptual understanding of the subject provides opportunities for employability and scopes for higher education.

Course Outcome

In this section students will be made aware of terminology used in

histotechnology, various instruments and their maintenance and also learn the processing of various samples for histopathological investigations.

Reception and labeling of histological specimens.

Use of antiseptics, disinfectants and insecticides in a tissue processing laboratory.

The students will learn about various staining procedures for demonstration of different substances & various cytological investigations.

The students will learn about special staining procedures & handling & testing of various cytological specimens.

CourseOutline

Module- I (8 Hrs)

Histotechnology, Care & Maintenance of histotechnology equipements and their parts and Safety measures of laboratory equipment used in histotechnology. Basic concepts about routine methods of examination of tissues, Collection and transportation of specimens for histological examination, fixation: Process, Various types of fixatives used in a routine histopathology laboratory- Simple fixatives, Compound fixatives, Special fixatives for demonstration of various tissue elements.

Practice: Care & maintenance of Histology equipments, Collection & transportation of specimens, Fixation

Module- II (8 Hrs)

Decalcification Criteria of a good decalcification agent, Technique of decalcification Followed with selection of tissue fixation, decalcification neutralization of acid and thorough washing. Various types of decalcifying fluids, Processing of various tissues for histological examination, Embedding, Schedule for manual or automatic Tissue processing, Components & principles of various types of a tissue processors.

Practice: -Method of Decalcification, Embedding, manual or automatic tissue processings schedule.

Module- III (10 Hrs)

Periodic Acid Schiff Staining, Impregnation and Mountains, Commonly used mountains in histotechnology lab. General Staining Procedures (routine H&E stain, PAP stain and other special stain) for Paraffin Infiltrated and Embedded tissue, To perform & practice the manual & automated Haematoxylin and Eosin staining technique, To perform & practice the Mallory's Phosphotungstic

Acid Haematoxylin (PTAH). Introduction of FNAC and its staining tech, museum technique, post mertum technique.

Practice:

Procedure for manual Staining and Automatic Staining Technique, FNAC technique, Museum technique(Hospital Visit), Post mertum technique(Hospital Visit).

Module- IV (8 Hrs)

Demonstration of instruments used for dissection Use of antiseptics, disinfectants and insecticides in a tissue processing laboratory Reception and labeling of histological specimens Preparation of various fixatives -Helly's fluid, Zenker's fluid, Bouin's fluid, Corney's fluid, 10% Neutral formalin, Formal saline, Formal acetic acid, Pereyn's fluid, prepare 70% alcohol from absolute alcohol. To perform embedding and casting of block.

Practice:

Use of antiseptics, disinfectants and insecticides in tissue processing laboratory, Preparation of various Fixatives, Labeling of Histological specimens, Embedding and Casting of block

Module- V (8 Hrs)

Tissue Processor, Microtomy, Honing and Stropping technique, Use of tissue floating bath, Use of incubator

Practice:

Processing of tissue by manual and automated processor. method To demonstrate various part and types of microtome. To learn sharpening of microtome knife (Honing and stropping technique) To perform section cutting, learn mounting of stained smears. To practice attachment of tissue sections to glass slides To learn using tissue floatation bath drying of sections in incubator (37^0 C)

Suggested Readings:

1. Color text book of histology by Gartner &Hiatt, publisherElsevier
2. Netter's essential histology by William Ovalle, publisherElsevier
3. Histology E-book by Barry Mitchell, publisherElsevier
4. Textbook of Histology (color atlas) by Krishna Garg, Indira Bahl, Mohini kaul, publisherCBS
5. Textbook of Histology and a Practical Guide by JP Gunasegaran, PublisherElsevier
6. Textbook of Medical Laboratory Technology by Praful B Godkar, Publisher Bhalami
7. Ebook link- https://books.google.co.in/books?id=qWScAQAAQBAJ&printsec=frontcover&source=gbs_ge_summary_r&cad=0#v=onepage&q&f=false

8. Ebook link- https://books.google.co.in/books?id=MrpEDwAAQBAJ&printsec=frontcover&source=gbs_ge_summar y_r&cad=0#v=onepage&q&f=false
9. Ebook link- https://books.google.co.in/books?id=CERPDwAAQBAJ&printsec=frontcover&source=gbs_ge_summar y_r&cad=0#v=onepage&q&f=false

DC-5- CUTM1727- Advanced Hematology

Subject Name	Code	Type of course	T-P-Pj	Prerequisite
Advanced Hematology	CUTM1727	Theory+Practice	3-1-0	Fundamental Medical science

Objective

The overall aims are that the student should obtain advanced knowledge of the most common hematologic diseases & understanding the concept of Blood cells and other blood components.

Demonstrate an understanding of the components of human blood and characteristics, functions, and abnormalities and disease states of each.

Demonstrate proficiency in the skills necessary to perform blood cell counts, and evaluation of blood elements within stated limits of accuracy.

Determine suitability of hematology specimens and dispose of them in the appropriate bio-hazard containers.

Course Outcome

Differentiate various hematological procedures and the use of basic equipment essential to working in a Hematology Laboratory.

Discuss differences between Quality control, Quality Assurance, and Continuing Quality Improvement principles as used in the Hematology Laboratory.

Categorize various hematology analyses, operational principles of various hematology instruments, and troubleshooting of various instruments.

Explain the principles and theories utilized in a variety of problem-solving situations.

Compare and contrast hematology values under normal and abnormal conditions

Course Outline

Module-I (8Hrs)

Quality assurance in hematology: Internal and external quality control including reference preparation Routine quality assurance**,** Protocol, Statistical analysis i.e. Standard deviation, Co-efficient variation, accuracy and precision, Safety precautions in hematology**.** Basic concepts of automation in hematology with special reference to: Blood cell counter, Coagulometer.

Practice: Collection of blood from different body parts. Data and record Maintain, Handling hematological equipments.

Module-II (12 Hrs)

Bone marrow examination:

1. Composition and functions, Aspiration of bone marrow (Adults and children), Processing of aspirated bone marrow (Preparation & staining of smear)

2. Brief knowledge about examination of aspirated bone marrow (differential cell counts and cellular ratios) .Special Stain for Bone Marrow -Periodic Acid Schiff, Sudan Black

3. Leukemia: Classification, Blood Picture, Differentiation of BlastCells. Laboratory diagnosis of leukaemias , Processing and staining of trephine biopsy specimens.

Practice: Method of aspiration bone marrow, method of Processing and staining of trephine biopsy.

Module-III (10 Hrs)

L.E. cell phenomenon

1. Definition of L.E. cell, Demonstration of L.E. cell by various methods , Clinicals Physiological variations in Hb, PCV, TLC and Platelets. Investigations of a case suffering from bleeding disorders.
2. Quantitative assay of coagulation factors - **a**. Principle **b**. Procedure **c**. Mechanism **d**. Tests
3. Biomedical waste management in hematology laboratory (Other than Radioactive material)

Practice-: Demonstration of functional aspect of blood cell counter Study the RBCs abnormal morphological form -**a.** Variation in size, shape and staining Character, **b.** Red cell inclusion, ***c.*** Identify morphologically the- Immature Erythroid series of cells **d.** Immature Myeloid ad other WBCs series of cells

Module-4 (10 Hrs)

Demonstration of various parts of centrifuge; its functioning and care, Cleaning and drying of glass and plastic ware, Cleaning of glass, syringes and its sterilization. Preparation of various anticoagulants, Preparation of buffers, Preparation of the stains and other reagents.

Practice: Use centrifuge machine to separate serum & plasma from whole blood cells, Sterilization, Buffer & stain preparation.

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-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 research from inception to completion using a wide range of techniques.

Course Outcome

Students can understand the ethical and philosophical issues associated with research in 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 and findings.

Enable students to be reflexive about their role and others' roles as researchers.

Course Outline

Module- I (9Hrs)

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 and semi 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 biochemical laboratory.

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-II (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: Estemate 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_st udents/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

DC8-CUTM1749-Applied Hematology

Subject Name	Code	Type of course	T-P-Pj	Prerequisite
Applied Hematology	CUTM1749	Theory+Practice	3-2-0	Basic Medical science

Objective

The overall aims are that the student should obtain advanced knowledge of the most common hematologic diseases & understanding the concept of Blood cells and other blood components.

Demonstrate an understanding of the components of human blood and characteristics, functions, and abnormalities and disease states of each.

Demonstrate proficiency in the skills necessary to perform blood cell counts, and evaluation of blood elements within stated limits of accuracy.

Determine suitability of hematology specimens and dispose of them in the

appropriate bio-hazard containers.

Course Outcome

The students be made aware of Safety precautions, Quality assurance, biomedical waste management and automation in haematology. It will also cover Red cell abnormalities, Disorder of leukocytes, Investigations of a case suffering from bleeding disorders, To learn about tests carried out for hematological investigations.

Understanding of Haemopoietic disorders, laboratory diagnosis of leukemia, hemolytic anemia.

Collection & preservation of blood for the investigations.

Course Outline

Module-I (12Hrs)

Laboratory diagnosis of leukaemias Definition and laboratory diagnosis of Leukamoid reactions. Cytochemical staining, procedure and their significance in various haemopoietic disorders. Laboratory diagnosis of iron deficiency anaemia, Laboratory diagnosis of megaloblastic anaemia ,Laboratory diagnosis of haemolytic anemia.

Practice: Collection of blood from different body parts. Data and record Maintain, Handling hematological equipments, Demonstrate the different abnormal morphology of RBCs in Anemia cases.

Module-II (8 Hrs)

Chromosomal studies in various hematological disorders and their significance. Mechanism of normal fibrinolysis and Laboratory diagnosis of hyperfibrinolysis. Mechanism and laboratory diagnosis of disseminated intravascular coagulation (DIC).

Practice: Laboratory diagnosis of Hyperfibrinolysis (D- dimer Method), laboratory diagnosis of disseminated intravascular coagulation (DIC)

Module-III (14 Hrs)

Laboratory diagnosis of Hemophilia and von-will brand disease. Laboratory diagnosis of Idiopathic thrombocytopenic purpura (ITP), Platelet function tests and their interpretation.

Practice: Complete Blood Count, Total Platelet Count, Bleeding time, Clotting time, Activated Partial Thromboplastin Time (APTT) Test, Prothrombin Time (PT)

Module-IV (12Hrs)

Measurement of:

1. Blood volume, b. Determination of Red cell volume and Plasma volume, c. Red cell life span,
2. Platelet life span. Estimate serum iron, total iron, Hb-F, Plasma and urine hemoglobin. Demonsrtrate the presence of Hb-S by Sickling and solubility, Perform various Platelet functiontest.

Practice: Demonstration the sickle cells, To estimate serum iron and total iron binding capacity. To estimate Hb-F in a given blood sample. To estimate plasma and urine. Haemoglobin in the given specimens. To demonstrate the presence of Hb-S by Sickling and solubility tests.

Suggested Readings:

1. Textbook of Medical Laboratory Technology P.B Gotkar Mumbai, Bhalani Publishing House
2. 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-9- CUTM1750- Immunopathology

Subject Name	Code	Type of course	T-P-Pj	Prerequisite
Immunopathology	CUTM1750	Theory+ Project	3-0-1	Fundamental Science

Objective

To understand how the immune system is working, about the components of the immune system, their functioning, the defense mechanisms against different pathogens (viruses, bacteria, and parasites), the pathogenesis of immune diseases (hypersensitivity, autoimmunity, immunodeficiencies), and on the mechanisms underlying the rejection of the transplants and the antitumor immune response.

It also provides knowledge of the main immunological techniques used in research and diagnostics.

Course Outcome

To know and describe the organization and functioning of the immune system, its cells and its molecules.

To know the principles of diagnostic tests described on immunological techniques.

To know the fundamental stages of the immune system and its changes over the course of life (intrauterine life, newborn, adult, elderly)

The conceptual understanding of the subject provides opportunities for employability and scopes for higher education.

Course Outline

Module I (7 Hrs)

Basic Components of the Immune System, Immunological Techniques, Immune Regulation, Immunological Aspects of Infection, Immunological Aspects of Immunodeficiency Diseases.

Module II (8 hrs)

Autoimmunity, Blood related disorder, Chronic Lymphocytic Leukemia, Immunology of HIV Infections and other viral infection, Immunological Aspects of Allergy and Anaphylaxis, Immunological Aspects of Skin and venereal Diseases.

Module III (10 hrs)

Experimental Approaches to the Study of Autoimmune Rheumatoid Arthritis Diseases, Immunological Aspects of Cardiac Disease, Immunological Aspects of Chest Diseases Pulmonary Tuberculosis

(MDRT), and XDRT, Immunological Aspects of Gastrointestinal and Liver in case of Hepatitis, Immunological Aspects of Endocrine Disease (Thyroid, diabetes, hypertension), Immunological aspects of organ transplantation.

Suggested Readings:

1. Text book of Microbiology by Ananthanereyan&Paniker, Publisher Universitiespress
2. Short text book of Medical microbiology by Satish Gupte, Publisher Jaypeebrotthers
3. Medical laboratory Technology vol.I ,II, III by K L Mukherjee, Publisher McGraw Hill education
4. Medical Laboratory manual for tropical countries Vol II Microbiology by MoniaCheesbrough, publisher Butterworth Heinemannltd
5. Immunology by Ivan Roitt, JonathaanBrostoff and DavidMale.

DC-10- CUTM1748- Parasitology

Subject Name	Code	Type of course	T-P-Pj	Prerequisite
Parasitology	CUTM1748	Theory+Practice	3-2-0	Fundamental Science

Objective

Describe basic morphology, life cycle, pathogenesis, lab diagnosis and treatment of parasites (Protozoa, metazoa and Helminth)

Perform appropriate laboratory techniques used in the processing of specimens and identification of parasites.

Course Outcome

Identification of pathogenic parasite in disease diagnosis and treatment.

The conceptual understanding of the subject provides opportunities for employability and scopes for higher education.

To serve as a resource for the clinical laboratories professionals in the different region.

Course Outline

Module-I

Introduction to Medical Parasitology, General characteristics and classification of protozoa and helminthes. Collection, Transport, processing and preservation of samples for routine parasitological investigations.

Practice: Method of sample Collection, Transport, processing and preservation of samples for routine parasitological investigations.

Module II

Morphology, life cycle and lab diagnosis of *Giardia* and *Entamoeba*, T.*solium, T.saginata,* malaria parasite with special reference to *P. vivax and P. falciparum* and *Leishmania donovani* (Kala azar). Morphology, life cycle and lab diagnosis of hook worm and round worm *(Ascaris lumbricoides and Anchylostoma duodenale).*Most common symptoms of parasitic infection and diagnosis and treatment methods. Procedures used in microscopic examination of stool from a parasitic infected individual.

Practice: Routine Stool examination for detection of intestinal parasites. Concentration techniques for demonstration of Ova (Principles and applications). Identification of adult worms from model's or slide's method.

Module III

Laboratory Diagnosis of Various Parasites: Direct method, Indirect method. Rapid Diagnostic Tests (RDTs), Quantitative buffy coat assay (QBC), Malaria Rapid diagnostic test (MRDT), Leishmanin test.

Practice: Demonstration of some rapid diagnostic method used 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

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 to purchase computer equipment.

Identify how to maintain computer equipment and solve common problems relating to computer hardware.

Identify how software and hardware work together to perform computing tasks and how 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's hardware 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 - CUTM1725- Blood Banking

Subject Name	Code	Type of course	T-P-Pj	Prerequisite
Blood Banking	CUTM1725	Theory+ Project	3-0-1	Fundamental Science

Objective

Understanding blood bank method, demonstrate knowledge of testing

Knowledge of Anticoagulant used in blood bank

Get knowledge about blood regulation policy

Understanding solid organ transplantation and it’s policy

Basic of transfusion reaction

Investigation related to blood bank

Course Outcome

Perform phlebotomy and related donor room activity in blood bank

Manage the blood bank

Identifies and communicate abnormal test report by alerting supervisory personal

Organize blood donation blood bank

Inventory and stock management in blood bank

Perform and maintain record of QC procedure related reagents, kits and equipments.

Course Outline

Module-I(11 Hrs)

Basic principle in blood banking, Blood bank organisation, Planning and documentation, NACO Blood bank policy, National blood policy, Equipment used in blood bank. Anticoagulant use in blood bank, Selection of blood donor, Rhesus blood group system, Human blood group system

Practice: Documentation, ABO Grouping, RH Typing, Operation of equipment.

Module-II (14 Hrs)

Auto-mentation technique used in blood bank, Techniques used for the separation of blood constituent, CBC, Blood preservation, Special investigation for processing of blood under the guide lines of NACO, Routine investigation for processing of blood, Phlebotomy in blood bank, Quality control in blood bank

Practice: Phlebotomy in blood bank, Cross matching and compatibility test, Measurement of Blood Pressure, Arrangement of blood bank lab

Module-III (20 Hrs)

Blood transfusion alternative, Prevention of diseases transmitted through blood transfusion, Transfusion reaction investigation, Transfusion reaction, Precaution taken for infusion of blood components, Pre-transfusion testing, Transfusion in solid organ transplantation, Exchange blood transfusion, Pre-surgical

blood transfusion, Blood and blood components transfusion, Selection of blood components, Aphersis and Hemapheresis

Practice: Routine hematological test, HIV, VDRL, Hbs-Ag, Other STD Test.

Suggested Readings:

1. Textbook of Clinical laboratory methods and diagnosis by Gradwohls, Publisher Mosby
2. Modern Blood Banking and transfusion Practice by Denise M Harming
3. Standards of blood bank by NACO (http://naco.gov.in/sites/default/files/Standards%20for%20Blood%20Banks%20and%20Blood%20Transfusion%20Services.pdf)
4. Handbook of blood banking and transfusion medicine (http://www.uomisan.edu.iq/library/admin/book/77040715888.pdf)
5. Medical laboratory technology Vol.1 by K. L. Mukherjee, 2007, Publisher Tata McGrawHill
6. Textbook of medical laboratory technology by Praful B Godkar, Publisher Bhalan
7. Medical laboratory science theory and practice by J Ochei and Kolhatkar, 2002, Tata McGraw- Hill, Publisher TBS

DC-13- CUTM1751- Medical Laboratory Management

Subject Name	Code	Type of course	T-P-Pj	Prerequisite
Medical Laboratory Management	CUTM1751	Theory+ Project	3-0-2	Fundamental Science

Objective

Explain and apply principle of effective test utilization

Interpret, implement and complying law, regulation, accrediting standards and guidelines of Govt. and NG organizations.

Design, implement and evaluate resources in lab

Communicate effectively with laboratory personnel and health care professional.

Explain and apply the major principle and tactics of laboratory administration.

Course Outcome

Become professional competent in medical laboratory

Exhibit a sense of commitment to the ethical and human aspect of patient care

Recognize the role of clinical laboratory scientist in the assurance of quality health care

Application of safety and governmental regulation and standards as applied to medical laboratory practice.

Course Outline

Module-I(16 Hrs)

Ethics of pathological clinics, Code of conduct for medical laboratory personal, Safety measure in the laboratory, Organization of Pathology laboratory under board of quality control, Clinical laboratory science, Functional components of the clinical laboratory, A Standardized clinical laboratory set up, Various types of laboratories, PPE in labs, Important instruction to minimize infection in laboratory workers

Practice: PPE Practice, Lab Setup, Sample collection and preservation.

Module-2 (16 Hrs)

Release of laboratory reports, Clinical alerts, Reporting results: Basic format of pathology reports, Transportation and preservation of lab sample, Patient management for clinical sample collection, National and international agency for clinical laboratory accreditation, Good laboratory practice, Medical legal problems,Laboratory regulation,Factors affecting productivity of laboratory, Responsibility of lab worker

Practice: Report writing, Lab record management

Module-3 (14 Hrs)

Quality management system, NABL Policy, Clinical establishment act policy, Annual maintenance contact for laboratory, General safety precautions in case of STD and drug resistant tuberculosis, Procurement and supply management, Different types of laboratory record management, Laboratory information management system (LIMS), Profit and loss analysis, WHO Policy for medical lab

Practice: Management information system, Procurement management, Profit and loss analysis

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

DC-14 - CUTM1753- Introduction to Quality and Patient Safety

Subject Name	Code	Type of course	T-P-Pj	Prerequisite
Introduction to Quality and Patient Safety	CUTM1753	Theory+ Project	3-0-2	Fundamental Science

Objective

Knowing patient safety
Report Distribution system
Laboratory infection control Policy
Bio-Medical waste management
Understanding Patient rights
ISO Policy for medical laboratory

Course Outcome

Know about rights and duties of patient
Know about right and duties of lab technician
Understand various policy to manage lab
Understand infection control procedure

Course Outline

Module-I (11Hrs)

Human factor Engineering, Patient safety, Health literacy, Report distribution system,

Error in reporting system, responding to adverse events, Investigation of error/ Root cause analysis, Medical Error, The science of safety

Practice: Safety precaution in laboratory, Report distribution, Prescription reading

Module-II (11 Hrs)

Team work and communication, Leadership, Quality control policy, Major development and evaluation in diagnostic division, Clinical establishment act policy, National accreditation board of laboratory, ISO Policy for medical laboratory, Fire and safety policy for medical laboratory

Practice: Fire Safety in lab, Documentation for Lab establishment

Module-III (13 Hrs)

Personal protective equipment in the laboratory, AIDS and laboratory safety, Safety protection in lab in STD and other infectious disease., Biomedical waste management, Patient care in medical laboratory, Patient rights., Counselling of patient during phlebotomy, First aid in medical laboratory service.

Practice: PPE, Bio-Medical waste management, First-Aid, Patient Counseling

Suggested Readings:

1. Understanding the patient safety (LANGE clinical medicine)
2. Textbook of Clinical laboratory methods and diagnosis by Gradwohls, Publisher Mosby
3. Medical laboratory technology Vol.1 by K. L. Mukherjee, 2007, Publisher Tata McGrawHill
4. Textbook of medical laboratory technology by Praful B Godkar, Publisher Bhalan
5. Medical laboratory science theory and practice by J Ochei and Kolhatkar, 2002, Tata McGraw- Hill, Publisher TBS

DC-15 - CUTM1752- Mycology & Virology

Subject Name	Code	Type of course	T-P-Pj	Prerequisite
Mycology and virology	CUTM1752	Theory+ Practice	3-2-0	General biology

Objective

To describe the characteristics and diseases caused by pathogenic viruses and fungi.

To perform basic laboratory techniques in mycology, to isolate fungus from clinical samples.

Understanding different methods of virus cultivation.

Understanding collection, transportation and preservation methods of clinical specimen.

Course Outcome

Broad idea about structure and basic characteristics of virus and fungus.

Plan, write and implement research projects in virology and mycology analyze their results and publish these in peer-reviewed journals.

Coordinate with concerned agencies regarding viral and fungal diseases and their outbreaks.

Plan and execute epidemiological studies and provide advice in relation to viral diseases.

Course outline

Module I

Introduction to medical mycology, Basic concepts about superficial and deep Mycoses. Taxonomy and classification and general characteristics of various medically important fungi. Normal fungal flora. Morphological, cultural characteristics of common fungal laboratory contaminants, Culture media used in mycology and staining process.

Practice-: To prepare culture media used routinely in mycology. To perform all the staining techniques for identification of fungi as mentioned in theory syllabus.

Module II

Direct microscopy in Medical mycology laboratory. Processing of clinical samples for diagnosis of fungal infections i.e. Skin, nail, hair, pus, sputum, CSF and other body fluids.Techniques used for isolation and identification of medical important fungi Methods for identification of yeasts and moulds.

Practice-: To identify given yeast culture (By performing various identification techniques studied in theory). To identify given mould culture (By performing various identification techniques studied in theory. To demonstrate dimorphism in fungi. To process clinical samples for laboratory diagnosis of fungal infection that is from skin, hair and nail etc.

Module III

Introduction to medical virology, Classification of viruses. Introduction to medically important viruses (Both DNA and RNA). Collection, transportation and storage of sample for viral diagnosis. Staining techniques used in Virology. Processing of samples for viral diagnosis (Egg inoculation and tissue culture). Antiviral drugs.

Practice: Demonstration of fertilized hen egg. Demonstration of various inoculation routes in fertilized hen egg.

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-8- 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- 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 aureus 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 to CUTM campus

DC-17- 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.

DataCollection/ThesisWriting:

Students will carry out data collection, data management, data analysis, and thesis writing during the remaining 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

Case record

Lab management and ethics

Evaluation -Guide(internal)

-Industries guide(external)

-University-project report/ Viva